

“The Swiss Pension Accounting Controversy”:
An Empirical Investigation of the Value-Relevance of Swiss Pension Plans

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“The standards of accounting, like those of any other field of human endeavor, should be in accord with the accepted hallmarks of clear thinking.”

(Paton & Littleton, 1940, p. 6)

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Abbreviations

Note. The list below excludes variables, mathematical symbols as well as generally accepted abbreviations applied, and may not be complete.

AAA	American Accounting Association
ABO	Accumulated Benefit Obligation
ACE	Accountancy Europe
AHV	Alters- und Hinterlassenenversicherung (Federal Old-age, Survivors' and Invalidity Insurance, OASI)
AIA	American Institute of Accountants
AICPA	American Institute of Certified Public Accountants
ALA	Asset-Liability Approach
APB	Accounting Principles Board
ARB	Accounting Research Bulletin
ARR	Accounting and Reporting Recommendation
ARS	Accounting Research Study
BFS	Bundesamt für Statistik (Swiss Federal Statistical Office)
BLUE / BUE	Best Linear Unbiased Estimator / Best Unbiased Estimator
BS	Balance-Sheet
BSV	Bundesamt für Sozialversicherungen (Swiss Federal Social Insurance Office)
BV	Bundesverfassung (Federal Constitution)
BVG	Bundesgesetz über die berufliche Alters-, Hinterlassenen- und Invalidenvorsorge (Federal Law on Retirement Provisions, Survivors Pension, and Disability Pension)
BVV	Verordnung über die berufliche Alters-, Hinterlassenen- und Invalidenvorsorge (Ordinance on Occupational Retirement, Survivors' and Disability Pension Plans)
BX	Berne eXchange
CAGR	Compound Annual Growth Rate
CAP	Committee on Accounting Procedure
CAPM	Capital Asset Pricing Model
CHF / CHFm / CHFbn	Swiss Franc / Million Swiss Francs / Billion Swiss Francs

CICA	Canadian Institute of Chartered Accountants
CLM	Classical Linear Model
CON	Concepts Statement
CORR	Corridor
CSR	Clean Surplus Relation
DAX	Deutscher Aktienindex (German Equity Index)
DB	Defined-Benefit
DC	Defined-Contribution
EBF	European Banking Federation
EC	European Commission
ED	Earnings Discount
EFRAG	European Financial Reporting Advisory Group
EU	European Union
FASB	Financial Accounting Standards Board
FER	Fachempfehlungen zur Rechnungslegung (Accounting and Reporting Recommendations, ARR)
FINMA	Swiss Financial Market Supervisory Authority
FS	Financial / Financial Services
G20	Group of Twenty
GAAP	Generally Accepted Accounting Principles
H	Hypothesis
HAC	Heteroskedasticity and Autocorrelation Consistent
IAS	International Accounting Standards
IASB	International Accounting Standards Board
IASC	International Accounting Standards Committee
ICB	Industry Classification Benchmark
IFRIC	International Financial Reporting Interpretations Committee
IFRS	International Financial Reporting Standards
IND	Industry
ISIN	International Securities Identification Number
IV	Invalidenversicherung (State Disability Insurance)
LIM	Linear Information Model

MEPP	Multi-Employer Defined Benefit Pension Plan
MFR	Minimum Funding Requirement
MLR	Multiple Linear Regression Analysis
OCI	Other Comprehensive Income
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
OR	Obligationenrecht (Code of Obligations)
P	Paper
PAYG	Pay-As-You-Go
PhD	Doctoral Thesis
PUCM	Projected Unit Credit Method
PVED	Present Value of Expected Dividends
REA	Revenue-Expense Approach
RIV	Residual Income Valuation
RQ	Research Question
SAA	Swiss Association of Actuaries
SDA	Schweizerische Depeschenagentur (Swiss Dispatching Agency)
SEC	Securities and Exchange Commission
SEPP	Single-Employer Defined Benefit Pension Plan
SFAS	Statement of Financial Accounting Standards
SGB	Schweizerischer Gewerkschaftsbund (Syndicate of Swiss Trade Unions)
SIC	Standard Interpretations Committee
SIX	Swiss Exchange
SLI	Swiss Leader Index
SMI	Swiss Market Index
SNB	Swiss National Bank
SPI	Swiss Performance Index
UNA	Unrecognized Net Assets
VIF	Variance Inflation Factor
WACC	Weighted Average Cost of Capital
WP	Working Paper

Abstract

Internationally, Switzerland has one of the highest ratios of occupational pension assets to GDP. Also, more than three-fourths of all employees are covered by a mandatory occupational pension scheme. Since long, accounting standard-setters throughout the world have been wrestling with the issue of pension accounting. In particular, how to best account for Swiss pension plans has been controversial. By law, these plans must be legally separate from the employer (i.e., sponsoring firm) and they have to be sufficiently funded. Nevertheless, in line with the International Accounting Standard No. 19 (IAS 19), *Employee Benefits*, Swiss pension plans must be classified as *defined benefit plans*, potentially triggering the recognition of a material net pension (asset)/liability (*NPL*) on the balance-sheet of the sponsoring (i.e., reporting) firm. Furthermore, net pension (income)/cost (*NPC*), to be recognized in profit or loss, has to be derived based on regular re-valuations of the *NPL*. In contrast, in line with the Swiss Accounting and Reporting Recommendation No. 16 (ARR 16), *Pension benefit obligations*, the recognition of the *NPL* arising from a Swiss pension plan is smoothed along the statutory funding ratio of the plan, and accordingly, *NPC* is mainly based on the employer contributions (*EC*) paid. Based on hand-collected data from annual reports of industry and financial firms listed in Switzerland, totaling 910 firm-year observations across the sample period of 2004 to 2012, evidence is provided here for the general decision-usefulness of financial information reported on Swiss pension plans. Notably, evidence suggests that net pension (income)/cost (*NPC*) recognized in profit or loss is generally more decision-useful to investors than the net pension (asset)/liability (*NPL*) recognized on the balance-sheet as well as the unrecognized net pension (asset)/liability (*NPLNR*) disclosed in the notes. Accordingly, findings are generally in support of a *Revenue-Expense Approach* (REA) to pension accounting. Further, the evidence presented here suggests that the decision-usefulness of pension accounting may also be dependent on industry classification (i.e., industry vs. financial sector) of the reporting firm. Lastly, the study may also contribute to the controversy about how to best account for Swiss pension plans. Notably, financial information on Swiss pension plans reported in line with IAS 19 (2004) is found to be more adequately reflected in the market value of equity of reporting firms, than respective information in line with ARR 16 (2005).

Zusammenfassung

Im internationalen Vergleich hat die Schweiz eines der höchsten Verhältnisse von Vorsorgevermögen zum BIP. Auch sind über drei Viertel aller Arbeitnehmer obligatorisch bei einer Pensionskasse versichert. Seit langem bekunden Standardsetzer weltweit Mühe bei der Erlassung geeigneter Standards zur Rechnungslegung von Vorsorgeverpflichtungen. Insbesondere erweist sich die Abbildung von Schweizer Vorsorgeplänen als umstritten. Per Gesetz sind solche Pläne vom Arbeitgeber rechtlich unabhängig und müssen entsprechend ausreichend finanziert sein. Nichtsdestotrotz gelten diese gemäss dem International Accounting Standard Nr. 19 (IAS 19), *Leistungen an Arbeitnehmer*, als sogenannte *Leistungsorientierte Pläne*. Demzufolge ist es möglich, dass eine wesentliche Nettovorsorgeverpflichtung (oder -vermögenswert, *NVV*) in der Bilanz des berichtenden Unternehmens erfasst werden muss. Weiter erfolgt die Erfassung des Nettovorsorgeaufwands (*NVA*) in der Gewinn- und Verlustrechnung (GUV) basierend auf regelmässigen Neubewertungen der *NVV*. Demgegenüber erfolgt nur eine teilweise Erfassung der *NVV*, basierend auf dem gesetzlichen Deckungsgrad des Vorsorgeplans, sofern der Schweizer Rechnungslegungsstandard Swiss GAAP FER Nr. 16 (FER 16), *Vorsorgeverpflichtungen*, Anwendung findet. Entsprechend umfasst hier der *NVA* grossmehrheitlich nur die Arbeitgeberbeiträge. Die Analyse basiert auf aus Geschäftsberichten erhobenen Daten, und umfasst 910 Beobachtungen von in der Schweiz börsenkotierten Industrie- und Finanzdienstleistungsunternehmen für den Stichprobenzeitraum von 2004 bis 2012. Die Studie liefert Evidenz für die grundsätzliche Entscheidungsnützlichkeit von Finanzinformationen über Schweizer Vorsorgepläne. Insbesondere deuten die Resultate darauf hin, dass der Nettovorsorgeaufwand (*NVA*), welcher in der GUV erfasst wird, insgesamt entscheidungsnützlicher ist, als die in der Bilanz erfasste Nettovorsorgeverpflichtung (*NVV*), sowie auch als der nicht erfasste, aber im Anhang offengelegte Teil der *NVV*. Diese Ergebnisse sind grundsätzlich im Einklang mit einem *Ertrag-Aufwand Ansatz* für die Rechnungslegung von Vorsorgeverpflichtungen. Weiter liefert die Studie Erkenntnisse dahingehend, dass die Entscheidungsnützlichkeit von Schweizer Vorsorgeplänen auch von der Industriezugehörigkeit (d.h. Industrie- oder Finanzsektor) des berichtenden Unternehmens abhängig sein kann. Abschliessend trägt die vorliegende Studie auch zur Kontroverse hinsichtlich der Abbildung von Schweizer Vorsorgeplänen bei. Die Ergebnisse zeigen, dass die entsprechenden Finanzinformationen nach IAS 19 (2004) adäquater im Marktwert des Eigenkapitals eines Unternehmens reflektiert werden, als dies bei FER 16 (2005) der Fall ist.

1 Introduction

1.1 Motivation and Research Questions

In a recent representative survey among 1,000 adults, the sustainability of the Swiss social welfare system has been identified as *the* main worry citizens of Switzerland currently have (Golder et al., 2017). The Swiss social welfare system is built upon three pillars (i.e., *Drei-Säulen-Konzept*). The focus of this research study lies on the second pillar (i.e., 2. *Säule*), which constitutes the occupational pension schemes. Specifically, firms operating in Switzerland, by law, are obliged to provide a minimum insurance coverage against the risks of old-age, death and disability to all employees of minimum age, or older, that earn more than a minimum annual salary stipulated by law. In practice, many firms offer insurance coverage that clearly exceeds this minimum level. Notably, Swiss pension plans must be legally separate from the employer and they have to be sufficiently funded. Specifically, at least half of all contributions must be financed by the employer (Helbling et al., 2006). For the sample period of 2004 to 2012, the mean annual share contributed by employers is found to be approximately 60%. On average, employers and employees combined contribute about 13-16% of total annual salaries to Swiss pension plans (Helbling et al., 2006). Across the sample period of 2004 to 2012, annual mean total contributions to Swiss pension plans were 42.44 billion Swiss Francs (CHFbn). Correspondingly, during the same period, mean total annual regulatory benefits paid to beneficiaries of Swiss pension plans were CHFbn 27.99. Moreover, between 2004 and 2012, the mean annual share of total employees in Switzerland covered by a mandatory occupational pension scheme is estimated to be 80.10%. Also, for the same period, annual mean total assets held by Swiss pension plans are found to be CHFbn 585.81. Thence, total pension assets as percentage of Swiss *Gross Domestic Product* (GDP) oscillate between a minimum of 90.15% (2008) and a maximum of 108.39% (2006), with a mean ratio of 102.62%. Accordingly, between 2004 and 2012, Switzerland has one of the highest ratios of accumulated occupational pension assets to GDP amongst most developed countries worldwide. Thus, overall, Swiss pension plans can be considered as economically and socially relevant (see chapter 2 for more details).

Accounting for Swiss pension plans is complex. Also, how to best account for these pension plans has been highly controversial. Notably, as above-mentioned, by law, Swiss pension plans are legally separate from the employer (i.e., the sponsoring firm), and they must be sufficiently funded. Moreover, employer and employee contributions must be regularly transferred to the pension plan, and any refund to the sponsoring firm

is prohibited. Nevertheless, in line with the International Accounting Standard No. 19 (IAS 19), *Employee Benefits*, issued by the International Accounting Standards Board (IASB), Swiss pension plans must be classified as *defined benefit plans* and, thus, based on the funding status (*FS*) of each plan, a potentially material net pension (asset)/liability (*NPL*) must be recognized on the balance-sheet of the sponsoring (i.e., reporting) firm. Furthermore, net pension (income)/cost (*NPC*), to be recognized in profit or loss, has to be derived based on regular re-valuations of the defined benefit obligation (*DBO*), as well as the plan assets (*PLA*), attributable to the respective pension plan. Moreover, during the sample period of 2004 to 2012, firms applying the so called *Corridor-Method* in line with IAS 19 (2004) were allowed to delay, and often also partially avoid, the recognition of actuarial gains and losses (*AGL*) as well as other components of *NPC* such as e.g., past service cost (*PSC*). Alternatively, firms applying the so called *PL-* and *OCI-Methods* in line with IAS 19 (2004) had to recognize these pension income and cost components immediately and directly in profit or loss and equity, respectively. In contrast, in line with Accounting and Reporting Recommendation No. 16 (ARR 16), *Pension benefit obligations*, issued by the Swiss standard-setter, the Commission of Swiss GAAP FER, the recognition of a *NPL* arising from a Swiss pension plan is smoothed along the statutory funding ratio of the plan, and *NPC* is mainly based on the employer contributions (*EC*) paid for the respective reporting period. Also, accounting for Swiss pension plans in line with ARR 16, in general, is less costly compared to IAS 19, since valuations are based on the financial statements of the pension plans, and disclosures are less exhaustive (see chapter 3 for more details).

From a labor economics perspective, occupational pension schemes can be seen as a form of *deferred payment* for employee service rendered in the past (Blake, 2006). Accordingly, international pension accounting standards, such as the Statement of Financial Accounting Standards No. 87 (SFAS 87), *Employers' Accounting for Pensions*, issued by the US standard-setter, the Financial Accounting Standards Board (FASB), as well as IAS 19, overtime, have evolved from a purely cost-based towards a more liability-based approach. Notably, this evolution is in line with a greater shift in paradigm, whereby the *Asset-Liability Approach* (ALA) has evolved to become “[...] the dominant worldwide accounting doctrine.” (Dichev, 2008, p. 456). The approach is often attributed to the seminal work of Sprouse and Moonitz (1962). According to the ALA, main goal of financial reporting is the estimation of the change in net assets (i.e., book equity), as result of the change in the valuation of the difference between recognized assets and liabilities, from the beginning to the end of an accounting period (Zülch, Fischer, & Willms, 2006). Thus, according to the ALA, the recognition of revenues,

expenses, gains and losses is based on the recognition and measurement of assets and liabilities (Dichev, 2008). In contrast, the *Revenue-Expense Approach* (REA), mainly attributed to Paton and Littleton (1940), had “[...] dominated theory, practice, standard-setting, and pedagogy until the mid-1970s.” (Dichev, 2008, p. 455). Correspondingly, the main purpose of financial reporting in line with the REA, is the determination of periodic income as the result of the realization of revenue and the respective matching of expenses. Thence, according to the REA, the recognition and measurement of assets and liabilities is mainly derivative on the recognition and measurement of revenues and expenses (Dichev, 2008) (see chapter 4 for more details).

As outlined above, Swiss pension plans can be considered as economically and socially relevant. Nevertheless, the question of whether these pension plans can also be considered as so called *value-relevant*, i.e., *decision-useful* to the equity holders (i.e., investors) of the sponsoring (i.e., reporting) firms, has not yet been sufficiently scrutinized in any empirical study. Notably, both standard-setters, the IASB as well as the Commission of Swiss GAAP FER, define the provision of decision-useful information to investors of the reporting firms as main objective of financial reporting. Thence, it is the aim of the study presented here to contribute to the pension accounting standard-setting process by investigating the decision-usefulness of the financial information on Swiss pension plans reported in line with IAS 19 and ARR 16. Specifically, in line with a vast body of existent literature, the value-relevance of Swiss pension plans is determined by analyzing the association of pension information recognized on the balance-sheet and on the income-statement, as well as disclosed in the notes, with the market value of equity (i.e., market capitalization, *MKTCAP*) of the reporting firms. The analysis is based on hand-collected data from the annual reports of an unbalanced panel data set of 227 industry as well as financial firms listed in Switzerland, totaling 910 firm-year observations across the sample period of 2004 to 2012.

Studies for other jurisdictions (mainly for the US and also for e.g., Germany and the UK) have found evidence that financial information reported on pension plans is decision-useful to investors of the sponsoring firms. Moreover, existent evidence is scarce with respect to the value-relevance of pension accounting in line with IAS 19, or any domestic pension accounting standard. The same also holds for institutional settings where pension plans are highly funded, as in the case of Swiss pension plans. Notably, for all private Swiss pension plans, the mean annual funding ratio is estimated to be 107.47% between 2004 and 2012 (BFS, 2017d). Last but not least, none of the prior studies reviewed explicitly investigates the value-relevance of pension accounting for

financial services firms. Accordingly, the first *research question*, *RQ(1)*, investigated in this study is formulated as follows,

RQ(1) Is financial information on Swiss pension plans, reported in line with IAS 19 (2004) and ARR 16 (2005), decision-useful to holders of equity securities of the reporting firms?

Overall, evidence found by prior research is rather equivocal with regard to the question of whether the Asset-Liability (ALA) or the Revenue-Expense Approach (REA) to pension accounting provides more value-relevant, i.e., more decision-useful information to investors. Thence, to enhance the granularity of the analysis, it is asked here whether investors have a preference for financial information on Swiss pension plans recognized on the balance-sheet, on the income-statement or disclosed in the notes. Thus, the second *research question*, *RQ(2)*, is formulated as follows,

RQ(2) Which elements of the financial information reported on Swiss pension plans in line with IAS 19 (2004) and ARR 16 (2005) are decision-useful to holders of equity securities of the reporting firms?

Finally, as mentioned above, accounting for Swiss pension plans has been highly controversial at least since the enactment of IAS 19 (1998). Focal point of the debate is the classification of Swiss pension plans as *defined benefit* rather than *defined contribution* plans in accordance with IAS 19. Some argue that, since Swiss pension plans are legally separate from the reporting firm, only the regular contributions paid to the plan should be accounted for in profit or loss. In contrast, according to IAS 19, there always remains some actuarial and/or investment risk with the sponsoring firm of Swiss pension plans. Therefore, these plans must be accounted for as defined benefit plans incl. the regular re-valuation of the defined benefit obligation (*DBO*) and the plan assets (*PLA*), as well as the recognition of any resulting net pension (asset)/liability (*NPL*) on the balance-sheet of the reporting firm. In recent years, the debate has gradually shifted towards the issue of whether financial reporting in line with IAS 19 or ARR 16 more faithfully represents the underlying economic phenomenon of Swiss pension plans. The controversy has also been fueled by public and private firms switching from IFRS to Swiss GAAP FER, not the least because of pension accounting (see chapter 5 for more details). Therefore, the third and last *research question*, *RQ(3)*, formulated for the purposes of this study is as follows,

RQ(3) Is financial information on Swiss pension plans reported in line with IAS 19 (2004) or ARR 16 (2005) more decision-useful to holders of equity securities of the reporting firms?

1.2 Main Empirical Results

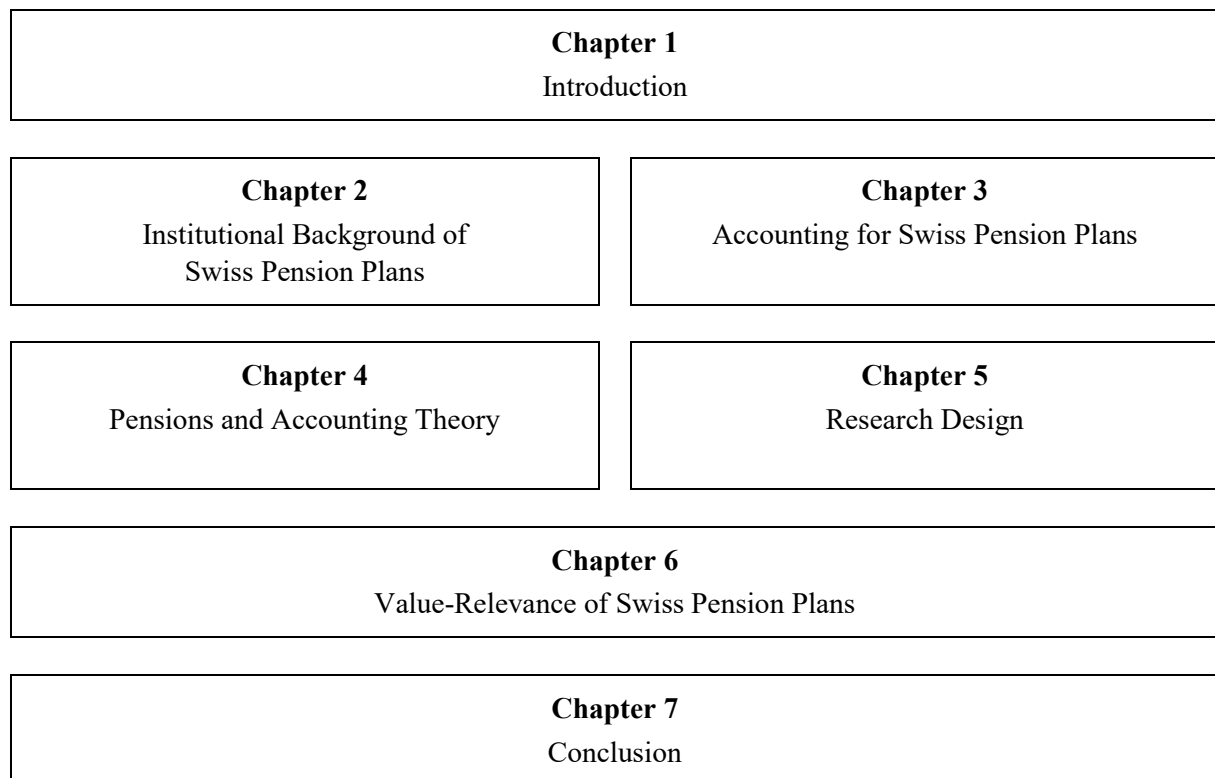
Across all analyzed sub-samples, statistical inference on the association of market capitalization (*MKTCAP*) and different pension accounting items suggests that Swiss pension plans are value-relevant for investors (research hypothesis *H(1)*). Specifically, the net pension (income)/cost (*NPC*), recognized in profit or loss, is found to be more value-relevant than the net pension (asset)/liability (*NPL*), recognized on the balance-sheet of the reporting firms (research hypotheses *H(2a)* and *H(2b)*). Furthermore, strong evidence for the value-relevance of employer contributions paid (*EC*) is found for only one of the analyzed sub-samples (research hypotheses *H(2c)*). For all other sub-samples, there is no evidence found in support of *H(2c)*. Also, there is only weak evidence found for the value-relevance of the unrecognized net pension (asset)/liability (*NPLNR*) disclosed in the notes (research hypothesis *H(2d)*). Overall, results hint at the fact that financial information on Swiss pension plans reported in line with IAS 19 (2004) is more value-relevant for investors than respective information reported in line with ARR 16 (2005). Thence, research hypothesis *H(3)*, whereas financial information reported in line with ARR 16 (2005) is more value-relevant than financial information reported in line with IAS 19 (2004), cannot be confirmed. Lastly, financial information reported on Swiss pension plans is also found to be more value-relevant for financial firms than for industry firms. This holds irrespective of the accounting standard applied (see chapter 6 for more details).

The findings outlined above may contribute to pension accounting standard-setting as they reveal a general decision-usefulness of financial information reported on pension plans, even in an institutional setting of high funding levels. Notably, evidence suggests that the net pension (income)/cost (*NPC*), recognized in profit or loss, is generally more decision-useful to investors than the net pension (asset)/liability (*NPL*) recognized on the balance-sheet as well as the unrecognized net pension (asset)/liability (*NPLNR*) disclosed in the notes. Furthermore, *NPC* is also found to be more decision-useful than the employer contributions (*EC*) paid to the pension plans. Accordingly, these findings are generally in support of a Revenue-Expense Approach (REA) to pension accounting. Moreover, results are even in support of smoothing mechanisms for actuarial gains and losses (*AGL*) and past service cost (*PSC*), such as e.g., the Corridor- or the OCI-Method

in line with IAS 19 (2004). Further, the evidence presented here suggests that the decision-usefulness of pension accounting may also be dependent on industry classification (i.e., industry vs. financial firms). Lastly, the study may also contribute to the long-standing and ongoing controversy about how to best account for Swiss pension plans. Notably, financial information on Swiss pension plans reported in line with IAS 19 (2004) is found to be more adequately reflected in the market value of equity of reporting firms, than respective information in line with ARR 16 (2005). This somewhat confirms the chairman of the IASB, who once noted: “[...] the comfort provided by Swiss GAAP to the preparer comes at a price to the investor.” (Hoogervorst, 2015b, p. 3)

1.3 Structure of the Dissertation

FIGURE 1.1 below depicts the organizational structure of the dissertation presented here. Specifically, after a brief summary of the motivation, the research questions, the main empirical results as well as the structure of the dissertation in chapter 1, the institutional background of Swiss pension plans is outlined in chapter 2. Notably, the legal form and organizational structure, the funding, the benefits, the financial reporting, the financial stability, as well as the restructuring of Swiss pension plans is discussed in more detail. Furthermore, in chapter 3, the accounting for Swiss pension plans in line with IAS 19 (2004) and ARR 16 (2005) is described as well as contrasted to each other. For the purposes of this study, these two pension accounting standards are assumed to be qualitatively unaltered during the sample period of 2004 to 2012. Following the description of the pension accounting standards, the evolution of pension accounting, from the beginning of the twentieth century until today, is discussed within the context of basic concepts of accounting theory in chapter 4. Subsequently, the research design is outlined in chapter 5. Concretely, the long-standing and ongoing controversy about how to best account for Swiss pension plans is discussed first. Then, the main objective of financial reporting is outlined, and, based on the discussion thus far, the three research questions *RQ(1)*, *RQ(2)* and *RQ(3)* are defined. Moreover, chapter 5 also entails a comprehensive literature review of prior pension value-relevance research, contributing to the formulation of the specific research hypotheses derived from the research questions. Lastly, research gap and potential contribution of the study conducted here are also discussed at the end of chapter 5. A detailed description of the sample selection process, data adjustments, definition of variables as well as sub-samples is given in chapter 6. Furthermore, a comprehensive outline of the applied research methodology is given, including a discussion of potential limitations as well as methodological remedies applied. Also, an extensive descriptive analysis of all sub-samples is conducted which pro-

FIGURE***1.1 Structure of the Dissertation***

Note. The FIGURE is based on Zingg (2014, p. 8) and depicts the organizational structure of the dissertation.

vides first insights regarding the research questions and hypotheses defined in chapter 5. Lastly, chapter 6 entails results and respective conclusions of the *Multiple Linear Regression Analysis* (MLR) conducted for different sub-samples of data, providing the main evidence of this study. Finally, the dissertation ends with a conclusion, outlined in chapter 7, about the main empirical results as well as the potential contribution of these findings for the pension accounting standard-setting process, as well as other stakeholders such as investors and analysts. Also, a short outlook regarding future research about the value-relevance of Swiss pension plans is included.

2 Institutional Background of Swiss Pension Plans

2.1 The Three Pillars of Swiss Social Welfare

In Switzerland, firms must provide a minimum occupational insurance coverage for the *risks of old-age, death and disability* to employees of minimum age, or older, that earn more than the minimum annual salary stipulated by law, and are insured against the risks of old-age and death by the public *Old-Age and Survivors' Insurance* (OASI, *Alters- und Hinterlassenversicherung*, AHV).¹ The prime focus of this study lies on these occupational pension schemes as prevalent during the period of 2004 to 2012. They constitute the second pillar of what is known as the *Three-Pillar-Concept* (*Drei-Säulen-Konzept*) of the Swiss social welfare system.²

The first pillar is formed by the above-mentioned OASI. The third pillar is based on voluntary savings by each individual.³ For the years 2005 and 2013, TABLE 2.1 shows total contributions and benefits paid as well as total assets of all three pillars, respectively. This succinctly illustrates some of the major characteristics of the Swiss social welfare system. Namely, the first pillar (OASI) is structured as a *Pay-As-You-Go* (PAYG) scheme, where contributions by active workers and firms pay for the rents of beneficiaries.⁴ Already in 2005, due to the demographic trend of an increasing number of beneficiaries per active insuree, benefits paid exceeded contributions by 32.36%. This

¹ As of December 31, 2004 and 2012, the minimum annual salary was CHF 19,350 and 20,880, respectively. For the risks of death and disability, insurance coverage must commence on January 1st of the year after the employee turns 17 years of age. Insurance coverage for old-age must commence on January 1st of the year after the employee turns 24 years of age (BVG, 2004, § 7 para. 1; 2012, § 7 para. 1). All employees (with or without residence) in Switzerland are insured against the risks of old-age and death by OASI (AHVG, 2004, § 1a para. 1 lit. b; 2012, § 1a para. 1 lit. b). One important exception to this rule are employees remunerated by a company without registered office in Switzerland that work in the country for no longer than three consecutive months within a single calendar year (AHVG, 2012, § 1a para. 2 lit. c; AHVV, 2004, § 2 para. 1 lit. b; 2012, § 2).

² See e.g., Stauffer (2012) for a brief summary of the history of law regarding the Three-Pillar-Concept and Leimgruber (2008) for an in-depth historical account of the evolution of the Three-Pillar-Concept in Switzerland.

³ The Swiss state promotes some forms of such private pension schemes through taxation policies. These schemes are known as *bound private pension schemes* or *Pillar 3a* (*Säule 3a*), and annual contributions up to a maximum are deductible from state income tax (BVV3, 2004, § 7; 2009, § 7). Since all voluntary pension savings in excess of the three pillars mentioned thus far cannot be estimated, only the Pillar 3a is included in further discussions.

⁴ Throughout this study, recipients of benefits from the Swiss social welfare system are denoted as *beneficiaries*. In essence, these could be retired persons (pensioners), survivors or disabled persons. In contrast, active workers

TABLE

2.1 Statistics on the Three Pillars of the Swiss Social Welfare System

Variable	1 st Pillar ^a		2 nd Pillar ^b		3 rd Pillar ^c	
	2005	2013 ^d	2005	2013	2010	2013
Contributions	23,271	29,539	32,023	42,897	8,718 ^e	9,640 ^e
	42.09%	35.99%	57.91%	52.26%	na	11.75%
Benefits	30,802	39,600	25,357	33,228	na	na
	54.85%	54.37%	45.15%	45.63%	na	na
Assets	29,393	43,080	545,500	712,500	72,474	89,009
	5.11%	5.10%	94.89%	84.36%	na	10.54%

Note. For 2005 and 2013, the TABLE depicts the contributions, benefits and assets of the Three Pillars of the Swiss social welfare system as well as the respective distributions across the pillars (in %). If not stated otherwise, all values are denoted in CHFm and sourced from BSV (2016). Due to data availability and comparability, values for the years 2005 and 2013 are shown. na indicates *not available*.

^a Old-Age and Survivors' Insurance (OASI). *State Disability Insurance (Invalidenversicherung, IV)* is not included. Any revenue other than contributions from employers and employees is not included. Benefits include monetary items only.

^b Occupational Pension Schemes. Any revenue other than contributions from employers and employees is not included. Benefits include rental and lump sum payments only.

^c Bound Private Pension Schemes (Pillar 3a) as described in footnote 3 on page 9. Benefits paid by banks and insurance companies are not available. Data on banks and insurance contracts are available from 2010 on only.

^d Data sourced from BSV (2017a).

^e Includes contributions to bank accounts only.

trend has since intensified and in 2013 benefits paid exceeded contributions by 34.06% (36.03% in 2015; BSV, 2017a).⁵ Thus, in order to fully fund all benefits, OASI is heavily subsidized by the federal government incl. e.g., proceeds from value-added tax and taxes on tobacco and alcohol. By law, the capital stock (i.e., assets) only functions as a reserve and shall cover approximately the amount of one year's total benefits to be paid (BSV, 2017c).

(i.e., individual contributors) are denoted as *active insurees* and *employees* interchangeably. Analogously, employers are denoted as *sponsoring* and *reporting firms* interchangeably.

⁵ The ratio of residents in Switzerland that are older than 64 years of age to the residents between 20 and 64 years of age (*Old-Age Dependency Ratio*) has increased from 25.52% in 2004 to 27.99% in 2012 and 28.99% in 2015 (BFS, 2016a). This ratio is expected to rise up to between 46.30 and 50.00% as of 2045 (BFS, 2015c).

In contrast to OASI, saving on an individual basis is the main characteristic with regard to the second pillar of the system. The state subsidizes these occupational pension schemes only indirectly through taxation policies (BSV, 2017d). This is in line with the fact that contributions exceed benefits paid (see TABLE 2.1). Thus, as of 2005 and 2013, assets of occupational pension schemes constitute the main part of savings amongst the three pillars (94.89% and 84.36%, respectively). Stipulated by the federal constitution of Switzerland, the first and second pillar combined shall be sufficient to adequately cover the risks of old-age, death and disability (BV, 2004, § 111 para. 1; 2012, § 111 para. 1). With regard to old-age, on average, combined benefits of the first and second pillar shall account for about 60% of the last insured salary before retirement (Helbling et al., 2006).

Finally, there has been an increasing trend of voluntary saving via bound private pension schemes – the so called Pillar 3a. As shown in TABLE 2.1, contributions and assets saved have increased between 2010 and 2013. For example, the ratio of assets saved within the third pillar to the assets saved within the second pillar has increased from 11.74% in 2010 to 12.49% in 2013.⁶ However, with respect to contributions and benefits, the first and the second pillar had been the dominant pillars of the Swiss social welfare system throughout the sample period of 2004 to 2012.

As outlined above, within the second pillar of the Swiss social welfare system, firms must provide occupational pension schemes (hereafter (*Swiss*) *pension plans*) to all employees that meet certain minimum requirements. Panel A of TABLE 2.2 illustrates the occupational pension coverage of employees in Switzerland throughout the sample period.⁷ Between 2004 and 2012, the percentage of employees covered by a Swiss pension plan (hereafter also *active insurees*) oscillates between a minimum of 76.94% (2004) and a maximum of 81.54% (2012), with a mean (median) ratio of 80.10% (80.41%). Hence, overall, throughout the entire sample period, more than three-fourths of all employees in Switzerland had been covered by a Swiss pension plan.

⁶ As of 2010, assets of the second pillar were CHFbn 617.50 (BSV, 2016).

⁷ Institutions that only indirectly belong to the second pillar, for example *welfare funds* (*Wohlfahrtsfonds*) or pension plans without active insurees, are not included in the data depicted in TABLE 2.2, nor are they included in any further discussion throughout this study. As of December 31, 2014, a total of 1,946 of such institutions held total assets of CHFbn 17.30. This amount corresponds to 2.23% of total assets attributable to pension plans as defined in TABLE 2.2 (see BFS, 2016c, p. 7 and 13).

TABLE
2.2 Active Insurees and Total Assets of Swiss Pension Plans

Panel A: Employees and Active Insurees of Swiss Pension Plans										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
1) Employees ^a	4,176,472	4,206,998	4,298,547	4,409,553	4,515,900	4,539,559	4,554,812	4,662,698	4,732,493	4,455,226
2) Active Insurees ^b	3,213,551	3,311,433	3,431,851	3,545,571	3,651,984	3,643,340	3,696,045	3,787,263	3,858,803	3,571,093
2) / 1)	76.94%	78.71%	79.84%	80.41%	80.87%	80.26%	81.15%	81.22%	81.54%	80.10%
Panel B: GDP and Total Assets of Swiss Pension Plans										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
1) GDP ^c	489,369	507,463	538,125	573,080	597,381	587,061	606,146	618,325	623,611	571,173
2) Total Assets ^d	484,177	542,629	583,270	605,459	538,524	598,930	621,234	625,295	672,785	585,811
2) / 1)	98.94%	106.93%	108.39%	105.65%	90.15%	102.02%	102.49%	101.13%	107.89%	102.62%

Note. Panel A depicts the total number of employees in Switzerland, the total number of active insurees covered by Swiss pension plans, as well as the respective ratio of employees covered by Swiss pension plans for the sample period of 2004 to 2012. Panel B shows the Gross Domestic Product (GDP) of Switzerland, total assets held by Swiss pension plans, as well as the latter expressed as percentage of the former for the sample period of 2004 to 2012.

^a Annual mean of all persons of 15 years of age or older that worked at least one hour during the reference week excluding housekeeping and voluntary work. See BFS (2017a) for more details. Sourced from BFS (2017c).

^b Includes all pension plans that provide regulatory benefits and cover active insurees. See BFS (2016c) for more details. Sourced from BFS (2017d).

^c Denoted in nominal terms (i.e., current prices) and in CHFm. See footnote 8 (page 13) for more details. Sourced from BFS (2016b).

^d Includes same pension plans as in Panel A (see note ^b above). Assets (i.e., redemption values) from insurance contracts are not included. See BFS (2016c) for more details. All values are denoted in CHFm. Sourced from BFS (2017d).

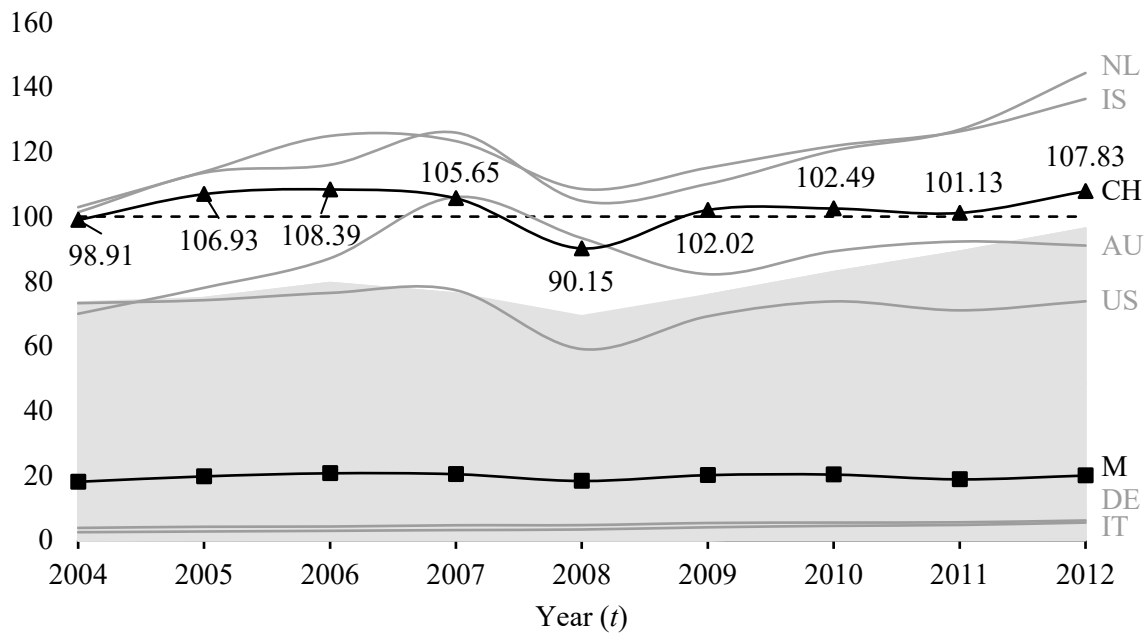
Furthermore, for 2004 to 2012, Panel B of TABLE 2.2 depicts total assets of these pension plans in relation to the Swiss *Gross Domestic Product* (GDP).⁸ Note, total assets correspond to TABLE 2.1 but exclude assets (i.e., redemption values) from insurance contracts (see note ^d in TABLE 2.2). Specifically, total pension assets as percentage of GDP oscillate between a minimum of 90.15% (2008) and a maximum of 108.39% (2006), with a mean (median) ratio of 102.62% (102.49%). The data shown in Panel B of TABLE 2.2 also illustrates how Swiss pension assets fluctuate with financial markets. For example, as the subprime crisis fully unfolded in the aftermath of the collapse of *Lehman Brothers* on September 15, 2008 (see e.g., Haldner (2013)), total pension assets, measured as percentage of GDP, hit their sample period minimum at the end of 2008. Moreover, by the end of the sample period in 2012, in relative terms, assets had not yet fully recovered to their sample period maximum reached at the end of 2006.

Measuring total pension assets relative to GDP also allows to compare the economic relevance of occupational pensions internationally.⁹ For the sample period, the *Organisation for Economic Co-operation and Development* (OECD) measures *Pension funds' assets* as percentage of GDP for 73 countries including all major economies (OECD, 2017b). FIGURE 2.1 shows the respective data for 67 of these countries. The data for Switzerland (CH) corresponds almost perfectly to the data shown in Panel B of TABLE 2.2, which was independently sourced from BFS (2016b) and BFS (2017d). Between 2004 and 2012, only Iceland (IS) and the Netherlands (NL) had ratios constantly higher than Switzerland. Also, Australia (AU) had slightly higher ratios in 2007 and 2008. Apart from these three countries, Switzerland had the highest ratios of pension assets to GDP throughout the entire sample period of 2004 to 2012. Also, those were considerably higher than the annual means (M) of all countries included. FIGURE 2.1 hints at the different structures of pension systems across countries. For example, in Italy (IT), occupational pension schemes are voluntary, and thus, had played only a very minor role throughout the sample period. Although also voluntary, for example in Germany, the Netherlands and the United States (US), such pension schemes were more

⁸ GDP is an economic indicator that measures the value of goods and services produced within a specific country during a specific period of time, excluding the value of goods and services used as inputs to produce other goods and services (BFS, 2017b). See BFS (2015a) for more details regarding the methods applied to estimate Swiss GDP. Due to the relatively high degree of international standardization in estimation methods, GDP is the best indicator available to compare the economic output between different countries (see e.g., BFS, 2015b).

⁹ Note, to measure the *true* economic relevance of pension plans, it would be more appropriate to use the benefits already earned by insurees (i.e., vested) instead of the accumulated pension assets. However, comparability of earned benefits is difficult due to different valuation methods applied in practice (see e.g., Mettler, 2007, p. 1).

FIGURE

2.1 Total Pension Funds' Assets as % of GDP

Note. For the sample period of 2004 to 2012, the FIGURE depicts total accumulated occupational pension assets as % of GDP for Switzerland and 66 other countries, including most members of the group of the 20 major economies, producing about 80% of global GDP (G20, 2017). Data is sourced from OECD (2017b). Six of the 73 countries in the database are excluded due to missing data. AU = Australia, CH = Switzerland, DE = Germany, IS = Iceland, IT = Italy, M = mean, NL = Netherlands and US = United States. The range of all other included countries is shaded grey. The dashed black line indicates a ratio of 100.00%. The other countries included are Albania, Argentina, Austria, Belgium, Bolivia, Brazil, Bulgaria, Canada, Chile, China (People's Republic of), Colombia, Costa Rica, Croatia, Czech Republic, Denmark, Dominican Republic, Egypt, El Salvador, Estonia, Finland, Former Yugoslav Republic of Macedonia, Hong Kong, Hungary, India, Indonesia, Ireland, Israel, Kenya, Latvia, Lesotho, Liechtenstein, Lithuania, Luxembourg, Malta, Mauritius, Mexico, Namibia, New Zealand, Nigeria, Norway, Pakistan, Panama, Peru, Poland, Portugal, Romania, Russia, Serbia, Slovenia, South Africa, South Korea, Spain, Sweden, Thailand, Trinidad and Tobago, Turkey, Ukraine, United Kingdom, Uruguay and Zambia.

widespread during the same period. However, compared to e.g., the Netherlands, Switzerland and the US, German pension funds had nonetheless rather few pension assets relative to GDP. This is because funding is not mandatory in Germany (Glaum, 2009). In contrast, and hence, more in line with Switzerland, e.g., also in Australia as well as in Iceland there exist compulsory occupational pension schemes, including mandatory contributions by employers and employees (OECD, 2011).

Thus far, the discussion indicates the *social* as well as the *economic* relevance of occupational pension plans in Switzerland. In order to investigate the *value-relevance* of such plans, the legal form and organizational structure as well as details regarding

funding, benefits, financial reporting, financial stability and restructuring are further discussed throughout the subsequent sub-sections.

2.2 Swiss Pension Plans

2.2.1 Legal Form and Organizational Structure

In Switzerland, by law, any contributions related to pension benefits must be transferred to an entity that is legally separate from the employer. Specifically, such an entity must have the legal form of either a foundation, a cooperative or a public institution (OR, 2004, § 331 para. 1; 2012, § 331 para. 1).¹⁰ The two main advantages of this legal separation are the protection of the pension assets from misuse by the employer (e.g., to service its debt), and the guarantee of the funding of already vested benefits even in the case of the employer's bankruptcy (Müller, 2013; Stauffer, 2012). Thus, in Switzerland, creditors of the employer have no claim on respective pension plan assets (Stauffer, 2012). For the sample period of 2004 to 2012, Panel A of TABLE 2.3 shows the ratios of active insurees and total assets covered by non-public (i.e., *private*) Swiss pension plans that have the legal form of either a foundation or a cooperative. The ratios are based on the values of total active insurees and total assets shown in TABLE 2.2. Overall, for the sample period, the mean (median) shares of active insurees and total assets covered by private Swiss pension plans is 83.63% (83.51%) and 70.40% (70.56%), respectively. Thus, throughout the sample period, private pension plans clearly dominate public plans with respect to the total number of active insurees as well as total assets. However, on average, there were less pension assets per active insuree with respect to private compared to public plans.¹¹

¹⁰ As of January 1, 2012, for newly founded Swiss pension plans, it is no longer allowed to choose the legal form of a cooperative (Stauffer, 2012). Due to its organizational particularities, such as e.g., equality of votes amongst all members for binding decisions, this legal form had never been well suited for the purposes of pension plans anyway (see e.g., footnote 33 in Müller, 2013). Also, for quite some time, it has not played a major role. For example, Helbling et al. (2006, p. 81) estimate that already back in 2002, only about 0.36% of all pension plans had the legal form of a cooperative.

¹¹ For example, Helbling et al. (2006, p. 36) also note the higher average occupational insurance coverage of employees of public compared to private Swiss pension plans.

TABLE
2.3 Legal Form and Organizational Structure of Swiss Pension Plans

Panel A: Legal Form and Organizational Structure										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
Private										
Active Insurees	83.57%	83.51%	83.78%	84.05%	83.99%	83.46%	83.40%	83.47%	83.40%	83.63%
Total Assets	69.43%	69.70%	70.19%	70.56%	70.44%	70.65%	70.69%	70.97%	70.98%	70.40%
Registered										
Active Insurees	96.41%	96.83%	96.99%	97.21%	97.24%	97.28%	97.44%	97.45%	97.45%	97.14%
Total Assets	97.41%	97.49%	97.78%	97.88%	97.92%	97.96%	98.00%	98.10%	98.12%	97.85%
Multi-Employer										
Active Insurees	92.87%	93.53%	93.97%	94.06%	94.72%	94.88%	95.14%	94.95%	95.07%	94.35%
Total Assets	89.88%	90.40%	90.40%	90.72%	91.88%	91.50%	92.00%	91.97%	91.60%	91.15%
Autonomous										
Active Insurees	38.21%	43.80%	44.17%	46.59%	47.19%	47.87%	47.63%	47.58%	47.47%	45.61%
Total Assets	72.77%	74.38%	73.64%	74.74%	74.50%	74.48%	74.38%	74.16%	74.00%	74.12%
Panel B: Sample Swiss Pension Plans										
Active Insurees	29.77%	28.86%	28.35%	28.16%	27.87%	27.32%	27.13%	26.76%	26.10%	27.81%
Total Assets	53.46%	52.82%	52.53%	52.07%	51.02%	50.68%	50.41%	49.92%	49.46%	51.37%

Note. For the sample period of 2004 to 2012, the TABLE depicts the ratios of all active insurees and total assets covered by Swiss pension plans with respect to legal form and organizational structure. The data corresponds to TABLE 2.2 and is sourced from BFS (2017d). Panel A shows ratios of pension plans with a private legal form (i.e., foundation or cooperative) as well as ratios of pension plans that are registered, cover multiple employers and are autonomous with respect to risk coverage, respectively. Panel B shows respective ratios of Swiss pension plans that are private and registered, and that cover either a single employer or cover multiple employers other than collective and group pension plans. Thus, this group mainly includes private medium sized and group enterprises (see e.g., BFS, 2016c, p. 34; Müller, 2013, p. 18).

Although the legal separation between Swiss pension plans and employers is guaranteed, only minimum requirements regarding the implementation are stipulated by law (BVG, 2004, § 6; 2012, § 6). Thus, there exists no *single one* Swiss pension plan applicable to every possible business case of an employer. On the contrary, one finds a rather wide spectrum of different possible legal and organizational arrangements. Nevertheless, the majority of pension plans can be classified according to three main characteristics: *registry*, *form of management* and *risk coverage* (Müller, 2013).

As outlined above, for qualified employees, there must exist a pension plan that covers the minimum benefits stipulated by law. However, employers can also provide *non-mandatory* benefits to their employees.¹² In principle, irrespective of the legal form (i.e., private or public), there are three kinds of Swiss pension plans: provision of mandatory benefits only, provision of non-mandatory benefits only or provision of non-mandatory benefits in addition to mandatory benefits (BFS, 2016c).¹³

All plans that provide mandatory benefits (exclusively or in addition to non-mandatory benefits) must be registered with the responsible supervisory authority (BVG, 2004, § 48 para. 1; 2012, § 48 para. 1).¹⁴ Overall, between 2004 and 2012, the mean (median) shares of active insurees and total assets covered by registered Swiss pension plans is 97.14% (97.24%) and 97.85% (97.92%), respectively (see Panel A of TABLE 2.3). Thus, plans that exclusively provide non-mandatory benefits (i.e., non-registered plans) play a very minor role throughout the sample period. Moreover, registered pension plans are subject to all minimum requirements stipulated by law (BVG, 2004, § 48 para. 2; 2012, § 48 para. 2). Hence, minimum requirements discussed hereafter apply to almost

¹² Benefits exceeding the minimum stipulated by law are commonly referred to as *überobligatorisch* (*over-obligatory*, hereafter *non-mandatory*). However, non-mandatory benefits need not necessarily be in addition to the mandatory ones, but could also be granted to employees that do not qualify for minimum benefits (e.g., part-time employees and trainees). Such benefits are usually called *under-obligatory* (*unterobligatorisch*). Also, benefits granted by plans that already existed before the law came into force on January 1, 1985 need not necessarily meet the minimum legal requirements. Such plans are called *vorobligatorisch* (*pre-obligatory*; see e.g., footnote 24 in Müller, 2013; Stauffer, 2012, pp. 129-135). As of 2002, Helbling et al. (2006) estimate that about 60% of all Swiss pension assets are attributable to non-mandatory benefits.

¹³ Pension plans that provide mandatory and non-mandatory benefits are also called *enveloping* (*umhüllend*; BFS, 2016c see e.g.,).

¹⁴ Most Swiss pension plans are supervised by nine cantonal or regional authorities (see e.g., OAK, 2017 for a regularly updated list). In turn, since January 1, 2012, these authorities are supervised by the *Supervisory Commission for Occupational Pension Funds* (*Oberaufsichtskommission Berufliche Vorsorge*, OAK BV, see e.g., Sager (2013)).

all active insurees and pension assets covered by Swiss pension plans throughout the sample period.

Another important structural characteristic of Swiss pension plans is the form of management. Basically, a pension plan can either cover only one single employer or more than one employer (Müller, 2013).¹⁵ Pension plans that cover multiple employers can be organized as either a *collective pension plan* (*Sammelstiftung*), a *group pension plan* (*Gemeinschaftsstiftung*) or it can be a pension plan that covers multiple employers due to a special purpose. These are established for certain public and/or state-controlled employers, exclusively for all subsidiaries of one and the same group (i.e., concern) or for a group of mostly small and medium-sized enterprises (SMEs; BFS, 2016c).

In principle, collective pension plans cover multiple but legally, organizationally and economically mutually independent employers of which pension assets are isolated from each other within the plan. Also, the regulations and the accounting is separate for each employer. Usually, collective plans are established and managed by insurance companies, banks, trustees or consulting firms. Main advantage of this organizational structure is the sharing of management services for pension plans between different employers. In contrast, group pension plans are usually established by industry bodies (*Verbände*) where the covered employers are economically relatively homogenous. Thence, pension assets of different employers are shared within a group plan, and also regulations and accounting is not separated between them (see e.g., BFS, 2016c; Helbling et al., 2006; Stauffer, 2012).

Panel A of TABLE 2.3 also depicts the shares of active insurees and total assets covered by multi-employer Swiss pension plans. Between 2004 and 2012, mean (median) shares of active insurees and total assets for multi-employer plans are 94.35% (94.72%) and 91.15% (91.50%), respectively. Hence, during the sample period, with respect to active insurees and total assets, multi-employer pension plans are considerably more prevalent than single-employer plans. First and foremost, this is due to the entrepreneurial landscape of Switzerland which has been dominated by SMEs that usually do not establish a separate pension plan but rather join a multi-employer plan (BFS, 2016c).

Lastly, another important characteristic of Swiss pension plans is the risk coverage. Plans can either cover all risks (old-age, death and disability) *autonomously* or all or

¹⁵ Analogously, one employer can also cover different groups of employees by different pension plans or provide different pension plans to all employees (e.g., one plan that covers mandatory benefits and one plan that covers non-mandatory benefits, respectively; BFS, 2016c).

some of the risks can be sourced out to insurance companies (BFS, 2016c). Pension plans that cover all risks autonomously need to re-insure certain *peak risks* if deemed necessary by its occupational pension expert, or if the number of active insurees is below the minimum required by law.¹⁶ In contrast, for *partially autonomous (teilautonome)* pension plans at least one of the two risks, death and disability, is covered by an insurance company.¹⁷ Last but not least, some pension plans have all of the risks covered by an insurance company. These so called *fully covered pension plans (Kollektive Vorsorgeeinrichtungen)* only play the role of an intermediary between the beneficiaries and the insurance company (BFS, 2016c). With regard to risk coverage, for the sample period, mean (median) shares of active insurees and total assets covered by autonomous pension plans without re-insurance are 45.61% (47.19%) and 74.12% (74.38%), respectively (see Panel A of TABLE 2.3). Thus, between 2004 and 2012, on average, almost half of all active insurees were covered by *fully* autonomous pension plans. Moreover, on average, these plans covered about three quarters of total pension assets. Hence, in contrast to private pension plans discussed above, fully autonomous Swiss pension plans had covered considerably more pension assets than active insurees throughout the sample period. Therefore, on average, active insurees of fully autonomous Swiss pension plans had a higher occupational insurance coverage compared to partially autonomous or fully covered pension plans, during the same period.

Overall, during the sample period of 2004 to 2012, with respect to active insurees and total assets, the landscape of Swiss pension plans had been dominated by private plans that provide mandatory benefits (exclusively or in addition to non-mandatory benefits, i.e., registered plans), and that cover more than one employer. Regarding risk coverage, on average, about three quarters of all pension assets had been covered by fully autonomous plans covering, on average, almost half of active insurees throughout the sample period. However, as outlined in more detail in chapter 6, the focus of this study primarily lies on Swiss pension plans that cover private medium to large enterprises which are publicly listed. Thence, Panel B of TABLE 2.3 illustrates the shares of total

¹⁶ For pension plans that were established before December 31, 2005, the minimum number of active insurees is 100. For all other plans, the minimum number is 300 (BVV2, 2004, § 43 para. 1 lit. a and b; 2012, § 43 para. 1 lit. a and b). Re-insurance is usually established in the form of *Excess-of-Loss* or *Stop-Loss* contracts with insurance companies. See e.g., Helbling et al. (2006, p. 108) for more details.

¹⁷ Partially autonomous pension plans can be further grouped into plans that provide old-age benefits autonomously as well as plans that either transfer saved pension assets as lump sum to beneficiaries or buy rent contracts for beneficiaries at the time of retirement. Thence, these plans also transfer the risk of longevity to an external party (BFS, 2016c).

active insurees and total pension assets covered by private and registered Swiss pension plans, other than collective and group plans described above, which are attributable to either a single employer or to multiple employers. This group includes single-employer pension plans of medium sized enterprises as well as pension plans of group enterprises, such as holding and parent companies, that establish multi-employer plans in order to cover all or some of their subsidiaries (see BFS, 2016c, p. 34; Müller, 2013, p. 18). Between 2004 and 2012, mean (median) shares of total active insurees and total assets covered by this group of Swiss pension plans were 27.81% (27.87%) and 51.37% (51.02%), respectively (see Panel B of TABLE 2.3). Apparently, during the sample period, on average, private and registered Swiss pension plans of medium sized and group enterprises covered more than a quarter of total active insurees and over half of total pension assets. First, this indicates an above-average occupational insurance coverage of the employees of these firms. Second, it hints at the economic and social relevance of Swiss pension plans of firms such as those investigated for the purposes of this study (see section 6.1 for more details).

Finally, it is also worth noting here, that, by law, employees and employers must be represented equally on the governing board (*Oberstes Organ*) of a Swiss pension plan (BVG, 2004, § 51, para. 1; 2012, § 51, para. 1). The governing board is responsible for the management of the pension plan in compliance with the law and all other regulations (BVG, 2012, § 51a para. 1; Helbling et al., 2006). Some of its main responsibilities include the issue of all rules and regulations regarding the pension plan, the preparation of financial statements and the financial reporting, the nomination and monitoring of management, the auditor as well as the occupational pension expert, as well as the periodic monitoring of the financial stability of the pension plan (BVG, 2012, § 51a para. 2; Helbling et al., 2006).

2.2.2 Funding

By law, at any point in time, Swiss pension plans must ensure the funding of all assumed obligations (BVG, 2004, § 65 para. 1; 2012, § 65 para. 1). Thus, financing must be managed in a way that (at least) the mandatory benefits can be paid as they are due (BVG, 2004, § 65 para. 2; 2012, § 65 para. 2). However, Swiss pension plans are free to choose the exact form of financing as long as respective obligations are funded upon maturity (Stauffer, 2012). In general, there exist four main sources of funding: contri-

butions by employers, contributions by employees, returns on pension assets and miscellaneous sources of funding such as, for example, actuarial gains and losses.¹⁸ Roughly speaking, the first two are *external* sources whereas the other two are *internal* (Müller, 2013).

On average, employers and employees combined contribute about 13-16% of total annual salaries to Swiss pension plans (Helbling et al., 2006). This includes contributions to cover the risks of old-age, death and disability as well as management fees and other contributions (see e.g., footnote 69 in Müller (2013)). By law, contributions attributable to mandatory benefits must be at least as high for employers as for employees. However, higher employer contributions are not compulsory (BVG, 2004, § 66 para. 1; 2012, § 66 para. 1).¹⁹ In practice however, on average, employers finance higher contributions than employees. (Helbling et al., 2006; Müller, 2013). Between 2004 and 2012, mean (median) annual total contributions of employers and employees combined were CHF million (CHFm) 42,437 (44,132). The mean (median) share funded by employers was 57.06% (57.25%; see Panel A of TABLE 2.4). Total contributions shown here also include return and one-time payments, purchase amounts as well as solvency contributions. In line with respective laws and regulations, active insurees can withdraw certain amounts of their pension assets for the funding of e.g., residential property (*Vorbezug*). Such withdrawals might be paid back into the pension plan later (return payments). Also, in line with the laws and regulations, active insurees and employers can contribute one-time payments and purchase amounts in order to increase levels of benefits (Helbling et al., 2006). Furthermore, if the pension plan is underfunded, employers and employees

¹⁸ See e.g., Helbling et al. (2006, pp. 166-168) for more details regarding such sources of funding.

¹⁹ For registered pension plans that provide mandatory and non-mandatory benefits (i.e., enveloping plans) the principle of *collective contribution parity* (*Kollektive Beitragsparität*) holds. Thus, total employer contributions must be at least as high as total employee contributions. However, it is possible to apply average contribution rates whereas, for example, individual employer contributions are higher for older but lower for younger employees compared to respective employee contributions. In any case, minimum contribution rates as stipulated by law must be ensured (Stauffer, 2012). Minimum contribution rates are defined for the funding of old-age benefits only, but not for benefits regarding death and disability (see footnote 69 in Müller (2013)). These rates are based on the *coordinated salary*. Thus, as of December 31, 2004 (2012), only an annual salary between CHF 22,575 (24,360) and CHF 77,400 (83,520) was mandatorily covered by occupational pension schemes. This ensures that the part of the salary which is already covered by the first pillar (OASI) is not covered twice (Müller, 2013). Salaries above the minimum salaries (see footnote 1, page 8) and below CHF 25,800 (27,840) are covered as CHF 3,225 (3,480). During the sample period, combined minimum contribution rates of employers and employees for mandatory old-age benefits as percentage of the coordinated salary were 7% (age 25-34), 10% (35-44), 15% (45-54) and 18% (55-65; BVG, 2004, § 16; BVG, 2012, § 16).

might have to contribute extra (solvency) contributions. This kind of contributions is discussed in more detail in sub-section 2.2.6.

In line with Müller (2013), Panel A of TABLE 2.4 also depicts total *regulatory* contributions by employers and employees which are mainly based on contributions attributable to the coverage of the risks of old-age, death and disability. These contributions are stipulated in the regulations of the respective pension plans (i.e., attributable to mandatory and non-mandatory benefits). Between 2004 and 2012, mean (median) total annual combined regulatory contributions were CHFm 34,277 (35,041). The mean (median) share contributed by employers was 58.15% (58.19%). This corroborates the findings above, whereas, on average, employers finance more than half of pension plan contributions during the sample period.

In contrast to contributions from employers and employees, investment returns on pension assets had been far more volatile between 2004 and 2012. As shown in Panel B of TABLE 2.4, total absolute returns net of asset management cost earned from total pension assets exceeded (were below) total contributions in two (eight) out of the nine sample years. The considerably higher volatility of absolute returns compared to contributions can also be illustrated by the comparison of the *Coefficient of Variation* (v) for both measures.²⁰ For the sample period of 2004 to 2012, v is estimated to be 2.25 and 0.12 for total absolute returns and total contributions, respectively.

As above-mentioned, pension assets and returns fluctuate with financial markets. This is also illustrated by the investment returns estimated as percentage of average total pension assets (see Panel B of TABLE 2.4). Between 2004 and 2012, these oscillate between a minimum of -13.57% (2008) and a maximum of 10.31% (2005), with a mean (median) return of 3.24% (4.16%). Obviously, as shown in Panel B of TABLE 2.4, during the climax of the subprime crisis in 2008 as well as the *euro-debt crisis* in 2011, financial markets had been in great turmoil and, thus, total absolute as well as relative returns of Swiss pension plans were negative for these two periods (Stauffer, 2012).²¹ Naturally, returns are also heavily affected by the asset allocation (see e.g., Deplazes, 2016). For the sample period of 2004 to 2012, FIGURE 2.2 depicts the allocation of total pension assets as well as the relative net returns illustrated in Panel B of TABLE

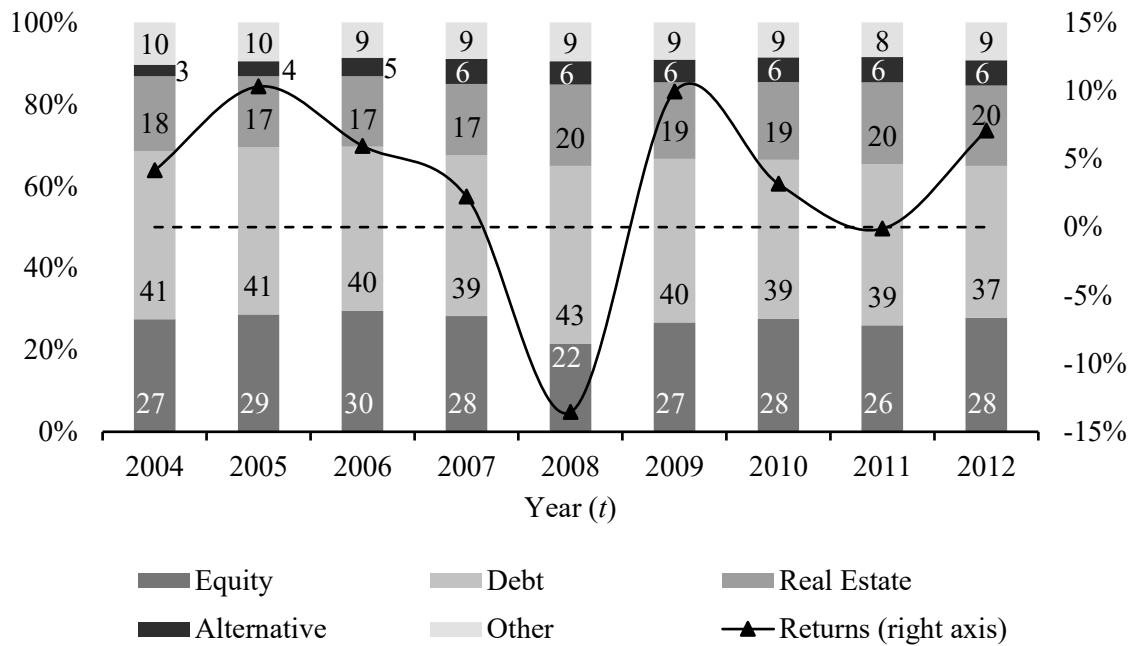
²⁰ v is defined as the standard deviation scaled by the mean, thus $v = \frac{\sqrt{\frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2}}{\bar{x}}$, whereas the nominator is defined as the sample standard deviation s of x (see e.g., Kohn & Öztürk, 2010).

²¹ See e.g., Haldner (2013) and Gruhnwald and Haffter (2012) for a chronology of the subprime and euro-debt crisis, respectively.

TABLE
2.4 Funding of Swiss Pension Plans

Panel A: Contributions by Employers and Employees										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
Total ^a	33,582	36,059	37,999	43,754	44,132	44,780	46,779	47,103	47,748	42,437
<i>Employers</i>	56.97%	56.16%	55.76%	58.03%	57.33%	57.25%	57.78%	57.53%	56.78%	57.06%
Regulatory ^b	28,533	29,842	31,001	32,890	35,041	36,384	36,971	38,283	39,551	34,277
<i>Employers</i>	58.00%	57.92%	57.71%	58.04%	58.43%	58.56%	58.33%	58.21%	58.19%	58.15%
Panel B: Investment Returns on Pension Assets										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
Returns ^c	19,161	52,654	33,376	13,233	(77,275)	56,288	19,277	(731)	45,768	17,972
<i>in % of assets^d</i>	4.16%	10.31%	5.95%	2.24%	(13.57)%	9.93%	3.17%	(0.12)%	7.07%	3.24%
<i>Note.</i> For the sample period of 2004 to 2012, Panel A depicts total contributions to Swiss pension plans (incl. respective shares of employers). Panel B shows total returns to pension assets of Swiss pension plans. The data corresponds to TABLE 2.2 and is sourced from BFS (2017d).										
^a In line with Müller (2013, p. 22) total contributions include regulatory, return and solvency contributions as well as one-time payments and purchase amounts. For employers, also transfers to employer contribution reserves (<i>ECR</i> , see sub-section 2.2.6) are included. All values are denoted in CHFm.										
^b Includes regulatory contributions by employers and employees as stipulated in the pension plan regulations (i.e., mandatory and non-mandatory benefits) only. All values are denoted in CHFm.										
^c Return on investments net of asset management cost. All values are denoted in CHFm. Negative values are shown in parentheses.										
^d Mean of total pension assets (excluding transitory assets) as of beginning and end of period. On average, this corresponds to 97.47% of total assets as depicted in Panel B of TABLE 2.2. For 2004, mean includes total pension assets as of the end of 2002 sourced from BFS (2002). Negative values are shown in parentheses.										

FIGURE

2.2 Asset Allocation and Investment Returns of Swiss Pension Plans

Note. For the sample period of 2004 to 2012, the FIGURE depicts the allocation of total pension assets (in %, excluding transitory assets) and net returns (in %, marked black line and right axis) corresponding to the data shown in Panel B of TABLE 2.4. Deviations from 100 are due to rounding. Data is sourced from BFS (2017d). Equity includes domestic (i.e., Swiss) and foreign shares as well as shares of employers. Debt includes domestic and foreign bonds, bonds denominated in foreign currencies as well as loans and receivables of employers. Real Estate includes domestic and foreign real estate as well as domestic and foreign mortgages. Alternative includes investments in private equity, hedge funds, insurance linked securities, commodities, infrastructure as well as other alternative assets. Other includes cash and cash equivalents, investments in collective funds as well as other assets. Returns are defined in note ° of TABLE 2.4.

2.4 (marked black line, right axis). Between 2004 and 2012, mean (median) shares of pension assets invested in *Equity*, *Debt*, *Real Estate*, *Alternative* and *Other* investments were 27.11% (27.67%), 39.97% (39.96%), 18.59% (18.72%), 5.20% (5.71%) and 9.13% (9.09%), respectively. Compared to 2004, asset allocation in 2012 had shifted from debt and other to equity, real estate, and especially alternative investments.²² Notable is also the shift from equity into debt and real estate during 2008. In absolute terms, the category that had increased the most during the sample period of 2004 to 2012, is the asset class of alternative investments with a compound annual growth rate (CAGR)

²² With respect to pension assets attributable to mandatory benefits, allocation ceilings for certain asset classes are stipulated by law. For example, allocation to the category of equity is not allowed to exceed 50% of total pension assets (BVV2, 2004, § 55; 2012, § 55).

of 15.05%. Amongst others, this class includes e.g., private equity, hedge funds and commodities (also see the note of FIGURE 2.2).

Summing up, during the sample period of 2004 to 2012, the funding of Swiss pension plans was mainly based on regulatory as well as other contributions by employers and employees. On average, employers had financed about 60% of these contributions. In addition, net returns (i.e., net of asset management cost) earned on the invested pension assets also contributed considerably to the funding. However, as these returns are strongly affected by the asset allocation and the fluctuations on financial markets, this internal source of funding is much more volatile. Overall, total contributions and net returns depicted in TABLE 2.4 contributed more than half of a billion CHF to Swiss pension plans across the entire sample period. More than 70% of this amount is attributable to contributions financed by employers and employees.

2.2.3 Benefits

In general, with respect to Swiss pension plans, there are three events triggering the payment of benefits: old-age (i.e., retirement), death and disability. As mentioned above, mandatory (i.e., minimum) benefits triggered by these events are stipulated by law (Müller, 2013). Regarding non-mandatory benefits, the regulations of each pension plan issued by the governing board and approved by the respective supervisory authority applies. However, mandatory benefits must be guaranteed at all time (Stauffer, 2012).²³ Panel A of TABLE 2.5 shows total regulatory benefits paid by Swiss pension plans for the years between 2004 and 2012. These include rental as well as lump sum payments for mandatory and non-mandatory benefits. Mean (median) total annual regulatory benefits paid during the sample period were CHFm 27,993 (28,312). The mean (median) share of total annual regulatory benefits paid for old-age (i.e., for retirement) was 77.87% (78.03%).

²³ If Swiss pension plans are enveloping, i.e., provide a combination of mandatory and non-mandatory benefits, usually these plans then apply so called *shadow accounting* (*Schattenrechnung*) in order to verify that mandatory benefits are guaranteed at all time regardless of whether parameters different from the ones stipulated by law are applied for the funding and estimation of plan-specific benefits (see e.g., Stauffer, 2012, p. 266).

TABLE
2.5 Benefits of Swiss Pension Plans

Panel A: Regulatory Benefits for Old-Age, Death and Disability										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
Regulatory ^a	23,743	24,331	25,794	27,306	28,312	29,406	30,189	30,894	31,962	27,993
<i>Old-Age</i>	76.30%	76.29%	76.91%	77.50%	78.03%	78.33%	78.81%	79.15%	79.47%	77.87%
<i>Death</i>	13.69%	13.91%	13.73%	13.57%	13.24%	13.38%	13.13%	13.10%	13.14%	13.43%
<i>Disability</i>	10.01%	9.80%	9.36%	8.93%	8.72%	8.29%	8.06%	7.75%	7.39%	8.70%
Panel B: Regulatory Benefits for Old-Age										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
Regulatory Old-Age ^b	18,116	18,561	19,838	21,162	22,092	23,035	23,791	24,453	25,401	21,828
<i>Rental</i>	77.81%	79.52%	77.46%	76.77%	76.71%	76.39%	76.93%	77.26%	76.78%	77.29%

Note. For the sample period of 2004 to 2012, Panel A depicts total regulatory benefits paid by Swiss pension plans (incl. respective ratios for the different risks of old-age, death and disability). For the same period, Panel B shows total regulatory benefits paid by Swiss pension plans for the risk of old-age only (incl. the share of which is paid as rent rather than lump sum). The data corresponds to TABLE 2.2 and is sourced from BFS (2017d).

^a Includes regulatory benefits for retirement (old-age), survivorship (death) and disability incl. lump sum payments for the three categories as stipulated in the pension plan regulations (i.e., mandatory and non-mandatory benefits), respectively. All values are denoted in CHFm.

^b Includes regulatory benefits for retirement (old-age) incl. lump sum payments as stipulated in the pension plan regulations (i.e., mandatory and non-mandatory benefits). All values are denoted in CHFm.

The rest had been paid to survivors (i.e., widows/widowers and/or children) of active insurees who died and to active insurees (as well as their children) who became disabled during the sample period.²⁴ Hence, between 2004 and 2012, mean (median) shares of total annual regulatory benefits paid for the events of death and disability were 13.43% (13.38%) and 8.70% (8.72%), respectively (see Panel A of TABLE 2.5).

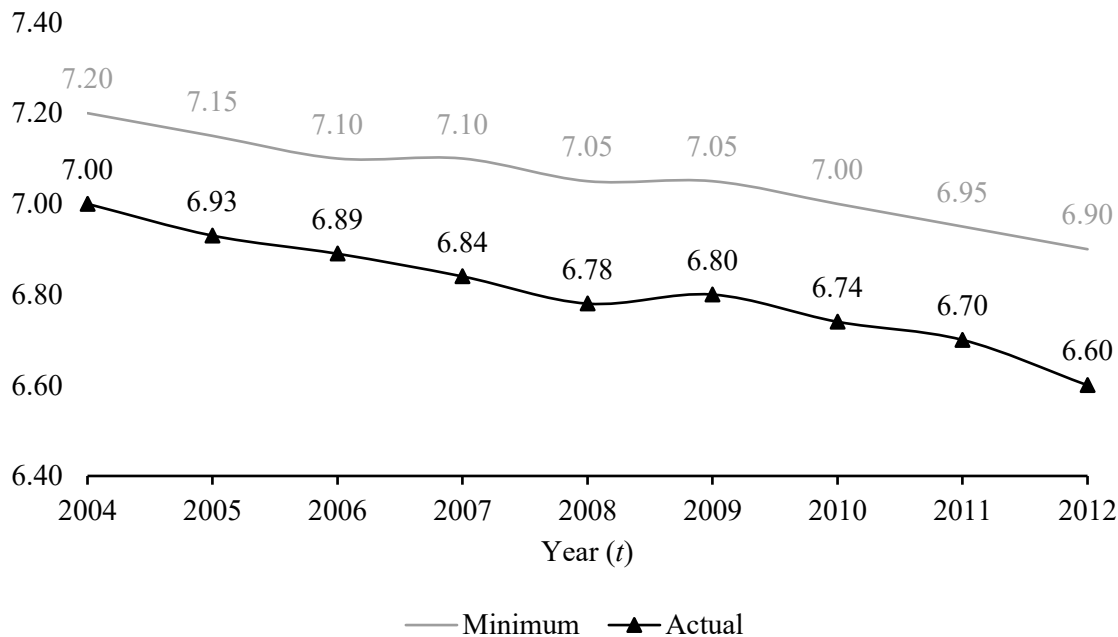
As above-mentioned, between 2004 and 2012, on average, more than three quarters of total annual regulatory benefits paid by Swiss pension plans were attributable to old-age benefits. Mean (median) total annual regulatory old-age benefits paid between 2004 and 2012 were CHFm 21,828 (22,092, see Panel B of TABLE 2.5). During these years, men were entitled to mandatory old-age benefits as they turned 65 years of age. For women, retirement age during the same period was 62 and 64 as of January 1, 2005 (BVG, 2004, § 13 para. 1; 2012, § 13 para. 1). Notably, pension plans providing non-mandatory benefits are allowed to set different retirement ages as long as minimum requirements are guaranteed at all time. Between 2004 and 2012, there had already been a relatively strong trend amongst a majority of Swiss pension plans to increase the regulatory retirement age of men and women from 62 or 63 to 65 and 64 (or even 65), respectively.²⁵

At the time of retirement, earned old-age benefits (*Altersguthaben*, hereafter *vested benefits*) are either converted into regular rent payments or (at least partially) paid out as lump sum (BVG, 2004, § 37; 2012, § 37). However, as depicted in Panel B of TABLE 2.5, between 2004 and 2012, mean (median) share of total annual regulatory old-age benefits paid out as regular rents rather than lump sum was 77.29% (76.93%). If old-age benefits come in the form of regular rent payments, vested benefits at the time of retirement are converted into an annual rent by multiplication with the so called *conversion rate* (*Umwandlungssatz*). The *minimum conversion rate* (*Mindestumwandlungssatz*) with respect to mandatory benefits is stipulated by law (BVG, 2004, § 14; 2012, § 14). FIGURE 2.3 depicts the evolution of this rate with

²⁴ Regarding mandatory benefits, in general, the spouse as well as the minor child or children of active insurees who died are entitled to benefits (BVG, 2004, § 19, 20 and 22; 2012, § 19, 20 and 22). Certain other potential beneficiaries can also be stipulated by the regulations of the pension plan (BVG, 2004, § 20a; 2012, § 20a). If an active insuree becomes disabled, also her minor child or children are entitled to certain benefits (BVG, 2004, § 25; 2012, § 25). See for example Müller (2013, pp. 9-30) for a succinct overview of the entitlements and benefits in the events of death and disability. With respect to non-mandatory benefits, entitlements and benefits in the events of death and disability are stipulated by the pension plan regulations (Müller, 2013; Stauffer, 2012).

²⁵ Data is sourced from Swissscanto (2016). See the note of FIGURE 2.3 for more details regarding the regular survey.

FIGURE

2.3 Minimum and Actual Conversion Rates of Swiss Pension Plans

Note. For the sample period of 2004 to 2012, the FIGURE depicts the minimum conversion rates (in %) for men at retirement age of 65 as stipulated by law (grey line). Data is sourced from BSV (2017e). Actual conversion rates (in %, marked black line) are annual mean rates for men at retirement age of 65 stipulated by the regulations of the enveloping Swiss pension plans covered by a regular survey of Swisscanto. Data is sourced from Swisscanto (2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013). Note, rates shown are based on different numbers of participating enveloping pension plans for each year. However, the regular survey is representative with respect to Swiss pension plans. For example, measured in terms of pension assets, the survey covered more than a third of all Swiss pension plans in 2004. As of 2012, the ratio of total pension assets covered by the survey to total pension assets shown in Panel B of TABLE 2.2 is 65% (see Swissca, 2004, p. 10; Swisscanto, 2012, p. 34).

respect to mandatory benefits for men as of the retirement age of 65 (grey line). Mainly due to the demographic trend of an ever increasing life expectancy paired with the incapacity of investment returns on pension assets to compensate this trend, the minimum conversion rate was lowered from 7.20% in 2004 to 6.90% in 2012 (Stauffer, 2012).²⁶ FIGURE 2.3 also shows the annual means of the actual conversion rates (marked black line) for men with retirement age of 65 as stipulated by the regulations of the enveloping

²⁶ For example, for a male active insuree that turned 65 years of age with earned *mandatory* benefits of CHF 1,000,000, annual rent payments were estimated as CHF 72,000 ($= 1,000,000 * 7.20\%$) in 2004 and CHF 69,000 ($= 1,000,000 * 6.90\%$) in 2012. Thus, monthly rent payments would have been estimated as CHF 6,000 and 5,750, respectively. See footnote 82 in Müller (2013) for an analogous example. Also for women, the minimum conversion rate for mandatory benefits was lowered from 7.20% in 2004 (with retirement age of 62) to 6.85% in 2012 (with retirement age of 64; BSV, 2017e).

Swiss pension plans covered by the regular survey of *Swisscanto* (see the note of FIGURE 2.3 for more details). Between 2004 and 2012, these rates were constantly below the minimum rates as stipulated by law. It is important to note that these rates are based on enveloping pension plans that provide non-mandatory in addition to mandatory benefits. As above-mentioned, these plans can set lower conversion rates as stipulated by law as long as minimum requirements regarding the mandatory benefits are guaranteed at all time. Nevertheless, the comparison of minimum and actual conversion rates illustrates how, in practice, Swiss pension plans often anticipate trends regarding demography and financial markets earlier than the law, which is always (at least partially) based on political compromise (Stauffer, 2012).

Vested benefits as of the retirement age are the basis for the estimation of the old-age benefits (either as rent, as discussed above, or lump sum payment). These vested benefits consist of the employer and employee contributions (described further above) for the time of employment with the last employer before retirement, the vested benefits from employments before the current employment (i.e., past contributions incl. interest) that were transferred-in, as well as interest accrued on these vested benefits (BVG, 2004, § 15 para. 1; 2012, § 15 para. 1). Interest is credited to vested benefits at the end of each financial year based on vested benefits as of the beginning of the respective period (i.e., annual compounding; Stauffer, 2012). With respect to mandatory benefits, a *minimum interest rate* (*Mindestzinssatz*) is stipulated by law. It is evaluated and fixed by the Swiss government (*Bundesrat*) at least once every two years taking into account the prevalent returns of asset classes such as government bonds, shares and real estate (BVG, 2004, § 15 para. 2 and 3; 2012, § 15 para. 2 and 3).²⁷

Again, as long as the minimum interest rate on mandatory benefits is guaranteed at all times, enveloping pension plans are allowed to set different interest rates to accrue on the combined mandatory and non-mandatory vested benefits (Stauffer, 2012).²⁸ The

²⁷ Since 2004, the rate is evaluated and fixed annually. The government has to consult parliamentary commissions as well as representatives of employers and employees before the minimum interest rate is changed (BVG, 2004, § 15 para. 3; 2012, § 15 para. 3). Thence, as is the minimum conversion rate discussed above, the minimum interest rate is a *political* rather than a purely *technical* parameter (Stauffer, 2012).

²⁸ Usually, in practice, pension plans either apply the same interest rate to mandatory and non-mandatory vested benefits or they apply the minimum interest rate to the mandatory and a different rate to the non-mandatory part of vested benefits. If uniform rates are applied, these are usually lower than the minimum rate. However, the minimum interest rate on the mandatory vested benefits must be guaranteed at all time. If necessary, this is done by charging the non-mandatory part of vested benefits (*Anrechnungsprinzip*, see e.g., Stauffer (2012, pp. 266-270)).

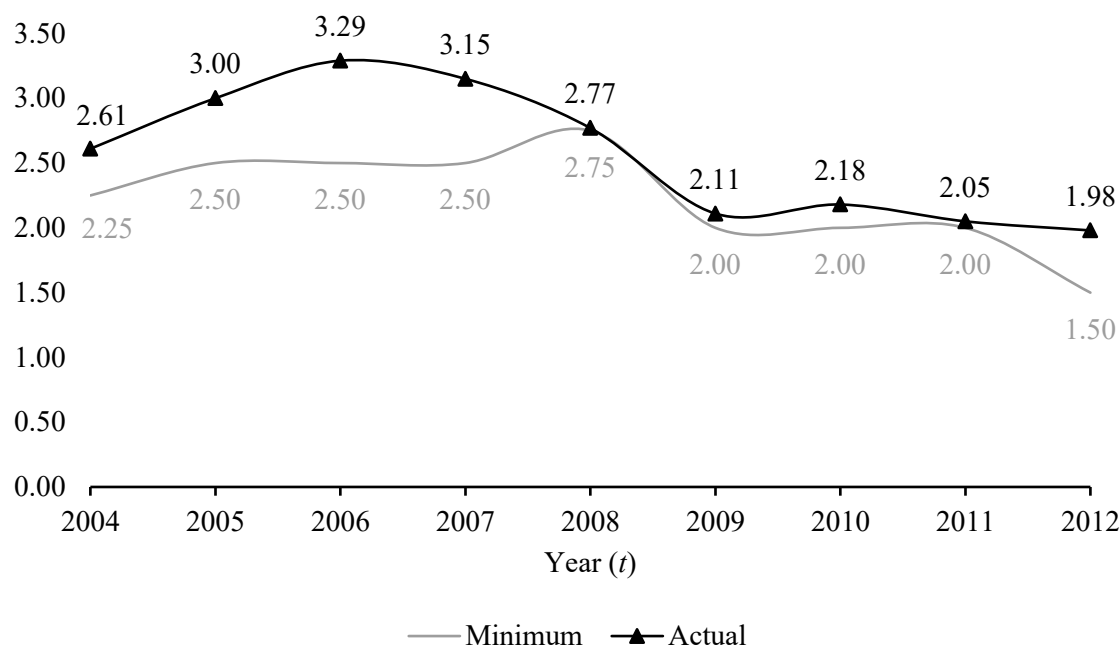
minimum interest rate had been unchanged at 4.00% from 1985 until the end of 2002. High inflation and high interest rates prevalent during the first half of the 1990s as well as the bullish equity markets towards the end of the twentieth century did not lead the Swiss government to adapt the rate. However, due to turbulent stock markets paired with low interest rates and an appreciation of the Swiss Franc between 2000 and 2002, change was inevitable and the minimum rate was lowered to 3.25% as of January 1, 2003 (Stauffer, 2012; Swissca, 2004). Since, the interest rate has been changed more regularly and during the sample period, it decreased from 2.25% as of January 1, 2004 to 1.50% as of January 1, 2012 (see FIGURE 2.4 below). Ironically, the minimum interest rate reached its sample period peak of 2.75% in 2008, the year where the subprime crisis fully unfolded. However, as the rate for each financial year is set in autumn of the previous period, there is necessarily a certain time-lag in the setting of each period's minimum interest rate (Stauffer, 2012). Nonetheless, the effect of the financial turmoil subsequently manifested itself in the relatively large drop of the minimum interest rate between 2008 and 2009 (from 2.75 to 2.00%). FIGURE 2.4 also depicts the annual means of actual interest rates applied by the enveloping Swiss pension plans covered by the Swisscanto survey. Overall, during the sample period, on average, the actual *mixed* interest rate applied to mandatory as well as non-mandatory vested benefits had been constantly above the minimum interest rate stipulated by law. However, in the aftermath of the subprime crisis in 2008, the average actual rates had only been slightly above the minimum interest rate (see FIGURE 2.4).

Overall, between 2004 and 2012, total regulatory benefits paid out by Swiss pension plans were CHFm 251,936. About 78% of these were attributable to old-age benefits rather than benefits triggered by the events of death and disability. Furthermore, on average, more than three quarters of those old-age benefits came in the form of regular rent rather than lump sum payments. Moreover, between 2004 and 2012, actual average conversion rates applied by enveloping pension plans to determine such rent payments were constantly below the minimum conversion rates stipulated by law. In contrast, average actual interest rates accrued on vested benefits had been slightly higher than the minimum interest rates throughout the sample period. However, the gap was narrowed considerably after 2008.

2.2.4 Financial Reporting

For financial years commencing on January 1, 2005, or after, all Swiss pension plans are obliged to account in accordance with the Swiss GAAP FER Accounting and

FIGURE

2.4 Minimum and Actual Interest Rates of Swiss Pension Plans

Note. For the sample period of 2004 to 2012, the FIGURE depicts the minimum interest rates (in %) stipulated by law for annual compounding of vested benefits (grey line). Data is sourced from BVV2 (2012, § 12). Actual interest rates (in %, marked black line) are annual mean rates of the enveloping Swiss pension plans covered by the regular Swisscanto survey. Data is sourced from Swisscanto (2005, 2006, 2007, 2008, 2009, 2010, 2013). See the note of FIGURE 2.3 for more details regarding the survey.

Reporting Recommendation 26 *Accounting of pension plans* (hereafter ARR 26; BVV2, 2004, § 47 para. 2; 2012, § 47 para. 2).²⁹ Furthermore, general provisions regarding *commercial accounting and financial reporting* stipulated by the *Swiss Code of Obligations* (hereafter OR) also hold for Swiss pension plans.³⁰ Financial statements of Swiss pension plans consist of a balance-sheet, an operative account as well as explanatory notes incl. figures of the prior year (ARR 26, 2004, para. 2). These elements “[...] shall

²⁹ ARR 26 (2004) was first enacted on January 1, 2004 and had to be applied as of January 1, 2005 (Helbling et al., 2006). However, “[...] comparative figures for the prior year [i.e., 2004...]” (ARR 26, 2004, para. 2) had to be reported. Moreover, the first revision of the standard was enacted on January 1, 2014 (see e.g., Sauter, 2014). Thus, ARR 26 (2004) was in force throughout the sample period of 2004 to 2012.

³⁰ Specifically, in addition to ARR 26 (2004), BVV2 (2004, § 47 para. 4; 2012, § 47 para. 4) stipulate OR (2004, § 957-964; 2012, § 957-964) to hold for Swiss pension plans. In the absence of specific rules stipulated by ARR 26 (2004), these general provisions take precedence, even over rules and guidelines stipulated by any other accounting and reporting recommendation of Swiss GAAP FER (see e.g., footnote 157 in Müller, 2013).

present a ‘true & fair view of the financial situation’ [...]” of the pension plan (ARR 26, 2004, para. 2).

Generally, assets must be valued at current values “[...] without any smoothing factors.” (ARR 26, 2004, para. 3). In principle, current values are based on market values. For assets (e.g., real estate) which are not traded regularly on a market, valuation shall be based on expected future cash-flows, discounted with a rate that adequately incorporates risk. Alternatively, such assets can also be valued by comparison with similar objects or any other generally accepted valuation method. Where the current value of an asset cannot be determined as described, the historical cost less identifiable losses may be applied as an exception. Details regarding the valuation methods and respective parameters applied must be disclosed in the notes. Specifically, with respect to bonds, real estate and participations, smoothing factors are not allowed (ARR 26, 2004, para. 14).³¹ Also, valuation methods must be applied consistently from year to year. Changes in these methods and potential effects of such changes must be disclosed in the notes (ARR 26, 2004, para. 5).

In line with assets, also liabilities must be valued as of the balance-sheet date (ARR 26, 2004, para. 4). Pension liabilities as well as actuarial reserves must be valued annually in accordance with generally accepted actuarial valuation principles and applying generally available technical (i.e., actuarial) parameters. The occupational pensions expert (appointed by the governing board of the pension plan, see sub-section 2.2.1) together with the governing board of the pension plan chooses the respective valuation method. In general, either a *static* or a *dynamic* method can be applied. Dynamic methods are only allowed to be applied if the valuations turn out to be higher than if valued with a static method based on minimum requirements stipulated by law (ARR 26, 2004, para. 15). Within the context of Swiss pension plans, the static method is common practice. It is based on current data (i.e., as of the reporting date) regarding the active insureds, salaries, benefits and beneficiaries and does not take into account expectations about future developments in salaries, investment returns, benefits and employee fluctuations. In contrast, parameters used when applying a dynamic method must adequately reflect expectations regarding long-term economic as well as demographic trends. As discussed in more detail in sub-section 3.2.6.1, in accordance with international financial reporting standards such as IFRS or US GAAP, dynamic rather than static methods

³¹ For example, even if bonds are held to maturity and 100% of the nominal value will be received, these assets must be valued at current (i.e., market) values (Stauffer, 2012).

must be applied for the valuation of pension liabilities (Helbling, 2010).³² A projection (*Fortschreibung*) of pension liabilities and actuarial reserves from one balance-sheet date to the next is allowed only, if there were no significant changes regarding the structure of the pension plan (e.g., due to mergers or partial liquidations), re-insurance contracts or benefits triggered during the reporting period. Moreover, if there were significant changes in the parameters used for valuation or if there was an underfunding at the beginning of the reporting period, a projection is not allowed either (ARR 26, 2004, para. 15). As is the case for assets, valuation methods for liabilities must be applied consistently from year to year. Changes in these methods and potential effects of such changes must be disclosed in the notes (ARR 26, 2004, para. 5).

Since January 1, 2005, Swiss pension plans must stipulate rules for the creation of reserves for fluctuations in asset value (*Wertschwankungsreserven*; BVV2, 2012, § 48e). Rules must be in line with ARR 26 (2004) and applied consistently over time (BSV, 2004a). The *reserve for fluctuations in asset value (RFAV)* is *quasi-equity* (“Quasi-Eigenkapital” (Helbling et al., 2006, p. 437)) that mitigates investment risks, and enhances the *risk capacity (Risikofähigkeit)* of the pension plan. Its target value should be around 10-20% of respective assets (Helbling et al., 2006). The estimation of the target value shall be based on financial and current circumstances such as e.g., the current situation on financial markets, asset allocation, investment strategy, target return and security level of the pension plan as well as the structure and the development of the pension liabilities and actuarial reserves (ARR 26, 2004, para. 15).³³ The *RFAV* is the only balance-sheet item allowed to have a smoothing effect on the pension plan’s operating result (ARR 26, 2004, para. 4). Apart from the assets, the liabilities as well as the *RFAV*, also the *dotation capital (Stiftungskapital)* is recognized on the balance-sheet of the pension plan. In essence, this is the *true equity* of the pension plan which absorbs the operating surplus or deficit at the end of each period (ARR 26, 2004, para. 2 and 7). This item is further discussed in sub-section 2.2.5 below.

In contrast to a commercial enterprise, Swiss pension plans must report an *operative account (Betriebsrechnung)* and not an ordinary profit and loss statement (Stauffer,

³² For example, Mettler (2007) develops a cash-flow valuation model for obligations of Swiss pension plans that is more in line with the dynamic valuation approaches stipulated by international accounting standards such as IFRS and US GAAP compared to traditional actuarial (i.e., static) methods.

³³ The reserve for fluctuations in asset value (*RFAV*) should be able to absorb small to medium depreciations in asset values (i.e., as above-mentioned, about 10-20% of asset values). A pragmatic estimation approach for the target value is the asset-weighted rate of risk. Also, as more sophisticated methods, *Asset-Liability-Studies* or *Value-at-Risk* could be applied (see e.g., Helbling et al., 2006, pp. 489-491).

2012). All changes in assets and liabilities must be accounted for in the operative account, regardless of whether these are income related or not. Netting of in- and outflows is prohibited (Helbling et al., 2006).³⁴ The structure of the operative account is outlined in ARR 26 (2004, para. 8). An operative surplus can only be recognized if the *RFV* has attained its target value (ARR 26, 2004, para 2). Analogously, an operative deficit can only be recognized if “[...] the reserve for fluctuations in asset value has been fully released.” (ARR 26, 2004, para 2).

Apart from the items recognized on the balance-sheet and in the operative account, all supplemental information necessary to understand the financial situation of the pension plan shall be reported in the explanatory notes. *Inter alia*, the disclosures shall entail information regarding the legal form and the organizational structure of the pension plan, the number of active insureds and beneficiaries, applied valuation methods for assets and liabilities, actuarial and technical parameters applied for the valuation of pension liabilities and actuarial reserves, information regarding the investment strategy and operations as well as the asset allocation, and, last but not least, information regarding any existing underfunding and waivers of use regarding employer contribution reserves (ARR 26, 2004, para. 9).

Finally, collective and group pension plans (see sub-section 2.2.1) shall report financial statements for each plan separately as well for the entire collective and group plan as a whole. Also, netting between positions of individual plans is not allowed. Specifically, the offsetting of one plan’s underfunding against another plan’s *non-committed funds* (*Freie Mittel*) is prohibited (ARR 26, 2004, para. 10).

2.2.5 Financial Stability

As mentioned at the beginning of sub-section 2.2.2, by law, at any point in time, Swiss pension plans must ensure the funding of all assumed obligations (BVG, 2004, § 65 para. 1; 2012, § 65 para. 1). The financial stability is measured by the ratio of *available pension assets* to *actuarial pension liabilities sufficient to cover the regulatory benefits of a pension plan* (Stauffer, 2012). By law, this so called *funding ratio* (*FR*) is defined as follows,

³⁴ Note, in that sense, the operative account can also be seen as a sort of *amalgam* between an ordinary profit or loss as well as an ordinary cash-flow statement. According to ARR 26 (2004, Introduction), it is not required that Swiss pension plans report a cash-flow statement. However, see e.g., Sager (2013, p. 45) for a short discussion on the concept of a cash-flow statement for Swiss pension plans within the context of ARR 26 (2004). More details regarding the cash-flows of Swiss pension plans can also be found in e.g., Mettler (2007).

$$FR = \frac{PA}{PL} \quad (2.1)$$

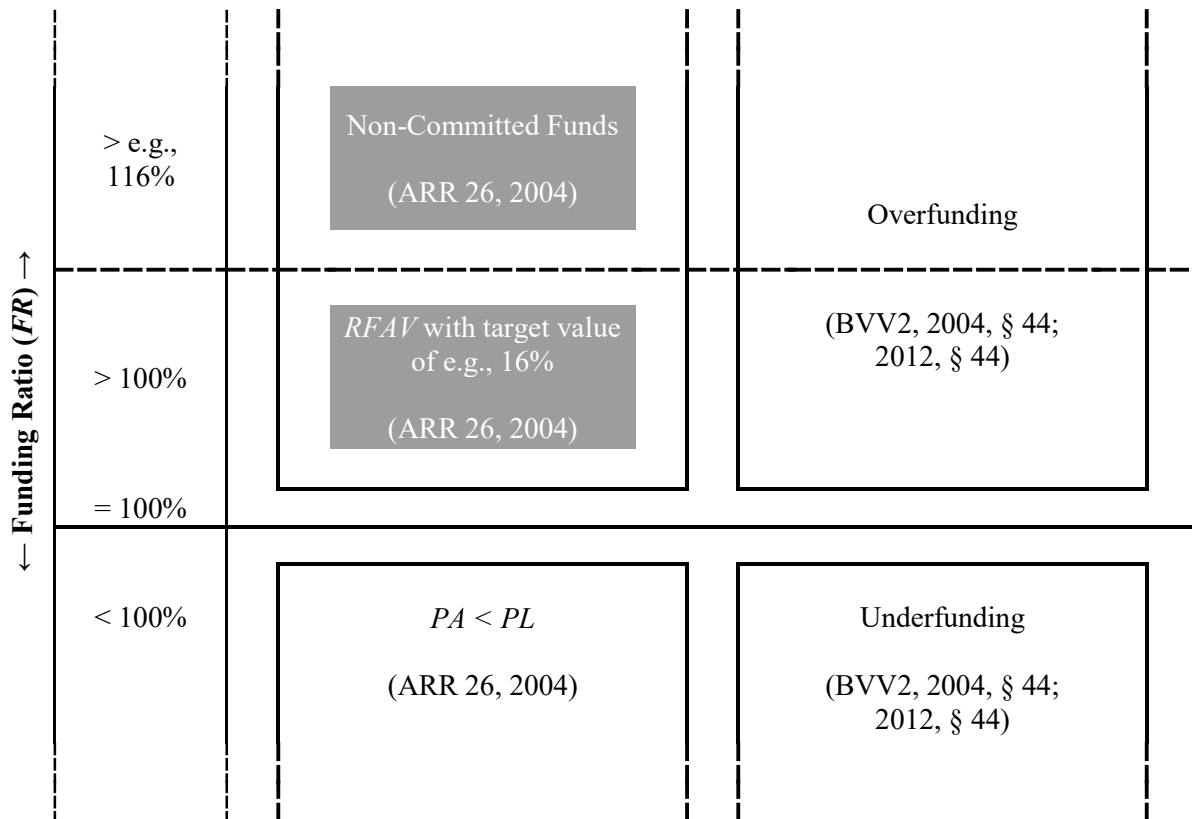
where, PA and PL denote all available assets and actuarial pension liabilities recognized on the balance-sheet as of the reporting date, respectively. As described above, assets and liabilities are recognized in accordance with ARR 26 (2004). Thus, in general, assets are valued at market values and pension liabilities are valued in accordance with generally accepted actuarial methods. Note, (accrued) liabilities, deferred income, and employer contribution reserves *without* waiver of use must be deducted from assets (PA). On the other hand, the reserve for fluctuations in asset value ($RFAV$) must be included in PA . Lastly, PL must also include actuarial reserves that account for e.g., increasing life expectancies (BVV2, 2004, Appendix; 2012, Appendix).³⁵

According to law, an *underfunding* (*Unterdeckung*) of the pension plan is indicated by a funding ratio (FR), as defined in (2.1), which is below 100% as of the balance-sheet date (BVV2, 2004, § 44 para. 1 and Appendix; 2012, § 44 para. 1 and Appendix). Analogously, there exists an *overfunding* (*Überdeckung*) if FR is greater than 100%. However, as above-mentioned, Swiss pension plans are required to build up reserves for fluctuations in asset value ($RFAV$), based on a risk-assessment regarding the structure of the assets and (pension) liabilities of the plan (see footnote 33, page 33). Thus, non-committed funds (Freie Mittel) can only be recognized *after* $RFAV$ has attained its target value. Thus, as long as $RFAV$ has not been fully funded, the pension plan cannot recognize an operative surplus, although, according to the funding ratio defined above, the pension plan is in a financial state of overfunding (ARR 26, 2004, para. 2). This concept is illustrated in FIGURE 2.5 below. Here, a target value of 16% is assumed for the $RFAV$.³⁶ Thus, non-committed funds are recognized only after the total value of respective assets (PA , incl. $RFAV$) exceeds the value of pension liabilities (PL) by more than 16%. Also, FIGURE 2.5 shows the existence of an underfunding as soon as PA

³⁵ Note, the meaning as well as the comparability between different pension plans of the funding ratio as defined in (2.1) is limited (Helbling et al., 2006). For example, (2.1) is highly dependent on the specific structure of active insureds and beneficiaries as well as on certain technical parameters (e.g., the conversion rate discussed in subsection 2.2.3) applied by the respective pension plan (Swisscanto, 2013).

³⁶ A target value of 16% of pension liabilities (PL) corresponds to the average value of the private Swiss pension plans covered by the Swisscanto survey for the sample period of 2004 to 2012 (see Swisscanto, 2013, p. 53). As above-mentioned, Helbling et al. (2006) estimate the target value to be between 10 and 20% of respective assets or 10-15% of the balance-sheet total.

FIGURE

2.5 Over- and Underfunding of Swiss Pension Plans

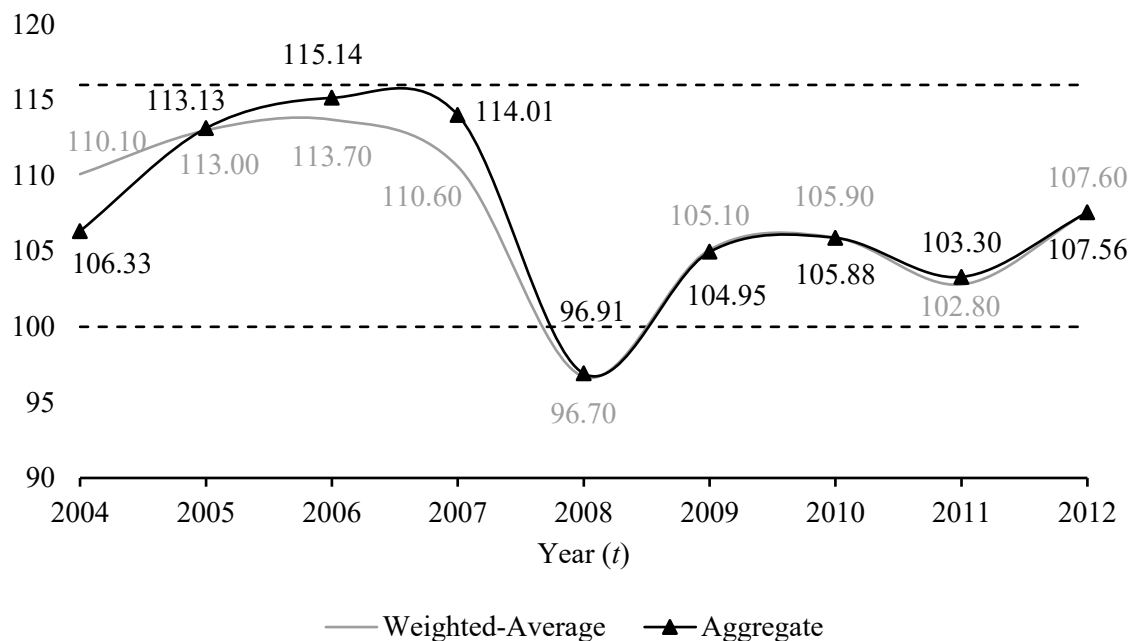
Note. The FIGURE is based on Dousse et al. (2014, p. 158) as well as Müller and Wyss (2015, p. 11) and depicts the relationships between the funding ratio FR , as defined in (2.1), the existence of an over- and underfunding in accordance with the law (BVV2, 2004, § 44; 2012, § 44) as well as the recognition of a reserve for fluctuations in asset value ($RFAV$) and non-committed funds in accordance with ARR 26 (2004). The straight and dashed black lines (horizontal) indicate a funding ratio of 100.00% and 116.00%, respectively.

drops below PL . Thence, an operative deficit can only be recognized after the $RFAV$ has been fully released (ARR 26, 2004, para. 2 and 13).

FIGURE 2.6 depicts the annual aggregated funding ratios, as defined in (2.1), of all private Swiss pension plans between 2004 and 2012 (marked black line). Public pension plans are not included here because these plans need not necessarily be fully funded as long as their benefits are state guaranteed (BVG, 2012, § 72a and 72c). Furthermore, FIGURE 2.6 shows the annual weighted-average of the funding ratios of all private Swiss pension plans covered by the regular Swisscanto survey (grey line).³⁷ As illustra-

³⁷ Annual averages are weighted by pension assets. Again, public pension plans are not included due to limited comparability (see Swisscanto, 2012, p. 50).

FIGURE

2.6 Funding Ratios of Swiss Pension Plans

Note. For the sample period of 2004 to 2012, the FIGURE depicts the funding ratios (in %), as defined in (2.1), of private Swiss pension plans. Funding ratios aggregated across all private Swiss pension plans are shown as marked black line. The data corresponds to TABLE 2.2 and is calculated based on data sourced from BFS (2017d). Annual weighted-average funding ratios of all private Swiss pension plans covered by the regular Swisscanto survey are shown as grey line. Annual averages are weighted by pension assets and data is sourced from Swisscanto (2012, 2013). See the note of FIGURE 2.3 for more details regarding the survey. The dashed black lines indicate a funding ratio of 100.00% and 116.00%, respectively.

-ted, both data sets correspond very closely (again, especially after 2008). For the sample period, mean (median) aggregated funding ratio was 107.47% (106.33%). Accordingly, mean (median) weighted-average funding ratio was 107.28% (107.60%). Overall, throughout the sample period of 2004 to 2012, private Swiss pension plans were highly funded with aggregate and weighted-average funding ratios above 100.00% in all but one year (2008, 96.91% and 96.70%, respectively). The sample period peaks were reached in 2006 with aggregate and weighted-average funding ratios of 115.14% and 113.70%, respectively. However, as mentioned above, for the sample period, Swisscanto estimates an average target value for the reserve for fluctuations in asset value (*RFAV*) of all private Swiss pension plans covered by their survey of 16%, measured as percentage of pension liabilities (*PL*). Accordingly, the dashed line in FIGURE 2.6 indicates the funding ratio of 116% above which, on average, respective pension plans would start to recognize non-committed funds as depicted in FIGURE 2.5. Throughout the sample period, this average target value had never been attained. Moreover, after

2007, aggregate and weighted-average funding ratios did not even reach the minimum target value for the *RFAV* of 10%, stipulated by Helbling et al. (2006). Between the years 2000 and 2002, turbulences on stock exchanges paired with low interest rates and an appreciation of the Swiss Franc lead to considerable losses on Swiss pension assets (Stauffer, 2012). Helbling et al. (2006) estimate that about CHFbn 70 (or 10-15%) worth of pension assets were lost during that phase. Nevertheless, by the end of 2005, most underfundings had been recovered (Helbling et al., 2006). Thus, underfundings mainly due to investment losses are often recovered fairly quickly by corresponding investment gains (Stauffer, 2012). The “[...] ‘double dip’ [...]” (Swisscanto, 2012, p. 50) in overall funding ratios of 2008 and 2011, shown in FIGURE 2.6, also naturally corresponds to the negative investment returns on pension assets realized during these periods (see sub-section 2.2.2 and FIGURE 2.2). In contrast, structural underfundings caused by demographic trends such as, for example, an increasing number of beneficiaries per active insuree and increasing life expectancies are often more difficult to compensate (Stauffer, 2012).³⁸

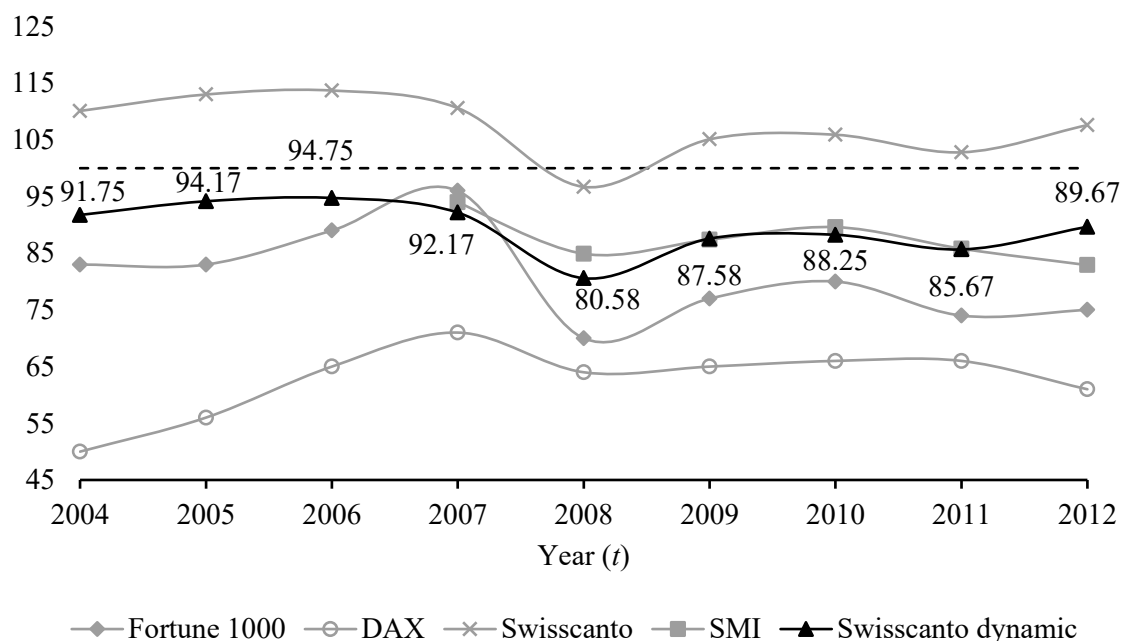
From an international perspective, on average, Swiss pension plans are highly funded (Helbling et al., 2006). As outlined in section 2.1, during the sample period of 2004 to 2012, Switzerland had some of the ratios of pension assets to GDP worldwide. This is also in line with the relatively high funding ratios of Swiss pension plans observable during that period. FIGURE 2.7 depicts the same funding ratios of the regular Swisscanto survey as shown in FIGURE 2.6 (marked grey line). Moreover, for the sample period, the figure illustrates annual average funding ratios of corporate pension plans reported by firms that belong to the 1,000 largest companies (measured in terms of revenue) operating in the US (*Fortune 1000*).³⁹ Also, the figure shows corresponding data

³⁸ It is also this demographic trend of an ever more ageing Swiss population paired with relatively low interest rates that, on March 17, 2017, was the main reason leading the Swiss parliament to pass a major reform of the Swiss social welfare system. However a majority of Swiss voters voted against this reform on September 24, 2017. Two of this reform’s main components were the increase of the retirement age of women from 64 to 65 as well as the reduction of the minimum conversion rate for both men and women at retirement age of 65 from 6.80 to 6.00%. As discussed in sub-section 2.2.3, on average, enveloping Swiss pension plans have applied conversion rates below 6.80% since 2008 (see FIGURE 2.3). However, this comprehensive reform package of the Swiss social welfare system (first and second pillar) is not further discussed here. All necessary information can be found on e.g., BSV (2017b).

³⁹ See e.g., Fortune (2017) for details regarding the Fortune lists. Data is sourced from Towers Watson (2013). All firms on the Fortune 1000 list that report defined benefit pension plans are included for the estimation of annual average funding ratios. The concept of defined benefit plans is discussed in more detail in section 3.2. For example, in 2012, 42.20% of these firms were included (see Towers Watson, 2013, p. 10). Note, also Swiss firms listed on

FIGURE

2.7 Swiss and International Funding Ratios



Note. For the sample period of 2004 to 2012, the FIGURE depicts annual average funding ratios (in %). Data of the Swisscanto survey is identical to the data shown in FIGURE 2.6. This data is multiplied by the factor 0.83, which corresponds to a 20% increase in pension liabilities (*PL*), and shown as marked black line. Data for the firms included in the *Swiss Market Index* (SMI) is sourced from Towers Watson (2013) for the periods 2007 to 2012. Data for the firms with defined benefit pension plans included in the Fortune 1000 list as well as the DAX index is also sourced from Towers Watson (2013). The dashed black line indicates a funding ratio of 100%.

reported by the largest firms listed in Germany (*DAX index*).⁴⁰ Overall, between 2004 and 2012, on average, reported pension plans of Fortune 1000 firms included as well as the firms listed on the DAX had never been fully funded (all values below 100%). Accordingly, between 2004 and 2012, mean (median) annual average funding ratios were 80.78% (80.00%) and 62.67% (65.00%), respectively. In contrast, between 2007 and 2012, annual average funding ratios reported by firms listed on the *Swiss Market Index*

the SMI can be included in the Fortune 1000 data. See e.g., SIX (2017d) for more details regarding the composition of the SMI.

⁴⁰ Again, data is sourced from Towers Watson (2013). The DAX index includes the 30 largest companies with respect to market capitalization and trading volume listed on *Deutsche Börse* in Frankfurt. Together, these firms represent about 80% of total market capitalization listed in Germany (STOXX, 2017).

(SMI) had a mean (median) value of 87.43% (86.60%). Nonetheless, also these pension plans had never been fully funded during the observed period.⁴¹

As outlined in sub-section 2.2.4, most Swiss pension plans value pension liabilities according to a static method. In contrast, firms reporting in accordance with international reporting standards, commonly apply dynamic methods. Such dynamic methods often lead to estimated values of pension liabilities that are about 10-20% higher than if valued statically (see e.g., Helbling et al., 2006, p. 530).⁴² On the other hand, estimated market values of pension assets are very similar regardless of whether ARR 26 (2004) or international reporting standards are applied (Müller, 2013). Thus, in order to make the annual average funding ratios sourced from Swisscanto more comparable to the rest of the funding ratios shown in FIGURE 2.7, these were multiplied with the factor 0.83. All else equal, this corresponds to an increase of the pension liabilities (*PL*) of 20%. These *dynamic* values are shown as marked black line in FIGURE 2.7. As can be seen, they correspond closely to the values of the SMI-firms. Thus, apparently, an average discount of 16.67% ($1-0.83$), corresponding to a 20% increase of pension liabilities, seems realistic for Swiss funding ratios that are based on dynamic rather than static valuation methods.

Summing up, the financial stability of Swiss pension plans is measured by the ratio of pension assets (*PA*) to pension liabilities (*PL*), i.e., the funding ratio as defined in (2.1). Notably, an overfunding in the form of committed funds can only exist after the reserve for fluctuations in asset value (*RFAV*) has attained its target value. Correspondingly, an underfunding only exists after the *RFAV* has been fully released. With the exception of 2008, on average, Swiss pension plans had been constantly overfunded throughout the entire sample period. However, funding ratios had been fluctuating strongly with financial markets. Moreover, during almost the entire sample period, Swiss pension plans showed higher mean (median) annual average funding ratios than plans of large firms operating in the US or listed in Germany. This holds whether pension liabilities of Swiss plans are valued statically or dynamically.

⁴¹ Data shown for firms listed on the SMI is also sourced from Towers Watson (2013). However, no data was reported for the years before 2007.

⁴² Müller (2013, pp. 95-96) illustrates a real example whereas the funding ratio of a Swiss pension plan is either 101% or 86%(sic), depending on whether pension liabilities are valued statically or dynamically.

2.2.6 Restructuring

By law, an underfunding of a Swiss pension plan, as defined in sub-section 2.2.5, is permitted *temporarily* as long as mandatory benefits can be paid, and certain measures are taken to eliminate the underfunding in due course (BVG, 2004, para 1; 2012, para 1).⁴³ If an underfunding exists, the pension plan (i.e., the governing board) must inform the supervisory authority, the employer(s), the active insurees as well as the beneficiaries about the causes and the degree of the underfunding, as well as about the *restructuring measures* (*Sanierungsmassnahmen*) taken (BSV, 2004b, § 222-224; BVG, 2004, § 65c para. 2; 2012, § 65c para. 2). First and foremost, the governing board of the pension plan is responsible for eliminating the underfunding. The *Guarantee Fund* (*Sicherheitsfonds*) supports the funding of benefits only, if the pension plan is insolvent (BSV, 2004b, § 221; BVG, 2004, § 65d para. 1; 2012, § 65d para. 1).⁴⁴ Specific restructuring measures to be taken in the case of an underfunding must be stipulated in the pension plan's regulations (BVG, 2004, § 65d para. 2; 2012, § 65d para. 2). By law, the following two restructuring measures are allowed to be taken if other measures are not sufficient (BVG, 2004, § 65d para. 3; 2012, § 65d para. 3):

- Restructuring contributions by employers and employees whereby employers must contribute at least as much as employees (BVG, 2004, § 65d para. 3 lit. a; 2012, § 65d para. 3 lit. a).
- Extraordinary contributions by beneficiaries (BVG, 2004, § 65d para. 3 lit. b; 2012, § 65d para. 3 lit. b).

The latter measure can only be applied to non-mandatory benefits, and only to those non-mandatory benefits that are based on benefit increases during the ten years before the measure is invoked which are not stipulated by either the law or the pension plan regulations (BVG, 2004, § 65d para. 3 lit. b; 2012, § 65d para. 3 lit. b). Thus, such a *de*

⁴³ This is an exception to the principle stated at the beginning of sub-sections 2.2.2 and 2.2.5, which stipulates the full funding of assumed pension obligations at all times (BVG, 2004, § 1; 2012, § 1). Through the measures taken, the funding ratio should reach 100% within about 5 to 10 years (see e.g., Helbling et al., 2006, p. 441). The legal rules regarding a temporary underfunding as well as admissible restructuring measures were enacted on January 1, 2005. However, due to the relatively small number of observations included in the final sample of this study based on financial data as of December 31, 2004, results of the analysis are not expected to be qualitatively altered. See section 6.1 for more details regarding the sample selection and data collection.

⁴⁴ The main task of the *LOB Guarantee Fund* (*Sicherheitsfonds BVG*) is the guarantee of mandatory as well as non-mandatory benefits (up to a maximum ceiling) of Swiss pension plans that become insolvent (BVG, 2004, § 56 para. 1 lit. b and c; 2012, § 56 para. 1 lit. b and c). It is funded by the covered pension plans (BVG, 2004, § 59 para. 1; 2012, § 59 para. 1). See e.g., Stauffer (2012, pp. 695-702) for more details.

facto cut of benefits (Müller, 2013, p. 39) is very restrictive and should only be considered if the funding ratio of the pension plan drops below 80% (see e.g., Helbling et al., 2006, p. 448).

In general, restructuring measures must follow *the principle of subsidiarity*. Hence, the above-mentioned measures are allowed to be taken only, if other, less far-reaching measures are insufficient to eliminate the underfunding (BSV, 2004b, § 222 para. 8). For example, in the state of an underfunding, the pension plan can cancel or restrict the option of active insureds to withdraw certain amounts of vested benefits in advance to finance residential property (BVG, 2004, § 30 para. 1; 2012, § 30 para. 1).⁴⁵ Also, if the pension plan provides non-mandatory benefits, the conversion rate can be reduced. However, the minimum conversion rate regarding mandatory benefits must be guaranteed at all times, and the reduction of the conversion rate is only admissible regarding future benefits (BSV, 2004b, § 321 para. 2).⁴⁶ A discussion of other potential restructuring measures, such as e.g., contributions or guarantees of welfare funds or risk reduction, can be found in e.g., Helbling et al. (2006, pp. 444-452).

If all of the above-mentioned restructuring measures are insufficient to eliminate the underfunding, the interest rate accrued on *mandatory* vested benefits can be reduced to as low as 0.5 percentage points below the minimum interest rate stipulated by law (BVG, 2004, § 65d para. 4; 2012, § 65d para. 4).⁴⁷

Another measure that does not lower or eliminate the underfunding, but which can be useful to buy some time in order to take other measures, is the *employer contribution reserve (ECR) with waiver of use* (Haag & Rüenauf, 2013). In general, employers can fund employer contribution reserves *without* any waiver of use even if there exists no

⁴⁵ *Vorbezug für Wohneigentumsförderung* (WEF).

⁴⁶ As outlined in sub-section 2.2.3, throughout the sample period, annual average conversion rates of enveloping Swiss pension plans had already been constantly lower than the minimum conversion rates as stipulated by law (see FIGURE 2.3).

⁴⁷ As outlined in sub-section 2.2.3, as long as the minimum interest rate is guaranteed on mandatory benefits, enveloping pension plans can lower the interest rate by compensating the effect via non-mandatory benefits (*Anrechnungsprinzip*), even if there exists no underfunding. However, the interest rate can never be negative (BSV, 2004b, § 311 para. 1). Nonetheless, as depicted in FIGURE 2.4, throughout the sample period, annual average interest rates of enveloping Swiss pension plans had been slightly above the minimum interest rates as stipulated by law.

underfunding. These must be transferred to the pension plan and accounted for separately (OR, 2004, § 331 para. 3; 2012, § 331 para. 3).⁴⁸ However, in order to limit potential tax shields for the employer resulting from these supplementary contributions, such reserves are limited to a maximum of the fivefold of total annual employer contributions (Stauffer, 2012).⁴⁹ After creation, employers are allowed to fund their contributions to the pension plan via existing employer contribution reserves (OR, 2004, § 331 para. 3; 2012, § 331 para. 3). On part of the employer, this could be motivated by e.g., taxation or liquidity planning.⁵⁰ As above-mentioned, in the case of an underfunding, an *ECR* can be created for which there exists a *waiver of use*. This *ECR* can be created either through additional employer contributions and/or by transfer from an existing *ECR without* waiver of use. It must not exceed the total underfunding, and no interest must be accrued on this reserve (BVG, 2004, § 65e para. 1 and 2; 2012, § 65e para. 1 and 2).⁵¹ As soon as the underfunding is entirely eliminated, the *ECR with* waiver of use must be released and transferred into an *ECR without* waiver of use.⁵² If this *ECR* is then higher as the allowed maximum of the fivefold of annual employer contributions, it must be steadily released throughout subsequent periods by funding from it the regulatory

⁴⁸ According to ARR 26 (2004, para. 7), Swiss pension plans must recognize employer contribution reserves *with* and *without* waiver of use (see below) separately as liabilities on the balance-sheet. Also, in line with ARR 26 (2004, para. 8 and 18), in- and outflows to and from the *ECR*, as well as interest accrued on reserves without waiver of use must be accounted for on a gross basis in the operative account (see sub-section 2.2.4). Lastly, comprehensive disclosures about any *ECR* with and without waiver of use must be made in the notes of the pension plan (see ARR 26, 2004, para. 9 and 19).

⁴⁹ In general, the regulatory employer contributions as well as the contributions to an *ECR* of a Swiss pension plan are deductible from Swiss federal, cantonal and communal taxes (BVG, 2004, § 81 para. 1; 2012, § 81 para. 1). However, according to common practice of Swiss tax authorities, the cumulative amount of employer contribution reserves and non-committed funds (if any) shall not exceed the sixth fold of total annual employer contributions (see e.g., Schaller & Alfieri, 2009, p. 887).

⁵⁰ See e.g., Helbling (2009); Loser (2002, pp. 125-126); Müller (2013, pp. 25-26).

⁵¹ An *ECR without* waiver of use may be interest-bearing for the benefit of the employer. For example, the applied interest rate could be the rate used to value the pension obligations or the rate for prime mortgages (see e.g., Helbling et al., 2006, p. 196).

⁵² Note, an existing *ECR without* waiver of use must be subtracted from pension assets (*PA*) when estimating the funding ratio as defined in equation (2.1). In contrast, an existing *ECR with* waiver of use must be included in *PA* (BVV2, 2012, Appendix para. 1). However, if there exists an *ECR with* waiver of use, the occupational pensions expert must estimate the funding ratio twice, once including the *ECR with* waiver of use and once excluding it from *PA* (BVV2, 2012, § 44a para. 4). Only if the latter has reached 100%, must the *ECR with* waiver of use be released to an *ECR without* waiver of use (see e.g., Peter, 2005, p. 6).

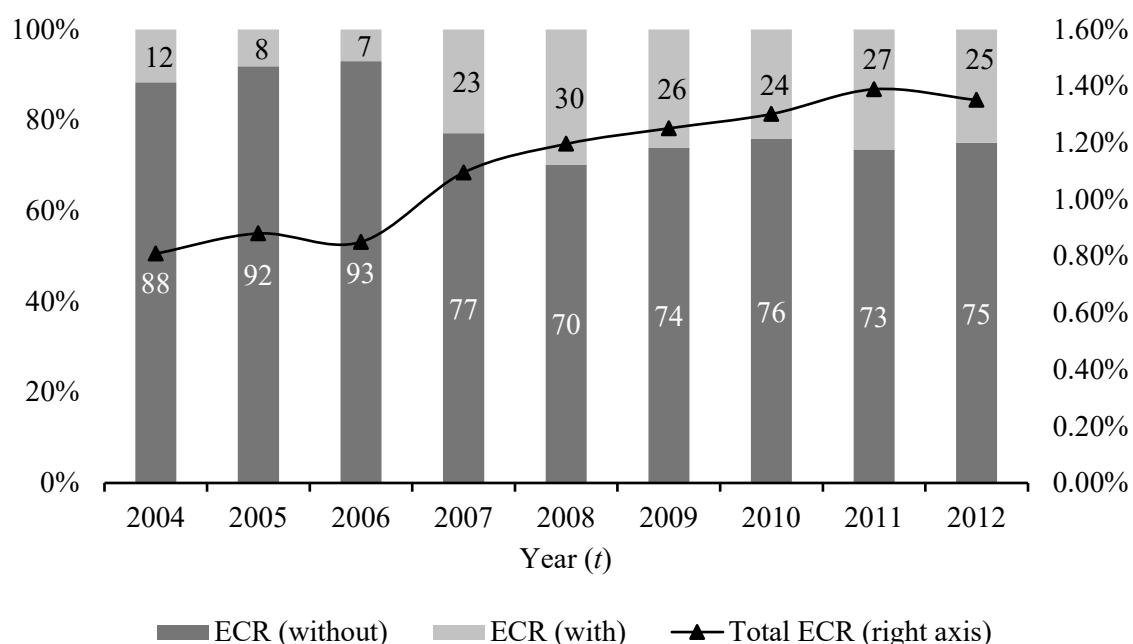
employer contributions until the maximum allowed is reached (BVV2, 2012, § 44a para. 1 and 3).

Overall, during the sample period, the total amount of *ECR* accounted for by Swiss pension plans had oscillated between a minimum of CHFbn 3.92 in 2004 and a maximum of CHFbn 9.09 in 2012, with a mean (median) amount of CHFbn 6.68 (6.63). For the same period, FIGURE 2.8 depicts the respective shares (in %) of total *ECR* *without* and *with* waiver of use, respectively. Furthermore, the FIGURE also illustrates total *ECR* in relation to total pension assets (in %, black line and right-axis). Between 2004 and 2012, the share of *ECR* with waiver of use as of total *ECR* had oscillated between a minimum of 7.00% in 2006 and a maximum of 29.77% in 2008, with a mean (median) amount of 20.13% (24.15%). Moreover, total *ECR* as percentage of total pension assets had oscillated between a minimum of 0.81% in 2004 and a maximum of 1.39% in 2011, with a mean (median) amount of 1.12% (1.20%) (BFS, 2017d). This is in line with the evolution of funding ratios of Swiss pension plans throughout that period as discussed in sub-section 2.2.5 above. Apparently, the option to contribute additional funds to employer contribution reserves and/or to grant waivers of use on employer contribution reserves had been widely used as restructuring measure around as well as in the aftermath of the subprime crisis of 2008.

Moreover, for the period of 2010, e.g., Swisscanto surveyed 373 Swiss pension plans regarding restructuring measures applied. Overall, 23% of the plans took restructuring measures during the year. At the time, most underfundings were a direct consequence of the subprime crisis unfolding in 2008. Most often, pension plans raised restructuring contributions from employers (57%) and employees (45%) and reduced the interest rate accrued on vested benefits (51%).⁵³ Apparently, in many cases, restructuring contributions were financed exclusively by employers. The other three measures that were taken most frequently during 2010 were the creation of an employer contribution reserve with waiver of use (17%), the reduction of the conversion rate (15%) as well as the restriction of advanced withdrawal for the funding of residential property (15%; see Swisscanto, 2011, p. 60). This is also in line with the evolution of *ECR* illustrated in FIGURE 2.8 below.

⁵³ Of those pension plans that took restructuring measures, 82 provided information regarding the types of measures that were taken (see Swisscanto, 2011, p. 60).

FIGURE

2.8 Employer Contribution Reserves of Swiss Pension Plans

Note. For the sample period of 2004 to 2012, the FIGURE depicts the shares (in %) of total employer contribution reserves (ECR) with and without waiver of use, respectively. Moreover, the FIGURE shows total ECR in relation to total pension obligations (excluding transitory liabilities) that equal total pension assets shown in Panel B of TABLE 2.2 (in %, marked black line and right-axis). Data is sourced from BFS (2017d).

Apparently, with respect to Swiss pension plans, the burden of an underfunding is often mainly shared between employers and employees (i.e., active insureds) rather than beneficiaries (Haag & Rüenauf, 2013). Nonetheless, it is difficult to estimate a typical share of an underfunding covered by the employer. For example, Müller (2013, p. 46) estimates the usual range to be 50-70%. Furthermore, Helbling (2010, p. 170) assume the typical share to be around 60% and also Suter (2012, p. 321) illustrates a real example whereas the employer covered 50% of the existing underfunding. Another possible indicator for the employer share of underfunding coverage could also be the share of total or regulatory contributions typically funded by the employer (Müller, 2013). As discussed in sub-section 2.2.2 and illustrated in TABLE 2.4, between 2004 and 2012, mean (median) employer share of contributions to Swiss pension plans was 57.06% (57.25%) and 58.15% (58.19%) for total and regulatory contributions, respectively. Thus, these findings are also in line with the estimates mentioned above. Last but not least, e.g., Müller (2013, pp. 42-44) investigates the ratios of total restructuring contributions to total existing underfundings accounted for by all private Swiss pension plans for the years of 2007 and 2010, respectively. According to his results, depending on the

timelag, the employer share oscillates between 6 and 64%. Again, the maximum estimate is somewhat in line with the evidence discussed above.

3 Accounting for Swiss Pension Plans

As outlined in section 2.1, for the sample period of 2004 to 2012, Swiss pension plans can be considered as socially and economically relevant. Mainly funded by contributions from employers and employees, as well as returns on invested pension assets, these pension plans had contributed considerably to the benefits paid for old-age, death and disability within the Swiss social welfare system. Demographic trends, such as an ever more ageing Swiss population, had pressured funding ratios of these plans downward. Moreover, due to a very high stock of invested pension assets relative to GDP, funding ratios had also been fluctuating strongly in accordance with financial markets. Nonetheless, on average, Swiss pension plans had still been highly funded throughout the sample period compared internationally.

Although legally separate, Swiss pension plans and sponsoring firms are economically interdependent. For example, as described in section 2.2, on average, employers financed about 60% of all contributions to the pension plans during the sample period. Moreover, employers could also be expected to cover a main share of existent underfundings. However, in order to investigate the *value-relevance* of a Swiss pension plan with respect to the covered employer(s), most often it is not possible to observe the financial statements of the pension plan directly. As described in sub-section 2.2.4, these statements are reported in accordance with ARR 26 (2004). Thus, analyses must be based on the publicly available financial reports of the employers. Accordingly, standards applied by sponsoring firms to account for their Swiss pension plans are discussed next.

3.1 Application of Accounting Standards in Switzerland

3.1.1 Non-Listed Firms

About two thirds of all employees in Switzerland are employed by enterprises with less than 250 employees.⁵⁴ Most of these firms exclusively apply the minimum general provisions of commercial accounting and financial reporting stipulated by Swiss law (i.e., OR). For example, for the year 2008, a survey of 819 Swiss non-listed SMEs showed 87% of firms with less than 50 employees and 65% of firms with between 50 and 249

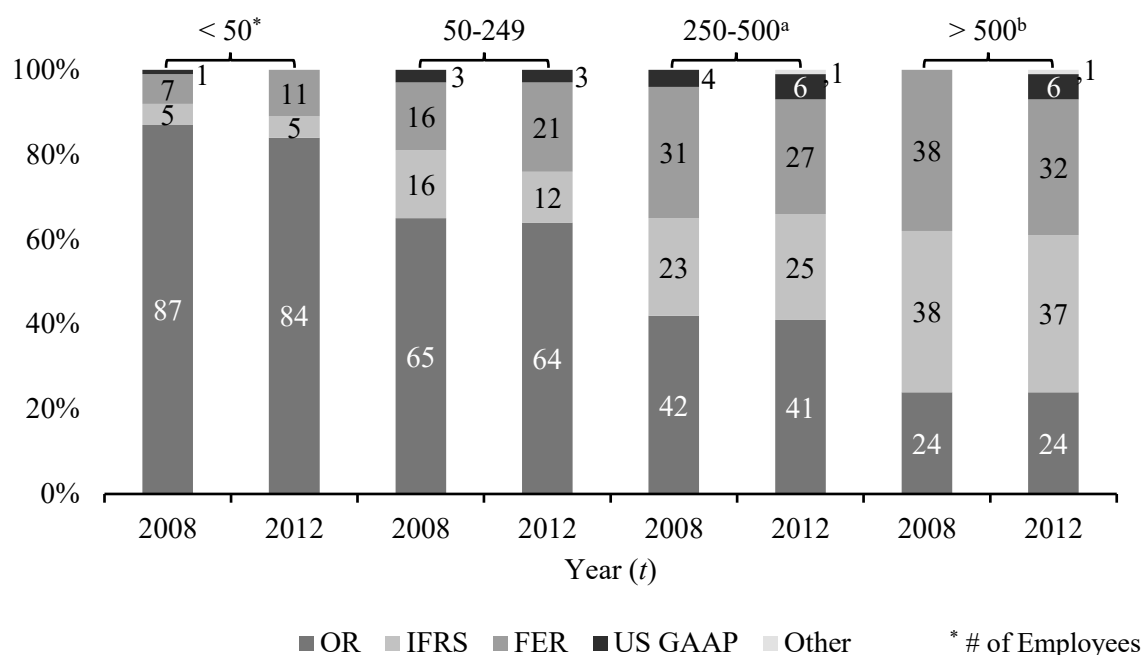
⁵⁴ According to provisional data for 2014, 67.99% of Swiss employees are employed by enterprises with less than 250 employees (BFS, 2016d).

employees to exclusively apply the accounting provisions of OR (see FIGURE 3.1). Based on 742 SMEs, an update of the survey for the year 2012 found respective ratios of 84% and 64% (also depicted in FIGURE 3.1). It is important to note, the accounting provisions of OR do not necessarily lead to a reflection of the economic facts, i.e., to a *true & fair view* of the financial position of the firm (Meyer, Bischoff, Dühaupt, & Weiss, 2009).⁵⁵ For example, between 2004 and 2012, a company limited by shares (hereafter *corporation*) had been required to value its assets in accordance with historical cost rather than market values (OR, 2004, § 665; 2012, § 665). Moreover, the law had explicitly stipulated the creation of reserves in order to protect creditors (Meyer et al., 2009).⁵⁶ Also, almost no specific provisions had been stipulated by law with respect to the accounting for pension plans. Only for corporations, OR (2004, § 663b and 673; 2012, § 663b and 673) had stipulated the presentation of pension liabilities in the notes and the possibility to create reserves in equity for the welfare of employees. Apart from that, only the limited rules regarding the recognition of *provisions* (*Rückstellungen*) might had been relevant to account for pension plans during the sample period (see footnote 17 in Müller & Wyss, 2015). Specifically, provisions had to be recognized for contingent liabilities and expected losses in the future (OR, 2004, § 669 para. 1; 2012, § 669 para. 1). In contrast, based on the surveys mentioned above, 58% of non-listed Swiss enterprises with 250 to 500 employees applied accounting standards different from OR in 2008. For firms with more than 500 employees the ratio is 76%. For 2012, the respective ratios are 59% and 76% (see FIGURE 3.1). Apparently, the larger a non-listed Swiss enterprise, the more likely it is that it applies accounting standards different from OR, i.e., different from basic commercial accounting and financial reporting provisions. Specifically, in both years, between 27 and 38% of the surveyed firms applied the *Swiss Accounting and Reporting Recommendations* (*Swiss GAAP FER*, hereafter FER or ARR). 25 to 38% applied the *International Financial Reporting Standards* (IFRS) and between 0 and 6% applied the *U.S. Generally Accepted Accounting Principles* (US GAAP). Only two of the surveyed firms applied standards other than the ones mentioned above (see FIGURE 3.1).

⁵⁵ The “[...] true & fair view principle [...]” (FER, 2014, p. 5) is further discussed below.

⁵⁶ In the interest of the protection of creditors, the general provisions of commercial accounting and financial reporting stipulated by Swiss law (i.e., OR) have been strongly influenced by the basic principle of *prudence* (*Vorsicht*) rather than the principle of “[...] ‘fair presentation’ [italic in original...]” (Handschin, 2008, p. 24). Between 2004 and 2012, in Switzerland, all types of trading, manufacturing and commercial businesses with annual revenue of CHF 100,000, or more, had to keep accounts and file financial reports in accordance with OR (HRegV, 2004, § 54; 2012, § 36 para. 1; OR, 2004, § 934 para. 1; 2012, § 934 para. 1).

FIGURE

3.1 Accounting Standards of Non-Listed Firms in Switzerland

Note. For the years 2008 and 2012, the FIGURE depicts the shares (in %) of Swiss non-listed firms that apply the general provisions of commercial accounting and financial reporting stipulated by Swiss law (OR), International Financial Reporting Standards (IFRS), the Swiss Accounting and Reporting Recommendations (FER), the U.S. Generally Accepted Accounting Principles and other standards (i.e., Indian GAAP). The data is grouped according to firm size measured in terms of employees (< 50, 50-249, 250-500 and > 500). Data for 2008 is based on 819 non-listed Swiss firms surveyed by Meyer et al. (2009). Data for 2012 is based on 742 non-listed Swiss firms surveyed by Meyer, Hüppin, Bächli, Leuppi, and Hüppin (2014).

^a One percent of firms applied Indian GAAP for which there is no label shown.

^b One percent of firms applied Indian GAAP for which there is no label shown.

3.1.2 Listed Firms

There exist two authorized domestic stock exchanges in Switzerland, *SIX Swiss Exchange AG* (i.e., Swiss Exchange, hereafter SIX) and *BX Swiss AG* (i.e., BX Berne eXchange, hereafter BX; FINMA, 2017). SIX is one of the largest stock exchanges in Europe with a domestic but also a global scope of small, medium and large issuers and investors.⁵⁷ In contrast, BX has a clear focus on SMEs as well as real estate and investment companies. Moreover, issuers on BX must be incorporated in Switzerland and

⁵⁷ As of 2016, measured in terms of free float market capitalization, SIX was the third largest stock exchange in Europe (see e.g., SIX, 2016, p. 4). *Free Float* is the part of listed shares of a company that is freely tradable at all time (incl. small shareholdings of private investors) and which is not held by e.g., the founder(s) or the management of the firm or institutional investors (see e.g., SIX, 2017a). See e.g., SIX (2017g) for more information on SIX.

must also have mainly domestic operations (BX, 2010, § 5 para. 1).⁵⁸ Overall, most equity securities in Switzerland are listed on SIX rather than BX.⁵⁹

With respect to financial reporting, during the sample period of 2004 to 2012, both exchanges had required issuers of equity securities to publish annual reports incl. financial statements (BX, 2010, § 16 para. 1; SIX, 2010, § 49 para. 1). Between 2009 and 2012, depending on the regulatory listing standard, issuers of equity securities on SIX had to apply either IFRS (all standards), FER (Domestic Standard and Standard for Real Estate Companies), US GAAP (Main Standard, Domestic Standard and Standard for Investment Companies) or, if applicable, the accounting provisions stipulated by the Swiss Banking Act (Domestic Standard; SIX, 2012, § 6). Before 2009, for issuers incorporated in Switzerland, IFRS, FER and US GAAP had been permissible.⁶⁰ For issuers not incorporated in Switzerland, accounting standards of EU and EEA countries, as well as accounting standards of Australia, Canada, Japan, New Zealand and South Africa had been admissible before 2009 (SIX, 2007, ANNEX 1 para. 2). For issuers on BX, throughout the sample period, the standards of FER as well as any other internationally accepted accounting principles had been admissible (BX, 2010, § 17 para. 2). Overall, between 2004 and 2012, issuers of equity securities listed in Switzerland had to apply either FER or an international accepted accounting standard. Specifically, the accounting provisions by OR had not been permissible for these firms.

For 2008, Meyer et al. (2009) surveyed 20 firms that were either listed on BX or the Domestic Standard of SIX. 56% of firms had at least 500 employees. The results show 85% of the listed medium-sized firms to apply FER. 15% applied IFRS and no firm applied US GAAP (see Meyer et al., 2009, pp. 10, 19 and 27). For 2012, the survey covered 46 medium-sized firms that were either listed on BX or on the Domestic Standard, the Standard for Investment Companies or the Standard for Real Estate Companies

⁵⁸ See BX (2015) for more information on BX.

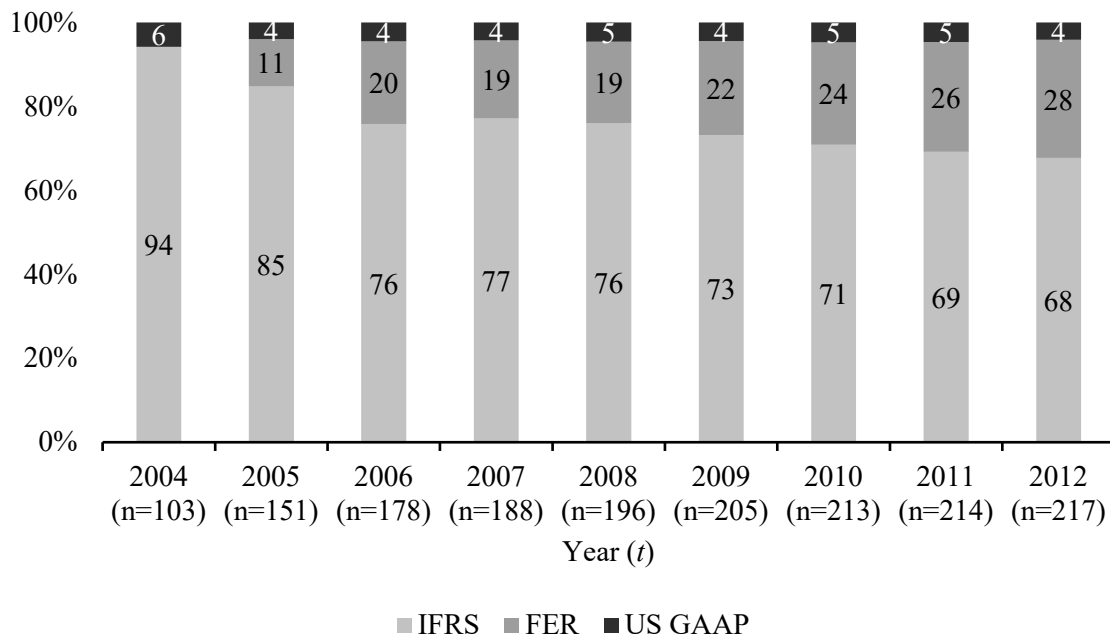
⁵⁹ For example, as of the cut-off date for the sample selection (August 3, 2015), there is a total of 264 equity instruments listed on SIX compared to 26 securities listed on BX. Regularly updated lists can be downloaded on SIX (2017b) and BX (2017), respectively. The sample selection procedure is discussed in detail in section 6.1.

⁶⁰ Until 2009, the regulatory listing standards of SIX had been called *Main segment*, *Investment Companies segment*, *Real Estate Companies segment*, *SWX Local Caps segment* and *SWX "EU-Compatible" segment*. Whereas IFRS and US GAAP were admissible in all segments, FER could not be applied by issuers listed in the Main and the SWX "EU-Compatible" segment (SIX, 2007, ANNEX 1 para. 1). On August 1, 2015, a new regulatory concept came into force. The Main and Domestic Standards were replaced by the *International* (IFRS and US GAAP) and *Swiss Reporting* (FER) *Standards*, respectively. The different concepts are not further discussed here. See e.g., SIX (2014) for more information.

of SIX. 52% of firms had at least 500 employees. Results showed 79 and 21% of medium-sized listed firms to apply FER and IFRS, respectively. Again, no firms applied US GAAP (see Meyer et al., 2014, pp. 10, 19 and 32). Furthermore, Müller and Wyss (2015) analyze the applied accounting standards of the firms listed on SIX. For 2014, depending on the firm size measured in terms of employees, they find the shares of firms applying IFRS, FER, and US GAAP to oscillate between 54 and 83%, 6 and 43% as well as 3 and 13%, respectively. Across all firms, they find 65%, 31% and 4% of them to apply IFRS, FER and US GAAP, respectively (see Müller & Wyss, 2015, p. 16). The results described thus far are further corroborated by the analysis of the applied accounting standards of the final sample firms included in this study. Based on 227 firms that were listed on SIX as of August 3, 2015, FIGURE 3.2 depicts the respective shares of firms applying IFRS, FER and US GAAP.⁶¹ Between 2004 and 2012, the shares of sample firms applying IFRS, FER and US GAAP oscillate between 68 and 94%, 0 and 28% as well as 4 and 6%, respectively

Summing up, during the sample period, it can be assumed that most firms in Switzerland exclusively applied the general provisions of commercial accounting and financial reporting (i.e., OR). Since these firms had not been listed, respective financial reports are not publicly available. Moreover, OR had not stipulated explicitly how to account for (Swiss) pension plans. Amongst larger non-listed firms in Switzerland with at least 250 employees, one can assume the accounting standards of IFRS and FER to be dominant throughout the sample period. In contrast, for the same period, the share of non-listed firms in Switzerland applying US GAAP can be assumed to be around 5%. With respect to listed firms in Switzerland, depending on firm size, IFRS and FER had clearly been dominant between 2004 and 2012. Again, for the same period, the share of listed firms applying US GAAP is around 5%, and obviously no firm could apply OR. In contrast to the non-listed firms, annual reports of listed firms are publicly available. Furthermore, during the sample period, IFRS, FER, and US GAAP had stipulated explicit standards in order to account for (Swiss) pension plans. Therefore, the study conducted here is focused on listed firms applying the respective pension accounting standards of IFRS and FER. These standards are discussed in more detail next.

⁶¹ The exact sample selection procedure as well as the data structure are outlined in detail in paragraphs 6.1.1 and 6.2.1, respectively.

FIGURE**3.2 Accounting Standards of Listed Firms in Switzerland**

Note. For the sample period of 2004 to 2012, the FIGURE depicts the shares (in %) of firms listed on SIX that apply IFRS, FER and US GAAP, respectively. Data is sourced from annual reports of the 227 sample firms investigated for the purposes of this study. All of these firms were listed on SIX as of August 3, 2015. The data has the structure of an unbalanced panel. Notably, the FIGURE shows one single cross-section rather than independent annual cross-sections of firms listed on SIX. The sample selection procedure as well as the data structure are outlined in detail in section 6.1. *n* indicates the total of firm-year observations included for the respective year.

3.2 IFRS

3.2.1 Standard-Setting

The *International Financial Reporting Standards* (IFRS) are stipulated by the *International Accounting Standards Board* (IASB) based in London (UK). The board is comprised of 13 members appointed by the trustees of the *IFRS Foundation*, which shall adequately represent all groups of stakeholders (e.g., experienced practitioners of standard setting and preparing, auditing and using financial reports as well as accounting education) and geographies. Standard setting is organized as rigorous process over which the trustees of the IFRS Foundation have oversight at any stage. Furthermore, the *IFRS Interpretation Committee* (IFRIC) is the interpretative body of the IASB and its members are also appointed by the trustees of the IFRS Foundation. Its main responsibilities

are the review of implementation issues arising from the application of current IFRS and the provision of authoritative guidance on these issues (i.e., *IFRIC Interpretations*). Finally, the IFRS Foundation, the IASB as well as IFRIC are all advised by the *IFRS Advisory Council* comprised of representatives of various interest groups such as investors, analysts, preparers and auditors of financial statements and also academia. Its members are also appointed by the trustees.⁶²

Originally, the IFRS Foundation was formed in 1973 as the *International Accounting Standards Committee* (IASC) by the professional accountancy bodies of Australia, Canada, France, Germany, Japan, Mexico, the Netherlands, the United Kingdom and Ireland, as well as the United States. The IASC as well as its *Standard Interpretations Committee* (SIC) developed and mandated a comprehensive body of accounting standards and interpretations including a conceptual framework. The standards issued by IASC are known as *International Accounting Standards* (IAS) rather than IFRS. Moreover, issued interpretations were named after SIC. In 2001, after a major reorganization, the IFRS Foundation, the IASB as well as IFRIC took over the standard setting functions of IASC and SIC. All IAS standards and SIC interpretations were endorsed by the IASB and since, these standards and interpretations are either amended or reissued if deemed necessary. However, standards and interpretations newly issued by the IASB and IFRIC are denoted as IFRS and IFRIC, respectively.⁶³

Thus far, 126 different jurisdictions around the globe – including all member states of the *European Union* (EU) as well as two-thirds of the 20 major economies worldwide (G20) - mandate the application of IFRS for all or most publicly listed entities.⁶⁴ Thus, “[...] IFRS has already become the de facto global language for financial reporting.”⁶⁵ Currently, the IASB has issued (and/or endorsed) 16 different IFRS standards, 25 different *International Accounting Standards* (IAS), 14 different IFRIC interpretations, five different *Standard Interpretations Committee* interpretations (SIC) as well as one standard on the financial reporting of small and medium-sized entities (*IFRS for*

⁶² Since January 2009, the *IFRS Foundation Monitoring Board*, oversees the IFRS Foundation and ensures the discharge of duties of trustees in accordance with the foundation’s constitution. Board members represent major public authorities responsible for financial reporting such as e.g., the *European Commission* (EC) and the *US Securities and Exchange Commission* (SEC). Note, all information given here is based on IASB (2017d).

⁶³ More information incl. a brief historical account of the IASC and the IASB can be found on e.g., Deloitte (2017b).

⁶⁴ See IASB (2017a) for more details.

⁶⁵ Quoted from IASB (2013). Note, same quote is used by e.g., Leibfried (2014, p. 378).

SMEs).⁶⁶ In order for the financial statements to be fully compliant with IFRS, an entity must comply with all applicable requirements of the above-mentioned standards and interpretations (IAS 1, 2004, para. 14; 2012, para. 16). Thus, during the sample period, firms covered by Swiss pension plans had to account for these plans in accordance with *IAS 19 Employee Benefits*. The evolution of this standard is outlined next.

3.2.2 IAS 19 Employee Benefits

IAS 19 Employee Benefits was first issued by the IASC in 1998 and applicable for financial years beginning on or after January 1, 1999. It had evolved from two precedent standards. Issued in 1983, *IAS 19 Accounting for Retirement Benefits in the Financial Statements of Employers* became effective for financial years beginning on or after January 1, 1985. This standard was then superseded by *IAS 19 Retirement Benefit Costs* issued in 1993 and effective for financial years beginning on or after January 1, 1995 (Mühlberger & Schwinger, 2012).

Some minor amendments to IAS 19 (1998), which were mainly attributable to terminology, were issued in 1999 and became effective for financial years beginning on or after January 1, 2000. IAS 19 (1999) was again revised in 2000. The changes included a revision of the definition of plan assets as well as of the recognition, the valuation and the disclosures of reimbursement rights. Accordingly, IAS 19 (2000) became effective for financial years beginning on or after January 1, 2001. Subsequently, the rules regarding the *asset ceiling* (discussed in paragraph 3.2.6.6) were amended in 2002 and IAS 19 (2002) became effective for financial years ending on or after May 31, 2002. This version of the standard held until December 31, 2005.⁶⁷

An important revision took place in 2004 (Mühlberger & Schwinger, 2012). IAS 19 (2004) was effective for financial years beginning on or after January 1, 2006. However, application as early as of December 16, 2004 was permitted (IAS 19, 2004, para. 159C). IAS 19 (2004, para. 93A-93D) introduced a new option for the accounting of actuarial

⁶⁶ Information is based on the official publication of the 2017 IFRS® Standards (Red Book) that includes all standards and interpretations issued as of January 1, 2017 (including early application). The English language version of this Red Book has about 1,500 pages of officially issued consolidated text regarding IFRSs, IASs, IFRICs and SICs (Part A). Moreover, Part B includes about 3,000 additional pages of accompanying documents (e.g., *BASIS FOR CONCLUSIONS* etc.). Registered users have electronic access via IASB (2017d).

⁶⁷ In February 2004, the rules regarding *Equity Compensation Benefits* (IAS 19, 2002, para. 144-152) were replaced by IFRS 2 (2004) *Share-based Payment*, effective for financial years beginning on or after January 1, 2005. However, this change had no direct consequence regarding the accounting for pension benefits (Mühlberger & Schwinger, 2012).

gains and losses (*AGL*) *outside of profit and loss* (hereafter *OCI-Method*). Details regarding the accounting of actuarial gains and losses are discussed further below. Moreover, the change also included specifications for the recognition and disclosure of assets and liabilities as well as income and cost resulting from multi-employer pension plans as well as pension plans of various entities under common control such as e.g., of a parent company and its subsidiaries (IAS 19, 2004, para. 32A and 34-34B).⁶⁸

Thereafter, minor amendments to IAS 19 (2004) regarding terminology were issued in 2007 and became effective for financial years beginning on or after January 1, 2009. Amendments had to be applied earlier if IAS 1 (2007) *Presentation of Financial Statements* was applied early (IAS 19, 2007, para. 161).

In May 2008, the IASB, again, issued certain amendments to IAS 19 (2007). Simple clarifications to existing requirements related to *short-term* and *other long-term employee benefits* and *return on plan assets* (IAS 19, 2007, para. 7 and 8 lit. b) as well as *contingent liabilities* (IAS 19, 2007, para. 32B) were permitted to be applied earlier than the effective date of January 1, 2009. The clarifications regarding *past service cost* and *curtailments* (discussed further below; IAS 19, 2007, para. 97-98, 111 and 111A(new)) had to be applied prospectively as of January 1, 2009 (see IASB, 2008, pp. 20-26). Apart from some minor amendments as a consequence of the change of related standards, IAS 19 (2008) subsequently held for financial years ending on December 31, 2012 or earlier.⁶⁹

Finally, a major revision of IAS 19 (2008) was issued on June 16, 2011. IAS 19 (2011) has been effective for financial years beginning on or after January 1, 2013. However, early application was permitted (IAS 19, 2011, para. 172). The revision was the result of a comprehensive consultation process conducted by the IASB between 2006 and 2010.⁷⁰ The two most important changes were the elimination of the so called Corridor-Method that allowed to delay the recognition of actuarial gains and losses (*AGL*)

⁶⁸ According to IAS 27 (2004, para 4; 2012, para 4), control “[...] is the power to govern the financial and operating policies of an entity so as to obtain benefits from its activities.”. Note, effective as of January 1, 2013 (early application permitted), IAS 27 (2012) was superseded by IAS 27 *Separate Financial Statements* as issued in 2011 (Deloitte, 2017a).

⁶⁹ See e.g., IAS 19 (2011, p. A721) for a short list of the respective amendments caused by related IFRS.

⁷⁰ The consultation process included the publication of a *Discussion Paper* (DP) *Preliminary Views on Amendments to IAS 19 Employee Benefits* in March 2008 as well as the publication of an Exposure Draft (ED) *Defined Benefit Plans (Proposed amendments to IAS 19)* in April 2010. Both publications attracted a lot of interest from stakeholders. Overall, the IASB received 150 and 227 comment letters for the DP and the ED, respectively. See e.g., Müller (2013, pp. 51-53) for a succinct discussion of this consultation process.

as well as the elimination of the expected rate of return (*ERR*) applied to plan assets and recognized as pension income. IAS 19 (2011, para. 57 lit. d) stipulates the recognition of AGL according to the OCI-Method, and the estimation of net interest by the application of an uniform discount rate. Moreover, the revised standard requires additional disclosures.⁷¹

Notably, the elimination of the Corridor-Method and the different estimation of net pension cost for financial years beginning on or after January 1, 2013 were expected to have material effects on the financial reporting of Swiss pension plans in accordance with IAS 19. For example, Leibfried and Müller (2011, pp. 332-333) illustrate potential effects of IAS 19 (2011). In one of their hypothetical examples, the net pension liability (*NPL*) recognized on the balance-sheet increases by 300%(sic) due to the elimination of the Corridor-Method. Moreover, due the different recognition and measurement of net pension cost (*NPC*), in both of their illustrative examples, recognized *NPC* increases by 11 and 17%, respectively. Also, Suter (2012, pp. 319-320) illustrates the effects of the revised standard based on a real example. Accordingly, for the years 2010 and 2011, due to the application of IAS 19 (2011), the recognized *NPL* would have been increased by 140.00% and 125.00%, respectively. Moreover, recognized *NPC* would have been increased by 80.00% and 66.67%, respectively. Furthermore, Suter (2015) analyzes the effect of the retrospective application of IAS 19 (2011) to the financial statements of 2012 for ten of the largest and most traded companies listed on SIX.⁷² The author finds the reduction of total equity to be between 0.3 and 19.6% (see Suter, 2015, p. 128). Moreover, recognized pension income is found to be reduced by between 12.4 and 58.2% (see Suter, 2015, pp. 125-126). Last but not least, for the sample period of 2005 to 2012, Schlatter (2013) estimates the deviations between recognized net pension cost (*NPC*) in accordance with IAS 19 (2004) and IAS 19 (2011) for 20 of the largest and most traded firms listed on SIX.⁷³ For most of the firms, recognized *NPC* is estimated to increase due to the application of IAS 19 (2011). For these sample firms, average increase across eight years is found to be between 4.7 and 236.0% (see Schlatter, 2013,

⁷¹ See e.g., Leibfried and Müller (2011); Ohlund and Alfieri (2011) and Suter (2015) for a discussion of the amendments issued on June 16, 2011. Also, see Müller (2013, footnote 183) for a comprehensive selection of further references regarding these amendments.

⁷² At the time of the analysis, the firms were part of the *Swiss Leader Index* (SLI). See SIX (2017c) for more information about the index composition.

⁷³ The sample firms were all part of the SLI.

p. 45). Overall, average increase of recognized *NPC* across all firm-year observations is estimated to be 25.6% (see Schlatter, 2013, p. 51).

Given the evolution of IAS 19 outlined above, firms that opted for an early application of IAS 19 (2011) before January 1, 2013 are excluded from any further analyses conducted here. Moreover, for the purposes of this study, IAS 19 (2002), IAS 19 (2004) and IAS 19 (2008) can be regarded as practically equivalent. Specifically, the application of the Corridor-Method had been permitted by all three versions of the standard and the OCI-Method introduced by IAS 19 (2004) was allowed to be applied as early as 2004. Overall, any minor differences between these three versions of the standard are not expected to qualitatively alter the analysis. Thus, in order to mitigate complexity, all discussions henceforth are based solely on IAS 19 (2004). The application of this standard in the context of Swiss pension plans is outlined in more detail next.

3.2.3 Objective and Scope

In principle, the objective of IAS 19 is to “[...] prescribe the accounting and disclosure for employee benefits.” (IAS 19, 2004, Objective). Concretely, the standard requires the employer to recognize “a liability when an employee has provided service in exchange for employee benefits to be paid in the future;” (IAS 19, 2004, Objective lit. a). Moreover, the employer must recognize an expense when it “[...] consumes the economic benefit arising from service provided by an employee in exchange for employee benefits” (IAS 19, 2004, Objective lit. b).

The scope of IAS 19 includes all employee benefits except share-based payments which are covered by IFRS 2 (IAS 19, 2004, para. 1). Specifically, amongst others, IAS 19 is applicable to all employee benefits which are provided “[...] under formal plans or other formal agreements between an entity and individual employees, groups of employees or their representatives;” (IAS 19, 2004, para. 3 lit. a).⁷⁴ Categories of benefits include all short-term benefits (e.g., wages, bonuses and paid sick leave etc.), non-monetary benefits (e.g., medical care, housing, cars etc.), post-employment benefits (e.g.,

⁷⁴ As discussed in sub-section 2.2.1 and depicted in TABLE 2.3 (page 15), most Swiss pension plans had been *registered* plans during the sample period. Thus, these plans provide *mandatory* benefits (exclusively or in addition to *non-mandatory* benefits). Regarding mandatory benefits, the legal (i.e., formal) relationship between the employee and the pension plan is established by law. However, regarding the non-mandatory benefits, the legal relationship is based on the pension plan regulations which, in turn, are stipulated by the governing board comprised of an equal number of representatives of the employer(s) and employees (see Stauffer, 2012, p. 142). See e.g., Stauffer (2012, pp. 136-144) for more details regarding the legal relationships between employers, employees and Swiss pension plans.

pensions and life insurance etc.), other long-term benefits (e.g., jubilee etc.) as well as termination benefits (IAS 19, 2004, para. 4).⁷⁵ Benefits for which IAS 19 is applicable are either paid to employees directly or to respective dependents (e.g., spouses and children etc.).⁷⁶

The accounting for a Swiss pension plan falls under the category of post-employment benefits covered by IAS 19.⁷⁷ Nevertheless, it is important to note that IAS 19 is *not* applicable to the accounting of the pension plan itself. According to IFRS, a Swiss pension plan would have to report its financial statements in line with *IAS 26 Accounting and Reporting by Retirement Benefit Plans* (IAS 19, 2004, para. 2). However, this standard must not be confused with the Swiss GAAP FER accounting and reporting recommendation *ARR 26 Accounting of pension plans*. As was discussed in sub-section 2.2.4, by law, Swiss pension plans must report financial statements in line with ARR 26.

3.2.4 Classification

3.2.4.1 General

In general, the accounting for a pension plan in accordance with IAS 19 is based on the classification of this plan in one of two different categories: *defined contribution plans* and *defined benefit plans* (Pellens, Fülbier, Gassen, & Sellhorn, 2011). The classification depends on the “[...] economic substance [of the pension plan] derived from its principal terms and conditions” (IAS 19, 2004, para. 25). A pension plan is classified as *defined contribution* plan if the following three cumulative criteria are met:⁷⁸

- The employer is obliged to pay “fixed contributions” to the pension plan.⁷⁹

⁷⁵ A graphical depiction of the classification structure of the kinds of benefits covered by IAS 19 can be found in e.g., Mühlberger and Schwinger (2012, p. 5).

⁷⁶ Apart from monetary payments, benefits could also be in the form of goods or services (IAS 19, 2004, para. 5). Also, within the scope of IAS 19, employees “may provide services to an entity on a full-time, part-time, permanent, casual or temporary basis. [...]and[...] employees include directors and other management personnel.” (IAS 19, 2004, para 6).

⁷⁷ For example, Krügel and Hermann (2006) note that the other benefits such as life insurance or medical care subsumed under this IAS19-category are (usually) taken care of by the employees themselves rather than the employers within the Swiss institutional setting. For example, also the Pillar 3a pension plans mentioned in section 2.2.1 would fall into this category. However, these are voluntary private pension plans that are funded fully by the employees.

⁷⁸ See e.g., Müller (2013, p. 55).

⁷⁹ IAS 19 (2004, para. 7).

- The contributions must be transferred to “a separate entity (a fund)”.⁸⁰
- The employer “will have no legal or constructive obligation to pay further contributions” if assets held by the separate entity are insufficient to cover benefits related to past or current service of the employees.⁸¹

Derived from the first and third of the above-mentioned criteria, IAS 19 (2004, para. 25 lit. a) stipulates that the employer’s “[...] legal or constructive obligation is limited to the amount that it agrees to contribute”. Specifically, the amount of the benefits received by employees is solely determined by the contributions (from employers and employees) to the plan as well as the investment returns earned on these contributions (IAS 19, 2004, para 25 lit. a).⁸² Moreover, “[...] actuarial risk (that benefits will be less than expected) and investment risk (that assets invested will be insufficient to meet expected benefits) fall on the employee.” (IAS 19, 2004, para. 25 lit. b).⁸³ Thus, in order for a pension plan to be classified as defined contribution plan, an underfunding of the plan shall not lead to a subsidiary liability (“Subsidiärhaftung”) or additional contributions (“Nachschusspflicht”) of the employer. Analogously, an overfunding of the plan shall not lead to a reduction in employer contributions or to a reimbursement (“Rückerstattung”) of pension assets to the employer (Mühlberger & Schwinger, 2012, p. 16).⁸⁴

The classification of *defined benefit* plans is directly derived from the definition outlined above. Defined benefit plans are “[...] post-employment benefit plans other than defined contribution plans.” (IAS 19, 2004, para. 7). Thus, in accordance with IAS 19, *any* pension plan that does not meet the definition of a defined contribution plan outlined above is classified as a defined benefit plan.⁸⁵ This mechanism ensures that, in accordance with

⁸⁰ IAS 19 (2004, para. 7).

⁸¹ IAS 19 (2004, para. 7).

⁸² Also see e.g., Mühlberger and Schwinger (2012, p. 16) and Müller (2013, footnote 190).

⁸³ Actuarial risk includes e.g., the risks of death and disability (as outlined in sub-section 2.2.3) as well as the risk of longevity. Investment risk also includes the risk that a defined interest rate to be accumulated on vested benefits (such as e.g., the minimum interest rate stipulated by Swiss law, see sub-section 2.2.2) is not met by actual investment returns (see e.g., Mühlberger & Schwinger, 2012, p. 16).

⁸⁴ According to Mühlberger and Schwinger (2012), for the pension plan to be classified as defined contribution plan, the employer shall neither bear any *other* risks apart from actuarial and investment risk. For example, pension plans where benefits are dependent on an employee’s last insured salary before retirement pose the risk that the actual growth rate of salaries is greater than anticipated (“Dynamisierungsrisiko”; Mühlberger & Schwinger, 2012, p. 16).

⁸⁵ For example, Mühlberger and Schwinger (2012, p. 17) call it *exclusion mechanism* („Ausschlussverfahren“) whereby any pension plan of a form other than defined contribution is classified as defined benefit plan.

IAS 19, any possible form of pension plan worldwide can be classified as either defined contribution or defined benefit plan (see e.g., Müller, 2013, footnote 194; Müller & Wyss, 2015, p. 7).

Given the comments about classification made thus far, in accordance with IAS 19, practically every Swiss pension plan has to be classified as defined benefit plan (Müller & Wyss, 2015). Specifically, the mostly registered Swiss pension plans prevalent during the sample period had provided mandatory benefits (exclusively or in addition to non-mandatory benefits, see sub-section 2.2.1). Whether non-mandatory benefits are provided or not, these plans must guarantee the minimum interest rate on vested benefits attributable to mandatory benefits. Moreover, mandatory benefits are also determined by the minimum conversion rate as stipulated by law (see sub-section 2.2.3). Thus, benefits of registered Swiss pension plans are not solely determined by the fixed contributions of employers and employees as well as investment returns but also by minimum parameters (i.e., interest and conversion rates) as stipulated by law. Furthermore, since January 1, 2005, registered Swiss pension plans that are underfunded have the right to claim restructuring contributions from employers and employees if deemed necessary. Respective contributions from employers must be at least equal to contributions from employees (BVG, 2004, § 65 para. 3 lit. a; 2012, § 65 para. 3 lit. a). However, as outlined in sub-section 2.2.6, employers had financed the main share of such restructuring contributions for underfunded Swiss pension plans throughout the sample period. Thus, employer contributions to Swiss pension plans are not necessarily *fixed*. As a consequence, although employer and employee contributions to Swiss pension plans must be transferred to a legally separate entity (see sub-section 2.2.1), the legal as well as the constructive obligation of an employer arising from its Swiss pension plan is *not* necessarily “[...] limited to the amount that it agrees to contribute” (IAS 19, 2004, para 25 lit. a).⁸⁶ As a result, some actuarial and/or investment risk of such a plan always remains with

⁸⁶ Accordingly, IAS 19 (2004, para 26) illustrates examples of where the employer’s obligation is not limited. Specifically, the obligation is not limited in the sense of IAS 19 (2004, para 26 lit. a) if the benefit formula is not solely linked to contributions (as is the case regarding the minimum conversion rate stipulated by Swiss law). Furthermore, an employer’s obligation is not limited if there exists “a guarantee [...] of a specified return on contributions;” (IAS 19, 2004, para 26 lit. b). The latter more or less exactly describes the minimum interest rate stipulated by Swiss law (see e.g., Müller, 2013, footnote 377).

the employer.⁸⁷ Hence, at least since the regulatory change regarding restructuring contributions was enacted as of January 1, 2005, there has been widespread consensus that Swiss pension plans must be classified as defined benefit plans in accordance with IAS 19.⁸⁸

As an exception to the above-mentioned classification, for example Jeger and Welser (2007) argue that a Swiss pension plan might be treated as defined contribution plan as long as it is *immaterial*. Within the context of IFRS, information is defined as *material* “[...] if its omission or misstatement could influence the economic decisions of users taken on the basis of the financial statements.” (IASB Framework, 1989, para. 30).⁸⁹ With regard to Swiss pension plans, materiality often plays an important role in cases where a small to medium-sized Swiss subsidiary must be consolidated into the financial statements of a foreign parent company. In such a case, based on the exact circumstance, a Swiss pension plan might be considered as immaterial relative to the consolidated group of companies. Thus, the auditor of the Swiss subsidiary could then accept the classification and accounting of the Swiss pension plan as defined contribution rather than defined benefit plan. However, in that situation, the local auditor shall report to the group auditor the fact that the Swiss pension plan, in principle, is still defined benefit in the context of IAS 19 (Jeger & Welser, 2007).⁹⁰

3.2.4.2 Risk-Coverage

It is important to note, the classification of Swiss pension plans as defined benefit plans within the context of IAS 19 even holds for fully covered pension plans (*Kollektive*

⁸⁷ See e.g., Müller (2013, pp. 101-103) for a detailed derivation of this conclusion. Notably, he also illustrates graphically how Swiss pension plans clearly tend towards defined contribution plans where all actuarial and investment risks entirely fall on employees. However, some residual risk always remains with the employer (see Müller, 2013, p. 103).

⁸⁸ See e.g., Berndt (2007); Helbling et al. (2006); Jeger and Welser (2007); Krügel and Hermann (2006); Leibfried and Müller (2009); Riemer (2003) and Zanella and Welser (2012). Further references in support of this view can be found in e.g., Müller (2013, footnote 384). See e.g., Schneider (2006) for arguments against this view.

⁸⁹ The *Conceptual Framework for Financial Reporting* superseded IASB Framework (1989) in 2010 (see IASB Conceptual Framework, 2010). The definition of *materiality* as a *qualitative characteristic of useful financial information* is stipulated in IASB Conceptual Framework (2010, QC11) and corresponds to IASB Framework (1989, para. 30). The *primary users* of financial statements are existing and potential investors, lenders, and other trade creditors (IASB Conceptual Framework, 2010, OB5; IASB Framework, 1989, para. 9).

⁹⁰ For example, Krügel and Hermann (2006) also argue that fully covered Swiss pension plans (discussed below) might be classified as defined contribution plans in accordance with IAS 19 as long as the residual risk remaining with the employer is considered to be immaterial within the context of IFRS.

Vorsorgeeinrichtungen). As described in sub-section 2.2.1, Swiss pension plans may be structured according to different forms of risk coverage. The continuum of risk coverage is limited by the two extreme forms of fully autonomous pension plans that have no risks re-insured and fully covered pension plans that, basically, are no more than intermediaries between the active insurees and beneficiaries of the plan and an insurance company. Specifically, IAS 19 (2004, para. 39) stipulates that pension plans with *insured benefits* must be classified as defined benefit if any legal or constructive obligation remains with the employer. Accordingly, a working group of the *Auditing Practice Committee* of the *Swiss Expert Association for Audit, Tax and Fiduciary (EXPERT-suisse)*⁹¹ has concluded that fully covered Swiss pension plans shall be classified as defined benefit rather than defined contribution plans. The committee argued along two main lines of reasoning. First, in principle, any insurance contract is cancelable (*kündbar*) by the insurance company where the pension plan has (fully) insured its benefits. Thus, the pension plan has no guarantee that it must not pay benefits at some point in time or must pay higher than the current premiums to a new insurance company or for a new insurance policy. Second, regarding the risks of death and disability, insurance premiums are usually not fixed in the sense that regularly set premiums are commonly linked to the number of events occurred (i.e., deaths and disabilities) that trigger the payment of benefits.⁹² As a result, even if a Swiss pension plan is fully covered, there always remains a legal or constructive obligation with the employer (see e.g., Jeger & Welser, 2007; Müller, 2013, p. 105).

3.2.4.3 Multi-Employer Plans

Basically, IAS 19 differentiates between three different categories of pension plans that cover multiple employers. First, a so called *mutli-employer plan* is defined as plan that pools “[...] the assets contributed by various entities that are not under common control;” (IAS 19, 2004, para. 7). Moreover, “[...] contribution and benefit levels [of such a plan] are determined without regard to the identity of the entity that employs the employees concerned.” (IAS 19, 2004, para. 7). Second, and in contrast to multi-employer plans, a so called *group administration plan* is defined as “[...] merely an aggregation of single employer plans [...] to pool their assets for investment purposes and reduce

⁹¹ Formerly, *Schweizer Treuhand-Kammer*.

⁹² Also e.g., Krügel and Hermann (2006, p. 140) acknowledge the fact that future premiums might be increased due to events of death and/or disability that occurred in the past. Accordingly, in the context of IAS 19, there exists a “downside risk” for the employer.

investment management and administration costs [...]” (IAS 19, 2004, para. 33). However, “[...] the claims of different employers are segregated for the sole benefits of their own employees.” (IAS 19, 2004, para. 33). Furthermore, “[...] such plans do not expose the participating entities to actuarial risks associated with the current and former employees of other entities.” (IAS 19, 2004, para. 33). Last but not least, defined benefit plans “[...] that share risks between various entities under common control, for example, a parent and its subsidiaries, are not multi-employer plans.” (IAS 19, 2004, para. 34).⁹³ Both multi-employer as well as group administration plans must be classified as either defined contribution or defined benefit plans according to the criteria discussed in paragraph 3.2.4.1 (IAS 19, 2004, para. 29 and 33).

The IAS 19-definition of multi-employer plans outlined above resembles the structural form of Swiss *group pension plans*. Usually, these pension plans share assets and regulations for all of the covered employers that are nevertheless legally and economically independent of each other (see sub-section 2.2.1). Thus, according to the implications described in paragraphs 3.2.4.1 and 3.2.4.2, also Swiss group pension plans had to be classified as defined benefit plans throughout the sample period. The same can be assumed for Swiss *collective pension plans*. Commonly, these plans cover multiple legally as well as economically independent employers of which pension assets are managed separately. Main advantage of this structure is the potential reduction in administration cost (see sub-section 2.2.1). Again this corresponds to the IAS 19-definition of group administration plans given above.

If the required information to account for a defined benefit multi-employer pension plan is either not available or unreliable (e.g., due to the sharing of actuarial risks between different employers), such a plan shall be treated as defined contribution plan and accounted for accordingly (IAS 19, 2004, para. 32).⁹⁴ However, the employer must then disclose the fact that, in principle, the pension plan is a defined benefit plan and the reason why the required information to appropriately account for the plan is not available (IAS 19, 2004, para. 30 lit. b). As outlined in sub-section 2.2.4, since January 1, 2005, all Swiss pension plans must report financial statements in accordance with ARR 26 (2004). Accordingly, also collective as well as group pension plans must report financial statements for each pension plan on a stand-alone basis (ARR 26, 2004, para.

⁹³ The definition of control in line with IFRS is provided in footnote 68, page 54.

⁹⁴ In contrast, due to the separate accounting and the lack of risk sharing, it is generally assumed that reliable and sufficient information is available to account for group administration plans as defined benefit plans (IAS 19, 2004, para. 33; Mühlberger & Schwinger, 2012).

10). Thus, the availability and reliability of sufficient information in order to account for these plans as defined benefit plans seems likely.⁹⁵

Finally, Swiss pension plans that cover multiple employers other than collective and group pension plans are mostly attributable to two or more employers that are legally separate but under common control (i.e., a parent company and its subsidiaries, see sub-section 2.2.1). In line with the discussion above, according to IAS 19 (2004), also these plans had to be classified as defined benefit plans throughout the sample period.

3.2.4.4 Defined Benefit vs. Defined Contribution Primacy

Last but not least, it is also important to clearly distinguish the classification of Swiss pension plans in accordance with IAS 19 from the traditional categorization of Swiss pension plans into either *defined benefit primacy* (*Leistungsprimat*) or *defined contribution primacy* (*Beitragsprimat*) plans as stipulated by Swiss law. From a legal point of view, the classification of Swiss pension plans into either defined benefit or defined contribution primacy plans is only relevant regarding the estimation of vested benefits that must be transferred between different Swiss pension plans (*Austrittsleitung*) as active insureds (i.e., employees) change from one employment to another.⁹⁶ In principle, Swiss defined benefit primacy pension plans define benefits as percentage of the insured salary. The contributions necessary to fund these benefits are then derivative on these defined benefits. In contrast, as outlined in sub-section 2.2.2, Swiss law stipulates the funding of mandatory benefits based on percentage rates of the insured salary dependent on the age of the active insured. As a result, this defined contribution primacy leads to benefits that are derivative on the contributions incl. investment returns (BFS, 2016c). However, whether a Swiss pension plan is structured according to the defined benefit or the defined contribution primacy is a mere technical issue.⁹⁷ In the end, both have to guarantee the minimum mandatory benefits as stipulated by Swiss law (Maran, 2011). For some time, there has been a clear trend of Swiss pension plans to change from the

⁹⁵ Note, as indicated in sub-sections 2.2.4 and 2.2.5, the exact method applied to estimate the values of pension liabilities of Swiss pension plans usually differs between ARR 26 (2004) and IAS 19 (2004). Thence, the availability and reliability of sufficient information in line with IAS 19 (2004) is not guaranteed by the application of ARR 26 (2004).

⁹⁶ The different estimation methods to be applied depending on the primacy of the plan are stipulated by FZG (2004, § 15 and 16; 2012, § 15 and 16). See e.g., Helbling et al. (2006, pp. 253-271) and Stauffer (2012, pp. 437-537) for details regarding the transfer of vested benefits between different Swiss pension plans.

⁹⁷ See e.g., Helbling et al. (2006, pp. 173-174) for a brief overview of the pros and cons incl. a schematic comparison of the funding schedules of the two different primacies.

defined benefit to the defined contribution primacy. This has been mainly due to the ever increasing discrepancy between actual investment returns achievable on pension assets on the one hand, as well as high defined benefits on the other hand (Bracher, 2011). For example, as of 2012, only about 11.48% of the 3,858,803 active insureds of Swiss pension plans depicted in TABLE 2.2 (on page 12) were still covered by defined benefit primacy pension plans. As of 2014, this ratio had further decreased to 9.01% (see BFS, 2016c, p. 13). Furthermore, the trend towards defined contribution primacy has also been observable for firms listed on SIX. For example, in 2009, only four out of the 20 firms listed in the SMI (i.e., 20%) still structured (part of) their Swiss pension plans based on the defined benefit primacy. In 2011, this ratio had decreased to 10% (i.e., 2 firms).⁹⁸

3.2.4.5 Summary

Given the comments above, it can be assumed that, throughout the sample period of 2004 to 2012, firms applying IAS 19 had to classify material Swiss pension plans as defined benefit plans. This held regardless of the exact risk coverage structure of the plan (i.e., even for fully covered plans). Normally, also material collective and group Swiss pension plans were required to be classified as defined benefit plans (as long as information was sufficient and reliable). Finally, the Swiss peculiarities of structuring pension plans as either defined benefit or defined contribution primacy had essentially no bearing with respect to the general classification of Swiss pension plans as defined benefit plans within the context of IAS 19. Thus, the different accounting treatments of defined contribution and defined benefit plans in line with IAS 19 (2004) are discussed next.

3.2.5 Defined Contribution Plans

“Accounting for defined contribution plans is straightforward [...]” (IAS 19, 2004, para. 43). For each period, the obligation for the employer is determined directly from the contributions payable for that period (IAS 19, 2004, para 43). Moreover, these contributions are *fixed* since this is one of the prerequisites for the classification as defined contribution plan (Müller, 2013).

The employer must recognize the contributions “as an expense, unless another Standard requires or permits the inclusion [...] in the cost of an asset [...]” (IAS 19,

⁹⁸ See Towers Watson (2011, p. 31) for more details.

2004, para 44 lit. b). For example, IAS 2, *Inventories*, and IAS 16, *Property, Plant and Equipment*, prescribe accounting treatments where contributions to pension plans must be included in the historical cost recognized as an asset on the balance-sheet, if they are directly attributable to the production or the acquisition of the asset. However, in practice, contributions to pension plans are oftentimes not recognized in historical costs of assets due to immateriality. The measurement of the expense is determined by the *benefit formula (Planformel)*. For example, the formula could stipulate a fixed percentage of total annual salaries payable as pension plan contributions (Mühlberger & Schwinger, 2012). Notably, the measurement is completely free of any actuarial assumptions and, consequently, no actuarial gains or losses (*AGL*) can occur (IAS 19, 2004, para 43). IAS 19 (2004) does not stipulate the exact position of the income-statement where the expense shall be recognized. Nevertheless, as is the case with defined benefit plans (discussed further below), the expense arising from defined contributions plans can be expected to be attributable to *personnel expenses* (see e.g., Müller, 2013, footnote 208).

Past Service Cost is defined as expense that arises due to the introduction or adjustment of pension benefits which are attributable to employee service already rendered in the past. For example, the employer decides to introduce a defined contribution plan and to contribute an initial amount for each employee based on the length of service (Mühlberger & Schwinger, 2012). Since the service attributable to these benefits was already rendered in the past, the respective contributions are due immediately and past service cost must be recognized as expense in the period of initialization (Müller, 2013).

Apart from the inclusion of pension contributions in the historical costs of assets, as outlined above, defined contribution assets and liabilities to be recognized on the balance-sheet can only arise with regard to *accruals (Abgrenzungen)*. After all, the legal and constructive obligation of the employer is limited to the fixed contributions and these are transferred to a legally separate entity. Thus, legally as well as economically pension assets are separate from the employer (Mühlberger & Schwinger, 2012).⁹⁹ However, pension expense must be *matched* to the respective economic benefits consumed by the employer that arise from the employee service rendered.¹⁰⁰ Thus, after deduction

⁹⁹ As an exception to this principle, it might be possible that a defined contribution plan that covers various different subsidiaries of the same parent company is itself classified as subsidiary and accordingly must be included in the consolidated financial statements of the group. In that case, from the perspective of the parent company, the plan would no longer be classified as defined contribution plan and its pension assets would be recognized on the consolidated balance-sheet of the employer (see e.g., Mühlberger & Schwinger, 2012, p. 19).

¹⁰⁰ This corresponds to the objective of IAS 19 outlined in sub-section 3.2.3. In general, the *matching principle* can be defined as “[...] the simultaneous or combined recognition of revenues and expenses that result directly

of any contribution already paid for the respective period, a liability (i.e., accrued expense) must be recognized on the balance-sheet (IAS 19, 2004, para 44 lit. a). Analogously, an asset (i.e., prepaid expense) must be recognized on the balance-sheet if contributions already paid during the respective period exceed the contributions payable for that period (IAS 19, 2004, para 44 lit. b).¹⁰¹ Moreover, defined benefit liabilities are measured without discounting except “[...] where they do not fall due wholly within twelve months after the end of the period in which the employees render the related service.” (IAS 19, 2004, para. 43). In these cases, the same discount rate as for defined benefit plans (discussed further below) shall be applied (IAS 19, 2004, para. 45).

Finally, the employer “[...] shall disclose the amount recognised as an expense for defined contribution plans.” (IAS 19, 2004, para 46). Where required by another IFRS standard, further disclosures shall be made (Müller, 2013). For example, IAS 24, *Related Party Disclosures*, might stipulate the disclosure of contributions to defined contribution plans with regard to “[...] key management personnel.” (IAS 19, 2004, para. 47).

As discussed in sub-section 3.2.4, throughout the sample period of 2004 to 2012, it can be assumed that most material Swiss pension plans had to be classified as defined benefit plans. Thence, the accounting for such plans in line with IAS 19 is discussed next.

3.2.6 Defined Benefit Plans

Compared to defined contribution plans, accounting for “[...] defined benefit plans is complex [...]” (IAS 19, 2004, para. 48). In particular, due to actuarial and investment risks, “[...] the expense recognised for a defined benefit plan is not necessarily the amount of the contribution due for the period.” (IAS 19, 2004, para. 49). Moreover, actuarial gains and losses (*AGL*) may occur and measurement involves discounting since the settlement of respective obligations may be “[...] many years after the employees

and jointly from the same transactions or other events;” (IASB Conceptual Framework, 2010, para. 4.50; IASC Framework, 1989, para. 95).

¹⁰¹ Note, accruals must also be strictly distinguished from past service cost. Regarding accruals, there is no adjustment of contributions attributable to past service. Instead, either not all contributions payable for a specific period have been already paid at the end of the period or the employer might have paid more contributions than actually payable until the end of the period. This is because, for example, the due date lies within the next period or the definitive amount payable is estimated only at the beginning of the next period (see e.g., Müller, 2013, p. 58). Moreover, regarding Swiss pension plans, prepaid contributions would also be defined as employer contribution reserves (*ECR*), as discussed in sub-section 2.2.6 (see e.g., Loser, 2003b, pp. 741-742).

render the related service.” (IAS 19, 2004, para. 48). The necessary steps in order to account for defined benefit plans are outlined below.

3.2.6.1 Defined Benefit Obligation

First, the benefits that employees have earned thus far need to be estimated reliably and attributed to the current and past periods (IAS 19, 2004, para. 50 lit. a). This amount must then be discounted to the present (IAS 19, 2004, para. 50 lit. b). Thus, the present value of the so called *defined benefit obligation* is defined as

“[...] the present value [...] of expected future payments required to settle the obligation resulting from employee service in the current and prior periods.” (IAS 19, 2004, para. 7).

For the purposes of this study, henceforth, the *present value of the defined benefit obligation* is described as *defined benefit obligation (DBO)*. Thus, hereafter, any reference to the *undiscounted* defined benefit obligation is indicated accordingly.

In line with IAS 19 (2004, para. 57), it is encouraged but not required to involve a qualified actuary in order to measure the *DBO*. However, in any case, the so called *Projected Unit Credit Method* (PUCM) must be applied for the actuarial valuation of the *DBO* (IAS 19, 2004, para. 64).¹⁰² The PUCM is a dynamic method by which future changes in valuation parameters are anticipated. Hence, the resulting valuation is not static in the sense that it is not solely based on the parameters as expected on the valuation date (Mühlberger & Schwinger, 2012).¹⁰³ In particular, expectations regarding long-term economic and demographic developments must be taken into account adequately. Compared to the common static practice of valuing obligations of Swiss pen-

¹⁰² The PUCM belongs to the so called *Accrued Benefit Methods*. See e.g., Mühlberger and Schwinger (2012, pp., 28-31) for a brief distinction of these methods from the so called *Projected Benefit Methods*. In German, the PUCM is denoted *Methode der Laufenden Einmalprämien* and *Anwartschaftsbarwertverfahren* interchangeably (see e.g., Müller, 2013, footnote 212). *Accrued Benefit Methods* may be defined as retrospective methods based on past service that account for the future by discounting (see e.g., Helbling et al., 2006, p. 424).

¹⁰³ As outlined in sub-sections 2.2.4 and 2.2.5, in line with ARR 26 (2004), Swiss pension plans are commonly valued by applying static rather than dynamic methods. On average, this leads to 10-20% lower values compared to the application of dynamic methods such as the PUCM.

sion plans, for a dynamic valuation, one must additionally consider expectations regarding future developments in salaries, benefits, employee fluctuations and actual investment returns on pension assets (Helbling et al., 2006).¹⁰⁴

Conceptually, the measurement of the *DBO* via the PUCM follows three main steps. First, the total absolute amount of expected future benefits to be received by employees must be estimated. Second, the expected amount of future benefits must be discounted to the expected date of retirement. Finally, the discounted amount of expected future benefits must be attributed to the current and prior periods and, again, discounted to the present reporting period (Pellens et al., 2011). This estimation process is schematically depicted in FIGURE 3.3 below. In particular, the estimation of future benefits (see STEP 1 in FIGURE 3.3) is uncertain since it depends on various factors and parameters that are unknown as of the valuation date (IAS 19, 2004, para. 63; Müller, 2013). Specifically, the valuation must be based on various *demographic* and *economic* (i.e., *financial*) assumptions that “[...] shall be unbiased and mutually compatible.” (IAS 19, 2004, para 72).¹⁰⁵ Furthermore, these assumptions shall be the “[...] best estimates of the variables that will determine the ultimate cost of providing post-employment benefits.” (IAS 19, 2004, para. 73).

Demographic assumptions are applied in order to account for the status quo as well as the expected future development of the plan-specific population of active insurees and beneficiaries (Mühlberger & Schwinger, 2012). Specifically, demographic assumptions comprise assumptions regarding the risks of death (i.e., mortality) and disability, employee fluctuation rates, the proportion of employees with dependents eligible for benefits as well as assumptions regarding early retirement (IAS 19, 2004, para. 73 lit. a). In principle, it would be best to base demographic assumptions on plan-specific historical data (Helbling et al., 2006). However, the estimation of plan-specific mortality and disability rates is costly and, oftentimes, such rates would also be statistically biased due to inferior sample sizes. Thus, in practice, most valuations are based on so called mortality and disability tables (*Tafelwerke* or *Sterbetafeln*) that are based on historical

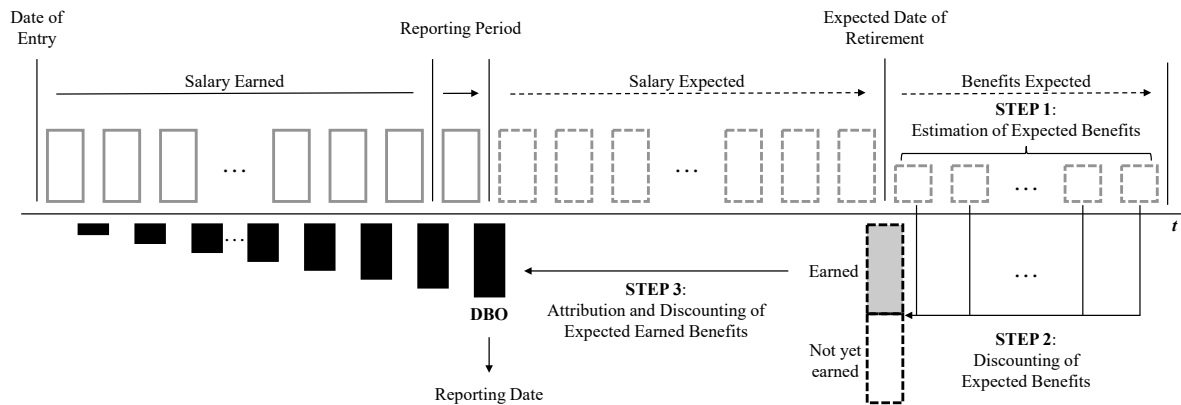
¹⁰⁴ As mentioned in sub-section 2.2.4, the static valuation commonly applied for Swiss pension plans is based on current data (i.e., as of the reporting date) regarding the active insurees, salaries, benefits and beneficiaries and expectations about future developments in salaries, investment returns, benefits and employee fluctuations are not taken into account (Helbling, 2010).

¹⁰⁵ “Actuarial assumptions are unbiased if they are neither imprudent nor excessively conservative.” (IAS 19, 2004, para. 74).

data of larger populations (Mühlberger & Schwinger, 2012). For instance, between 2005 and 2012, valuation of Swiss pension plans could be based on the so called *BVG 2005*

FIGURE

3.3 Estimation of the Defined Benefit Obligation



Note. The FIGURE schematically depicts the application of the Projected Unit Credit Method (PUCM) for the valuation of the defined benefit obligation (DBO). The author's illustration is based on Mühlberger and Schwinger (2012, p. 33); Müller (2013, p. 61) and Pellens et al. (2011, p. 461). The DBO is estimated retrospectively. First, the expected benefits for the time between the expected date of retirement (e.g., at age 65) and the expected date of death (e.g., at age 85) must be estimated (STEP 1). Next, the estimated expected benefits are discounted to the expected date of retirement (STEP 2). Third, the estimation of STEP 2 must be attributed to the current and prior periods of employee service. This part is then discounted to the current reporting date (STEP 3). Date of Entry is the date rendered employee service first leads to the earning of pension plan benefits (e.g., at age 25).

technical assumptions (technische Grundlagen). Amongst others, these assumptions include e.g., probabilities regarding mortality and disability and are based on historical data of some of the major Swiss pension plans. Between 2010 and 2012, an updated version (*BVG 2010*) was available for use as well.¹⁰⁶ Notably, *BVG 2010* introduced mortality tables that adequately account for the increasing life expectancy over time (so called *Generationentafeln*). Concretely, over the last century, life expectancy at birth of people born in Switzerland has almost doubled. Furthermore, based on the technical

¹⁰⁶ BVG 2005 technical assumptions are based on historical data of 1,218,291 active insurees and 638,727 beneficiaries attributable to 15 major Swiss pension plans for the years 1999 to 2004. The updated version of BVG 2010 was based on data of 1,207,600 active insurees and 776,614 beneficiaries for the years 2005 to 2009 (see e.g., BVG 2015, 2017 for more details). Furthermore, two different technical assumptions based on data from public Swiss pension plans (*EVK* and *VZ*) had also been widely used during the sample period. See e.g., Helbling et al. (2006, pp. 375-395) for a comprehensive overview on technical assumptions used to value Swiss pension plans.

assumptions of *BVG 2005*, a male of age 65 had a life expectancy of 17.9 years in 2002. According to the updated assumptions of *BVG 2010*, this value had increased to 18.93 years until 2007 (see Ambrosini & Lombardi, 2011, p. 129). Nevertheless, as of the end of the sample period in 2012, only about 16% of private and 10% of public Swiss pension plans included in the regular survey of Swisscanto (see note of FIGURE 2.3) had already used technical assumptions that adequately accounted for the increasing life expectancy over time (i.e., *Generationentafeln*). The majority of surveyed pension plans still used so called *Periodentafeln*, where life expectancy is held constant over time (see Swisscanto, 2013, p. 58).¹⁰⁷ Notably, as of 2011, also most IAS 19-valuations of Swiss pension plans had still been based on *static* rather than *dynamic* life expectancies (Ambrosini & Lombardi, 2011).¹⁰⁸ Furthermore, also disability rates are dynamic and constantly changing due to factors such as the unemployment rate, the business-cycle in general as well as changes in legislation.¹⁰⁹ The regularly updated versions of the above-mentioned technical assumptions are intended to account for such dynamics (BVG 2015, 2017). Further demographic assumptions relevant for Swiss pension plans are, for example, the probability that an employee is married at the time of death, the average age of the widow or widower at the time of death as well as the average number and average age of children at the time of death (Helbling et al., 2006). Respective probabilities based on larger populations are also provided by the above-mentioned technical assumptions.

In contrast to the demographic (i.e., biometric) assumptions such as mortality and disability rates which are based on larger populations, demographic assumptions regarding the employee fluctuation as well as the retirement age are commonly derived from

¹⁰⁷ Usually, to account for increasing life expectancies, pension plans applying *Periodentafeln* recognize additional provisions (see e.g., Helbling et al., 2006, p. 387). In general, for males and females, *Periodentafeln* show the probability that a person of a specific age (e.g., 60) dies one year later. However, the mortality rates are independent of the exact age group. For example, a male of age 65 has the same mortality rate as a male of age 50 in 15 years (see Ambrosini & Lombardi, 2011, p. 129). See e.g., Ambrosini and Lombardi (2011, pp. 129-130); Helbling et al. (2006, pp. 384-388) for more details regarding the differences between *Perioden-* and *Generationentafeln*.

¹⁰⁸ Overall, the application of dynamic life expectancies (i.e., *Generationen-* rather than *Periodentafeln*) is more in line with IAS 19 (Ambrosini & Lombardi, 2011). Moreover, for a *typical* Swiss pension plan, the estimation of the *DBO* can be expected to rise due to the change from static to dynamic life expectancies (see e.g., generic example in Ambrosini & Lombardi, 2011, pp. 130-134).

¹⁰⁹ Assumptions regarding the risk of disability are particularly uncertain since they are dependent on many factors that are difficult to measure adequately. Amongst the factors mentioned above, the risk of disability is also dependent on e.g., the success of reintegration of an employee into the workforce etc. See e.g., Helbling et al. (2006, pp. 389-390) for more details.

firm- and plan-specific historical data. Specifically, the retirement age is usually defined as the age stipulated by the pension plan regulations or respective laws. If there exists a period rather than a specific age of retirement, different ages must be weighted by different probabilities. However, in practice, the most likely age of retirement is normally used in the valuation (Mühlberger & Schwinger, 2012).

Economic (i.e., financial) assumptions comprise assumptions about the discount rate used for estimating the present value of the defined benefits (see below) as well as assumptions about the investment returns on pension assets.¹¹⁰ Furthermore, economic assumptions entail assumptions regarding the future developments of salaries and benefit levels of the pension plan (IAS 19, 2004, para. 73 lit. b). Specifically, the measurement of the *DBO* shall reflect any expected future increases in salaries as well as future changes in benefits that are either required by the pension plan regulations (e.g., use of potential surplus for the increase of benefit levels) or that are based on a constructive obligation such as e.g., past history of increasing benefits due to inflation (IAS 19, 2004, para. 83 lit. a and 85 lit. a and b). Moreover, factors such as inflation, promotion schemes as well as current dynamics in the employment market must be considered for the estimation of future salary increases (IAS 19, 2004, para. 84).¹¹¹ Last but not least, where benefits might be affected by future changes in state benefits, the measurement shall also reflect such future changes “[...] based on past history and other reliable evidence.” (IAS 19, 2004, para. 87).¹¹² As above-mentioned, all economic assumptions used for the estimation of the *DBO* shall be mutually consistent and based on “[...] market expectations, at the balance-sheet date, for the period over which the obligations are to be settled.” (IAS 19, 2004, para. 77). For example, all factors affected by inflation shall reflect the same (expected) inflation rates (IAS 19, 2004, para 75). Overall, all economic assumptions shall be based on common macro-economic factors.¹¹³

In the second step depicted in FIGURE 3.3, the future expected benefits estimated as outlined above, must be discounted to the expected retirement age. “The rate used to

¹¹⁰ Pension (i.e., plan) assets as well as respective investment returns are discussed in more detail in paragraphs 3.2.6.2 and 3.2.6.3, respectively.

¹¹¹ For example, for the firms listed in the SLI (see footnote 72, page 55) applying IAS 19, the average assumed future growth rate of salaries had oscillated between 2.6 and 2.9% during the period of 2008 to 2012. Analogously, the average assumed growth rate in future benefit levels (*Rentenindexierung*) had oscillated between 0.6 and 0.7% during the same period (see Towers Watson, 2013, p. 5).

¹¹² For example, major legislative reforms such as e.g., described in footnote 38 on page 37 would need to be reflected in the estimation of the *DBO* as of the valuation date.

¹¹³ See e.g., Mühlberger and Schwinger (2012, pp. 41-44) for more details.

discount [the *DBO*] shall be determined by reference to market yields at balance-sheet date on high quality corporate bonds.” (IAS 19, 2004, para. 78). Alternatively, the discount rate shall be based on yields of government bonds if a sufficiently deep (i.e., liquid) market of corporate bonds does not exist for the respective country or currency (IAS 19, 2004, para 78). Analogously, if there does not exist a sufficiently deep market for longer maturities, respective yields shall be estimated by “[...] extrapolating current market rates along the yield curve.” (IAS 19, 2004, para 81). In general, the discount rate shall exclusively reflect the time value of money. In particular, it shall not reflect any actuarial, investment or firm-specific credit risk (IAS 19, 2004, para 79). This is based on the idea that, in theory, the employer could buy a portfolio of corporate bonds that exactly matches the term and payment structure of the pension plan benefits to be funded (see e.g., Mühlberger & Schwinger, 2012, p. 39). Therefore, the currency as well as the term structure of the corporate bonds used to estimate the discount rate shall be consistent with the pension plan benefit payments (IAS 19, 2004, para 78). The discount rate shall also be applied in *nominal* terms except where *real* terms are more reliable (e.g., in hyperinflationary economies; IAS 19, 2004, para. 76).¹¹⁴ In practice, firms usually apply a “[...] single weighted average discount rate that reflects the estimated timing and amount of benefit payments and the currency in which the benefits are to be paid.” (IAS 19, 2004, para 80).¹¹⁵ Overall, the discount rate has a “material effect” on the estimation of the *DBO* (IAS 19, 2004, para. 79). For example, as of 2012, a reduction of the discount rate by 0.5 percentage points was estimated to lead to a corresponding aggregated increase of the *DBOs* of firms listed in the SMI of between 5 and 7.5 percent (i.e., between CHFbn 8.1 and 12.1).¹¹⁶ Furthermore, for the firms listed in the SLI, average applied discount rates had steadily decreased from 4.2% in 2008 to 2.8% in 2012 with respective implications for the valuations of the *DBOs* (see Towers Watson, 2013, pp. 4-5). Thus, this reflects the application of market based discount rates as outlined above.

¹¹⁴ In practice, the discount rate is estimated as *pre-tax nominal rate* (see e.g., Mühlberger & Schwinger, 2012, p. 39; Pellens et al., 2011, p. 461).

¹¹⁵ See e.g., Mühlberger and Schwinger (2012, pp. 39-40) for an illustration. Many practical issues regarding the estimation of the discount rate have also been critically debated in the literature (see e.g., Müller, 2013, footnote 227). For example, what rating of corporate bonds implies *high quality*? (see e.g., Mühlberger & Schwinger, 2012, p. 40).

¹¹⁶ The estimation is based on an assumed average duration of pension obligations of 10 to 15 years. For the firms listed in the SLI, the corresponding increase was estimated to be between CHFbn 8.8 and 13.1 (see Towers Watson, 2013, p. 5).

As the third and final step in the estimation process of the *DBO* (see FIGURE 3.3), the estimated expected defined benefits attributable to the current and prior periods must be, again, discounted from the expected retirement age to the current balance-sheet date. The same discount rate as described above is used for discounting (Pellens et al., 2011). In principle, the attribution of the estimated defined benefits to the current and prior periods shall be based on the benefit formula of the respective pension plan. However, if the plan formula leads to “materially higher” levels of benefits attributable to later years of service, benefits shall be attributed on a *straight-line basis* between the date employee service first leads to the earning of pension plan benefits and the date after which any employee service leads to no material further pension plan benefits apart from salary increases (IAS 19, 2004, para. 67). As outlined in paragraph 3.2.4.4, most Swiss pension plans are structured in accordance with the defined contribution primacy. Accordingly, the plan formula is based on contribution rates stipulated in the pension plan regulations and the law stipulates minimum contribution rates depending on the age of employees (see sub-section 2.2.2). During the sample period, combined minimum contribution rates of employers and employees for mandatory old-age benefits as percentage of the coordinated (i.e., insured) annual salary were 7% (age 25-34), 10% (35-44), 15% (45-54) and 18% (55-65, see footnote 19, page 21). Hence, due to increasing contribution rates (oftentimes combined with increasing salaries) over the service life of employees, benefits of most Swiss pension plans are attributed on a straight-line basis in accordance with IAS 19 (see e.g., Suter, 2000; Zanella & Welser, 2012).¹¹⁷

3.2.6.2 Plan Assets

After the *DBO* has been estimated reliably, the reporting entity must measure the *fair value* of the pension plan assets (IAS 19, 2004, para. 50 lit. c). Henceforth, the terminology of IAS 19 (2004, para. 7) is followed and pension plan assets are denoted as *plan assets (PLA)*.

In principle, assets qualify as *plan assets* if they meet the following criteria cumulatively (IAS 19, 2004, para. 7):¹¹⁸

- The assets are held by a legally separate entity (a fund) that exists for the sole purpose of funding or paying pension plan benefits.

¹¹⁷ The straight-line attribution of Swiss pension plans in line with IAS 19 corresponds to an average contribution rate of about 12.5% over a service life of 40 years compared to the increasing contribution rates as stipulated by law (see e.g., Suter, 2000, p. 458).

¹¹⁸ See e.g., Mühlberger and Schwinger (2012, pp. 45-46) and Müller (2013, pp. 63-64).

- The assets are actually available to the separate legal entity and can be used for the sole purpose of funding or paying pension plan benefits.
- Even in the case of bankruptcy, the assets cannot be made available to the creditors of the employer.
- The assets cannot be returned to the employer.

In general, there exist two exceptions to the last of the above-mentioned criteria. First, assets can be returned to the employer if they “[...] are sufficient to meet all the related employee benefit obligations of the plan or the [employer]” (IAS 19, 2004, para. 7). For instance, this could be the case if there exists an overfunding of the pension plan (see e.g., Mühlberger & Schwinger, 2012, p. 45). And second, assets can be returned to reimburse the employer for “[...] benefits already paid.” (IAS 19, 2004, para. 7).

As outlined in sub-section 2.2.1, Swiss pension plans must be legally separate from the employer. Moreover, during the sample period, most Swiss pension plans had provided mandatory benefits (exclusively or in addition to non-mandatory benefits). For these plans, Swiss law stipulates minimum contributions that must be transferred to the pension plan in order to fund minimum mandatory benefits (see sub-sections 2.2.2 and 2.2.3).¹¹⁹ Furthermore, as stated at the beginning of sub-sections 2.2.2 and 2.2.5, Swiss pension plans must ensure the fulfillment of assumed pension obligations at all time (BVG, 2004, § 65 para. 1; 2012, § 65 para. 1). Specifically, plan assets must be managed in a way that the fulfillment of assumed pension obligations is ensured (BVV2, 2004, § 50 para. 2; 2012, § 50 para. 2). Last but not least, even in the case of bankruptcy, employer contributions to Swiss pension plans cannot be returned to the respective employer (see e.g., Ambrosini & Haag, 2008, p. 539; Loser, 2002, p. 46; Schaller & Alfieri, 2009, pp. 885-886; Stauffer, 2012, p. 758).¹²⁰ Overall, the above-mentioned criteria of IAS 19, are fulfilled with respect to Swiss pension plans.

¹¹⁹ Notably, Swiss law even specifies that the employer must deduct the annual employee contributions from respective salaries and transfer these together with the annual employer contributions to the separate pension plan until no later than the end of the first month after the end of the year for which pension contributions are payable (see BVG, 2004, § 66 para. 2-4; 2012, § 66 para. 2-4; OR, 2004, § 331 para. 3; 2012, § 331 para. 3).

¹²⁰ Specifically, employer contributions can only be returned to the employer if, during a specified period, changes of employments lead to adjustments of contributions payable for the respective period and respective employer contributions have already been paid to an open account (*Kontokorrent*) of the pension plan. However, employer contributions paid for earlier periods can never be returned to the employer (see e.g., Steinmann, 1992, p. 515).

Plan assets consist of the employer and employee contributions to the plan incl. respective proceeds (or losses) earned less actual benefits paid from these assets.¹²¹ They can either comprise financial assets such as e.g., cash and cash equivalents, equity instruments and bonds etc. or they can also be in the form of property, plant and equipment such as e.g., machines and real estate etc. (see e.g., Mühlberger & Schwinger, 2012, p. 46; Müller, 2013, p. 64). Also, financial instruments issued by the covered employer qualify as plan assets of the pension plan as long as these are *transferable* (IAS 19, 2004, para. 7). Notably, financial instruments issued by the employer can definitely be considered as transferable if these instruments are freely traded on e.g., an exchange. However, *tradability* is not necessary for *transferability*. Thus, also e.g., non-traded debt instruments could qualify as plan assets (see e.g., Mühlberger & Schwinger, 2012, p. 46).¹²² As noted in footnote 22 on page 24, Swiss law stipulates certain allocation ceilings with respect to plan assets. Overall, as depicted in FIGURE 2.2 (page 24), throughout the sample period, most plan assets of Swiss pension plans (excl. assets from insurance contracts) had been invested in financial instruments as well as real estate.

In principle, plan assets must be measured by *fair values*.¹²³ However, if no market price is available at the reporting date, valuation shall be based on other methods. For example, where possible, future cash-flows from the assets shall be discounted to the reporting date applying a discount rate that incorporates the risk as well as the maturity of the asset or alternatively the expected maturity of the related obligation (IAS 19, 2004, para. 102). For property, plant and equipment, for example real estate assets, valuation shall be based on experts or other standards such as e.g., IAS 40, *Investment*

¹²¹ Contributions due but not yet paid are excluded from plan assets. Furthermore, any liability of the pension plan not related to pension benefits (e.g., trade payables resulting from derivative instruments) reduces plan assets (IAS 19, 2004).

¹²² Also, *qualifying insurance policies* count as plan assets if they fulfill the following criteria: proceeds can solely be used for the payment of pension plan benefits, proceeds are not available to the creditors of the employer (even in the case of bankruptcy) and proceeds cannot be returned to the employer except for the cases outlined above (IAS 19, 2004, para. 7). Note, within the Swiss setting, it is usually the pension plan itself that has insurance policies for risk coverage (see sub-section 2.2.1). Hence, in line with the comments made above regarding contributions, proceeds from such policies cannot be returned to the employer. In general, a qualifying insurance policy must not be issued by a related party defined as in IAS 24, *Related Party Disclosures* (IAS 19, 2004, para. 7). See e.g., Mühlberger and Schwinger (2012, pp. 87-88) for more details.

¹²³ „*Fair value* is the amount for which an asset could be exchanged [...] between knowledgeable, willing parties in an arm's length transaction [*italics in original*].“ (IAS 19, 2004, para. 7).

Property (see e.g., Mühlberger & Schwinger, 2012, p. 52).¹²⁴

3.2.6.3 Pension Income and Pension Cost

Conceptually, the derivation of pension income and pension cost components is based on the measurement of the defined benefit obligation (*DBO*) and the plan assets (*PLA*; Pellens et al., 2011). As is the case with respect to defined contribution plans (see subsection 3.2.5), if prescribed by other standards such as e.g., IAS 2, *Inventories*, or IAS 16, *Property, Plant and Equipment*, all or some of the components of pension income and cost must be included into the historical costs of respective assets (IAS 19, 2004, para. 62). Otherwise, these components must be recognized in profit or loss (IAS 19, 2004, para. 61).¹²⁵

Current Service Cost (CSC) is defined as “[...] the present value of the defined benefit obligation [*DBO*] resulting from employee service in the current period.” (IAS 19, 2004, para. 7). Accordingly, the measurement of *CSC* follows the measurement of the *DBO* as outlined in paragraph 3.2.6.1 and depicted in FIGURE 3.3. Concretely, *CSC* is the present value as of the reporting date of the estimated expected benefits attributed to (i.e., earned during) the current period. However, in practice, interest accrued on *CSC* might also be entirely attributed to interest cost discussed below. In that case, *CSC* is discounted to the beginning of the current reporting period (see e.g., Mühlberger & Schwinger, 2012, p. 55). As another alternative, *CSC* could also be compounded to the middle of the year as follows,

$$CSC_t = CSC_{t-1} \times \left(1 + \frac{DR_{t-1}}{2}\right) \quad (3.1)$$

¹²⁴ If qualifying insurance contracts are perfectly congruent with related benefit obligations, these shall be valued by the value of the related *DBO* which in turn is valued as outlined in paragraph 3.2.6.1 (IAS 19, 2004, para. 104). If the contract is not perfectly congruent with the related obligation, it is common practice to use the value reported by the insurance company (see e.g., Mühlberger & Schwinger, 2012, p. 53). Also, see Mühlberger and Schwinger (2012, pp. 52-53) for more details regarding re-measurement of assets that are transferred from the employer to the pension plan as well as particularities between *sale-and-lease-back* arrangements between employers and pension plans.

¹²⁵ There exist certain exceptions to the recognition of actuarial gains and losses outlined in paragraph 3.2.6.4 as well as the recognition of effects from the asset ceiling described in paragraph 3.2.6.6.

where, DR_{t-1} denotes the discount rate as assumed at the beginning of the period (i.e., at the end of the prior period, see paragraph 3.2.6.1) and CSC_{t-1} is the current service cost discounted to the beginning of the period. In that case, current service cost is assumed to arise evenly across period t . Overall, measuring current service cost completely free of interest (i.e., as CSC_{t-1}) best accounts for the differentiation between current service and interest cost that is discussed next (see e.g., Mühlberger & Schwinger, 2012, p. 55).

Interest Cost (IC) is defined as “[...] the increase during a period in the present value of a defined benefit obligation [*DBO*] which arises because the benefits are one period closer to settlement.” (IAS 19, 2004, para. 7). Specifically, *IC* is estimated “[...] by multiplying the discount rate as determined at the start of the period by the present value of the defined benefit obligation [i.e., the *DBO*] throughout that period, taking account of any material changes in the obligation.” (IAS 19, 2004, para. 82). For example, the expected benefits payable during the current period reduce the *DBO* throughout that period. Thus, if benefits are paid on a monthly basis, *IC* could be measured as follows,

$$IC_t = DR_{t-1} \times (DBO_{t-1} - 0.5 \times Benefits_t) \quad (3.2)$$

where, DR_{t-1} denotes the discount rate as assumed at the beginning of the period (i.e., at the end of the prior period, see paragraph 3.2.6.1) and $Benefits_t$ denotes the total sum of *expected* benefits paid during period t . (3.2) follows the assumption that benefit payments are distributed evenly across t . In contrast, if benefits are paid as lump-sum at the beginning or at the end of the period, for the estimation of *IC*, the *DBO* needs to be reduced or kept constant, respectively (see e.g., Mühlberger & Schwinger, 2012, p. 55).¹²⁶ Lastly, as outlined above, whether interest accrued on the current service cost is attributed to *CSC* or *IC* also affects the measurement of interest cost (see e.g., Mühlberger & Schwinger, 2012, p. 55). Overall, as is current service cost (*CSC*), also interest cost (*IC*) is derived from the valuation of the *DBO* outlined in paragraph 3.2.6.1 and depicted in FIGURE 3.3.

Expected Return on Plan Assets (ER) is defined as follows (IAS 19, 2004, para. 106),

¹²⁶ Note, also with regard to Swiss pension plans expected contributions payable must be estimated at the beginning of the reporting period (see more details in paragraph 3.2.6.8).

$$ER_t = ERR_{t-1} \times PLA_{t-1} \quad (3.3)$$

where ERR_{t-1} denotes the *Expected Rate of Return on Plan Assets* and PLA_{t-1} denotes plan assets measured as outlined in paragraph 3.2.6.2 at the beginning of period t (i.e., at the end of $t-1$).¹²⁷ ERR is based on the market expectations as of the beginning of the period for the return on plan assets over the expected maturity of the related benefit obligations (IAS 19, 2004, para. 106).¹²⁸ Specifically, ERR consists of “[...] interest, dividends and other revenue derived from the plan assets, together with realised and unrealised gains or losses on the plan assets, less any costs of administering the plan and less any tax payable by the plan itself.” (IAS 19, 2004, para. 7).¹²⁹ Main building block for the estimation of ERR is the expected allocation of plan assets throughout the respective period. Concretely, based on the expected asset allocation (i.e., expected asset weights) as well as the expected risk premiums of the different classes of assets (e.g., corporate bonds, equity instruments etc.) achievable in addition to the risk-less returns implied by the market prices of government bonds, ERR is accordingly estimated as expected weighted-average return (see e.g., Mühlberger & Schwinger, 2012, p. 43). Between 2008 and 2012, average applied expected rates of return of the firms listed in the SLI, had oscillated between 5.0% in 2009 and 4.1% in 2012 with respective implications for the measurement and recognition of expected returns in profit or loss (see Towers Watson, 2013, p. 7). Notably, ERR had been considerably higher than the applied discount rates for the measurement of the DBO (see paragraph 3.2.6.1).¹³⁰

¹²⁷ If applicable, ER also includes the expected return from any *reimbursement rights* (IAS 19, 2004, para. 61 lit. c). However, with respect to Swiss pension plans, benefits are never paid directly by the employer. Moreover, any contributions to the plan cannot be transferred back to the firm (see paragraph 3.2.6.2). Thus, in the context of a Swiss pension plan, a right to reimbursement would most likely be in the form of a qualifying insurance policy for risk coverage (see paragraph 3.2.4.2). As described in footnote 122 (page 75), such policies are included in the plan assets (PLA) of Swiss pension plans. In that case, the respective rules regarding reimbursement rights do not apply (IAS 19, 2004, para. 104B). Therefore, for the purposes of this study, accounting for reimbursement rights is not further discussed. See e.g., Mühlberger and Schwinger (2012, pp. 87-88) for more details.

¹²⁸ Together with the respective parameters relevant to estimate the DBO outlined in paragraph 3.2.6.1 (e.g., the discount rate), ERR forms the crest of *economic* actuarial assumptions applied to account for pension plans.

¹²⁹ Administration costs shall be deducted only if these are not included in actuarial assumptions applied to measure the DBO (IAS 19, 2004, para. 107). Moreover, ERR could also be defined as *gross return* if, for example, administration and tax costs attributable to plan assets are solely funded by the employer (see e.g., Mühlberger & Schwinger, 2012, p. 42).

¹³⁰ It is also worth noting here that, in the past, ERR had regularly been suspected to be misused for *earnings management* (Mühlberger & Schwinger, 2012). For instance, the IASB itself expressed that concern and noted: “[...] the subjectivity inherent in determining the [ERR] could provide entities with an opportunity to manage

As outlined regarding interest cost (*IC*) above, the expected return (*ER*) on plan assets shall also reflect within-period changes in *PLA* expected to occur due to actual contributions received and benefits paid during that period (IAS 19, 2004, para. 106). Based on the example outlined in IAS 19 (2004, para. 106), FIGURE 3.4 below illustrates the expected return (*ER*) as part of the change in the fair value of plan assets (*PLA*) between the beginning (01.01.) and the end (31.12.) of period *t*. In particular, *ERR after tax* is estimated to be 10.25%. This includes a deduction of 1.00% for expected administration costs. For the purpose of illustration, it is assumed here that the fair values of *PLA* are 100 and 150 units as of the beginning (01.01.) and end (31.12.) of period *t*, respectively. Furthermore, expected and actual benefits and contributions paid during *t* are assumed to be equal. In essence, it is assumed that there are no changes, whatsoever, regarding the pension plan (e.g., number of insurees, regulations etc.). It is further assumed that the plan pays 19 units of benefits and receives 49 units of contributions as of June 30 (i.e., at midyear; IAS 19, 2004, para. 106). Accordingly, the expected return is estimated as follows,

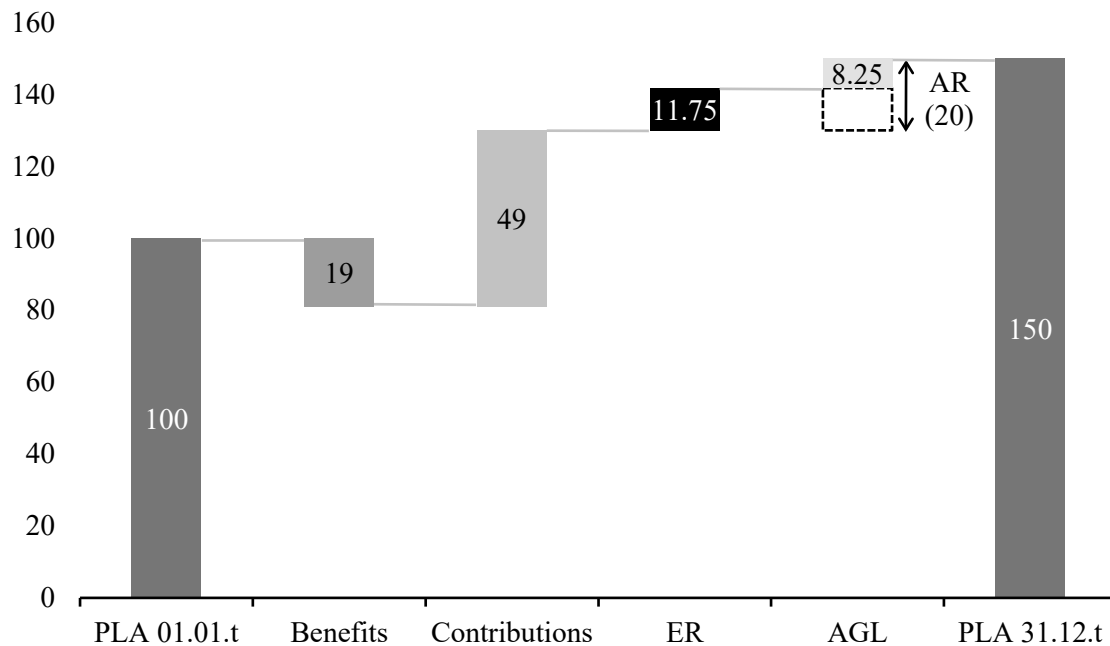
$$ER_t = 10.25\% \times 100 \text{ units} + 5\% \times (49 - 19 \text{ units}) = 11.75 \text{ units} \quad (3.4)$$

(3.4) accounts for the fact that 100 units of *PLA* are compounded for the first half of period *t* and 135 units of *PLA* (incl. the expected return for the first half, 5 units, and the net contributions received at midyear, 30 units) are compounded for the second half of *t*. Thus, 5% compounded every six months is equal to 10.25% compounded annually (IAS 19, 2004, para. 106). However, according to the example, the *actual return on plan assets* (*AR*) is higher than the expected return (i.e., 20 units vs. 11.75 units as indicated in FIGURE 3.4). The difference between *ER* and *AR* is part of the so called *actuarial gains and losses* (*AGL*) discussed next (IAS 19, 2004, para. 105).

Actuarial Gains and Losses (*AGL*) arise due to differences between the *actual* and the *assumed* demographic and economic parameters applied for the measurement of the

profit or loss.” (IASB, 2010, para. BC41). However, empirical evidence is not unequivocal. For example, Ljubicic (2013) investigates a sample of firms listed in Germany and finds evidence in favor of earnings management hypotheses. In contrast, e.g., Adams, Frank, and Perry (2011) do not find systematic upward bias in *ERR* relative to benchmark rates for a sample of firms applying almost identical rules in accordance with US GAAP between 1991 and 2005. The subject of earnings management is not further discussed in this study. See e.g., Ljubicic (2013) for an in-depth treatment of earnings management in the context of IAS 19.

FIGURE
3.4 Expected Return on Plan Assets



Note. The FIGURE illustrates the change in plan assets (*PLA*) between the beginning (01.01.) and the end (31.12.) of period *t*. The change is split into actual benefits and contributions paid, the expected return (*ER*, black bar) as well as the actuarial gains and losses (*AGL*) caused by the difference between the expected and the actual return on plan assets (*AR*). The example is based on IAS 19 (2004, para. 106). Notably, expected and actual benefits and contributions are assumed to be equal (i.e., no change in number of insureds or regulations of the pension plan etc.). Furthermore, benefits and contributions are assumed to be paid at June 30 (i.e., midyear) of period *t*. The expected rate of return on plan assets (*ERR*) is estimated to be 10.25%. Accordingly, *ER* reflects the net contributions received at midyear and thus 100 units of *PLA* are compounded at 5% for the first half of *t* and 135 units of *PLA* (incl. expected return for the first half, 5 units; and net contributions at midyear, 30 units) are compounded at 5% for the second half of period *t*.

DBO and the *PLA* (Mühlberger & Schwinger, 2012). Specifically, *AGL* may be caused by “experience adjustments [i.e.,] the effects of differences between the previous actuarial assumptions and what has actually occurred [...]” (IAS 19, 2004, para. 7). For example, regarding the measurement of the *DBO*, mortality or disability rates, employee fluctuation or increases in salary or benefit levels or a combination of all these factors may happen to be different during a specific period relative to the expectations at the beginning of that period (IAS 19, 2004, para. 94 lit. a). With respect to the measurement of *PLA*, this may occur due to differences between the expected and the actual rate of return as outlined above (IAS 19, 2004, para. 94 lit. d). *AGL* may also arise due to “the effects of changes in actuarial assumptions.” (IAS 19, 2004, para. 7). For example, demographic assumptions such as mortality and disability rates or employee turnover as well as economic assumptions such as expected salary increases used to measure the

DBO must be updated compared to the previous valuation date (IAS 19, 2004, para. 94 lit. b). In particular, this might also be true with regard to the applied discount rate (IAS 19, 2004, para. 94 lit. c). In principle, during the sample period, IAS 19 (2004) allowed three different methods for the recognition of actuarial gains and losses (*AGL*). First, *AGL* estimated for the period could be immediately recognized in full in profit or loss. Henceforth, this method is denoted as *PL-Method*. Second, firms were not required to recognize *AGL* within a certain range (i.e., a *corridor*) and were allowed to delay the recognition of *AGL* beyond that corridor to later periods. Hereafter, this method is denoted as *Corridor-Method*. Last but not least, as mentioned in sub-section 3.2.2, the 2004 amendment of IAS 19 introduced the so called *OCI-Method*. Accordingly, firms could recognize *AGL* immediately and in full in *other comprehensive income* (OCI, i.e., in equity). Moreover, *AGL* recognized in accordance with the OCI-Method was not allowed to be recycled in profit or loss during later periods.¹³¹ The different methods for the recognition of *AGL* are described in more detail in paragraph 3.2.6.4 below.

As outlined in relation with defined contribution plans in sub-section 3.2.5, *Past Service Cost (PSC)* is defined as expense that arises due to the introduction or adjustment of pension benefits which are attributable to employee service already rendered in the past (Mühlberger & Schwinger, 2012). Specifically, with regard to defined benefit pension plans *PSC* is defined as “[...] the increase in the [*DBO*] for employee service in prior periods, resulting in the current period from the introduction of, or changes to, post-employment benefits [...]”. Furthermore, *PSC* is *positive* (i.e., a loss) if benefits are introduced or improved and *negative* (i.e., a gain) if benefits are reduced (IAS 19, 2004, para. 7). It is important to distinguish past service cost (*PSC*) from actuarial gains and losses (*AGL*) as well as from changes of benefits attributable to future employee service (Mühlberger & Schwinger, 2012). In particular, the effects of differences between expected and actual increases in salaries and/or benefits attributable to service rendered in prior periods is recognized as actuarial gains or losses (IAS 19, 2004, para. a and b). Moreover, expected benefit improvements resulting from actuarial gains (i.e., an overfunding) already recognized in past periods must be recognized as actuarial losses rather than past service cost (IAS 19, 2004, para. c). Also, increases in *vested* benefits are recognized in current service cost (*CSC*) immediately if there is no introduction of new or improved benefits (IAS 19, 2004, para. d). Finally, amendments to a pension plan that lead to a reduction of benefits attributable to future employee service

¹³¹ As mentioned in sub-section 3.2.2, since January 1, 2013, IAS 19 (2011) allows only the OCI-Method for the recognition of *AGL*.

are recognized as *curtailments* (see below; IAS 19, 2004, para. e). Past service cost (*PSC*) is measured as the change in the *DBO* resulting from the respective plan amendment (IAS 19, 2004, para. 97). Thus, based on identical actuarial assumptions, the *DBO* must be estimated with and without the plan amendment (see e.g., Mühlberger & Schwinger, 2012, p. 66). *PSC* shall be recognized in profit or loss “[...] on a straight-line basis over the average period until the benefits become vested.” In contrast, past service cost due to already vested benefits shall be recognized immediately in profit or loss (IAS 19, 2004, para. 96).¹³² Lastly, if amendments to a pension plan lead to increases of certain benefits and decreases of other benefits simultaneously, these past service cost must be treated on a net basis (IAS 19, 2004, para. 101).

Gains and losses from *Curtailments and Settlements* (*CS*) must be recognized in profit or loss as they occur (IAS 19, 2004, para. 109). Concretely, a curtailment occurs if the employer “[...] is demonstrably committed to make a material reduction in the number of employees covered by a plan;” (IAS 19, 2004, para. 111 lit. a). Moreover, a *curtailment* can also occur if the employer “[...] amends the terms of a defined benefit plan such that a material element of future service by current employees will no longer qualify for benefits, or [...] only for reduced benefits.” (IAS 19, 2004, para. 111 lit. b).¹³³ Curtailments may be caused by isolated events “[...] such as the closing of a plant, discontinuance of an operation or termination or suspension of a plan.” (IAS 19, 2004, para. 111). Furthermore, curtailments might also be related to restructuring and accordingly shall be recognized simultaneously (IAS 19, 2004, para. 111). In contrast, the elimination of “[...] all further legal or constructive obligation for part or all of the defined benefits provided under a defined benefit plan [...]” leads to a *settlement* (IAS 19, 2004, para. 112). For example, upon settlement the employer pays a lump-sum to beneficiaries of the plan or to an insurance company that subsequently provides benefits (IAS 19, 2004, para. 112). However, if the employer retains any legal or constructive obligation from an insurance policy, such a transaction is *not* a settlement (IAS 19, 2004, para. 113).¹³⁴ A curtailment and a settlement occur simultaneously if “[...] a plan is terminated such that the obligation is settled and the plan ceases to exist.” (IAS 19, 2004, para. 114). However, the replacement of a terminated plan by an almost identical plan

¹³² Since January 1, 2013, past service cost (*PSC*) must be recognized immediately (see IAS 19, 2011, para. 103).

¹³³ As mentioned in sub-section 3.2.2, the amendment of IAS 19 in 2008, included clarifications regarding curtailments. Specifically, since January 1, 2009, curtailments must no longer be *material* in order to be recognized (see e.g., Mühlberger & Schwinger, 2012, p. 68).

¹³⁴ As outlined in paragraph 3.2.4.2, within the context of IAS 19 it has not been possible to eliminate all legal or constructive obligations arising from a Swiss pension plan by purchasing any form of insurance policy.

is neither a curtailment nor a settlement (IAS 19, 2004, para. 114). Overall, the measurement of curtailments and settlements shall include the resulting changes in the *DBO* and the *PLA* as well as any actuarial gains and losses (*AGL*) and past service cost (*PSC*) not previously recognized (IAS 19, 2004, para. 109 lit. a-c). Anyhow, the related *DBO* as well as the related *PLA* shall be re-measured based on current actuarial assumptions before any effect of curtailments and/or settlements are determined (IAS 19, 2004, para. 110).

3.2.6.4 Recognition of Actuarial Gains and Losses

As above-mentioned, throughout the sample period firms could choose different methods for the recognition of actuarial gains and losses (*AGL*). These methods are discussed next.

According to the so called Corridor-Method, at the end of a reporting period a firm must evaluate whether *cumulative unrecognized net actuarial gains and losses (AGLNR)* exceed 10% of the greater of the *DBO* and the *PLA* measured as of that date (IAS 19, 2004, para. 92).¹³⁵ Furthermore, the accordingly estimated excess amount must be “[...] divided by the expected average remaining working lives of the employees participating in that plan.” (IAS 19, 2004, para. 93).¹³⁶ This portion of the excess amount must then be recognized in profit or loss during the subsequent reporting period. The entire procedure must be followed separately for each of the reporting firm’s defined benefit plans (IAS 19, 2004, para. 92).

FIGURE 3.5 below schematically illustrates the application of the Corridor-Method. It is important to note, at the beginning of each reporting period (i.e., at the end of previous reporting periods) a firm applying the Corridor-Method conducts the Corridor-Test outlined above. Hence, only the part of *AGL* in excess of the 10%-corridor as of that evaluation date is recognized in profit or loss. Moreover, in the end even this excess part of *AGL* might only be partly recognized since the test is conducted for each reporting period and occurring actuarial gains and losses might cancel each other out over time (Pellens et al., 2011). This is also one of the main reasons in favor of the concept

¹³⁵ In the literature, this evaluation is sometimes also called *Corridor-Test* (see e.g., Mühlberger & Schwinger, 2012, p. 61).

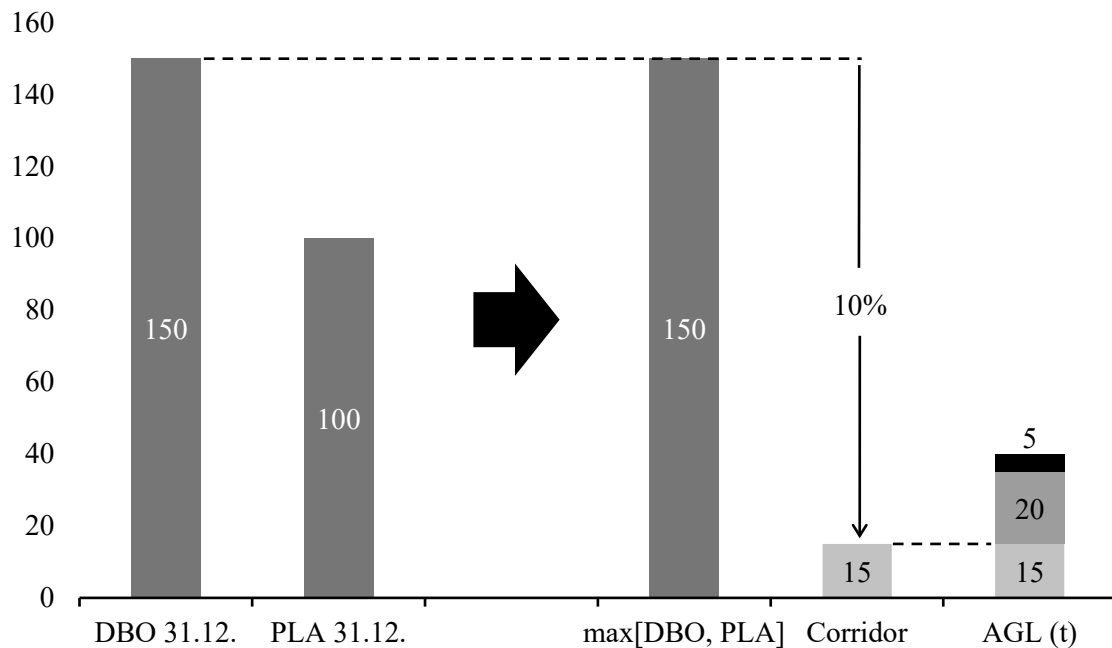
¹³⁶ If there are no active insureds but only beneficiaries insured by the plan, the entire excess amount of *AGL* must be recognized in profit or loss for the reporting period for which the Corridor-Test is conducted (see e.g., Mühlberger & Schwinger, 2012, p. 61).

of the Corridor-Method. Since actuarial gains and losses might offset one another in the long-term, “[...] estimates of post-employment benefit obligations may be viewed as a range (or ‘corridor’) around the best estimate.” (IAS 19, 2004, para. 95). Accordingly, the deferred and partial recognition of actuarial gains and losses (*AGL*) accounts for this inherent uncertainty. This is also in line with the notion that the application of the Corridor-Method attenuates potential volatility introduced to the balance-sheet and profit or loss by *AGL*. Lastly, the Corridor-Method can also be regarded as a countermeasure to earnings management that might be due to the discretion of management in setting actuarial assumptions for the estimation of the *DBO* and the *PLA* (see e.g., Mühlberger & Schwinger, 2012, p. 60).¹³⁷

Apart from the Corridor-Method, a firm is allowed to adopt “[...] any systematic method that results in faster recognition of actuarial gains and losses [...] even if they are within the limits [i.e., within the corridor]” (IAS 19, 2004, para. 93). In principle, if a firm opts for the recognition of actuarial gains and losses (*AGL*) in the period in which these occur, it is allowed to recognize them either in profit or loss or directly in equity (i.e., in other comprehensive income, *OCI*). Thence, for the purposes of this study, these methods are denoted as *PL-Method* and *OCI-Method*, respectively. Whatever option is chosen, it must be applied to all defined benefit plans as well as to all actuarial gains and losses (*AGL*) arising from these plans (IAS 19, 2004, para. 93A). If the reporting firm chooses the immediate and full recognition of *AGL* in profit or loss (*PL-Method*), conceptually, net pension cost (*NPC*) is then fully determined by the change in the current values of the *DBO* and the *PLA* (Mühlberger & Schwinger, 2012). Specifically, whereas interest cost on the *DBO* (*IC*) and the expected return on plan assets (*ER*) must be measured as of the beginning of the reporting period (see paragraph 3.2.6.3), the full recognition of *AGL* in profit or loss at the end of the respective period reconciles the assumed and actual values of the *DBO* and *PLA*, respectively. As a result, the *full* net pension liability (*NPL*), as difference between the *DBO* and the *PLA*, is recognized on

¹³⁷ The Corridor-Method was introduced with IAS 19 (1998) and had to be applied for financial years beginning on or after January 1, 1999. Due to the delayed and often only partial recognition of actuarial gains and losses (*AGL*) this method had also been widely criticized (see e.g., Mühlberger & Schwinger, 2012, p. 62; Müller, 2013, footnote 261). Since the introduction of IAS 19 (2011) for financial years beginning on or after January 1, 2013, the Corridor-Method is no longer applicable (see sub-section 3.2.2). Overall, users of financial statements had generally been in support of this change (IAS 19, 2011, para. BC72).

FIGURE

3.5 Corridor-Method for the Recognition of Actuarial Gains and Losses

Note. The FIGURE is based on Mühlberger and Schwinger (2012, p. 60) and schematically illustrates the application of the Corridor-Method for the recognition of actuarial gains and losses (*AGL*) in line with IAS 19 (2004, para. 92 and 93). The corridor is estimated as 10% (i.e., 15 units) of the greater of the present value of the defined benefit obligation (*DBO*) and the fair value of plan assets (*PLA*), as measured at the end of the previous reporting period (*t-1*). Total cumulative unrecognized net actuarial gains and losses (*AGLNR*) exceeding that corridor at the end of *t-1* (i.e., 25 units) are then divided by the expected average remaining working lives of employees participating in the respective defined benefit pension plan. For illustration, this was assumed here to be 5 years. Thus, the respective portion of 5 units of *AGLNR* exceeding the corridor (depicted as black bar) is recognized in profit or loss of period *t*.

the balance-sheet (see below).¹³⁸ It is also worth noting that the permissible methods for the recognition of *AGL* in profit or loss oscillate on a spectrum between the two extreme variants of the Corridor- and the PL-Method. Whereas according to the Corridor-Method the recognition is considerably deferred and often only partial, the PL-Method leads to an immediate and full recognition in profit or loss. Nonetheless, other systematic methods might be applied that, conceptually, are located in-between the two extremes. For example, it would also be possible to recognize the *full* part of cumulative unrecognized net actuarial gains and losses in excess of the corridor at the end of the

¹³⁸ The recognized *NPL* is *full* in the sense that it is equal to the difference of the current measures of the *DBO* and the *PLA* only if there is no past service cost (*PSC*) left to be amortized as outlined in paragraph 3.2.6.3 (see e.g., Mühlberger & Schwinger, 2012, p. 63).

reporting period in profit or loss in the subsequent period. This corresponds to the recognition of the 25 units of unrecognized *AGL* in excess of the corridor in period t as depicted FIGURE 3.5 above. Furthermore, all actuarial gains and losses could also be recognized in full in profit or loss in the period after they arise. Since the recognition would then be deferred by one period, recognition would still be slower than if the PL-Method is applied.¹³⁹

As mentioned in paragraph 3.2.2, with the introduction of IAS 19 (2004) the immediate and full recognition of actuarial gains and losses (*AGL*) outside of profit or loss could be applied as early as for financial years ending on December 16, 2004. Furthermore, since January 1, 2013, this method is the only one permitted for the recognition of *AGL*. The OCI-Method was introduced so that firms could recognize the full net pension liability (*NPL*) - subject to unrecognized past service cost (*PSC*) – on the balance-sheet while at the same time avoiding potential volatility in profit or loss arising from *AGL* (Mühlberger & Schwinger, 2012). If a firm opts for the OCI-Method, actuarial gains and losses (*AGL*) must be recognized in the period in which they arise outside of profit or loss in *Other Comprehensive Income* (OCI; IAS 19, 2004, para. 93B).¹⁴⁰ Specifically, *AGL* are recognized “[...] immediately in retained earnings [and] shall not be recognised in profit or loss in a subsequent period.” (IAS 19, 2004). Thus, there is no *recycling* of actuarial gains and losses in later periods (see e.g., Baetge & Haenelt, 2006, p. 2416). Finally, if a firm applies the OCI-Method to account for actuarial gains and losses (*AGL*), also adjustments arising from the recognition of a negative net pension liability (i.e., a net pension asset, see paragraph 3.2.6.6 below) must be treated in accordance with this method (IAS 19, 2004, para. 93C).

¹³⁹ See e.g., Suter (2008, pp. 28-53) for a discussion and illustration of the five variants – *Corridor*-, *Full Excess Recognition*-, *Full Recognition*- and *PL-Method* mentioned here. Hereafter, any method applied that leads to a faster recognition of actuarial gains and losses (*AGL*) in profit or loss than the Corridor-Method is subsumed under the PL-Method.

¹⁴⁰ For financial years ending on or after December 16, 2004, firms applying the OCI-Method had to recognize *AGL* in the *Statement of Recognised Income and Expense* (SORIE; IAS 19, 2004, para. 93B). In particular, it was the IASB’s intend that *AGL* are presented separately from transactions with equity holders in order to emphasize the fact that, in principle, *AGL* is viewed as part of profit or loss (IASB, 2004, para. BC12). Main components of the SORIE were profit or loss for the period as well as items to be recognized directly in equity required by other IFRS (IAS 1, 2005, para. 96). As of January 1, 2009, with the revised standard IAS 1 (2007) SORIE was replaced by the *Statement of Comprehensive Income* (see e.g., Mühlberger & Schwinger, 2012, p. 63). The new statement comprises profit or loss for the period as well as all items to be recognized directly in equity subsumed under *Other Comprehensive Income* (IAS 1, 2012, para. 7, 81A and 82A). For the purposes of this study, the term Other Comprehensive Income (OCI) is used instead of Statement of Recognised Income and Expense (SORIE).

3.2.6.5 Net Pension Liability

According to IAS 19, the recognition of defined benefit plans on the balance-sheet as well as in profit or loss is based on the *offsetting* of defined benefit obligations (*DBO*) and plan assets (*PLA*) as well as of pension income and cost components outlined above.¹⁴¹ Hence, firms are required to recognize a *Net Pension Liability* (or Asset, *NPL*) on the balance-sheet (Mühlberger & Schwinger, 2012). However, a plan asset related to one pension plan shall only be offset against an obligation from another plan if such an offsetting is “[...] legally enforceable [...]” as well as actually intended by the reporting firm (IAS 19, 2004, para. 116).

TABLE 3.1 below illustrates the measurement of the net pension liability (*NPL*) to be recognized on the balance-sheet for the three different methods of recognizing actuarial gains and losses (*AGL*) outlined above, respectively. As mentioned at the beginning of this paragraph, measurement is based on offsetting the defined benefit obligation (*DBO*) with plan assets (*PLA*) if such assets exist (IAS 19, 2004, para. 54 lit. d).¹⁴² Thence, the *Funding Status* (*FS*) of the respective pension plan is determined by the deduction of the fair value of plan assets (*PLA*) from the present value of the defined benefit obligation (*DBO*) measured as of the balance-sheet date (IAS 19, 2004, para. 54 lit. a and d).¹⁴³ A positive (negative) funding status (*FS*) accordingly indicates a plan deficit (surplus).¹⁴⁴ The values for the *DBO* and the *PLA* shall be determined “[...] with sufficient regularity that the amounts recognised in the financial statements do not differ materially from the amounts that would be determined at the balance-sheet date.” (IAS 19, 2004, para. 56).¹⁴⁵ If a firm applies the Corridor-Method, cumulative unrecognized net actuarial gains and losses (*AGLNR*) must be included in the measurement of *NPL*.

¹⁴¹ As Müller (2013, p. 70) notes, the rules of IAS 19 regarding the recognition of pension plans are not in line with the fundamental IFRS principle of not offsetting assets and liabilities as well as income and cost stipulated by IAS 1 (2004, para. 32; 2012, para. 32).

¹⁴² As outlined in section 2.2, Swiss pension plans must be funded by an entity that is legally separate from the employer. Thus, in the context of IAS 19, there are always plan assets (*PLA*) to be accounted for with respect to Swiss pension plans.

¹⁴³ This measure corresponds to the annual average funding status of firms applying IFRS as depicted in FIGRUE 2.7 (page 33). As mentioned in sub-sections 2.2.4 and 2.2.5, the measurement of pension liabilities differs between IAS 19 (2004) and ARR 26 (2004). Thus, *FS* is not necessarily in line with the *funding ratio* (*FR*) of a Swiss pension plan measured as stipulated by law (see sub-section 2.2.5 and FIGURE 2.6 on page 36).

¹⁴⁴ Henceforth, the net pension liability (*NPL*) is measured as positive value as long as $DBO > PLA$ and vice versa.

¹⁴⁵ If the balance-sheet date of the current reporting period is December 31, the valuation of the *DBO* and the *PLA* could for example be conducted in November of the current reporting period (see e.g., Suter, 2008, pp. 25-26).

TABLE
3.1 Recognition of Net Pension Liability (IAS 19)

Sign	Recognition of <i>AGL</i>		
	Corridor-Method	PL-Method	OCI-Method
+	<i>DBO</i>	<i>DBO</i>	<i>DBO</i>
-	<i>PLA</i>	<i>PLA</i>	<i>PLA</i>
=	<i>FS</i>	<i>FS</i>	<i>FS</i>
+/-	Net Unrecognized <i>AGL</i> ^a	-	-
-/+	Net Unrecognized <i>PSC</i> ^b	Net Unrecognized <i>PSC</i> ^b	Net Unrecognized <i>PSC</i> ^b
=	<i>NPL</i>	<i>NPL</i>	<i>NPL</i>

Note. The TABLE illustrates the measurement of the net pension liability (*NPL*) to be recognized on the balance-sheet in accordance with IAS 19 (2004, para. 54) and is based on Mühlberger and Schwinger (2012, p. 75). The measurement is outlined for the three main methods to recognize actuarial gains and losses (*AGL*), respectively. All items are valued as of the balance-sheet date. The funding status (*FS*) is determined by the subtraction of the fair value of plan assets (*PLA*) from the current measure of the defined benefit obligation (*DBO*). Accordingly, a positive (+) and negative (-) funding status indicate a deficit and surplus in the defined benefit plan, respectively. Irrespective of the method applied, cumulative unrecognized net past service cost (*PSC*) must be accounted for (see note ^b below). In addition, if the Corridor-Method is applied, cumulative unrecognized net actuarial gains and losses (*AGLNR*) must also be accounted for separately (see note ^a below).

^a A cumulative unrecognized net actuarial gain (loss) is added to (subtracted from) the funding status and thus, increases (decreases) *NPL*.

^b Attributable to non-vested benefits only. A cumulative unrecognized net positive (negative) past service cost (*PSC*) is subtracted from (added to) the funding status and thus, decreases (increases) *NPL*.

Concretely, a cumulative unrecognized net actuarial gain (loss) is added to (subtracted from) *NPL* (IAS 19, 2004, para. 54 lit. b). These actuarial gains and losses have already been included in the measurement of the *DBO* and/or the *PLA* (i.e., in *FS*) but must not (yet) be recognized on the balance-sheet. In contrast, if *AGL* are fully and immediately recognized in either profit or loss (PL-Method) or equity (OCI-Method) there are no unrecognized actuarial gains and losses (*AGLNR*) to account for separately in the measurement of *NPL* (see TABLE 3.1). Moreover, irrespective of the method applied, cumulative unrecognized net past service cost (*PSC*) attributable to non-vested benefits must be included in the measurement of *NPL* (see paragraph 3.2.6.3). Hence, since the valuation of the *DBO* already includes net unrecognized past service cost (*PSC*), this item decreases *NPL*. Correspondingly, *negative* net unrecognized *PSC* (i.e., unrecognized past service income) increases *NPL* (IAS 19, 2004, para. 54 lit. c).

3.2.6.6 Asset Ceiling

In general, the measurement of the net pension liability (*NPL*) outlined in paragraph 3.2.6.5 and illustrated in TABLE 3.1 could also result in a net pension *asset* (i.e., a negative *NPL*; IAS 19, 2004, para. 58). Such an asset could arise due to an actual surplus of the plan (i.e., a negative funding status, *FS* as outlined in TABLE 3.1), an actual plan surplus in combination with unrecognized actuarial gains and losses (*AGL*) and unrecognized past service costs (*PSC*) or it could also arise due to unrecognized *AGL* and unrecognized *PSC* only.¹⁴⁶ However, in the IASB's view, the amount of such an asset recognized on the balance-sheet should not be greater than "[...] the present value of the future benefits that are expected to flow to the entity from that asset." (IAS 19, 2004, para. BC76).¹⁴⁷ Therefore, IAS 19 (2004, para. 58) stipulates a so called *Asset Ceiling* for the recognition of a net pension asset. In particular, the asset ceiling shall ensure that the amount of a recognized net pension asset does not exceed the aggregate of "(a) any refunds expected from the plan; and (b) any expected reduction in future contributions arising from the surplus." (IAS 19, 2004, para. BC76). Nevertheless, the asset ceiling shall not "[...] over-ride the treatments of actuarial losses or past service cost [...]" (IAS 19, 2004, para. BC77). Thus, in the context of IAS 19 (2004), the asset ceiling shall not eliminate the option for deferred recognition of *AGL* and *PSC* for firms that recognize a net pension asset instead of a net pension liability (IAS 19, 2004, para. BC78F).

In accordance with IAS 19 (2004, para. 58), the asset ceiling is defined as the lower of the net pension asset (i.e., negative *NPL*), measured as outlined in paragraph 3.2.6.5 and illustrated in TABLE 3.1, as well as the aggregate of "(i) any cumulative unrecognized net actuarial losses and past service cost [...]" and "(ii) the present value of any economic benefits available in the form of refunds from the plan or reductions in future contributions to the plan [...]" (IAS 19, 2004, para. 58 lit. b). Put differently, if the entire plan surplus (i.e., the entire negative funding status, *FS*) is expected to flow to the firm in the form of (future) economic benefits, and a net pension asset (i.e., a negative *NPL*) is derived as in TABLE 3.1, this asset is recognized on the balance-sheet in full. In contrast, if the expected (future) economic benefits are lower than the estimated plan surplus and, at the same time, there is a net pension asset derived as in TABLE 3.1, the

¹⁴⁶ In principle, even if there is a plan deficit (i.e., a positive funding status, *FS*) estimated, cumulative unrecognized net actuarial losses and/or cumulative unrecognized net past service costs could lead to a negative *NPL* (i.e., an asset) being estimated in accordance with the process outlined in paragraph 3.2.6.5 and depicted in TABLE 3.1. See e.g., Deiter and Sellhorn (2008, p. 357) for illustrative examples.

¹⁴⁷ This is also in line with the stipulations regarding the recognition of assets set out in the (conceptual) framework of IFRS (IASB Conceptual Framework, 2010, para. 4.44-4.45; IASC Framework, 1989, para. 53-59).

mechanism of the asset ceiling described above shall be applied. As a consequence, the recognized net pension asset can never be higher but it can be lower than the measure derived as illustrated in TABLE 3.1. Hence, only this part of a surplus that is actually expected to flow to the firm in the form of (future) economic benefits is recognized as an asset on the balance-sheet (see e.g., Deiter & Sellhorn, 2008, p. 358; Hagemann, Neumeier, & Verhuven, 2009, pp. 633-634). The application of the asset ceiling is illustrated in TABLE 3.2 for each of the three different methods for the recognition of actuarial gains and losses (*AGL*) discussed in paragraph 3.2.6.4, respectively.

Income and cost effects arising from the application of the asset ceiling outlined above must be recognized in profit or loss unless the firm applies the OCI-method (IAS 19, 2004, para. 61). If actuarial gains and losses (*AGL*) are recognized directly in equity, also the effects from the asset ceiling must be treated accordingly (IAS 19, 2004, para. 93C). In that case, as are *AGL*, also the effects from asset ceilings are not recycled to profit or loss in subsequent periods (IAS 19, 2004, para. 93D). As a result, subject to the application of the OCI-Method, effects arising from the application of asset ceilings must be included in *Net Pension Cost (NPC)* together with the other income and cost components described in paragraph 3.2.6.3. More details regarding *NPC* are outlined in paragraph 3.2.6.7 below.¹⁴⁸

As noted in sub-section 3.2.2, in 2002, the rules regarding the application of the asset ceiling outlined above were amended. Specifically, the following issue was addressed: the deferred recognition of actuarial gains and losses (*AGL*) and/or past service cost (*PSC*), as outlined in TABLE 3.1, may lead to changes in the asset ceiling, as derived in TABLE 3.2, including corresponding effects to be recognized in profit or loss, that are not based on changes in the estimated present value of economic benefits expected to flow to the firm from an existing surplus in the pension plan (IAS 19, 2004, para. BC78C). Thus, the IASB agreed that “[...] recognizing gains (losses) arising from past service cost and actuarial losses (gains) is not representationally faithful.” (IAS 19, 2004, para. BC78D). As a result, net actuarial losses and past services cost arising in the current period must be immediately recognized in profit or loss in full (if the present value of economic benefits remains constant or increases during the current period) or to the extent that they exceed a reduction in the present value of economic benefits

¹⁴⁸ Illustrative examples for the application of the asset ceiling in line with the Corridor-Method can be found in e.g., Mühlberger and Schwinger (2012, pp. 78-79) and Deiter and Sellhorn (2008, p. 357). Analogous examples illustrating the difference between the Corrido- and the OCI-Method can be found in e.g., Hagemann et al. (2009, pp. 633-635) and Deiter and Sellhorn (2008, pp. 357-361).

TABLE

3.2 Asset Ceiling (IAS 19)

Sign	Recognition of <i>AGL</i>		
	Corridor-Method	PL-Method	OCI-Method
=	<i>NPL</i> (A) ^a	<i>NPL</i> (A) ^a	<i>NPL</i> (A) ^a
-	PV of Economic Benefits ^b	PV of Economic Benefits ^b	PV of Economic Benefits ^b
+/-	Net Unrecognized <i>AGL</i> ^c	-	-
-/+	Net Unrecognized <i>PSC</i> ^d	Net Unrecognized <i>PSC</i> ^d	Net Unrecognized <i>PSC</i> ^d
=	Limit of IAS 19.58 (B)	Limit of IAS 19.58 (B)	Limit of IAS 19.58 (B)
	min[A , B] ↓	min[A , B] ↓	min[A , B] ↓
=	Asset Ceiling	Asset Ceiling	Asset Ceiling

Note. The TABLE illustrates the application of the asset ceiling for the recognition of a net pension asset (i.e., a negative *NPL*) as stipulated by IAS 19 (2004, para. 58). The TABLE is based on TABLE 3.1 as well as Suter (2008, p. 15). The amount to be recognized is the lower of the *NPL* as derived in TABLE 3.1, and the aggregate of the present value (PV) of expected (future) economic benefits that flow to the firm from a plan surplus as well as net unrecognized actuarial losses and net unrecognized past service cost. Note, since in line with TABLE 3.1, a net pension asset has a negative sign (-), also the *limit* is estimated as negative amount. Hence, the minimum (i.e., the asset ceiling) of these two items is estimated based on absolute values.

^a Net pension liability (*NPL*) is derived as outlined in TABLE 3.1.

^b Present value (PV) of expected (future) refunds and/or reductions in contributions in line with IFRIC 14 (2007). See more details further below.

^c See note ^a of TABLE 3.1.

^d See note ^b of TABLE 3.1.

(IAS 19, 2004, para. 58A lit. a). Analogously, net actuarial gains arising in the current period after the deduction of past service cost of the current period must be immediately recognized in profit or loss in full (if the present value of economic benefits remains constant or decreases during the current period) or to the extent that they exceed an increase in the present value of economic benefits (IAS 19, 2004, para. 58A lit. b).¹⁴⁹ IAS 19 (2004, para. 58A) is only applicable for pension plans with an actual surplus at the beginning or the end of the respective reporting period that is not fully recoverable

¹⁴⁹ Illustrative examples for the application of IAS 19 (2004, para. 58A) can be found in e.g., Mühlberger and Schwinger (2012, pp. 79-82) and Deiter and Sellhorn (2008, pp. 358-360). Moreover, since there arise no unrecognized actuarial gains and losses from the application of the OCI-Method, IAS 19 (2004, para. 58A) is mostly relevant for firms applying the Corridor-Method (see e.g., Hagemann et al., 2009, p. 637; Mühlberger & Schwinger, 2012, pp. 80-81).

“[...] through refunds or reductions in future contributions.” (IAS 19, 2004, para. 58B).¹⁵⁰

For the application of the asset ceiling outlined in TABLE 3.2 it is necessary to estimate the present value of economic benefits that are expected to flow to the reporting firm from a pension plan surplus. Specifically, such economic benefits shall be in the form of refunds and/or future contribution reductions. Furthermore, for the estimation of the present value, the same discount rate as applied for the measurement of the defined benefit obligation (*DBO*, see paragraph 3.2.6.1) shall be applied (IAS 19, 2004, para. 58 lit. b). However, the estimation of the present value of economic benefits in line with IAS 19 (2004, para. 58 lit. b), had often been difficult to implement in practice. Therefore, in July 2007, the IFRS Interpretation Committee (IFRIC, see sub-section 3.2.1) published the interpretation IFRIC 14 (2007), *IAS 19 - The Limit on a Defined Benefit Asset, Minimum Funding Requirements and their Interaction*, to provide further guidance on the estimation of economic benefits arising from a pension plan surplus. The rule had to be applied for financial years beginning on or after January 1, 2008 (IFRIC 14, 2007, para 27).

In line with IFRIC 14 (2007, para. 7), the availability of an economic benefit in the form of refunds or future reductions of contributions must be determined based on the laws of the respective jurisdiction as well as the specific pension plan regulations. The availability is given if the firm can realize the economic benefit from refunds and/or future contribution reductions at some point in time during the life of the pension plan or, at the latest, when the plan is finally settled (IFRIC 14, 2007, para. 8). The availability might even be given, if the economic benefit “[...] is not realizable immediately at the balance-sheet date.” (IFRIC 14, 2007, para. 8). The economic benefit is not dependent on how the firm intends to actually use the surplus in the pension plan. In contrast, the firm shall estimate the maximum available economic benefit arising from refunds and/or future contribution reductions except where these two options are “[...] mutually exclusive.” (IFRIC 14, 2007, para. 9). Furthermore, a refund is available to the firm only, if the firm “[...] has an unconditional right to [the] refund [...]” (IFRIC 14, 2007, para. 11). In particular, this is not the case if the refund depends on the occurrence of uncertain future events not entirely under the control of the firm (IFRIC 14, 2007, para. 12). If a refund is available, it is measured as the share of the surplus valued as *DBO*

¹⁵⁰ Thus, as Hagemann et al. (2009, p. 637) note, this rule cannot resolve the fundamental issue of recognizing a net pension asset due to net unrecognized actuarial losses and or unrecognized past service cost while at the same time the respective pension plan is actually in a deficit (see footnote 146, page 89).

minus *PLA*, as outlined in TABLE 3.1, that is attributable to the firm less any associated costs such as e.g., tax payments (IFRIC 14, 2007, para. 13). In the absence of any *minimum funding requirement* (MFR), the economic benefit from future contribution reductions shall be estimated as the lower of the plan surplus or the present value of the *future* current service cost (*CSC*) excluding any contributions from employees estimated over the shorter of the expected life of the plan and the expected life of the firm (IFRIC 14, 2007, para. 16).¹⁵¹ The estimation of the present value shall be consistent with the measurement of the related *DBO* as of the balance-sheet date.¹⁵² However, if the law or any other relevant regulation stipulates a minimum funding requirement (MFR) for the pension plan, this requirement shall be separated into the part attributable to *past* as well as *future* employee service, respectively (IFRIC 14, 2007, para. 18 and 19). Usually, a MFR regarding the coverage of an existing underfunding would result in an equal increase of the *DBO* and the *PLA*, hence in a net increase of the recognized net pension liability (or asset) of zero (IFRIC 14, 2007, para. 3). However, if this MFR is not available as a refund or future contribution reductions (as outlined above), it must be immediately recognized as liability incl. a corresponding expense and thus, an existing net pension liability (asset) is accordingly increased (decreased). Recognition of (future) income and cost effects from such a liability shall be analogous to the application of the asset ceiling outlined above (see IFRIC 14, 2007, para. 23-26 for more details).¹⁵³ On the other hand, the economic benefit arising from future contribution reductions that include a minimum funding requirement shall be estimated as the present value of future current service cost (*CSC*, as described above) less the expected effects of the MFR in any of the future periods (IFRIC 14, 2007, para. 20). Again, the estimation shall be in line with the measurement of the related *DBO* (see IFRIC 14, 2007, para. 21 for more details). Last but not least, if the MFR exceeds the future *CSC* in any given year, this

¹⁵¹ Due to the *going concern* (i.e., the continuation of operations) assumed for the reporting firm in line with IASB Conceptual Framework (2010, para. 4.1) and IASB Framework (2004, para. 23), in practice, estimation is usually based on the life of the pension plan (e.g., 70 years; see e.g., Mühlberger & Schwinger, 2012, p. 85). However, with respect to Swiss pension plans, the estimation period is usually assumed to be infinite (see e.g., Ambrosini & Haag, 2008, p. 544).

¹⁵² For example, no future changes in plan benefits as well as a stable workforce shall be assumed (see e.g., IFRIC 14, 2007, para. 17 for more details).

¹⁵³ In particular, the recognition of the liability shall be done in a way that “[...] no gain or loss is expected to result from applying paragraph 58 of IAS 19 when the contributions are paid.” (IFRIC 14, 2007, para. 24). See e.g., Deiter and Sellhorn (2008, p. 363); Hagemann et al. (2009, p. 638) and IFRIC 14 (2007, Illustrative examples) for illustrative examples. This specific issue was not expected to have major implications with respect to the accounting for Swiss pension plans (see e.g., Ambrosini & Haag, 2008, p. 541).

shall reduce the estimated present value. However, the overall estimation shall never be below zero (IFRIC 14, 2007, para. 22).¹⁵⁴

With respect to Swiss pension plans, refunds from the pension plan to the employer are prohibited by law (see paragraph 3.2.6.2 and footnote 122, page 76). Thence, in the context of IAS 19 (2004) and IFRIC 14 (2007), the economic benefit arising from a surplus of a Swiss pension plan arises due to future contribution reductions only (see e.g., Ambrosini & Haag, 2008, p. 539; Schaller & Alfieri, 2009, pp. 885-886). Specifically, before the introduction of IFRIC 14 (2007), the economic benefit arising from future contribution reductions of Swiss pension plans was commonly estimated based on the differences between (temporary) reduced contribution rates and the regulatory contribution rates as stipulated by the pension plan regulations. Such reductions must be enacted by the governing board of a Swiss pension plan. In contrast, as outlined above, according to IFRIC 14 (2007), the economic benefit from future contribution reductions must be estimated based on the expected current service cost (*CSC*) estimated in line with IAS 19. In 2008, the Auditing Practice Committee of the Swiss Expert Association for Audit, Tax and Fiduciary (*EXPERTsuisse*) proposed to estimate the economic benefit arising from future contribution reductions of a Swiss pension plan as follows: present value of the difference between the *CSC* (IAS 19) and the regulatory contributions based on the body of insurees as well as the actuarial assumptions made as at the balance-sheet date for an infinite time horizon discounted at the rate applied to the related *DBO* (Ambrosini & Haag, 2008).

Lastly, employer contribution reserves (*ECR*) of Swiss pension plans (as outlined in sub-section 2.2.6), in principle, qualify as plan assets in line with IAS 19 (2004, para. 7) as described in paragraph 3.2.6.2. Thus, implicitly, an existing *ECR* is included in the measurement of the *NPL* as depicted in TABLE 3.1. Thence, if this measurement results in a net pension liability at the balance-sheet date, an existing *ECR* cannot be recognized separately as an asset of the reporting firm (Loser, 2003b). In contrast, before the enactment of IFRIC 14 (2007), the reporting firm could recognize a net pension asset of the amount of an existing employer contribution reserve, even if the application of the asset ceiling outlined above lead to a recognizable amount below the *ECR* (Ambrosini & Haag, 2008). However, as of January 1, 2008, an existing *ECR* had to be included for the estimation of the economic benefit from future contribution reductions as described

¹⁵⁴ Further details regarding the general application of IFRIC 14 (2007) can be found in e.g., IFRIC 14 (2007, Illustrative examples) and Deiter and Sellhorn (2008, pp. 361-364); Mühlberger and Schwinger (2012, pp. 83-87) and Hagemann et al. (2009, pp. 632, 637-638).

above. Specifically, an existing *ECR* was assumed to be used in full during the period following the balance-sheet date and accordingly, lead to an increase of the asset ceiling in line with IFRIC 14 (2007).¹⁵⁵ Given the right circumstances, this lead to the recognition of income and cost related to the *ECR* that was inconsistent with the basic purpose of prepaid contributions. For example, the estimation of the economic benefit from future contribution reductions (incl. the *ECR*) could result in a negative present value as of the balance-sheet date. This could be the case if future minimum funding requirements (MFR) exceeded future service cost in all or some of the periods included for estimation. However, the estimated recognizable amount for the economic benefit of a plan surplus was not allowed to become negative and thus, in that situation, the recognizable amount of the net pension asset was zero (IFRIC 14, 2007, para. BC28). As result, the existing contribution reserve had to be impaired by recognizing a corresponding cost in profit or loss although the *ECR* might have been used for the funding of contributions in later periods only. Correspondingly, the usage of the *ECR* in later periods lead to respective income for that periods. Finally, in 2009, the IASB issued an amendment that corrected the above-mentioned mistreatment of employer contribution reserves (*ECR*). IFRIC 14 (2009) had to be applied for financial years beginning on or after January 1, 2011. Thereafter, as was common practice before the introduction of IFRIC 14 (2007), an existing *ECR* had to be explicitly excluded from the estimation of the economic benefit of future contribution reductions.¹⁵⁶

3.2.6.7 Net Pension Cost

TABLE 3.3 below illustrates the composition of the *Net Pension Cost (NPC)* in line with IAS 19 (2004, para. 61) for the three different methods of recognizing actuarial gains and losses (*AGL*) as described in paragraph 3.2.6.4. *NPC* is based on the pension income and cost components described in paragraph 3.2.6.3, as well as the effects from the application of the asset ceiling described in paragraph 3.2.6.6 above.

Current service cost (*CSC*) and interest cost (*IC*) are based on the measurement of the defined benefit obligation (*DBO*) as at the beginning of the respective reporting period (i.e., the end of the previous period). From these two items, the expected return

¹⁵⁵ See e.g., illustrative example 2 in Ambrosini and Haag (2008, p. 542).

¹⁵⁶ For more details as well as an illustrative example regarding the treatment of an *ECR* before and after the amendment of IFRIC 14 (2007), see e.g., Schaller and Alfieri (2009). Also see e.g., Loser (2003b) for a discussion as well as an illustrative example for the recognition of an *ECR* regarding Swiss pension plans before the introduction of IFRIC 14 (2007) as of January 1, 2008.

TABLE
3.3 Recognition of Net Pension Cost (IAS 19)

Sign	Recognition of <i>AGL</i>		
	Corridor-Method	PL-Method	OCI-Method
+	<i>CSC</i>	<i>CSC</i>	<i>CSC</i>
+	<i>IC</i>	<i>IC</i>	<i>IC</i>
-	<i>ER</i>	<i>ER</i>	<i>ER</i>
-/+	Amortization of <i>AGL</i> ^a	<i>AGL</i> ^c	-
+/-	(Amortization of) <i>PSC</i> ^b	(Amortization of) <i>PSC</i> ^b	(Amortization of) <i>PSC</i> ^b
+/-	Effects of <i>CS</i>	Effects of <i>CS</i>	Effects of <i>CS</i>
+/-	Effects of Asset Ceiling	Effects of Asset Ceiling	-
=	<i>NPC</i>	<i>NPC</i>	<i>NPC</i>

Note. The TABLE illustrates the measurement of the net pension cost (*NPC*) to be recognized in profit or loss in accordance with IAS 19 (2004, para. 61) and is based on Suter (2008, p. 17). The measurement is outlined for the three main methods to recognize actuarial gains and losses (*AGL*), respectively. *NPC* is determined by the subtraction of the expected return on plan assets (*ER*) from the sum of current service cost (*CSC*) and interest cost (*IC*) based on the defined benefit obligation (as described in paragraph 3.2.6.3). Moreover, amortization amounts of net unrecognized past service cost (*PSC*) attributable to non-vested benefits must be included in *NPC*. Also, effects of curtailments and settlements (*CS*) are included. As described in paragraph 3.2.6.4, if the Corridor- or the PL-Method is applied, recognition of actuarial gains and losses (*AGL*) is either deferred or immediate. In contrast, if the OCI-Method is applied, *AGL* is not included in *NPC*. The same holds for the recognition of effects of the application of the asset ceiling as outlined in paragraph 3.2.6.6.

^a Amortization amount of a cumulative unrecognized net actuarial gain (loss) for the current period estimated in line with the Corridor-Method is subtracted from (added to) *NPC*.

^b Attributable to non-vested benefits. Amortization amount of a net positive (negative) unrecognized past service cost (*PSC*) is added to (subtracted from) *NPC*.

^c Actuarial gains (losses) estimated for the current period in line with the PL-Method are subtracted from (added to) *NPC*.

(*ER*) on the plan assets (*PLA*), again estimated at the beginning of the reporting period, is subtracted. The recognition of actuarial gains and losses (*AGL*) in *NPC* follows the different methods outlined in paragraph 3.2.6.4. Specifically, if the Corridor-Method is applied, the amortization amount to be recognized in the current reporting period is estimated at the beginning of the period in line with the Corridor-Test illustrated in FIGURE 3.5. Accordingly, the amortization amount of a cumulative unrecognized net actuarial gain (loss) is subtracted from (added to) *NPC*. In contrast, if the Corridor-Method is not applied, *AGL* for the current reporting period is estimated at the end of the period and immediately recognized in full, either in profit or loss (PL-Method) or in equity (OCI-Method). Further, the amortization amount for unrecognized past service cost (*PSC*) attributable to non-vested benefits is estimated at the date of the plan amendment and recognized on a straight-line basis over the expected average working lives of re-

spective employees (see paragraph 3.2.6.3). *PSC* attributable to vested benefits is recognized immediately in *CSC* of the current period. A net positive (negative) *PSC* is added to (subtracted from) *NPC*. Also, effects from curtailments and settlements (*CS*) are recognized immediately in the period of the plan amendment and/or settlement. Finally, the effects from the application of the asset ceiling outlined in paragraph 3.2.6.6 are either recognized immediately in *NPC* (Corridor- and PL-Method) or in equity (OCI-Method; Mühlberger & Schwinger, 2012).

3.2.6.8 Presentation and Disclosures

IAS 19 (2004) does not stipulate that the net pension liability (asset, *NPL*) must be presented separately on the face of the balance-sheet. Moreover, the standard also gives no guidance on what other line item of the balance-sheet a *NPL* shall be included in (Mühlberger & Schwinger, 2012). It is also not specified whether *current* and *non-current* assets and liabilities arising from pension plans should be distinguished for presentation (IAS 19, 2004, para. 118).¹⁵⁷ Furthermore, pension assets and liabilities are also not included in the minimum selection of separate line items that must be presented on the balance-sheet (IAS 1, 2004, para. 68; 2012, para. 54). However, additional line items or sub classifications of line items shall be presented on the balance-sheet if these are relevant to the understanding of the financial statements (IAS 1, 2004, para. 69; 2012, para. 55). For example, a firm could disaggregate provisions into those arising from employee benefits and others (IAS 1, 2004, para. 75 lit. d; 2012, para. 78 lit. d). Overall, either due to its materiality or its special character, in practice, the *NPL* is often presented as separate line item on the balance-sheet (Mühlberger & Schwinger, 2012).

In line with *NPL*, there is also no further guidance on the exact presentation of net pension cost (income, *NPC*) in the income-statement (Mühlberger & Schwinger, 2012). For example, *NPC* is not outlined as separate line item of the income-statement in the minimum requirements (IAS 1, 2004, para. 81; 2012, para. 82). The different components of *NPC* outlined in paragraph 3.2.6.3 could also be recognized within different line items of the income-statement. Specifically, interest cost (*IC*) and expected return

¹⁵⁷ In general, assets (liabilities) are defined as current if they are held solely for trading and/or are expected to be realized (settled) within twelve months after the balance-sheet date (see IAS 1, 2004, para. 57 and 60; 2012, para. 66 and 69 for more details). Regarding pension assets and liabilities, “[...] such a distinction may sometimes be arbitrary.” (IAS 19, 2004, para. BC81). See also e.g., Mühlberger and Schwinger (2012, p. 89).

on plan assets (*ER*) could be included in either operating or finance costs.¹⁵⁸ If actuarial gains and losses (*AGL*) and effects from the application of the asset ceiling are recognized according to the OCI-Method, these components are commonly also not presented separately but rather within the line item of other comprehensive income.¹⁵⁹ Nonetheless, since there is no recycling to profit or loss in subsequent periods, a firm must disclose the cumulative amount of *AGL* recognized in OCI (IAS 19, 2004, para. 120A lit. i).

Overall, the disclosure requirements for defined benefit pension plans are stipulated in (IAS 19, 2004, para. 120-125). In principle, a firm shall disclose information about the nature as well as the financial effects of these plans (IAS 19, 2004, para. 120). In the view of the IASB, information about defined benefit plans are particularly important since users of financial statements cannot evaluate the nature and financial effects of such plans from any other information disclosed in the financial statements (IAS 19, 2004, para. BC82). Notably, a firm is required to disclose the following information:¹⁶⁰

- the applied method for the recognition of actuarial gains and losses (*AGL*).
- general description of the nature of the plan incl. for example informal practices that give rise to constructive obligations included in the measurement of the *DBO*. However, more details are not required.
- Actuarial gains and losses (*AGL*) recognized in OCI (incl. cumulative amounts as mentioned above).
- Asset allocation (in relative or absolute terms) of plan assets (*PLA*).¹⁶¹

¹⁵⁸ Concretely, if the firm presents expense by nature (*Gesamtkostenverfahren*), *NPC* (incl. or excl. *IC* and/or *ER*) is included in employee benefits expense. In contrast, if the firm presents expense by function (*Umsatzkostenverfahren*), the respective components of *NPC* are included in either *Cost of Goods Sold* (*COGS*), administrative or other expenses (see e.g., Mühlberger & Schwinger, 2012, p. 91).

¹⁵⁹ Moreover, since the change from the *SORIE* to the *OCI* (see footnote 141 on page 87), these components are recognized as other comprehensive income within retained earnings in the *Statement of Changes in Equity* (see e.g., Mühlberger & Schwinger, 2012, pp. 91-92).

¹⁶⁰ The list outlined here is based on IAS 19 (2004, para. 120A) which also entails some more disclosure requirements apart from the ones outlined further below. If firms did not opt for the application of the *OCI-Method*, some of the disclosures discussed here were not required for financial years ending on or earlier than December 31, 2005 (see sub-section 3.2.2). However, if information necessary for any empirical analyses conducted in this study was not disclosed, this firm was excluded from the final sample. The sample selection process is further discussed in section 6.1.

¹⁶¹ The asset allocation of plan assets (*PLA*) was not required to be disclosed for financial years ending on or earlier than December 31, 2005 (IAS 19, 2004, para. BC85A). In line with the comments about earnings management and the expected rate of return on plan assets (*ERR*) given in footnote 130 (page 81), it is also worth noting that for example Chuk (2013) finds evidence that firms applying an upward-biased *ERR* assumption before a similar

- Narrative description of the estimation of the expected rate of return on plan assets (*ERR*).
- Actual return on plan assets (*AR*).
- Actuarial assumptions applied for the measurement of the *DBO* and the *PLA* such as e.g., discount rate, expected rate of return on plan assets, expected rates of salary increases etc.
- History of the amounts recognized for the *DBO*, the *PLA*, the funding status (*FS*) as well as the actuarial gains and losses (expressed as either percentage of the *DBO* and the *PLA* or absolute amount) for the current as well as the four prior reporting periods.
- Best estimate of the expected employer contributions for the reporting period beginning after the current balance-sheet date.

Firms must also disclose a reconciliation of the *DBO* and the *PLA* to the amount of the net pension liability (asset, *NPL*) recognized on the balance-sheet as illustrated in TABLE 3.1 on page 89. The disclosure must include any amount recognized on the balance-sheet including potential assets recognized because of the application of the asset ceiling (IAS 19, 2004, para. 120A lit. f). Moreover, also the composition of net pension cost (*NPC*), as outlined in TABLE 3.3 on page 97, as well as the respective line item(s) of the income-statement the components of *NPC* are included in must be disclosed (IAS 19, 2004, para. 120A lit. g). Firms must also disclose the change in measurement between the beginning and the end of the reporting period for the *DBO* and the *PLA*, respectively. Concretely, if applicable, the following effects must be disclosed separately for the reconciliation of the *DBO* (IAS 19, 2004, para. 120A lit. c):

- Current service cost (*CSC*)
- Interest cost (*IC*)
- Actuarial gains and losses (*AGL*)
- Past service cost (*PSC*)
- Curtailments and settlements (*CS*)

disclosure requirement was introduced to US GAAP either alter the allocation of their plan assets towards more risky securities and/or reduce their *ERR* assumption after the disclosure of the asset allocation becomes mandatory. Thence, this shows that not only newly introduced recognition rules but also new disclosure rules might alter firm behavior (Chuk, 2013). However, with respect to Swiss pension plans, the asset allocation of plan assets is usually not solely determined by the employer but rather by representatives of the employer and employees on the governing board of the pension plan (see sub-section). For example, based on a survey study Müller and Wyss (2015) find that most firms do not see any risk that the asset allocation or any other aspect regarding the organization of Swiss pension plans is affected by the application of IAS 19.

- Contributions by plan participants (i.e., employees)
- Benefits paid
- Foreign currency exchange rate changes, and
- Business combinations

Correspondingly, the following effects must be disclosed separately if they apply to the reconciliation of the *PLA* (IAS 19, 2004, para. 120A lit. e):

- Expected return on plan assets (*ER*)
- Actuarial gains and losses (*AGL*)
- Settlements
- Contributions by the employer
- Contributions by plan participants (i.e., employees)
- Benefits paid
- Foreign currency exchange rate changes, and
- Business combinations

If applicable, firms must also disclose the amounts of the *DBO* attributable to wholly unfunded as well as partly or wholly funded defined benefit plans (IAS 19, 2004, para. 120A lit. d).¹⁶² Finally, if an entity has more than one defined benefit plan, disclosures may be distinguished in accordance with a useful grouping such as e.g., geographic regions or different types of risks. However, a firm is allowed to disclose numerous defined benefit plans in total. In that case, disclosures must be given in the form of weighted-averages or narrow ranges (IAS 19, 2004, para. 122).

3.2.6.9 Illustrative Example

TABLE 3.4 illustrates the application of IAS 19 (2004) over three reporting periods based on an example outlined in Mühlberger and Schwinger (2012, pp. 71-74). For the purpose of illustration, it is assumed that there are no effects from curtailments and settlements (*CS*) as well as from the application of the asset ceiling outlined in paragraph 3.2.6.6.

At the beginning of Period X1 (i.e., 01.01.X1), the defined benefit obligation (*DBO*, item [1] shown in TABLE 3.4) and the plan assets (*PLA*, [8]) are measured at 1,000 and

¹⁶² As outlined in section 2.2 and paragraph 3.2.6.2, by law, Swiss pension plans must be funded. Thus, within the context of IAS 19, disclosed amounts of the *DBO* attributable to wholly unfunded plans can be assumed to be attributable to non-Swiss pension plans. This point is further discussed in paragraph 6.1.3.2.

TABLE

3.4 Illustrative Example of IAS 19

#	Item	Period		
		X1	X2	X3
[1]	Defined Benefit Obligation (<i>DBO</i>) at 01.01.	1,000	1,060	1,080
[2]	Current Service Cost (<i>CSC</i>)	18	19	20
[3]	Interest Cost (<i>IC</i>)	60	64	65
[4]	Benefits paid	-64	-65	-70
[5]	Past Service Cost vested and non-vested (+/-)	15	0	0
[6]	Actuarial Gain (-) / Loss (+)	31	2	5
[7]	Defined Benefit Obligation (<i>DBO</i>) at 31.12.	1,060	1,080	1,100
[8]	Plan Assets (<i>PLA</i>) at 01.01.	800	806	835
[9]	Expected Return (<i>ER</i>)	64	66	67
[10]	Contributions paid	15	17	19
[4]	Benefits paid	-64	-65	-70
[11]	Actuarial Gain (+) / Loss (-)	-9	11	4
[12]	Plan Assets (<i>PLA</i>) at 31.12.	806	835	855
[13]	Corridor	100	106	108
[14]	Unrecog. Actuarial Gain (+) / Loss (-) at 01.01.	-76	-116	-106
[15]	Amortization of Actuarial Gain (-) / Loss (+)	0	1	0
[16]	Actuarial Gain (+) / Loss (-)	-40	9	-1
[17]	Unrecog. Actuarial Gain (+) / Loss (-) at 31.12.	-116	-106	-107
[18]	Unrecog. Past Service Cost (+/-) at 01.01.	0	8	6
[19]	Amortization of Past Service Cost non-vested (-/+)	-2	-2	-2
[20]	Past Service Cost non-vested (+/-)	10	0	0
[21]	Unrecog. Past Service Cost (+/-) at 31.12.	8	6	4
[22]	Funding Status (<i>FS</i>) at 31.12.	254	245	245
[17]	Unrecog. Actuarial Gain (+) / Loss (-) at 31.12.	-116	-106	-107
[21]	Unrecog. Past Service Cost (-/+) at 31.12.	-8	-6	-4
[23]	Net Pension Liability (<i>NPL</i>) at 31.12., Corridor	130	133	134
	- PL	246	239	241
	- OCI	246	239	241
[2]	Current Service Cost (<i>CSC</i>)	18	19	20
[3]	Interest Cost (<i>IC</i>)	60	64	65
[9]	Expected Return (<i>ER</i>)	-64	-66	-67
[15]	Amortization of Actuarial Gain (-) / Loss (+)	0	1	0
[24]	Past Service Cost (+/-)	7	2	2
[25]	Net Pension Cost (<i>NPC</i>), Corridor	21	20	20
	- PL	61	10	21
	- OCI	21	19	20

Note. The TABLE illustrates the application of IAS 19 (2004) over three periods based on an example of Mühlberger and Schwinger (2012, pp. 71-74). For the purpose of illustration, it is assumed that there are no effects from curtailments and settlements (*CS*) as well as from the application of the asset ceiling outlined in paragraph 3.2.6.6. The example is described in more detail throughout paragraph 3.2.6.9.

800 units, respectively. Moreover, for the illustration of the Corridor-Method, it is assumed that the amount of cumulative unrecognized net actuarial losses (*AGLNR*, [14]) is 76 units as of 01.01.X1. Accordingly, the Corridor [13] is estimated to be 100 units (i.e., 10% of $\max[DBO, PLA]$) at 01.01.X1. Consequently, in line with the Corridor-Method, there is no amortization of *AGL* recognized in net pension cost (*NPC*, [25]) for Period X1. Furthermore, it is assumed that the pension plan is amended during Period X1. Specifically, it is assumed that the plan amendment leads to 15 units of past service cost (*PSC*, [5]) of which 5 and 10 units are attributable to vested and non-vested benefits, respectively. Thence, 5 units of *PSC* related to vested benefits are recognized immediately during Period X1. In contrast, 10 units of *PSC* related to non-vested benefits [20] must be amortized over the expected average period until the benefits become vested (assumed to be 5 years). Hence, 2 units must be amortized in Period X1 and the total of *PSC* recognized during the first period is 7 units (see [24] in TABLE 3.4). Throughout Period X1, the *DBO* is increased by current service cost (*CSC*, [2]) and interest cost (*IC*, [3]), both estimated as of 01.01.X1. Furthermore, the plan amendment outlined above also increases the *DBO* in the form of past service cost (*PSC*, [5]). In contrast, benefits paid [4] during Period X1 decrease the *DBO*. Finally, 31 units of actuarial losses [6] arise due the difference between the expected and actual measurement of the *DBO* as of the end of Period X1 (i.e., at 31.12.X1).¹⁶³ Correspondingly, the *PLA* are increased by the expected return (*ER*, [9]) estimated as of the beginning of Period X1. Moreover, contributions paid [10] are also added to *PLA* of the beginning of Period X1.¹⁶⁴ In contrast, in line with the *DBO*, benefits paid [4] decrease the *PLA*. Lastly, the difference between the expected and the actual return on plan assets earned during Period X1 leads to an actuarial loss of 9 units [11] which accordingly decreases the *PLA*. Overall, at 31.12.X1, the funding status (*FS*, [22]) of the pension plan is estimated to be 254 units (i.e., $DBO > PLA$). If the Corridor-Method is applied, the cumulative unrecognized net actuarial loss is increased to 116 units as of 31.12.X1 [17]. Thence, excluding the unrecognized actuarial loss [17] as well as the unrecognized past service cost [21], the net pension liability (*NPL*, [23]) to be recognized at the end of Period X1 is 130 units. Note,

¹⁶³ As outlined in section 2.2, Swiss pension plans are usually funded by contributions from employers and employees. Thus, in line with IAS 19 (2004, para. 120A lit. c), for the reconciliation of the *DBO* related to Swiss pension plans, also the contributions by employees must be disclosed. Accordingly, such contributions also lead to an increase of the *DBO*.

¹⁶⁴ For the reconciliation of the plan assets (*PLA*), the employer and employee contributions must also be disclosed separately (IAS 19, 2004, para. 120A lit. e). However, for the purpose of the illustrative example discussed here, these contributions are not shown separately but are rather combined in item [10] of TABLE 3.4.

although the changes in measurement of the *DBO* and the *PLA* generate a net actuarial loss of 40 units [16] for Period X1, no actuarial loss is recognized in net pension cost (*NPC*, [25]) due to the deferred recognition of the Corridor-Method. Thus, the total of 21 units recognized as *NPC* for Period X1 consists of 18 units of *CSC* [2], 60 units of *IC* [3], 64 units of *ER* [9] and 7 units of *PSC* [24], including 5 units for vested and 2 units for non-vested benefits, respectively. In contrast to the Corridor-Method, the *NPL* [23] to be recognized corresponds to 246 units (+89.23%) if either the PL- or the OCI-Method is applied. Here, only the unrecognized past service cost (*PSC*, [21]) is excluded from the funding status (*FS*, [22]) and actuarial gains and loss (*AGL*) are recognized immediately, either in profit or loss (i.e., *NPC*) or in equity (i.e., OCI). Furthermore, since the 41 units of net actuarial loss arising in Period X1 [16] must be recognized immediately in profit or loss, *NPC* is estimated at 61 units (+190.48%) if the PL-Method is applied compared to the Corridor- and the OCI-Method. The 41 units of net actuarial loss of Period X1 are recognized immediately in equity if the OCI-Method is applied.

At the beginning of Period X2, the estimated corridor [13] of 106 units is exceeded by the cumulative unrecognized net actuarial losses [14] of 116 units. Thence, as outlined in paragraph 3.2.6.4, the difference must be amortized over the expected average remaining working lives of the employees (assumed here to be 10 years). Accordingly, one unit of actuarial losses must be amortized in Period X2 (see [15] in TABLE 3.4) if the Corridor-Method is applied. Overall, the change in measurement of the *DBO* and the *PLA* has generated a net actuarial gain [16] of 9 units for Period X2. Hence, the funding status (*FS*, [22]) is decreased to 245 units. Also the cumulative unrecognized net actuarial loss [17] is correspondingly decreased to 106 units. Analogously, the net pension liability (*NPL*, [23]) recognized at 31.12.X2 is 133 units, if the Corridor-Method is applied. During Period X2, again, 2 units of past service cost attributable to non-vested benefits [19] were recognized in profit or loss. Thus, the unrecognized *PSC* is decreased to 6 units as of 31.12.X2. This amount is also excluded from the measurement of *NPL* [23]. Overall, compared to the Corridor-Method, the recognized *NPL* at the end of Period X2 is 239 units (+79.70%) if either the PL- or the OCI-Method is applied. Moreover, the recognized *NPC* if the OCI-Method is applied is one unit (i.e., 19 units) below the 20 units of *NPC* recognized if the Corridor-method is applied. This is due to the amortization of actuarial losses described above. The 9 units of net actuarial gain arising in Period X2 is recognized immediately in equity if the OCI-Method is applied. In contrast, this net actuarial gain is recognized immediately in profit or loss if the PL-Method is applied. Correspondingly, *NPC* [25] recognized for Period X2 is only 10 units

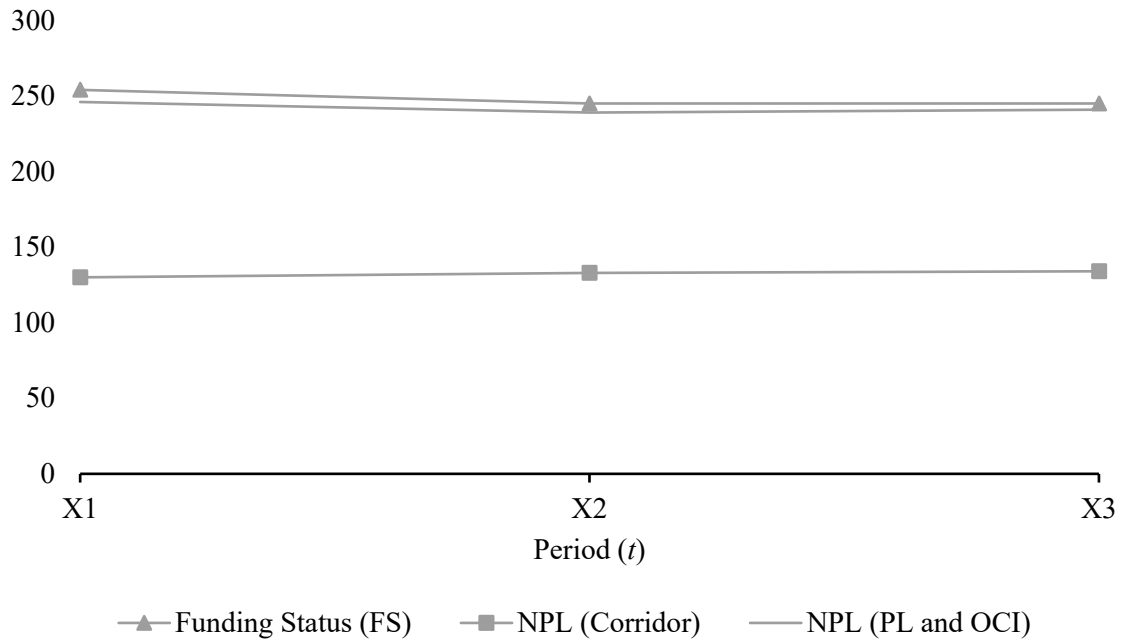
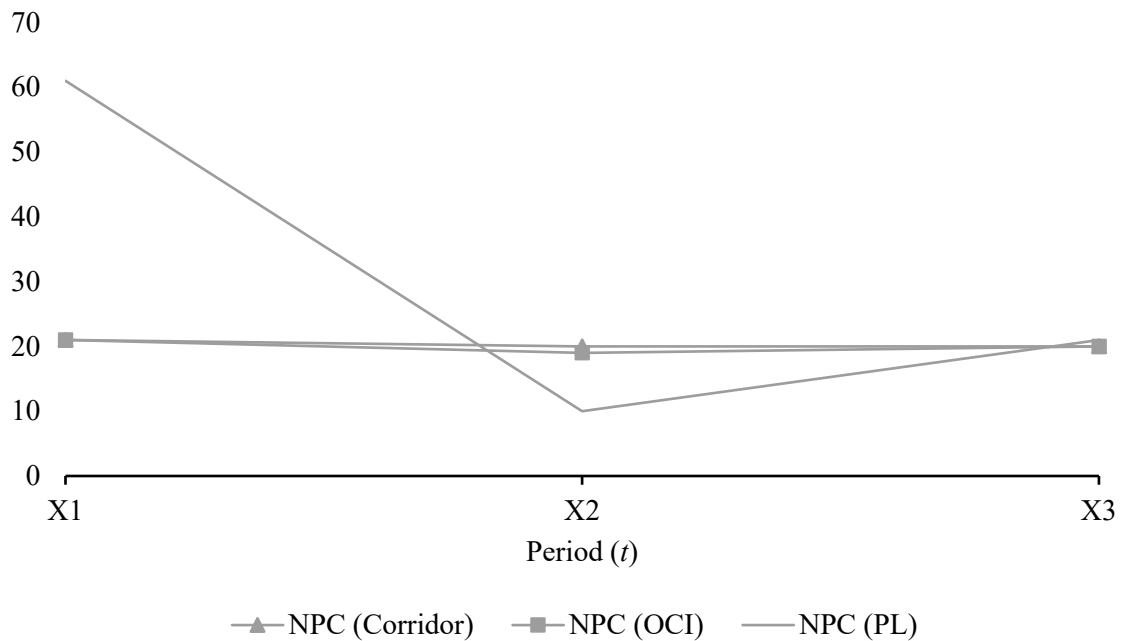
if the PL-Method is applied. This is 50.00 and 47.37% below the Corridor- and the OCI-Method, respectively (see [25] in TABLE 3.4).

In Period X3, there is no amortization of actuarial gains and losses in line with the Corridor-Method, since cumulative unrecognized net actuarial losses at the beginning of Period X3 [14] do not exceed the respective corridor [13]. Overall, the changes in measurement of the *DBO* and the *PLA* lead to a net actuarial loss of one for Period X3 [16]. However, the funding status (*FS*, [22]) at 31.12.X3 remains unchanged compared to 31.12.X2. If the Corridor-Method is applied, the cumulative unrecognized net actuarial losses [17] are increased by one unit. Nevertheless, this effect is over-compensated by the amortization of 2 units of unrecognized past service costs (*PSC*, [19]). All in all, the recognized net pension liability (*NPL*, [23]) is increased by one unit to 134 units, if the Corridor-Method is applied. In comparison, due to the immediate recognition of the net actuarial loss of one unit as well as the decrease in unrecognized past service cost (*PSC*, [19]) of 2 units, the recognized *NPL* [23] is increased to 241 units (+79.85%) if either the PL- or the OCI-Method is applied. Finally, since there is no amortization of net actuarial gains and losses, the recognized *NPC* [25] for Period X3 is equal whether the Corridor- or the OCI-Method is applied (i.e., 20 units). In contrast, due to the immediate recognition of one unit of net actuarial loss in *NPC* [25], the recognized *NPC* for Period X3 is 21 units (+5.00%) if the PL-Method is applied.

Last but not least, it is also worth noting that, assuming TABLE 3.4 depicts the accounting for a Swiss pension plan, the net cash outflow of the firm arising in each of the three periods is equal to the contributions paid [15] during the period, i.e., 15, 17 and 19 units for the periods X1, X2 and X3, respectively. In contrast, benefits [4] are paid directly by the Swiss pension plan out of the plan assets (*PLA*) that were transferred to the separate legal entity in prior periods. Thus, the net cash outflow of the pension plan would be contributions received less benefits paid, i.e., 49, 48 and 51 units for the periods X1, X2 and X3, respectively. This is in line with the change in the *PLA* illustrated in TABLE 3.4.¹⁶⁵

Panel A of FIGURE 3.6 depicts the funding status (*FS*) as well as the net pension liability (*NPL*) recognized in accordance with the Corridor-, the PL-, and the OCI-Method for the three periods of the illustrative example outlined above, respectively.

¹⁶⁵ Further details regarding the recognition of cash-flows arising from changes in plan assets of defined benefit pension plans in the IFRS cash-flow statement of the reporting firm can be found in e.g., J. Zimmermann, Zülch, Knigge, and Teuteberg (2012a, 2012b) and Berger (2012). See footnote 34 on page 33 for further comments on the cash-flows of Swiss pension plans.

FIGURE**3.6 Illustrative Example of IAS 19****Panel A: Funding Status (FS) and Net Pension Liability (NPL)****Panel B: Net Pension Cost (NPC)**

Note. Panel A depicts the development of the funding status (FS, item [22]) as well as the recognized net pension liability (NPL, [23]) for the Corridor-, the OCI- and the PL-Method, respectively, over the three reporting periods of the illustrative example outlined in TABLE 3.4.

Panel B correspondingly depicts the development of the recognized net pension cost (NPC, [25]).

The FIGURE clearly indicates how the immediate recognition of actuarial gains and losses (*AGL*), either in profit or loss (PL-Method) or equity (OCI-Method), leads to the recognition of a *NPL* that is relatively close to the estimated *FS* (i.e., *DBO* minus *PLA*) at the end of each reporting period. In contrast, as illustrated in FIGURE 3.6, the deferred and often only partial recognition of *AGL* in line with the Corridor-Method may lead to the recognition of a *NPL* that is considerably different from the actual funding status (*FS*) of the respective pension plan. Correspondingly, Panel B of FIGURE 3.6 illustrates the recognized net pension cost (*NPC*) for the three different accounting methods and reporting periods, respectively. Obviously, the immediate and full recognition of *AGL* in profit or loss (PL-Method) potentially leads to more volatility in *NPC*. However, if the recognition of *AGL* is deferred and/or partial (Corridor-Method) or done directly in equity (OCI-method), *NPC* is smoothed compared to the PL-Method. Overall, the patterns of *NPL* and *NPC* shown here may not be generalizable to each and every reporting firm and pension plan. Nonetheless, the example clearly hints at the focal point of criticism regarding IAS 19 (2004). Namely, the deferred and often only partial recognition of *AGL* under the Corridor-Method leads to a rather unfaithful representation of the true financial status and effects of the respective pension plan (see chapter 5 for further discussions).

3.3 Swiss GAAP FER

3.3.1 Standard-Setting

The *Swiss Accounting and Reporting Recommendations* (Swiss GAAP FER, hereafter FER or ARR) are stipulated by the *Commission for Financial Reporting Standards* (hereafter Commission) of the *Foundation for Accounting and Reporting Recommendations Swiss GAAP FER* (hereafter Foundation). The Commission is comprised of 25 voting members that are appointed by the board of the Foundation. All stakeholders (e.g., preparers of financial statements, investors, analysts, auditors etc.) as well as the different language regions of Switzerland shall be represented on the Commission as adequately as possible. The standard-setting process is led by the president of the Commission as well as the *Executive Committee* that consists of a maximum of six members of the Commission. The Executive Committee may delegate work to sub-commissions usually led by one of its members including external experts and representatives from other interested parties. After a consultation process with all relevant interested parties,

the draft of a new or amended standard prepared by the Executive Committee is dealt with and possibly approved by the voting members of the Commission (FER, 2014).¹⁶⁶

Originally, the Foundation was created in 1984 for the main purpose of creating Swiss accounting rules that enhance the comparability of financial statements in Switzerland as well as approximate internationally accepted accounting standards (FER, 2014). Accordingly, “[...] superior principle [is] the presentation of a true & fair view of the financial position, the cash flows and the results of operations (true & fair view principle)” (FER, 2014, p. 5).¹⁶⁷ With respect to preparers of financial statements, FER has a clear focus on small and medium-sized organizations that mainly operate in Switzerland. The application of FER is not stipulated by Swiss law (FER, 2014). However, as outlined in paragraph 3.1.2, depending on the specific regulations of the stock exchanges SIX and BX, FER is one of the possible accounting standards that can be applied by firms listed in Switzerland.

Since January 1, 2007, the concept of FER is modular (Meyer et al., 2014). According to *ARR 1 Basics*, organizations are defined as small if at least two of the following three criteria are not exceeded in two consecutive years (ARR 1, 2009, para. 2):

- balance-sheet total of CHFm 10,
- annual net sales from goods and services of CHFm 20, and
- 50 fulltime employees on average per year

These organizations are not obliged to apply the full set of FER. Instead, they can confine themselves to the application of a core of seven standards (incl. the framework, i.e., the *core FER*) which nonetheless results in a true and fair presentation of the financial position, the operating result as well as the cash-flows. In addition to the core FER, groups need to apply *ARR 30 Consolidated financial statements* which entails all necessary rules regarding consolidation. However, listed organizations are not allowed to exclusively apply the core FER (ARR 1, 2009, para. 2). Thus, listed organizations need to apply the full set of FER (incl. the core) applicable to their business model. Moreover, since January 1, 2015, listed organizations applying FER also need to apply *ARR 31 Complementary recommendation for listed companies* (Dousse et al., 2014). This standard entails specific rules regarding e.g., share-based payments and segment reporting,

¹⁶⁶ Regularly updated information on the members of the Foundation, the Commission, the Executive Commission and all other relevant interested parties of Swiss GAAP FER can be found on FER (2017b).

¹⁶⁷ Further details regarding the main objective of FER are discussed in paragraph 5.1.2.1.

which aim at improving the relevance of financial reports of listed organizations (ARR 31, 2013, Introduction).

Overall, there is a total of 25 FER standards that comprise 19 ordinary standards (incl. the Framework as well as the core FER), the two standards relevant for consolidation and listed firms mentioned above as well as four industry-specific standards.¹⁶⁸ Three of the four industry-specific standards stipulate specific rules for the financial reporting of insurance companies (ARR 14), charitable non-profit organizations (ARR 21) and real estate and health insurers (ARR 41). The fourth industry-specific standard is *ARR 26 Accounting for pension plans*. As outlined in sub-section 2.2.4, ARR 26 (2004) had to be applied by all Swiss pension plans during the sample period. Analogously, between 2004 and 2012, listed firms applying FER had to account for their (Swiss) pension plans in line with ARR 16 *Pension benefit obligations* (FER, 2014). The evolution of this standard is discussed in more detail next.

3.3.2 ARR 16 Pension Benefit Obligations

The first version of ARR 16 had to be applied for financial years commencing on or after January 1, 2000 (Suter, 1999). According to ARR 16 (1999), pension plans had to be classified as either defined benefit or defined contribution plans. Concretely, pension plans in the form of a *pure* savings plan (*Sparplan*) or with full risk coverage (see also paragraph 3.2.4.2), where there remain no guarantees for additional contributions with the pension plan and/or the employer and, in particular, where the future benefits are not dependent on investment returns and/or guarantees such as minimum conversion rates (as described in sub-section 2.2.3), could be treated as defined contribution plans (ARR 16, 1999, para. 13). However, ARR 16 (1999, para. 32) specified that Swiss pension plans providing mandatory benefits (as discussed in section 2.2) or similar pension plans (usually) do not qualify as pure savings plans even if they are structured in accordance with the Swiss contribution primacy outlined in paragraph 3.2.4.4. Nonetheless, if such plans were considered to be immaterial, they could be treated as defined contribution plans (ARR 16, 1999, para. 32). In principle, this classification scheme strongly resembled the classification in line with IAS 19 outlined in sub-section 3.2.4, where only those pension plans where zero risk remains with the employer are classified as defined contribution plans (Suter, 1999). However, an important exception to the above-described classification was the treatment of Swiss pension plans of firms that had, on average,

¹⁶⁸ A regularly updated list of FER standards can be found on FER (2017b).

less than 250 employees throughout the reporting period. These plans were permitted to be classified as defined contribution plans (ARR 16, 1999).

Analogous to the IAS 19-accounting for defined contribution plans described in sub-section 3.2.5, for the pension plans classified as defined contribution plans in accordance with ARR 16 (1999), the annual net pension cost was simply recognized in the form of the annual contributions paid (ARR 16, 1999). In contrast, again in line with IAS 19 (1998), pension obligations classified as defined benefit plan had to be regularly re-measured by a retrospective valuation method (ARR 16, 1999, para. 7). Specifically, the projected unit credit method (PUCM, described in paragraph 3.2.6.1) was recommended (ARR 16, 1999, para. 25). Accordingly, for defined benefit plans, the net pension cost (*NPC*) to be recognized consisted of the current service cost (*CSC*), the interest cost (*IC*), the expected return on plan assets (*ER*) as well as actuarial gains and losses (*AGL*). Moreover, for the recognition of *AGL* it was possible to choose between the Corridor- and the PL-Method (ARR 16, 1999, para. 8, 10 and 28). Finally, the net pension liability (or asset, *NPL*) to be recognized was defined as the funding status (*FS*, i.e., *DBO* minus *PLA*) whereby cumulative unrecognized net actuarial gains (losses) had to be added (subtracted) if the Corridor-Method was applied. The rules also included the application of an asset ceiling similar to the one of IAS 19 outlined in paragraph 3.2.6.6 (ARR 16, 1999, para. 9, 29 and 30). Again, there was an important exception to the rules outlined above. Even in the case where either a Swiss pension plan providing mandatory benefits or a similar pension plan had to be classified as defined benefit plan, it was not necessarily required to re-measure the obligations regularly with a retrospective valuation method such as the PUCM. At the beginning of a reporting period, the annual change in measurement of the obligations (i.e., the current service cost, *CSC*) could instead be valued as the expected employer and employee contributions incl. appropriate risk premiums for the period (ARR 16, 1999, para. 25).¹⁶⁹

¹⁶⁹ In the view of Suter (1999), the question of whether a defined benefit Swiss pension plan, in the context of ARR 16 (1999), could be exempt from the regular re-valuation with a retrospective method such as the PUCM boiled down to the question of whether the difference between the valuation in accordance with such a method and the more traditional actuarial (i.e., static or prospective) methods (as outlined in sub-section 2.2.4) is material. However, the author argues that, originally, it was not the intent of the Commission that, *de facto*, every Swiss pension plan was exempt from the regular re-valuation with a retrospective method (see Suter, 1999, p. 1248). See e.g., Suter (1999) for more details regarding the (first) application of ARR 16 (1999). An illustrative example can be found in e.g., Loser (2003a, pp. 613-615).

A major revision of ARR 16 (1999) was undertaken in 2005 and ARR 16 (2005) had to be applied for financial years commencing on or after January 1, 2006. Nevertheless, earlier application was permitted if the necessary financial statements of the respective Swiss pension plans had already been reported in line with ARR 26 (2004), as described in sub-section 2.2.4 (FER, 2005, para. 2.1). The revision of the standard was triggered by two important changes to Swiss law that came into force on January 1, 2005. First, as outlined in sub-section 2.2.4, for financial years beginning on or after January 1, 2005, all Swiss pension plans are required to report in accordance with ARR 26 (2004). And second, as discussed in sub-section 2.2.6, since January 1, 2005, the governing board of a Swiss pension plan is authorized to collect additional restructuring contributions from employers and employees if deemed necessary for the elimination of an underfunding of the plan. With regard to the latter point, some commentators expressed the concern that, according to ARR 16 (1999), this might lead to the necessary classification of all Swiss pension plans (incl. those that provide mandatory benefits only) as defined benefit plans with respective implications for the accounting treatment of these plans (see e.g., Meyer & Suter, 2005, p. 635).¹⁷⁰

After its enactment in 2005, a revised version of the standard, ARR 16 (2009), could be applied for financial years beginning on or after January 1, 2009. Through the revision, respective formulations were clarified so that, in principle, also Swiss pension plans in the form of either collective pension plans (*Sammelstiftung*) and/or group pension plans (*Gemeinschaftsstiftung*, see sub-section 2.2.1) had to be treated equally to single-employer pension plans within the context of ARR 16 (2009). Furthermore, the revision included the deletion of the rule that effects from the first application of the standard had to be accounted for directly in equity.¹⁷¹ Also, changes included reformulations regarding the accounting for employer contribution reserves (*ECR*, as described in sub-section 2.2.6). For example, interest income or cost earned on an *ECR* could now be recognized separately in financial income or cost rather than in personnel cost.¹⁷²

Finally, after 2009, there was a second revision of the standard in 2010 and ARR 16 (2010) was enacted for financial years beginning on or after January 1, 2011. Specifically, the revision eliminated the option to account for (Swiss) pension plans in line with

¹⁷⁰ For example, also the Commission itself expressed this very concern during the consultation process of the revision undertaken in 2005. See e.g., FER (2005) for more details as well as a general summary of all comment letters received during the consultation process.

¹⁷¹ See e.g., FER (2009b) for an overview of the exact reformulations.

¹⁷² See e.g., FER (2009a) for an overview of the exact reformulations.

an international standard (such as e.g., IAS 19) and to disclose all necessary information required by that standard, as well as regarding the rationale for choosing the option, in the notes of the financial statements. Thus, for financial years beginning on or after January 1, 2011, (Swiss) pension plans were required to be accounted for solely in line with ARR 16 (2010). Nevertheless, firms applying the eliminated option before the revision, were granted a three-year transition period. Note, as described further below, also after this revision, the valuation of pension plan obligations was still allowed to be done in line with an internationally accepted valuation method such as the projected unit credit method (PUCM, required by IAS 19). However, the accounting for the financial effects of such plans was, thereafter, required to be fully in line with ARR 16 (2010).¹⁷³

Summing up, before January 1, 2005, the application of ARR 16 (1999) was conceptually very similar to IAS 19. However, in practice, most Swiss pension plans were treated as defined contribution plan (see e.g., Loser, 2003b, p. 741 and 744). However, due to changes in Swiss law enacted as of January 1, 2005, especially with respect to potential claims of restructuring contributions by Swiss pension plans, the concept of pension accounting was fundamentally adapted, whereby the classification into defined benefit and defined contribution plans was eliminated and accounting for Swiss pension plans was newly based on the financial statements of the pension plan reported in line with ARR 26 (2004).¹⁷⁴ As outlined above, the revisions thereafter did not materially change the principles of accounting for Swiss pension plans during the sample period and are not expected to qualitatively alter the results of any analysis conducted hereafter.¹⁷⁵ Thus, for the purposes of this study, all further discussions about pension accounting within the context of Swiss GAAP FER are based solely on ARR 16 (2005). The application of this standard is described in more detail next.

3.3.3 Objective and Scope

The objective of ARR 16 is “[...] the accounting [for] the real economic impacts of pension benefit obligations on the organization (employer).” (ARR 16, 2005, Introduction). Specifically, this requires the reporting firm to clarify whether, at the balance-sheet date, there exists any *economic benefit* (i.e., asset) or *economic obligation*

¹⁷³ See e.g., FER (2010) for an overview of the exact reformulations.

¹⁷⁴ Moreover, in line with ARR 16 (2005), it had no longer been permitted to use the terms *defined benefit* and *defined contribution* with respect to Swiss pension plans (see e.g., Dousse et al., 2014, p. 164).

¹⁷⁵ In particular, firms that did not report all necessary information in line with ARR 16 are excluded from the final sample. See section 6.1 for more details regarding the sample selection process.

(i.e., liability) in addition to regular contributions payable as well as respective accruals (ARR 16, 2005, Introduction).

The scope of ARR 16 extends to the accounting for all sorts of pension plans (incl. patronage funds) that provide benefits for at least one of the risks, death, disability and old-age (ARR 16, 2005, para. 1).¹⁷⁶ In particular, the standard does *not* cover the accounting for other (long-term) employee benefits such as long-service benefits (e.g. sabbatical or termination benefits etc.), jubilee benefits, as well as any kind of special personnel expense related to e.g., redundancy programs or restructuring measures. Such benefits must be accounted for via provisions or other personnel expense. Finally, the standard is also not applicable to the accounting of a pension plan itself but only treats the accounting for pension plans from the view-point of the employer. (ARR 16, 2005, para. 7). For example, although the standard is closely related to the accounting of Swiss pension plans, as described in sub-section 2.2.4, these must report their financial statements in accordance with ARR 26 (2004).

Lastly, it is important to note, the scope of the standard also extends to collective and group pension plans (i.e., multi-employer plans). For example, as explained in sub-section 2.2.4, Swiss collective and group pension plans must report financial statements in line with ARR 26 (2004) for each enclosed plan separately. Thus, in line with ARR 16 (2005, para. 9), these plans shall be accounted for in the same way as single-employer pension plans. However, if the necessary information to account for such a plan cannot be obtained due to e.g., comprehensive risk-sharing between different pension plans enclosed in a multi-employer plan, this fact shall be disclosed and explained in the notes accordingly (ARR 16, 2005, para. 9).

3.3.4 Economic Benefits and Obligations

The economic (i.e., financial) impact of a pension plan on the reporting firm is based either on an economic benefit or an economic obligation arising from this plan. Such benefits and obligations may arise due to any specific laws, regulations or contractual agreements (e.g., prepaid or deferred contributions). Furthermore, economic benefits (obligations) from pension plans may also arise due to the chance (risk) of positive (negative) impacts on future cash-flows of the reporting firm. For example, a reduction in future contributions may qualify as economic benefit whereas an economic obligation may arise from future restructuring contributions (ARR 16, 2005, para. 2).

¹⁷⁶ Where applicable, patronage funds were excluded from empirical analyses. See section 6.1 for more details.

The estimation of economic benefits and obligations from pension plans must be based on “[...] objective, market-based and realistic assumptions [...]” (ARR 16, 2005, para. 8). In general, the estimation shall be based on the funding status (*FS*) as reported in the financial statements of the pension plan. These shall not be prepared more than 12 months in advance of the current balance-sheet date of the reporting firm. Specifically, for Swiss pension plans, the financial statements must be reported in accordance with ARR 26 (2004). For non-Swiss pension plans that, for example, cover subsidiaries abroad, the plan’s financial statements in accordance with local laws and regulations (i.e., local GAAP) and/or international accounting standards (such as e.g., IAS 26, see sub-section 3.2.3) form the bases of the estimation (ARR 16, 2005, para. 8).

The funding status (*FS*) of a pension plan must be estimated in line with generally accepted and appropriate methods such as e.g., the methods prescribed by Swiss law and regulations or a dynamic method (e.g., PUCM) in line with international accounting standards (ARR 16, 2005, para. 10). As outlined in sub-section 2.2.4, for the valuation of the obligations of Swiss pension plans, a dynamic method may only be applied if it leads to a higher valuation than a static method (ARR 26, 2004, para. 15). Actuarial assumptions (i.e., demographic and economic parameters) applied for the valuation of pension obligations must be logically consistent as well as generally accepted. In particular, applied discount rates must be in line with market rates. Overall, it is not required to apply the same valuation method to different pension plans but, in principle, similar plans shall be treated equally. Anyhow, a chosen method must be applied consistently to a specific pension plan. Accordingly, the impact of methodological changes must be “[...] explained and quantified in the notes.” (ARR 16, 2005, para. 10).

Overall, economic benefits and obligations arising from pension plans must be assessed and estimated on the basis of the specific regulations of a pension plan as well as the contractual agreements between that pension plan and the reporting firm (ARR 16, 2005, para. 10). For example, with respect to Swiss pension plans, oftentimes contribution reductions are granted to employers *and* employees. In that case, an existing surplus is not fully attributable to the reporting firm (Dousse et al., 2014). Moreover, the estimation of any economic benefit or obligation must be performed for an adequate period of time. For example, if, at the balance-sheet date, there exists a known and/or already approved concept for the financial restructuring of the pension plan over a certain period of time, the estimation of the economic obligation shall be done accordingly. However, if it is not possible to evaluate an adequate period of time, the estimation of an economic benefit or obligation shall be performed for a period of five years. Accordingly, respective values must also be discounted (ARR 16, 2005, para. 10).

3.3.5 Net Pension Liability

The reporting firm must assess annually whether, at the balance-sheet date, there exists an economic benefit or an economic obligation arising from a pension plan. As outlined above, the assessment is based on contractual agreements, financial statements of the pension plan as well as any other documents that support the presentation of the effective financial situation of the plan. The assessment must be done separately for each pension plan (ARR 16, 2005, para. 3 lit. b). In principle, the recognition of economic benefits and obligations from pension plans is dependent on the “[...] probability and reliability of the economic impacts” of such benefits and obligations on the reporting firm (ARR 16, 2005, para. 8).

In the case of a plan surplus (i.e., an overfunding), an economic benefit arises if, for the reporting firm, it is *permitted* and also *intended* to use this surplus for either the reduction of future employer contributions, for future refunds to the employer or for any other form of economic benefit (ARR 16, 2005, para. 8). As discussed in paragraph 3.2.6.2, with respect to Swiss pension plans, any refund to the employer is prohibited. Hence, only future contribution reductions may lead to the recognition of an asset (i.e., a negative net pension liability (*NPL*), also see paragraph 3.2.6.6).¹⁷⁷ In sum, if, at the balance-sheet date, based on all relevant laws, regulations and contractual agreements, a firm is permitted and also intends to use an existing surplus of a Swiss pension plan for future contribution reductions, it has to recognize an asset on the balance-sheet (ARR 16, 2005, para. 3). If applicable, the asset is measured as the present value of discounted cash-flows (see above). Subsequent changes in the asset are recognized in profit or loss (see sub-section 3.3.7 below).

In the case of a plan deficit (i.e., an underfunding), an economic obligation may be of either *legal* or *factual* (i.e., *constructive*) form. Thus, the legal obligation may arise from respective laws and regulations regarding the pension plan. For example, given the right circumstances, the governing board of a Swiss pension plan has the legal right to claim restructuring contributions from employers and employees (see sub-section 2.2.6). In contrast, a constructive obligation may arise because of *conduct implying an intent* (*Konkludentes Handeln*). For example, if a firm has regularly paid additional contributions in order to eliminate or reduce the underfunding of a pension plan in the past, this

¹⁷⁷ Note, although the term *net pension liability* is not used in ARR 16, it is used here for the purpose of consistency with IAS 19. After all, due to the external funding of Swiss pension obligations with plan assets, irrespective of the applied accounting standard, any asset or liability to be recognized on the balance-sheet of a firm relating to the funding status of this plan, by definition, is measured on a net basis.

conduct may give rise to a constructive obligation regarding a plan deficit that exists at the current balance-sheet date (see e.g., Behr & Leibfried, 2014, p. 438). According to ARR 16 (2005, para. 8), an economic obligation arising from a pension plan deficit must be assessed in line with the requirements for the recognition of a *provision (Rückstellung)*. Specifically, in order to recognize a provision the following three criteria must be met cumulatively (ARR 23, 2009, para. 1):¹⁷⁸

- the obligation must be based on a past event,
- the obligation must be probable, and
- the obligation can be estimated reliably

In general, pension obligations are based on employee service rendered in the past (i.e., before the current balance-sheet date). For example, regarding mandatory pension benefits, the insurance coverage of Swiss employees commences with the signing of the contract of employment.¹⁷⁹ Thus, in relation to Swiss pension plans, the first criteria outlined above is clearly fulfilled.¹⁸⁰ The second criteria is fulfilled if future cash-outflows, triggered by the obligation, are *more likely than not*. Concretely, the probability for future cash-outflows must be greater than 50%.¹⁸¹ As outlined in sub-section 2.2.6, different measures may be taken by the governing board of a Swiss pension plan in order to reduce or eliminate a current deficit. Not all of these measures automatically lead to cash-outflows from the employer and additional restructuring contributions can only be claimed if other measures are not sufficient to cover the underfunding in due time. Thence, the probability of future cash-outflows must be estimated on the basis of the measures taken by the governing board as of the current balance-sheet date. Moreover, the estimation must be in line with “[...] the manner in which [the firm] acts or intends to act in regard to the pension institution.” (ARR 16, 2005, para. 12). For example, if

¹⁷⁸ For the purpose of this study, comments about the accounting for provisions in line with FER are based on ARR 23 *Provisions* as revised in 2009 and enacted for financial years beginning on or after January 1, 2010. More details regarding the application of ARR 23 can be found in e.g., Dousse et al. (2014, pp. 229-242); Teitler-Feinberg (2008, pp. 325-330). In comparison, the accounting rules for provisions in accordance with IFRS are stipulated by IAS 37 *Provisions, Contingent Liabilities and Contingent Assets*. Details regarding the application of IAS 37 may be found in e.g., Pellens et al. (2011, pp. 425-454). Also, see e.g., Behr and Leibfried (2014, pp. 433-452) for a general comparison of IAS 37 to the application of ARR 23.

¹⁷⁹ See e.g., Stauffer (2012, p. 139).

¹⁸⁰ Also see e.g., Müller (2013, pp. 107-109) who evaluates whether Swiss pension plans meet the necessary criteria for the recognition of provisions in line with IAS 37. His approach is based on Berndt (2007, pp. 79-80).

¹⁸¹ This is in line with common accounting practice (see e.g., Dousse et al., 2014, pp. 230-231; Teitler-Feinberg, 2008, pp. 325-326). For example, this principle is also stipulated by IAS 37 (2004, para. 23; 2012, para. 23).

the representatives of the employer on the governing board of the pension plan have officially agreed to contribute a certain amount in order to reduce or eliminate a current deficit, the firm is not allowed to take on a contradicting position on that issue for the purpose of estimating the respective economic obligation (Dousse et al., 2014). Lastly, it must also be possible to estimate the obligation reliably. In general, this criteria is fulfilled in most cases (Dousse et al., 2014). After all, *estimation* is “[...] a key factor in preparing financial statements [...]” (ARR Framework, 2014, para. 32). Particularly with respect to Swiss pension plans, this criteria should definitely be fulfilled since applied valuation methods are widely used and generally accepted and, usually, the required data is also available (Müller, 2013). As is the case for the recognition of an asset, if time is an important factor, the economic obligation shall be discounted (ARR 23, 2009, para. 6). Specifically, the estimated amount must be the present value of future expected cash-outflows whereby the uncertainty of these outflows must be taken into account (ARR 23, 2009, para. 19). Thus, if an economic obligation from a plan deficit meets the criteria for the recognition of a provision, the firm must recognize a liability (ARR 16, 2005, para. 3). As in the case of recognized pension assets, subsequent changes in the liability are recognized in profit or loss (see sub-section 3.3.7 below).

3.3.6 Employer Contribution Reserves

“Employer contribution reserves or similar items are recognised as assets.” (ARR 16, 2005, para 5). Specifically, employer contribution reserves (*ECR*) that can be released, at any time, for the payment of contributions by the employer and which are accounted for separately by the pension plan must be measured as respective economic benefit.¹⁸² If applicable, measurement shall be in the form of present values (ARR 16, 2005, para 14). Notably, the recognition is compulsory even if this is not required for the reporting of statutory financial statements (ARR 16, 2005, para 14). Hence, the consistent recognition of an *ECR* as asset of the reporting firm leads to the shift of corresponding pension cost to the period of actual utilization of the reserve for payment of contributions. Accordingly, the net pension cost (discussed in sub-section 3.3.7 below) always entails the entire contributions payable for the period, regardless of whether these are paid directly

¹⁸² The definition is in line with the concept of employer contribution reserves (*ECR*) *without* waiver of use to be accounted for by Swiss pension plans as outlined in sub-section 2.2.6.

or by release from the respective employer contribution reserve (ARR 16, 2005, para. 14).¹⁸³

If the reporting firm grants a waiver of use on the employer contribution reserve (*ECR*) to the respective pension plan, the recognized asset must be accordingly impaired by the recognition of the cost in profit or loss (ARR 16, 2005, para. 5). In other words, as long as the pension plan is underfunded, it is not allowed to derive an economic benefit from the part of the *ECR* for which the firm has granted a waiver of use (at least in the amount of the deficit).¹⁸⁴ In general, a waiver of use may be granted to either (partially) cover a plan deficit or to increase the risk capacity of the pension plan in line with a specific asset management strategy (ARR 16, 2005, para. 15). If there exists a plan deficit at the balance-sheet date, the part recognized by the waiver of use on the *ECR* must no longer be included for the estimation of the respective economic obligation. As outlined in sub-section 3.3.7 below, the change in a recognized *ECR* over time is recognized in profit or loss (ARR 16, 2005, para. 5). Finally, as outlined in sub-section 2.2.6, if the underfunding of a Swiss pension plan is entirely eliminated, any existing *ECR* with waiver of use must be released to an *ECR* without waiver of use and accordingly increases the respective asset recognized on the balance-sheet of the reporting firm.

3.3.7 Net Pension Cost

The pension income and cost components are derived as follows. First, the employer contributions payable for the reporting period are recognized in personnel expenses of the reporting firm (ARR 16, 2005, para. 3 lit. a). For example, with respect to Swiss pension plans, the contributions payable consist of the regulatory contributions payable

¹⁸³ In the past, the recognition of an *ECR* as asset in statutory financial statements according to Swiss law has been controversial. After all, as outlined in sub-section 2.2.6, one of the main motivations for a firm to pay extra contributions to its Swiss pension plan is the corresponding tax saving effect. According to Swiss law, the statutory financial statements rather than the statements in line with IFRS or FER are relevant for taxation. Hence, the recognition of an *ECR* as asset in the statutory financial statements would eliminate any corresponding tax saving effect (see e.g., Helbling, 2009, pp. 126-127). Nonetheless, for example Loser (2002) argues that, since also in line with Swiss law, income and cost must be accrued and matched accordingly in order to reliably recognize profit or loss for any given period, the *ECR* should be recognized as asset in the period the contributions are paid (i.e., flow out). Subsequently, the *ECR* shall then be amortized as cost in profit or loss in the period(s) it is actually used by the firm to fund its contributions to the pension plan. The accounting for employer contribution reserves in line with IFRS is outlined in paragraph 3.2.6.6. See e.g., Loser (2003a) for a discussion as well as an illustrative example for the accounting treatment of an *ECR* in line with ARR 16 (1999).

¹⁸⁴ As mentioned in sub-section 2.2.6, according to law, an *ECR* with waiver of use is not allowed to exceed the total underfunding of a Swiss pension plan.

by the reporting firm for mandatory and non-mandatory benefits covering the risks of death, disability and old-age. Furthermore, contributions payable may also entail management fees, restructuring contributions in the case of a plan deficit and other contributions (see in sub-section 2.2.2). Second, the change in the recognized net pension liability (asset, *NPL*, as described in sub-section 3.3.5 above) is also recognized in personnel expense (ARR 16, 2005, para. 3 lit. b). Changes in *NPL* may occur due to the following (ARR 16, 2005, para. 11):

- Changes in the values of plan assets and pension obligations of the pension plan
- Set-up of new or closure of existing pension plans as well as plan amendments
- Changes in technical (i.e., actuarial) assumptions applied for estimation
- Differences between expected and actual developments (e.g., interest rates)
- Changes in the body of insureds (i.e., entries and exits to the pension plan)
- Changes in insured salaries
- Changes to pension plan regulations, contractual agreements (e.g., risk coverage by insurance company) and/or respective laws

Finally, the result from recognized employer contribution reserves (*ECR*, as outlined in sub-section 3.3.6 above) must also be included in personnel expense (ARR 16, 2005, para. 5). It is important to note, the result from *ECR* includes decreases due to the release for the payment of contributions attributable to the current reporting period and/or the granting of a waiver of use as outlined in sub-section 3.3.6. In contrast, the increase of a recognized *ECR* is either due to inflows from prepaid contributions, the release from an *ECR* with waiver of use or interest income. However, the accumulation of new reserves must not be recognized in profit or loss since prepaid contributions are economically not attributable to the current reporting period (Dousse et al., 2014). The composition of net pension cost (*NPC*) in line with ARR 16 (2005) is illustrated in TABLE 3.5 below.

3.3.8 Presentation and Disclosures

The reporting firm must recognize a net pension asset (i.e., a negative *NPL* as outlined in sub-section 3.3.5) on the balance-sheet as *asset from pension institutions* within the class of long-term financial assets. Correspondingly, a net pension liability (*NPL*) must be recognized as *liability from pension institutions* within the class of long-term liabilities (ARR 16, 2005, para. 3). Furthermore, an existing employer contribution reserve (*ECR*) without waiver of use or similar assets are recognized on the balance-sheet as long-term financial assets under *assets from employer contribution reserve*

TABLE

3.5 Recognition of Net Pension Cost (ARR 16)

Sign	Item
+	Employer Contributions Payable for the Current Reporting Period ^a
+/-	Increase / Decrease in <i>NPL</i> ^b
-/+	Increase / Decrease in <i>ECR</i> ^c
=	<i>NPC</i>

Note. The TABLE illustrates the measurement of the net pension cost (*NPC*) to be recognized in profit or loss in accordance with ARR 16 (2005).

^a Based on respective laws, regulations and/or contractual agreements with the pension plan(s).

^b If *NPL* is negative (i.e., an asset), an increase / decrease leads to a decrease (-) / increase (+) of net pension cost (*NPC*), respectively.

^c An increase in *ECR* may only be recognized as part of *NPC* if it is attributable to the release from an *ECR* with waiver of use or interest income. Prepaid contributions (i.e., accumulation of *ECR*) are not recognized in profit or loss. A decrease to be recognized may be due to either the release for payment of contributions attributable to the current reporting period or the granting of a waiver of use.

(ARR 16, 2005, para 5). Finally, the components of pension income and cost outlined in sub-section 3.3.7 must be recognized in profit or loss within personnel expenses (ARR 16, 2005, para. 3 and 5). However, as mentioned in sub-section 3.3.2, for financial years beginning on or after January 1, 2009, interest earned on an existing *ECR* could also be recognized as part of financial income instead of personnel expenses.

In general, information shall be disclosed in the notes in *tabular form*.¹⁸⁵ Specifically, the required information shall be disclosed separately for the group of underfunded pension plans as a whole, the group of overfunded pension plans as a whole, the group of pension plans without any deficit and surplus as a whole, the group of pension plans without own assets as a whole as well as the group of patronage funds (ARR 16, 2005, para. 6).¹⁸⁶ Accordingly, the following information needs to be disclosed (ARR 16, 2005, para. 6):

- Surplus and deficit at the current balance-sheet date.

¹⁸⁵ See sub-section 3.3.9 below for an illustration. The reporting firm may not disclose information in tabular form, if, for example, the employees of the firm are covered by a multi-employer pension plan for which the required information regarding the reporting firm's share of plan deficits/surpluses etc. is not available (see e.g., Dousse et al., 2014, p. 164).

¹⁸⁶ As noted in footnote 176 on page 112, where applicable, patronage funds were excluded from empirical analyses. See section 6.1 for more details.

- Economic benefits and obligations (i.e., recognized *NPL*) at the current as well as former balance-sheet date incl. explanations regarding the recognition
- Change in economic benefits and obligations (i.e., recognized *NPL*) during the current reporting period.
- Employer contributions payable for the current reporting period.
- Extraordinary employer contributions for the reduction or elimination of current plan deficits for the current reporting period.
- Net pension cost recognized for the current as well as the former reporting period.

In addition to the information outlined above, for the groups of pension plans as a whole as well as patronage funds as a whole, the following information with regard to recognized employer contribution reserves (*ECR*) must also be disclosed in the notes (ARR 16, 2005, para. 5):

- Nominal value (i.e., without discounting and/or deduction of existing waiver of use) of *ECR* at the current balance-sheet date.
- Amount of any waiver of use or other impairments as of the current balance-sheet date.
- In-flows (i.e., accumulation) to the *ECR* during the current reporting period.
- Amount of recognized *ECR* at the current as well as the former balance-sheet date.
- Result of the *ECR* to be recognized in profit or loss for the current as well as the former reporting period.

Apart from the information above, if applicable, the reporting firm must also disclose information related to the following (ARR 16, 2005, para. 8, 9, 10 and 13):

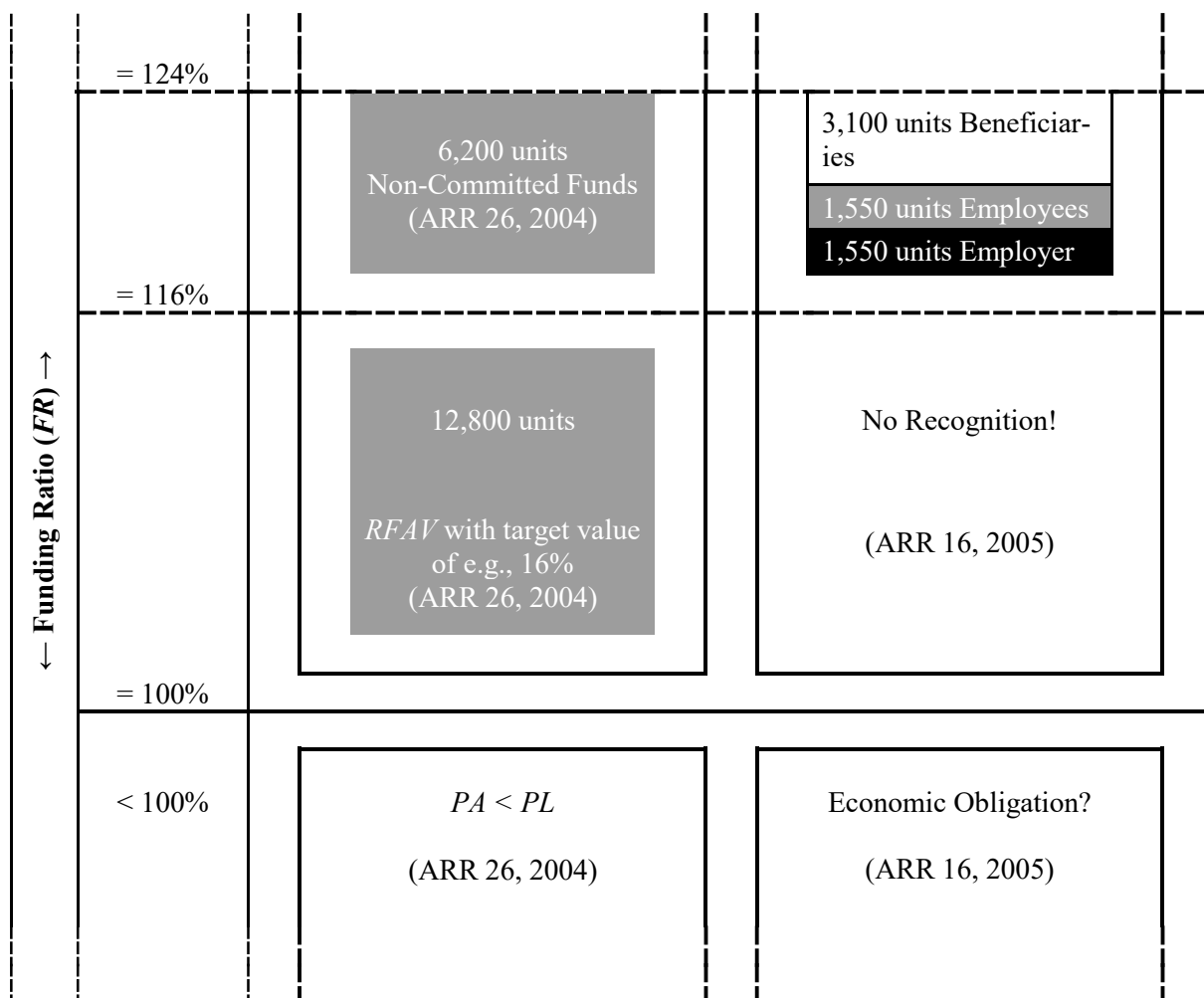
- Changes to the applied valuation-methodology of pension plans.
- Application of an international pension accounting standard (e.g., IAS 19).
- Relevant events and developments that have taken place between the current balance-sheet date of the reporting firm and the last balance-sheet date of the pension plan if these are not equal.
- Information about collective and/or group pension plans for which the required information is not available separately.

Last but not least, the disclosure requirements of ARR 16 (2005) take precedence over the respective requirements of ARR 23 (2009). As described above, net pension liabilities must be recognized separately as liabilities from pension institutions. This shall prevent users of financial statements from confusing such liabilities with the recognition of other forms of provisions (Dousse et al., 2014).

3.3.9 Illustrative Example

The following example illustrates the application of ARR 16 (2005) to account for a Swiss pension plan. The information is based on Dousse et al. (2014, pp. 166-167). As described in sub-section 3.3.4, the basis for the estimation of economic benefits and obligations arising from a Swiss pension plan are the plan's most recent financial statements in accordance with ARR 26 (2004). FIGURE 3.7 depicts the financial situation of the Swiss pension plan as of December 31, of Period X2. Note, in principle, FIGURE 3.7 is identical to FIGURE 2.5 on page 36. Concretely, at 31.12.X2, the Swiss pension plan reports an overfunding of 24% (i.e., 19,000 units). This corresponds to a legal funding ratio (*FR*), as defined in equation (2.1) on page 35, of about 124%. However, Swiss pension plans must create a reserve for fluctuations in asset value (*RFAV*) before any operative surplus and non-committed funds are allowed to be recognized. Moreover, based on a risk assessment of the plan, the governing board of the pension plan must define a target value for the *RFAV* (see sub-section 2.2.4). For the purpose of illustration, this target value is assumed to be 16% of total pension assets (*PA*, excluding *RFAV*). Hence, 12,800 units of the existing plan surplus are part of the *RFAV*. Therefore, 6,200 units of the plan surplus are allowed to be recognized as non-committed funds in accordance with ARR 26 (2004). In principle, the recognized non-committed funds of the pension plan are the basis for any economic benefit of the reporting firm (see FIGURE 3.7). However, it is assumed here that the governing board of the plan decides to use half of non-committed funds (i.e., 3,100 units) recognized at the balance-sheet date for future benefit increases of beneficiaries. Furthermore, the board decides to use the other half of non-committed funds for contribution reductions over the coming five years. Specifically, the amount is split equally between the employer (i.e., the reporting firm) as well as the employees. Overall, the reporting firm is permitted and also intends to use the economic benefit of future contribution reductions. Hence, as of 31.12.X2, the firm

FIGURE

3.7 Illustrative Example of ARR 16: Financial Situation of Swiss Pension Plan

Note. The FIGURE is based on FIGURE 2.5 on page 36 and depicts the relationship between the financial situation of a Swiss pension plan reported in accordance with ARR 26 (2004) and respective laws and regulations, as well as the accounting for an economic benefit of the reporting firm in line with ARR 16 (2005). The illustrative example is based on Dousse et al. (2014, pp. 166-167). The funding ratio (*FR*), as defined in (2.1) on page 35, informs about the existence of an over- and underfunding in accordance with the law (BVV2, 2004, § 44; 2012, § 44) as well as about the recognition of a reserve for fluctuations in asset value (*RFAV*) and non-committed funds in line with ARR 26 (2004). The horizontal straight and dashed black lines indicate a funding ratio of 100.00%, 116.00% and 124%, respectively. For illustrative purposes, it is assumed that a *FR* of 116.00% corresponds to an amount of 12,800 units of *RFAV*. Moreover, it is assumed that there are 6,200 units of non-committed funds at the balance-sheet date of period X2. Thus, at 31.12.X2, total overfunding is reported to be 19,000 units (12,800 + 6,200, 123.75%). In line with the decisions taken by the governing board of the pension plan, 1,550 units of non-committed funds are used for future contribution reductions for the employer (i.e., the reporting firm) and the employees, respectively. Analogously, 3,100 units of non-committed funds are used for future benefit increases of beneficiaries.

must recognize a net pension asset (i.e., a negative net pension liability, *NPL*) of 1,550 units.¹⁸⁷

TABLE 3.6 illustrates the recognition as well as the required disclosures in the notes of the reporting firm for the Swiss pension plan in line with ARR 16 (2005). On 31.12.X2, the reporting firm must recognize its respective share of 1,550 units of future contribution reductions as economic benefit in assets from pension institutions [1] on the balance-sheet. For the purpose of tax savings, the reporting firm has also accumulated an employer contribution reserve (*ECR*) which is not recognized in the statutory financial statements. However, as outlined in sub-section 3.3.6, the *ECR* must be recognized as assets from employer contribution reserves [2] on the balance-sheet reported in line with ARR 16 (2005). As of 31.12.X2, the recognized *ECR* is based on the nominal value [3] of 1,300 units. Thus, it is assumed that the firm has not granted any waiver of use on the *ECR*. Moreover, it is assumed that the nominal value is not discounted and thence, the pension plan pays no interest on the *ECR* to the reporting firm. Thus, the *ECR* recognized on the balance-sheet is equal to the nominal value as of the end of Period X2. Furthermore, the reporting firm has not accumulated any more employer contribution reserves [4] during Period X2. Hence, the result of the *ECR* [5] to be recognized in profit or loss of the current reporting period is solely based on the difference between 1,400 and 1,300 units of *ECR* recognized at 31.12.X1 and 31.12.X2, respectively. In essence, the reporting firm has released 100 units of the *ECR* in order to fund part of its contributions payable [8] for Period X2.

The reporting firm must also disclose the 6,200 units of the current pension plan surplus [6], as illustrated in FIGURE 3.7, in its notes. Moreover, the change in the recognized net pension asset (i.e., negative net pension liability *NPL*, [7]) is based on the difference between 1,330 and 1,550 units recognized as *NPL* [1] as of 31.12.X1 and 31.12.X2, respectively. As outlined in FIGURE 3.7, this change is based on the change in the financial situation of the pension plan as reported in line with ARR 26 (2004) as well as the respective decisions of the governing board. Overall, the net pension cost (*NPC*, [9]) to be recognized for Period X2 consists of 2,900 units of contributions payable [8] as stipulated by the pension plan regulations. However, as mentioned above, the

¹⁸⁷ Note, as outlined in sub-section 2.2.1, by law, there must be an equal number of representatives from the employer and the employees on the governing board of a Swiss pension plan. Thus, the employer (i.e., the reporting firm) cannot dispose of any non-committed funds without the consent of the employee representatives. Furthermore, if the employer representatives on the governing board agree to use certain non-committed funds for future contribution reductions, the reporting firm is not allowed to act differently regarding the estimation and recognition of economic benefits from such contribution reductions. This was outlined in sub-section 3.3.5 above.

TABLE
3.6 Illustrative Example of ARR 16

#	Item	Period	
		X1 ^a	X2
Panel A: Balance Sheet			
[1]	Assets from Pension Institutions (<i>NPL</i>)	1,330	1,550
[2]	Assets from Employer Contribution Reserves (<i>ECR</i>)	1,400	1,300
Panel B: Notes <i>ECR</i>			
[3]	Nominal Value	1,400	1,300
[2]	Assets from Employer Contribution Reserves (<i>ECR</i>)	1,400	1,300
[4]	Accumulation of <i>ECR</i>		0
[5]	Result from <i>ECR</i>	0	100
Panel C: Notes <i>NPL</i> and <i>NPC</i>			
[6]	Pension Plan Surplus	na	6,200
[1]	Assets from Pension Institutions (<i>NPL</i>)	1,330	1,550
[7]	Change in <i>NPL</i>		-220
[8]	Contributions Payable		2,900
[9]	Net Pension Cost (<i>NPC</i>)	2,950	2,680

Note. The TABLE illustrates the accounting and disclosures for a Swiss pension plan in accordance with ARR 16 (2005). The example is based on Dousse et al. (2014, pp. 166-167) and corresponds to the financial situation of the pension plan as depicted in FIGURE 3.7. The example is discussed in more detail throughout paragraph 3.3.9. na indicates *not available*.

^a Information not required to be disclosed by ARR 16 (2005) is indicated by na.

firm pays 2,800 units of these contributions directly and funds the residual by releasing 100 units of *ECR*. Furthermore, the increase in the net pension asset (*NPL*, [7]) correspondingly reduces *NPC* by 220 units. Thus, for Period X2, the firm must recognize 2,680 units of net pension cost (*NPC*, [9]) in profit or loss under personnel expenses (see TABLE 3.6). Finally, total cash-outflow of the reporting firm arising from the pension plan during Period X2 is limited to the 2,800 units of actual contributions transferred to the plan excl. the 100 units released from the *ECR*. Note, this also excludes the employee contributions that must be transferred from the reporting firm to the pension plan.

3.4 Comparative Analysis

In order to illustrate how the accounting for a Swiss pension plan may differ between the application of IAS 19 (2004) and ARR 16 (2005), an example based on real data is discussed next. The example is outlined by Suter (2012, pp. 317-322) and all necessary

information is depicted in TABLE 3.7. Furthermore, it is assumed that there are no effects from past service costs (*PSC*), from curtailments and settlements (*CS*) nor from the application of an asset ceiling. Moreover, it is assumed that the obligations of the Swiss pension plan are valued via the projected unit credit method (*PUCM*). As outlined in sub-section 2.2.4, this is explicitly permitted by ARR 26 (2004, para. 15). Thus, for the purpose of illustration, the valuation of the pension plan in accordance with IAS 19 (2004) and ARR 26 (2004) is assumed to be equal.

As illustrated in TABLE 3.7, at the end of Period X1 (i.e., at 31.12.X1), the defined benefit obligation (*DBO*, item [7]) exceeds the plan assets (*PLA*, [12]) and thus, the funding status (*FS*, [18]) of the pension plan consists of a deficit of 15 units. As noted above, this funding status is equal whether the pension plan is valued in accordance with IAS 19 (2004) or ARR 26 (2004). However, if the reporting firm applies the Corridor-Method for the recognition of actuarial gains and losses (*AGL*, [16]), the recognized net pension liability (*NPL*, [19]) in line with IAS 19 excludes the 21 units of cumulative unrecognized net actuarial losses (*AGLNR*, [17]) as of the balance-sheet date. The *AGLNR* of 17 units as of 01.01.X1 [14] is increased during Period X1 by 6 units of actuarial losses (*AGL*) related to the re-valuation of the *DBO* [6] and decreased by 2 units of actuarial gains related to the re-valuation of the *PLA* [11]. Note, since the cumulative unrecognized net *AGL* at the beginning of the period [14] did not exceed the Corridor [13] of 10% of the maximum of the *DBO* and the *PLA* (i.e., 36 units), there must be no amortization of *AGL* [15] in profit or loss during Period X1. Overall, although the pension plan shows a deficit of 15 units, a reporting firm applying the Corridor-Method of IAS 19 must recognize a net pension asset (i.e., a negative *NPL* [19]) of 6 units as of 31.12.X1. Accordingly, the 5 units of net pension cost (*NPC*, [20]) to be recognized in profit or loss in line with the Corridor-Method consist of the current service cost (*CSC*, [2]), excluding the employee contributions [3], the interest costs (*IC*, [4]), as well as the expected return on the plan assets (*ER*, [9]). In contrast, if the reporting firm applies either the PL- or the OCI-Method in line with IAS 19, the net pension liability (*NPL*, [19]) to be recognized at 31.12.X1 is equal to the funding status (*FS*, [18]) of the pension plan (i.e., 15 units). Moreover, the net pension cost (*NPC*, [20]) to be recognized are 9 and 5 units applying the PL- and the OCI-Method, respectively. As illustrated in paragraph 3.2.6.9, whereas in line with the PL-Method the 4 units of actuarial losses (*AGL*) occurring during Period X1 [16] must be recognized directly in profit or loss, these have to be recognized directly in equity in accordance with the OCI-Method.

TABLE
3.7 Comparative Analysis of IAS 19 and ARR 16

#	Item	Period	
		X1	X2
[1]	Defined Benefit Obligation (<i>DBO</i>) at 01.01.	360	370
[2]	Current Service Cost (<i>CSC</i>)	8	9
[3]	Employee Contributions	5	5
[4]	Interest Cost (<i>IC</i>)	11	10
[5]	Benefits paid	-20	-18
[6]	Actuarial Gain (-) / Loss (+)	6	4
[7]	Defined Benefit Obligation (<i>DBO</i>) at 31.12.	370	380
[8]	Plan Assets (<i>PLA</i>) at 01.01.	345	355
[9]	Expected Return (<i>ER</i>)	14	13
[10]	Employer Contributions	9	10
[3]	Employee Contributions	5	5
[5]	Benefits paid	-20	-18
[11]	Actuarial Gain (+) / Loss (-)	2	-25
[12]	Plan Assets (<i>PLA</i>) at 31.12.	355	340
[13]	Corridor	36	37
[14]	Unrecog. Actuarial Gain (+) / Loss (-) at 01.01.	-17	-21
[15]	Amortization of Actuarial Gain (-) / Loss (+)	0	0
[16]	Actuarial Gain (+) / Loss (-)	-4	-29
[17]	Unrecog. Actuarial Gain (+) / Loss (-) at 31.12.	-21	-50
[18]	Funding Status (<i>FS</i>) at 31.12.	15	40
[17]	Unrecog. Actuarial Gain (+) / Loss (-) at 31.12.	-21	-50
[19]	Net Pension Liability (<i>NPL</i>) at 31.12., Corridor	-6	-10
	- PL	15	40
	- OCI	15	40
[2]	Current Service Cost (<i>CSC</i>)	8	9
[4]	Interest Cost (<i>IC</i>)	11	10
[9]	Expected Return (<i>ER</i>)	-14	-13
[15]	Amortization of Actuarial Gain (-) / Loss (+)	0	0
[20]	Net Pension Cost (<i>NPC</i>), Corridor	5	6
	- PL	9	35
	- OCI	5	6
[21]	Net Pension Liability (<i>NPL</i>) at 31.12., ARR 16	0	20
[10]	Employer Contributions	9	10
[22]	Change in <i>NPL</i>	0	20
[23]	Net Pension Cost (<i>NPC</i>), ARR 16	9	30

Note. The TABLE illustrates the application of IAS 19 (2004) and ARR 16 (2005) based on an example of Suter (2012, pp. 317-322). It is assumed that there are no past service costs (*PSC*), effects from curtailments and settlements (*CS*) as well as from the application of the asset ceiling. Moreover, it is assumed that the obligations of the Swiss pension plan are valued via the PUCM. The example is described in more detail throughout section 3.4.

Compared to the accounting for the pension plan in line with IAS 19 as outlined above, the accounting in line with ARR 16 differs quite considerably. Assuming the pension plan is valued in line with the PUCM, the statutory funding ratio (*FR*) at year-end, as defined in equation (2.1) on page 35, is equal to the value of the plan assets (*PLA*, [12]) divided by the *DBO* [7]. Thus, the funding ratio of 95.95% at 31.12.X1 corresponds to the funding status (*FS*, [18]) of 15 units. However, as discussed in sub-section 3.3.5, in line with ARR 16, an economic obligation arising from a pension plan deficit only needs to be recognized on the balance-sheet of the reporting firm, if the obligation meets the criteria for the recognition of a provision. Whereas the economic obligation is clearly based on a past event (the commencement of contractual employment), a probability greater than 50% as well as a reliable estimation of future cash-outflows must be assessed on the basis of how the representatives of the firm on the governing board of the pension plan act or intend to act. For example, if the board has officially decided on restructuring measures to be taken before the balance-sheet date of the reporting firm, a respective economic obligation must be recognized. Equivalently, the firm's conduct in the past might give rise to a constructive obligation. Nonetheless, in practice, a funding ratio of a Swiss pension plan of about 96% rarely triggers the recognition of an economic obligation in line with ARR 16 (see e.g., Suter, 2012, pp. 321-322). Thence, it is assumed here that there exists neither a legal nor a constructive obligation arising from the plan deficit as of 31.12.X1. Accordingly, as at the prior year-end, the reporting firm must not recognize any net pension liability (*NPL*, [21]) on the balance-sheet. Hence, the net pension cost (*NPC*, [23]) to be recognized in profit or loss, solely consist of the 9 units of employer contributions [10] payable for Period X1.

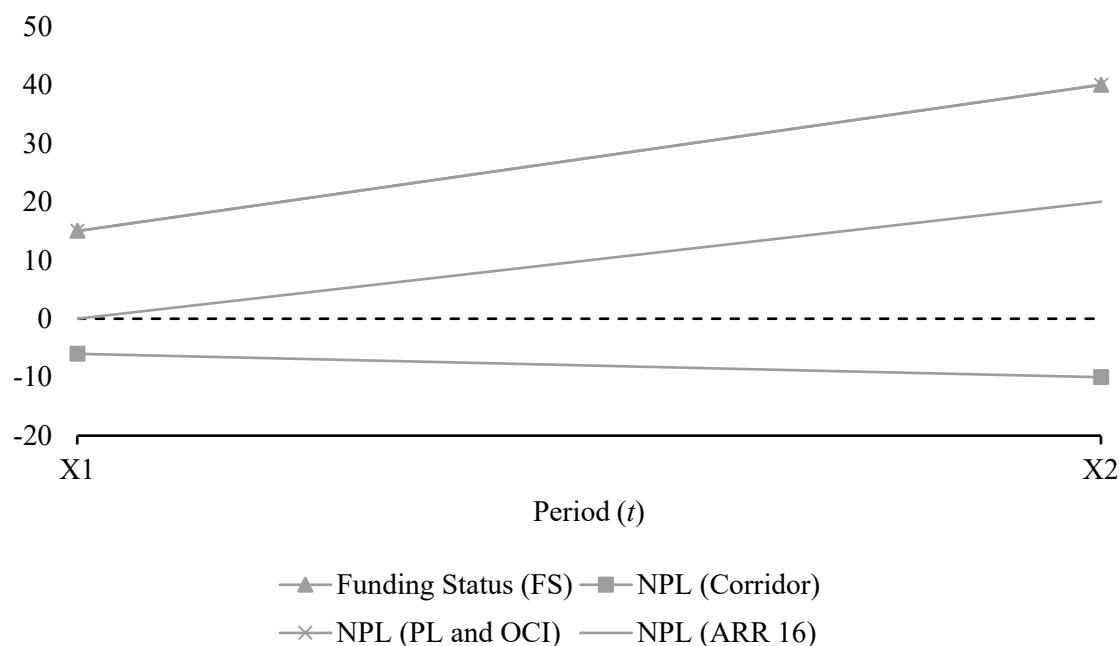
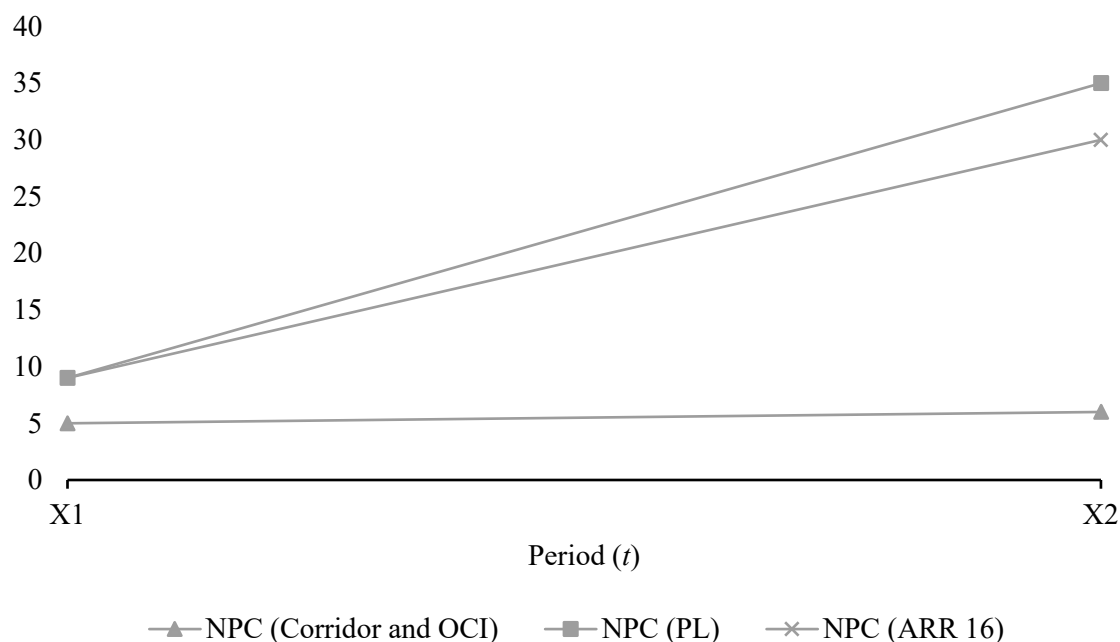
Due to significant actuarial (i.e., investment) losses on the plan assets [11], the funding status (*FS*, [18]) of the pension plan increases to 40 units as of the end of Period X2. This corresponds to a statutory funding ratio (*FR*) of 89.47%. As illustrated in TABLE 3.7, the net pension liability (*NPL*, [19]) recognized in line with the PL- and the OCI-Method is equal to the funding status of 40 units. In contrast, the net pension asset (i.e., negative *NPL*) recognized in accordance with the Corridor-Method even increases to 10 units. This is because no actuarial gains and losses (*AGL*) had to be amortized [15] during Period X2 (Corridor [13] of 37 units). Moreover, the significant increase of cumulative unrecognized net actuarial losses [17] to 50 units as of 31.12.X2 leads to an increase of the recognized net pension asset. As for Period X1, the net pension cost (*NPC*, [20]) to be recognized in profit or loss for Period X2 (i.e., 6 units) are equal whether the Corridor- or the OCI Method is applied. In contrast, *NPC* to be recognized in line with the PL-Method fully incorporates the net actuarial loss [16] of 29 units occurring during

Period X2. Hence, *NPC* [20] of Period X2 in accordance with the PL-Method is 35 units or 483.33% of *NPC* in line with either the Corridor- or the OCI-Method.

Assuming, as of the balance-sheet date, the governing board of the pension plan has decided to claim half of the plan deficit (i.e., 20 units) as restructuring contributions from the employer in order to eliminate the plan deficit over the coming periods, the reporting firm must recognize a *NPL* in line with ARR 16 [21] of 20 units.¹⁸⁸ Furthermore, the change in the *NPL* during Period X2 (from 0 to 20 units) must be recognized directly in profit or loss as part of net pension cost (*NPC*, [23]). Therefore, the net pension cost in line with ARR 16 to be recognized in personnel expenses are 30 units (see TABLE 3.7).

FIGURE 3.8 illustrates the different amounts to be recognized on the balance-sheet and in profit or loss in line with the Corridor-, the PL-, and the OCI-Method of IAS 19 as well as according to ARR 16. Specifically, Panel A and Panel B depict the recognized amounts of the net pension liability (*NPL*, [19] and [21]) as well as of the net pension cost (*NPC*, [20] and [23]) as outlined in TABLE 3.7, respectively. Apparently, the accounting for one and the same Swiss pension plan may differ considerably depending on the specific accounting option applied. Given the assumption that for both IAS 19 and ARR 26 the valuation of the pension plan is based on the projected unit credit method (PUCM), the PL- and the OCI-Method both recognize the funding status (*FS*, [18]) of the pension plan in full on the balance-sheet of the reporting firm. In contrast, in line with ARR 16, the recognition of a plan deficit of a Swiss pension plan is dependent on the actual restructuring measures to be taken by the governing board. Moreover, the reporting firm must only account for its own share of the economic obligation which excludes the obligation arising for employees and/or beneficiaries of the pension plan. Furthermore, Panel A of FIGURE 3.8 also illustrates, as e.g., Suter (2012) notes, one of the most controversial features of IAS 19 (2004). Namely, although the pension plan is clearly underfunded in both periods, the reporting firm must recognize a net pension asset when applying the Corridor-Method. As outlined above, this is due to the deferred and often only partial recognition of actuarial gains and losses (*AGL*). Specifically, if the cumulative unrecognized net actuarial loss exceeds the plan deficit, this leads to the recognition of a negative net pension liability (*NPL*), i.e., an asset.

¹⁸⁸ The other half of the plan deficit is assumed to be eliminated by a decrease of the interest rate on vested benefits as well as a decrease of the conversion rate as discussed in sub-section 2.2.3. Moreover, restructuring contributions are also claimed from employees (see Suter, 2012, p. 321).

FIGURE**3.8 Comparative Analysis of IAS 19 and ARR 16****Panel A: Funding Status (FS) and Net Pension Liability (NPL)****Panel B: Net Pension Cost (NPC)**

Note. Panel A depicts the development of the funding status (*FS*, item [18]) as well as the recognized net pension liability (*NPL*, [20]) for the Corridor-, the OCI- and the PL-Method as well as for ARR 16 [21], respectively, over the two reporting periods of the illustrative example outlined in TABLE 3.7.

Panel B correspondingly depicts the development of the recognized net pension cost (*NPC*, [20, 23]).

Panel B of FIGURE 3.8 correspondingly illustrates how the recognized net pension cost (*NPC*) is strongly dependent on the accounting for actuarial gains and losses (*AGL*). If the recognition of *AGL* is either deferred (Corridor-Method) or done directly in equity (OCI-Method), *NPC* is considerably less volatile than if *AGL* are recognized directly in profit or loss (PL-Method). Moreover, *NPC* recognized in line with ARR 16 is mainly based on the actual employer contributions [10] payable for the period. However, as outlined in sub-section 3.3.5, in line with ARR 16, the recognition of actuarial gains and losses (i.e., changes in the funding status of the pension plan) is also deferred and only partial. Concretely, the reporting firm must only account for its own share of the economic benefit or obligation arising from a plan surplus or deficit excluding the shares attributable to the employees and/or the beneficiaries.¹⁸⁹ As a final note, obviously the different accounting methods and options do not affect the actual cash-flows of the reporting firm that arise from the pension plan. Specifically, the cash-outflows consist of the employee and employer contributions totaling 14 and 15 units for Period X1 and X2, respectively (see item [3] and [10] in TABLE 3.7).

Briefly summarized, the accounting for pension plans is complex (Müller & Wyss, 2015). As e.g., Helbling et al. (2006) note, there is probably no other area of accounting where the subject-matter has such a high degree of idiosyncrasy across different countries and/or institutional settings. Specifically, as illustrated throughout chapter 3, depending on the different accounting standards and options applied, the accounting for Swiss pension plans could have differed quite considerably throughout the sample period of 2004 to 2012. Whereas in accordance with IAS 19 (2004), Swiss pension plans had generally been classified and accounted for as defined benefit rather than defined contribution plans, the rules of ARR 16 (2005) were explicitly *tailored* to the specific institutional and organizational structure of Swiss pension plans, and accounting was based on the financial statements of the pension plans in line with ARR 26 (2004). As illustrated, during the sample period, the only method leading to the immediate and full recognition of actuarial gains and losses (*AGL*) had been the PL-Method in line with IAS 19. In contrast, *AGL* had either been recognized directly in equity (OCI-Method) or deferred and often only partially recognized in profit or loss during later periods in line with the Corridor-Method. Lastly, in line with ARR 16, the recognition of net pension cost (*NPC*) had been mainly based on actual employer contributions. Moreover, for the recognition of economic benefits and obligations arising from any plan surplus or deficit

¹⁸⁹ It is worth noting here, in the literature, the separation of economic benefits and obligations arising from a pension plan between the employer, the employees and/or beneficiaries is also called *risk sharing*. See e.g., Müller (2013) for an in-depth treatment of risk sharing in the context of Swiss pension plans.

the respective shares of employees and/or beneficiaries had to be taken into account as well.

4 Pensions and Accounting Theory

4.1 Concepts of Accounting

As Dichev (2008, p. 454) notes: “Accounting has a long-standing debate about two alternative and competing approaches to doing financial reporting.” First, in general, the *Revenue-Expense Approach* (REA) had been the conceptual foundation of accounting until the mid 1970s. Since, the *Asset-Liability Approach* (ALA) has evolved to become “[...] the dominant world-wide accounting doctrine.” (Dichev, 2008, p. 457).¹⁹⁰ Notably, also the evolution of pension accounting reflects this shift in paradigm (Napier, 2009).

4.1.1 Revenue-Expense Approach

The Revenue-Expense Approach (REA) was dominant during the first half of the twentieth century and, at the time, found two of its most influential proponents in *William Andrew Paton* and *Ananias Charles Littleton* (Dichev, 2008).¹⁹¹ In 1940, the *American Accounting Association* (AAA) published a monograph of the two authors called *An introduction to corporate accounting standards* that, by some, has been viewed as one of the most influential works on accounting ever published (see e.g., Dichev, 2008; Samuelson, 1996; Zeff, 1999).

In the spirit of the REA “[...] the principal concern of accounting is the periodic matching of costs and revenues as a test-reading by which to gauge the effect of the efforts expended.” (Paton & Littleton, 1940, p. 7). In that light,

¹⁹⁰ The expressions *Revenue-Expense* and *Asset-Liability Approach* are used for the purposes of this study. However, oftentimes, these concepts are called differently. For example, Dichev (2008) uses the terms *Income Statement* and *Balance Sheet Approach*, respectively. Others have coined them as *Revenue-Expense* and *Asset-Liability Theory*, respectively (Zülch et al., 2006). Finally, e.g., the US accounting standard-setter FASB as well as the IASB, traditionally, have spoken of these two concepts as *Revenue Expense* and *Asset Liability View*, respectively (Bullen & Crook, 2005). In comparison, within the context of German balance-sheet theories (“Bilanztheorien”), the Revenue-Expense and the Asset-Liability Approach correspond to the *Dynamic Balance-Sheet Theory* (*Dynamische Bilanztheorie*) of Schmalenbach and the *Static Balance-Sheet Theory* (*Statische Bilanztheorie*) of Simon, respectively (Zülch et al., 2006).

¹⁹¹ Apparently, Paton later started to reject the Revenue-Expense Approach and endorsed a view more in line with the Asset-Liability Approach discussed in sub-section 4.1.2 below (Miller & Bahnson, 2010).

“Earning power - not cost price, not replacement price, not sale or liquidation price - is the significant basis of enterprise value. The income-statement, therefore, is the most important accounting report. By means of this statement a section of the continuous flow of cost and revenue is made available as an exhibit of management’s effectiveness in handling the available resources.” (Paton & Littleton, 1940, p. 10)

According to the *realization principle*, revenue is recognized at the end of a sale of goods or services (Zülch et al., 2006). According to Paton and Littleton (1940),

“[...] the sale is the capstone of activity, the end toward which all efforts are directed. [...] the sale brings into the enterprise new assets, usually cash or receivables, to renew the funds absorbed by expiring costs and - if operation produces favorable results - to furnish a basis for payments of income taxes to the government and interest and dividends to investors.” (Paton & Littleton, 1940, pp. 53-54)

“The realization of revenue from sales therefore marks the time and measures the amount of [...] the] recapture of costs previously advanced in productive efforts [...]” (Paton & Littleton, 1940, p. 14). Subsequently, costs are charged against the realized revenues in order to estimate income (*matching principle*). In the words of Dichev (2008, p. 455): “The goal of accounting is to record accruals, which properly record the timing of economic achievements (revenue) and the alignment of associated expenses (matching).”. According to the REA, assets on the balance-sheet are considered as “[...] ‘revenue charges in suspense’ [...]” (Paton & Littleton, 1940, p. 25). Thus, assets are interpreted as “[...] unamortized costs [...]” (Paton & Littleton, 1940, p. 11) awaiting the matching with revenues (Zülch et al., 2006). Furthermore, “[...] until] revenue has been generated by the effort expended, costs merely accumulate.” (Paton & Littleton, 1940, p. 32). So, “[...] cost is initially an acquisition price and only finally a deduction from revenue.” (Paton & Littleton, 1940, p. 66). Therefore, in line with the REA, the balance-sheet is seen as “[...] a connecting link joining successive income-statements into a composite picture of the income stream.” (Paton & Littleton, 1940, p. 67). Specifically, it carries forward “[...] unamortized acquisition prices, the not-yet-deducted costs;” (Paton & Littleton, 1940, p. 67). Thus, assets are accruals of “[...] price-aggregates [...]” (Paton & Littleton, 1940, p. 12) that reflect “[...] service-potentialities [...]” (Paton & Littleton, 1940, p. 13) and hence, these aggregates are to be measured at historical cost (Zülch et al., 2006).

4.1.2 Asset-Liability Approach

In the late 1970s, the US accounting standard-setter FASB adopted the view that the Asset-Liability Approach (ALA) “[...] is the only logical and conceptually sound basis of accounting [...]” (Dichev, 2008, p. 456). Two early proponents of the ALA were *Robert Thomas Sprouse* and *Maurice Moonitz*. In 1962, they wrote a research study for the *American Institute of Certified Public Accountants* (AICPA) called *A Tentative Set of Broad Accounting Principles for Business Enterprises* which “[...] became the springboard for a quest for the development and use of fundamental concepts in analyzing and resolving financial accounting and reporting issues.” (Swieringa, 2011, p. 218).

In the spirit of the ALA, the relevant performance measure for a period is the change in net assets of an entity (Zülch et al., 2006). In the words of Sprouse and Moonitz (1962),

“Profit is a function of an increase in the net resources of the business entity. The measurement of the components of profit (revenue, expense, gain, and loss) must accordingly rest on measurements in the area of assets and liabilities.” (Sprouse & Moonitz, 1962, p. 11).

According to Sprouse and Moonitz (1962), assets are “[...] scarce resources [...] assignable to specific entities [...] capable of exchange [...] and expressible in terms of money.” (Sprouse & Moonitz, 1962, p. 19). Accordingly, those scarce resources convey “[...] expected future economic benefits [...] as a result of some current or past transaction.” (Sprouse & Moonitz, 1962, p. 8). Thence, it is those future economic benefits that have to be measured in order to value the asset. Events following the acquisition of the asset may lead to changes in this valuation (Sprouse & Moonitz, 1962). Hence, “[...] current market prices [...]” (Sprouse & Moonitz, 1962, p. 26), rather than historical costs, accurately measure the benefits. “Market price is [...] independent of the plans or expectations of the individual entity [and thus] represents a neutral, objective evaluation [...]” (Sprouse & Moonitz, 1962, pp. 26-27). “Since people act in the present and the future, and not in the past, current market price is preferable to past, all other things being equal.” (Sprouse & Moonitz, 1962, p. 27). Analogous to assets, liabilities are defined as “[...] obligations to convey assets or perform services, obligations resulting from past or current transactions and requiring settlement in the future.” (Sprouse & Moonitz, 1962, p. 8). Consequently, the measurement of a liability is the determination of “[...] the ‘weight’ or the ‘burden’ of the obligation on the balance-sheet date.” (Sprouse & Moonitz, 1962, p. 39).

Proponents of the Asset-Liability Approach (ALA) often argue that their accounting concept is founded on the economic theory on *value and capital* of Hicks (1939). Specifically, the argument is based on Hicks' definition of income (Dichev, 2008). Accordingly, the *central meaning* of income is defined as follows,

“The purpose of income calculations in practical affairs is to give people an indication of the amount which they can consume without impoverishing themselves. Following out this idea, it would seem that we ought to define a man's income as the maximum value which he can consume during a week, and still expect to be as well off at the end of the week as he was at the beginning. [...]” (Hicks, 1939, p. 172)

As outlined by e.g., Solomons (1961), in order to transfer the definition of *Hicksian income*, as outlined above, from the level of an individual to the level of a firm, it requires only slight modification. Accordingly,

“[...] the income of the business [...] is the amount by which its net worth has increased during the period, due allowance being made for any new capital contributed by its owners or for any distributions made by the business to its owners. This form of words would also serve to define accounting income, insofar as net accounting income is the figure which links the net worth of the business as shown by its balance-sheet at the beginning of the accounting period with its net worth as shown by its balance-sheet at the end of the period.” (Solomons, 1961, p. 376)

4.1.3 Comparative Summary

As outlined in sub-section 4.1.1, in line with the Revenue-Expense Approach (REA), firm value is “[...] arising from the firm's ability to generate a stream of earnings, and therefore financial reporting's goal should be the correct determination of earnings.” (Dichev, 2008, p. 455). In contrast, as described in sub-section 4.1.2, according to the Asset-Liability Approach (ALA), firm value is equal to the net potential of economic benefits and thus, the primary goal of accounting is the accurate determination of the change in this net potential during a period (Zülch et al., 2006). Thence, whereas in line with the REA, the main purpose of financial reporting is the determination of periodic income as the result of the realization of revenue and the respective matching of expense, the main goal according to the ALA is the estimation of the change in net assets as result

of the change in the valuation of the difference between assets and liabilities from the beginning to the end of an accounting period (Zülch et al., 2006). Put more plainly, in line with the REA, the recognition of assets and liabilities is mainly derivative on the realization of revenues and the corresponding matching of expenses. In contrast, according to the ALA, the recognition of revenues, expenses, gains and losses is based on the recognition and measurement of assets and liabilities (Dichev, 2008). In the words of Johnson (2004),

“[...] the former alternative [i.e., REA] would accord conceptual primacy to the definitions of revenues and expenses and base the definitions of assets and liabilities on those definitions. The latter alternative [i.e., ALA] would do the converse.” (Johnson, 2004, p. 1)

According to the REA, the balance-sheet is seen as a sort of *power house* (*Kräftepeicher*) where assets and liabilities, valued at historical cost, await the process of revenue realization and matching of expenses in subsequent periods recognized on the income-statement. In contrast, in line with the ALA, the balance-sheet depicts the net assets as residual value of all recognized assets and liabilities, valued at current market prices (i.e., *fair values*). Correspondingly, the income-statement illustrates the revenues, expenses, gains and losses as the result of the periodic re-valuation of the assets and liabilities recognized on the balance-sheet (Zülch et al., 2006). Nevertheless, it is important to note that the conceptual contrast between the REA and the ALA is based on the different views on income manifestation rather than on which of the two, the balance-sheet or the income-statement, is emphasized over the other (Johnson, 2004). After all, both statements are inherently linked to each other. As e.g., Solomons (1995, p. 44) puts it: “There cannot be a conflict between the two any more than there can be a conflict between the two sides of an equation [...]”.

As a final comment, it is noteworthy here that also senior staff of the FASB as well as of the IASB have expressed their personal views on the two opposing accounting concepts of REA and ALA. These are in line with the above-outlined descriptions. For example, in a joint communication, *FASB Senior Project Manager Halsey G. Bullen* and *IASB Senior Project Manager Kimberley Crook* have described the ALA as an accounting concept,

“[...] in which income is a measure of the increase in the net resources of the enterprise during a period, defined primarily in terms of increases in assets and decreases in liabilities.” (Bullen & Crook, 2005, p. 7)

They further note,

“That definition of income is grounded in a theory prevalent in economics: that an entity’s income can be objectively determined from the change in its wealth plus what it consumed during a period (Hicks, pp. 178-179, 1946).. That view is carried out in definitions of liabilities, equity, and income that are based on the definition of assets, that is, that give “conceptual primacy” to assets. That view is contrasted with a “revenue and expense view,” in which income is the difference between outputs from and inputs to the enterprise’s earning activities during a period, defined primarily in terms of revenues (appropriately recognized) and expenses (either appropriately matched to them or systematically and rationally allocated to reporting periods in a way that avoids distortion of income.) [incl. typographical errors]” (Bullen & Crook, 2005, p. 7)¹⁹²

4.2 Paradigm Shift in Standard-Setting

In the US, the *Securities and Exchange Commission* (SEC) was created in the aftermath of the great stock market crash in 1929 (Davidson & Anderson, 1987). The SEC was given the authority “[...] to prescribe accounting standards if it chose to do so.” (Davidson & Anderson, 1987, p. 114). However, the commission decided to leave standard setting to the private sector. Hence, the *American Institute of Accountants* (AIA), later renamed *American Institute of Certified Public Accountants* (AICPA), formed the *Committee on Accounting Procedure* (CAP). The committee released so called *Accounting Research Bulletins* (ARB) dealing with specific accounting issues prevalent at the time. Notably, early on, the CAP decided “[...] that it wouldn’t seek to develop a comprehensive statement of accounting principles or a conceptual framework.” (Davidson & Anderson, 1987, p. 115). In general, throughout the existence of the CAP from 1938

¹⁹² See e.g., Bromwich, Macve, and Sunder (2010) for a discussion on why the FASB and the IASB might have been misguided in grounding their asset liability view to financial reporting on the income concept of Hicks (1939).

to 1959, accounting practice was mainly based on historical cost accounting in line with the Revenue-Expense Approach (REA) outlined in sub-section 4.1.1 (Zeff, 2003).¹⁹³

In 1959, the CAP was succeeded by the *Accounting Principles Board* (APB), also formed by the AICPA. Further, the institute also formed a research division with the aim that newly issued authoritative statements of the APB should be based on research studies first conducted by the research division. Nonetheless, during its existence between 1959 and 1973, the APB “[...] wasn’t very different from its predecessor, the CAP.” (Davidson & Anderson, 1987, p. 117). Moreover, the research division “[...] was used primarily to provide background material for the topic-by-topic firefighting activities of the board.” (Davidson & Anderson, 1987, p. 117). Notably, the third study completed by the research division was the *Accounting Research Study* (ARS) no. 3 *A Tentative Set of Broad Accounting Principles for Business Enterprises* by Sprouse and Moonitz (1962) which, as outlined in sub-section 4.1.2, laid the foundations for the Asset-Liability Approach (ALA). The conclusions of Sprouse and Moonitz (1962) “[...] raised a storm.” (Davidson & Anderson, 1987, p. 117) and the board “[...] paid little, if any, attention to ARS no. 3 in any of its later deliberations.” (Davidson & Anderson, 1987, p. 117). Nevertheless, in October 1970, three years before its dissolution, the APB published the Statement no. 4 *Basic Concepts and Accounting Principles Underlying Financial Statements of Business Enterprises* which can be seen as the board’s attempt to develop its own comprehensive conceptual framework of financial reporting. However, “[...] the result was almost entirely a description of present practice rather than a conceptual framework.” (Davidson & Anderson, 1987, p. 123). Notably, the research study of Sprouse and Moonitz (1962) was among the sources the framework was based upon (APB Statement 4, 1970, para. 1). Specifically, according to APB Statement 4 (1970, para. 132), assets and liabilities were defined as follows:

“*Assets* - economic resources of an enterprise that are recognized and measured in conformity with generally accepted accounting principles. Assets also include certain deferred charges that are not resources²⁶ but that are recognized and measured in conformity with generally accepted accounting principles [... *italic in original, footnote omitted*]

¹⁹³ Notably, William A. Paton himself served as a member of the CAP for eleven years (Zeff, 2003).

“*Liabilities* - economic obligations of an enterprise that are recognized and measured in conformity with generally accepted accounting principles. Liabilities also include certain deferred credits that are not obligations²⁸ but that are recognized and measured in conformity with generally accepted accounting principles [... *italic* in original, footnote omitted]”

It must be noted, the APB’s definitions of assets and liabilities above are circular (Johnson, 2004). As Johnson (2004) notes,

“Defining assets (liabilities) as anything that GAAP treats as assets (liabilities) confuses the *accounting representations* on the balance-sheet with the *economic phenomena that are to be represented*. [*italic* in original]” (Johnson, 2004, p. 3)

In spite of the vague definitions of what exactly constitute assets and liabilities to be recognized on the balance-sheet, in APB Statement 4 (1970, para. 134) the board defined revenue and expense as follows,

“*Revenue* - gross increases in assets or gross decreases in liabilities recognized and measured in conformity with generally accepted accounting principles that result from those types of profit-directed activities³³ of an enterprise that can change owners' equity [... *italic* in original, footnote omitted]”

“*Expenses* - gross decreases in assets or gross increases in liabilities recognized and measured in conformity with generally accepted accounting principles that result from those types of profit-directed activities of an enterprise that can change owners' equity [... *italic* in original]”

Apparently, the APB definitions of revenue and expense were, conceptually, already in line with Asset-Liability Approach (ALA) outlined in sub-section 4.1.2. In particular, it was acknowledged that it is the changes in assets and liabilities that forms the bases for the recognition of revenues and expenses and that activities should be accounted for that have an impact on the reporting entity’s net assets.

In 1973, the FASB superseded the APB as US accounting standard-setting body. Shortly after, the board started an extensive project in order to develop a conceptual framework for financial reporting as well as standard-setting (Dichev, 2008). In the words of Davidson and Anderson (1987): “[...] the FASB began [...] to search for the

Holy Grail of accounting concepts.” Notably, the board asked interested parties to submit definitions of revenue, expense and/or income without referring to economic resources and obligations (i.e., assets and liabilities) and/or “[...] highly subjective terminology like *proper matching*. [*italic in original*]” (Bullen & Crook, 2005, p. 7). None of the respondents was able to meet the challenge. As a consequence, the FASB adopted, what it calls, the *asset and liability view* to financial accounting (see e.g., Bullen & Crook, 2005; Johnson, 2004). In December 1980, the FASB issued its *Concepts Statement No. 3 Elements of Financial Statements of Business Enterprises* (CON3) including the following definitions of assets, liabilities, revenues and expenses:

“Assets are probable⁹ future economic benefits obtained or controlled by a particular entity as a result of past transactions or events. [footnote omitted]” (CON3, 1980, para. 19)

“Liabilities are probable¹³ future sacrifices of economic benefits arising from present obligations¹⁴ of a particular entity to transfer assets or provide services to other entities in the future as a result of past transactions or events. [footnotes omitted]” (CON3, 1980, para. 28)

“Revenues are inflows or other enhancements of assets of an entity or settlements of its liabilities (or a combination of both) during a period from delivering or producing goods, rendering services, or other activities that constitute the entity's ongoing major or central operations.” (CON3, 1980, para. 63)

“Expenses are outflows or other using up of assets or incurrences of liabilities (or a combination of both) during a period from delivering or producing goods,³² rendering services, or carrying out other activities that constitute the entity's ongoing major or central operations. [footnote omitted]” (CON3, 1980, para. 65)

The definitions above are practically equivalent to the definitions given by the FASB in its Concepts Statement No. 6 *Elements of Financial Statements* which replaced CON3 in 1985 and is in force at the time of this writing.¹⁹⁴

Apart from the FASB, accounting standard-setters in Australia, Canada, New Zealand and the UK have all adopted the Asset-Liability Approach (ALA) as the conceptual basis for their standard-setting. Importantly, this is also the case with respect to the IASB (Johnson, 2004).¹⁹⁵ In its *Conceptual Framework for Financial Reporting* issued in September 2010, the IASB provides the following definitions for assets, liabilities, income (i.e., revenue) and expenses:¹⁹⁶

“An asset is a resource controlled by the entity as a result of past events and from which future economic benefits are expected to flow to the entity.” (IASB Conceptual Framework, 2010, para. 4.4 lit. a)

“A liability is a present obligation of the entity arising from past events, the settlement of which is expected to result in an outflow from the entity of resources embodying economic benefits.” (IASB Conceptual Framework, 2010, para. 4.4 lit. b)

“Income is increases in economic benefits during the accounting period in the form of inflows or enhancements of assets or decreases of liabilities that result in increases in equity, other than those relating to contributions from equity participants.” (IASB Conceptual Framework, 2010, para. 4.25 lit. a)

“Expenses are decreases in economic benefits during the accounting period in the form of outflows or depletions of assets or incurrences of liabilities that

¹⁹⁴ See CON6 (1985, para. 25, 35, 78 and 80). Notably, the FASB is currently undertaking a project to develop an improved conceptual framework that builds on the existing concept statements. Originally, the project was commenced as a joint project of the FASB and the IASB in October 2004. However, in 2010, the joint project was suspended and the FASB continued research on the project without the IASB as of 2014. See e.g., FASB (2017) for more details.

¹⁹⁵ Notably, this view has also been shared by senior staff of the FASB and the IASB (Bullen & Crook, 2005).

¹⁹⁶ All definitions are practically equivalent to the definitions of the preceding standard, the *Framework for the Preparation and Presentation of Financial Statements* which, originally, was issued by the IASC in 1989. See IASC Framework (1989, para. 49 lit. a and b and para. 70 lit. a and b). Note, the IASB is expected to issue an updated version of its conceptual framework at the end of 2017. See e.g., IASB (2017b) for more details.

result in decreases in equity, other than those relating to distributions to equity participants.” (IASB Conceptual Framework, 2010, para. 4.25 lit. b)

Notably, the definitions of assets, liabilities, revenues and expenses given by the IASB are all in line with the definitions provided by the FASB.

Finally, also the Swiss standard-setter, the Commission of Swiss GAAP FER, has issued respective definitions of assets, liabilities, income (i.e., revenue) and expenses in its *Framework*.¹⁹⁷ The definitions are as follows,

“Assets originate from past transactions or events. They are tangible or intangible goods, controlled by the organisation and of which the organisation is likely to benefit for more than one period. The value of such goods must be determined reliably. If no sufficiently reliable estimate is possible, then the good is a contingent asset.” (ARR Framework, 2014, para. 15)

“Liabilities originate from past transactions or events if a future cash outflow is probable (e.g., through the acquisition of goods and services, through liabilities from guarantees or from liability claims arising from rendered services). The amount needed to settle the liability must be determined or estimated reliably. If this is not possible, then there is a contingent liability.” (ARR Framework, 2014, para. 17)

“Income is the inflow of benefits in the reporting period through an increase of assets and/or decrease of liabilities that increases shareholders’ equity without receiving an investment from the shareholders.” (ARR Framework, 2014, para. 21)

“Expenses are the outflow of benefits in the reporting period through a decrease of assets and/or increase of liabilities that decreases shareholders’ equity without making a distribution to the shareholders.” (ARR Framework, 2014, para. 22)

¹⁹⁷ The first version of the framework was applicable for financial years beginning on or after January 1, 2006 (see e.g., Meyer, 2007). The definitions here are based on the version revised in 2014 and applicable for financial years beginning on or after January 1, 2016.

Overall, also the definitions provided by the Commission of Swiss GAAP FER are in line with the definitions of the FASB as well as the IASB. Moreover, the Commission implicitly specifies its adoption of the Asset-Liability Approach (ALA) via the following stipulation in its framework:

“Income and expenses are only recognised if the related changes in assets and/or liabilities may be reliably determined.” (ARR Framework, 2014, para. 23)

4.3 Evolution of Pension Accounting

In developed countries, corporate pension schemes started to appear towards the end of the nineteenth century but reached widespread coverage only during the second half of the twentieth century (Blake, 2006). This is in line with the evolution of occupational pension schemes in Switzerland (Leimgruber, 2008). Notably, certain types of so called *relief schemes* (*Hilfskassen*) had been installed by leading corporations of the metal and machine making industry for their workforce as early as 1830. These schemes usually covered risks such as disability, poverty, income shortages during military service as well as the risk of old-age (see e.g., Leimgruber, 2008, Table 1.1 on page 51). Nevertheless, also in Switzerland, occupational pension schemes had not been widely spread before the second half of the twentieth century. Specifically, the share of the non-farm workforce covered by (private and public) occupational pension schemes had increased from 8.20% in 1903 to 47.70% in 1955 and to 80.00% in 2004 (see e.g., Leimgruber, 2008, Table A.2 on page 295).¹⁹⁸

Different reasons have been put forward as to why firms provide pension schemes to their employees. For example, during the early days, corporate pensions could be viewed as *altruism* on behalf of the employer towards her workers (Blake, 2006). This view is closely related to, what some call, the *gratuity theory*.¹⁹⁹ Accordingly, pensions are viewed as a reward for loyal service, granted and paid by the employer to the employees usually at the end of a working life (Napier, 2009). However, it is important to note, normally, such *gifts* were within the discretion of the employers. For example, this

¹⁹⁸ Note, the coverage ratio of 80.00% provided by Leimgruber (2008) for 2004 is well in line with the estimated coverage ratio of 76.94% depicted in Panel A of TABLE 2.2 (see page 11).

¹⁹⁹ See e.g., Klumpes (2001) and Napier (2009) incl. respective references made by these authors. Notably, the gratuity theory has historically also played a major role for public state pensions in the US (see e.g., Monahan, 2010).

view is also supported by plan descriptions of early pension schemes in the US (Stone, 1984). Also, for occupational pension schemes in Switzerland that existed throughout the nineteenth century and until the start of World War I, e.g., Leimgruber (2008) notes,

“[...] workers’ rights to benefits depended on employers’ goodwill and could be terminated without further notice or denied to striking or dismissed employees. Considered as corporate gratuities, occupational benefits were reserved for those handpicked by management and, apart from packages offered to high-ranking employees, seldom went beyond “alleviating deprivation”.” (Leimgruber, 2008)

During these early days, employers usually accounted for pensions by recognizing cost equal to the cash-payments made during the respective period (Napier, 2009).²⁰⁰ For example, Stone (1984) investigates pre-1930 annual reports of a sample of US firms that had installed pension plans before 1922. She finds that companies usually applied different variations of *reserve accounting* where employer contributions were booked to a special equity reserve and either recognized as operating expense or directly reclassified from surplus (i.e., retained earnings). If the firm established a fund in order to invest contributions into securities and pay pensions from this fund’s earnings, it was usually recognized as asset on the balance-sheet. Moreover, additional payments necessary if fund earnings fell short of pension payments were commonly expensed as operating costs. However, at the time, pension reserves could be reclassified to surplus at the discretion of the employer in order to e.g., smooth corporate losses. Overall, in general, pension cost were not estimated via actuarial methods (Stone, 1984).

Early on in the twentieth century, some started to view corporate pensions as a form of *deferred payment* rather than mere gratuities (Napier, 2009). For example, DeRoode (1913) notes:

“In thus viewing pensions as part of real wages, I do not wish to overlook the humanitarian motives of the employers in establishing these pension systems. On the other hand, a temperamental treatment of the wage question leads to unsound conclusions. The establishment of pension funds by large employers of laborers proceeds, I believe, not so much from any humanitarian motive (except in so far as that is induced by public opinion) as from a recognition

²⁰⁰ Note, conceptually, this is similar to the accounting for defined contribution plans in line with IAS 19 (2004) outlined in sub-section 3.2.5.

that the establishment of pension funds is profitable in attracting a more desirable class of employees, leading to permanency of service, and therefore increasing the collective efficiency of the employees.” (DeRoode, 1913, p. 287)

The notion of deferred payment has led to a labor economics perspective on pensions (Klumpes, 2001). Accordingly, pension arrangements are structured in order to achieve efficiency in the long-term relationship between an employer and her employees (see e.g., Lazear, 1979). For example, the employer wants to attract high quality workers and reduce cost by minimizing turnover rates. Further, the employer wants to minimize agency costs by encouraging workers to act in the best interest of the employer. Also, workers need to be retained long enough in order to amortize investment costs in firm-specific human capital (i.e., on-the-job training etc.). Finally, superannuated employees need to be encouraged to retire without risking reputational damage to the firm (see e.g., Blake, 2006). Overtime, the deferred payment view on pensions has also shifted the approach taken to pension accounting from merely matching pension cost with accrued benefits (i.e., revenues), as in the case of wages, to the need to actuarially fund pension obligations for employee service rendered (Klumpes, 2001).

Early authoritative pension accounting statements were oriented towards the recognition (i.e., matching) of pension cost rather than the accounting treatment of pension assets and liabilities. If externally funded, pension costs were usually equal to the cash-payments contributed to the pension fund. Nonetheless, these contributions, oftentimes, were already estimated based on actuarial funding methods (Napier, 2009).

4.3.1 ARB 36 and ARB 47

In the US, the first official statement dealing with the accounting treatment of pension plans was *Accounting Research Bulletin* (ARB) Number (No.) 36, *Pension Plans - Accounting for Annuity Costs Based on Past Services*, (ARB 36) issued by the above-mentioned Committee on Accounting Procedure (CAP) in November 1948 (Kvifte, 2003). Notably, as outlined in section 4.1, the Revenue-Expense Approach (REA) was predominant at the time. The bulletin consisted of only three pages and neither the word *asset* nor *liability* appears anywhere throughout the text (see ARB 36, 1948). In contrast, it was the CAP’s intent to deal with the issue of *past service cost* arising from services rendered prior to the adoption of a pension plan and whether such costs “[...] are applicable to the past or to the present and future periods and, accordingly, whether they should be charged to income.” (ARB 36, 1948, para. 1). At the time, past service cost

had often been accounted for in *surplus* (i.e., equity) rather than profit or loss (ARB 36, 1948, para. 3). However, the CAP now expressed the view that past service cost shall be allocated to current and future periods of service and accounted for in income rather than equity (ARB 36, 1948, para. 5).

In September 1956, the CAP published its seven pages long ARB No. 47, *Accounting for Costs of Pension Plans*. Apparently, the growing diversity in corporate pension plans provided throughout the US at the time had led to “[...] substantial differences in accounting for pension costs.” (ARB 47, 1956, para. 1). The committee deemed the following method as “[...] most likely to effect a reasonable matching of costs and revenues, [...]” (ARB 47, 1956, para. 7):

“[...] costs based on current and future services should be systematically accrued during the expected period of active service of the covered employees, generally upon the basis of actuarial calculations. [...] These calculations, although made primarily for funding purposes, may be used also for accounting purposes. [...]” (ARB 47, 1956, para. 5)

Notably, the CAP acknowledged the fact that the above-described method may lead to the recognition of pension costs “[...] differing materially from the payments made under the plan [and/or] varying widely from [the employer’s] legal liabilities.” (ARB 47, 1956, para. 6). Furthermore, the committee acknowledged the debate already ongoing at the time about how to best account for pension costs and concluded:

“[...] for the present, the committee believes that, as a minimum, the accounts and financial statements should reflect accruals which equal the present worth, actuarially calculated, of pension commitments to employees to the extent that pension rights have vested in the employees, reduced, in the case of the balance-sheet, by any accumulated trusteed funds or annuity contracts purchased.” (ARB 47, 1956, para. 7)

Apart from semantics, the approach outlined above, at least conceptually, is very much in line with the accounting treatment of defined benefit plans stipulated by IAS 19 (2004) discussed in sub-section 3.2.6. Overall, it is the view of the author that ARB 47 (1956), at least in spirit, can be seen as a first official step towards a balance-sheet approach of pension accounting where pension income and cost is mainly derivative on the recognition and measurement of pension assets and liabilities, i.e., in line with the

Asset-Liability Approach (ALA). Nevertheless, at the time, firms usually accounted for pension costs essentially equal to the cash-payments made for funding purposes (see e.g., APB 8, 1966, para. 6; see below; Napier, 2009).

4.3.2 APB 8

In November 1966, the then operative Accounting Principles Board (APB; see sub-section 4.2) issued its *Opinion No. 8, Accounting for the Cost of Pension Plans*, (APB 8), a comprehensive document of 39 pages, mainly based on the previously conducted Accounting Research Study No. 8, *Accounting for the Cost of Pension Plans* (APB 8, 1966, para. 5). APB 8 is mainly cost-based (Napier, 2009). Specifically, “[...] pension cost should be based on an accounting method that uses an acceptable actuarial cost method [...]” (APB 8, 1966, para. 17). However, the rule also stipulates the recognition of additional costs for any existing over- or underfunding of a pension plan (APB 8, 1966, para. 17 lit. a and b and 44). Moreover, differences between the recognized pension cost and actual payments must be recognized as prepaid or accrued pension costs (i.e., as assets or liabilities) on the balance-sheet (APB 8, 1966, para. 18). Overall, APB 8 mainly evolved around the recognition and measurement of normal (i.e., current service) and past service cost with a clear preference for cost-spreading across subsequent accounting periods (Napier, 2009). Furthermore, in the Opinion different actuarial cost methods incl. *projected benefit cost methods*, related to the PUCM outlined in paragraph 3.2.6.1, are discussed at length. The board concludes that, to be acceptable for accounting purposes, “[...] an actuarial cost method should be rational and systematic [...]” (APB 8, 1966, para. 23). The board also discusses the nature and accounting treatment of actuarial gains and losses (*AGL*). In general, the spreading of *AGL* across a period of 10 to 20 years is deemed reasonable (APB 8, 1966, para. 30). Noteworthy is also the introduced distinction for the accounting treatment of defined contribution (DC) and defined benefit (DB) pension plans. As outlined in sub-section 3.2.4, this has been particularly controversial in the case of Swiss pension plans.²⁰¹ In the view of the APB, DC pension plans are plans where contributions are based on the plan formula and benefits paid are determined by the amount accrued by the contributions. Accordingly, pension cost to be recognized is equal to the periodic contributions paid (APB 8, 1966, para. 38). In contrast, for DB plans, pension cost must be determined actuarially and recognized in line with all other stipulations of the Opinion (APB 8, 1966, para. 39).

²⁰¹ The controversy regarding the accounting for Swiss pension plans is also discussed in more detail in sub-section 5.1.1 further below.

4.3.3 SFAS 87

As outlined above, pension accounting between the 1940s and 1970s was mainly cost-based and in line with the main purpose of financial reporting at the time, the determination of realized revenues and the proper timing (i.e., matching) of related costs (Napier, 2009). Dewhirst (1971) was one of the first to express the view that pension costs recognized by the firm should not solely be based on the (actuarially determined) cash-payments made to the pension plan (Napier, 2009). Moreover, the pension accounting approach proposed by Dewhirst (1971) strongly resembles the accounting treatment of defined benefit pension plans stipulated by IAS 19 (2004) and outlined in sub-section 3.2.6. Specifically, Dewhirst (1971) argues in line with the deferred payment view of pensions and advocates considering pensions as an *exchange* between the employer and the employee. Hence,

“Pension benefits, like wages, represent bargained consideration exchanged for employee labor-services. Unlike wages, however, pension benefits are not paid until long after related employee labor-services are received by a company. In order to match pension expense with revenues properly over the intervening years, therefore, each period's revenues should bear associated pension expense in the ratio of employee labor service received in the current period to total work-life labor-services expected to be received from the existing work-force.” (Dewhirst, 1971, p. 366)

Notably, the matching of revenues and expenses is still at the core of Dewhirst (1971)'s approach. However, the determination of pension cost is entirely derivative on the (actuarially) determined pension liability.²⁰² Concretely,

“The increment in the pension liability is the "offset" to the accrual of pension expense in a given period, and it represents the unpaid cost of employee labor-services exchanged for pension benefits.” (Dewhirst, 1971, p. 367)

Notably, Dewhirst (1971) also advocates the recognition of investment returns on the pension plan assets in profit or loss of the firm. He argues as follows,

²⁰² Notably, Dewhirst (1971) also refers to the definition of liabilities given by Sprouse and Moonitz (1962) outlined in sub-section 4.1.2 (see Dewhirst, 1971, p. 367).

“The earnings achieved by the pension fund trustee accrue to the benefit of shareholders in the sense that a high earning fund improves earnings per share. This results from the fact that less cash has to be transferred to the trustee over time to satisfy the pension obligation, and more cash can be retained for use in the generally more profitable investment opportunities in the business itself.” (Dewhirst, 1971, p. 370)

Accordingly, it was proposed by Dewhirst (1971) to recognize the *market value* of pension assets on the balance-sheet and to recognize the respective earnings (i.e., dividend and interest income and capital gains) in the income-statement. Furthermore, Dewhirst (1971) also argued for the capital cost of the reporting firm as adequate discount rate in estimating the pension liability. In his words “[...] cost of capital represents the weighted average expected cost of all components of company financing.” (Dewhirst, 1971, p. 368).²⁰³ Further, “[...] cost of capital [...] represents the opportunity cost of funds frozen in pension fund investments [...]” (Dewhirst, 1971, p. 368). As a result, the difference between these interest costs on the pension liability and the earnings recognized on the pension assets would indicate “[...] the cost of investing company funds in traditionally low-earning assets such as pension funds.” (Dewhirst, 1971, p. 368).²⁰⁴

Finally, for funded plans, Dewhirst (1971) also advocates the gross recognition (i.e., non-netting) of pension plan assets and pension liabilities on the balance-sheet. Moreover, he argues,

“The fact that the pension fund in the hands of a trustee is generally not "legally" owned by the depositing company should not deter accountants from reporting the fund in the financial statements.” (Dewhirst, 1971, p. 369)

Apparently, Dewhirst (1971) would have supported the full recognition of Swiss pension plans in the reporting entity’s financial statements.

²⁰³ This corresponds to the *Weighted Average Cost of Capital* (WACC) discount rate which is widely used in many corporate finance applications. See e.g., Volkart, Lautenschlager, and Soldenhoff (2011) for more details.

²⁰⁴ As outlined in paragraph 3.2.6.1, IAS 19 (2004) stipulates the use of high quality corporate bond yields or, alternatively, yields of government bonds. This corresponds to the underlying idea that, theoretically, the firm could buy a portfolio of (corporate or government) bonds with a term and payment structure exactly matching the pension plan’s benefit payments.

In December 1985, the FASB issued its *Statement of Financial Accounting Standards* No. 87 (SFAS 87), *Employers' Accounting for Pensions*, generally applicable for financial years beginning on or after December 15, 1986 (SFAS 87, 1985, para. 76).²⁰⁵ This marked the shift of focus in authoritative pension accounting pronouncements from pension costs to pension liabilities (Napier, 2009). After all, one of the official main objectives for issuing SFAS 87 (1985) was to “[...] improve reporting of financial position.” (SFAS 87, 1985, para. 6 lit. d). Notably, SFAS 87 (1985) was based on the *exchange view* (i.e., deferred payment view) of pensions as e.g., advocated by Dewhirst (1971). Thence,

“The Board's conclusions in this Statement [i.e., SFAS 87] derive from the basic idea that a defined benefit pension is an exchange between the employer and the employee. In exchange for services provided by the employee, the employer promises to provide, in addition to current wages and other benefits, an amount of retirement income. It follows from that basic view that pension benefits are not gratuities but instead are part of an employee's compensation, and since payment is deferred, the pension is a type of deferred compensation. It also follows that the employer's obligation for that compensation is incurred when the services are rendered.” (SFAS 87, 1985, para. 79)

Furthermore, again in line with Dewhirst (1971), the FASB recognized that the financial reporting of firms on their pension plans should be based on *accrual accounting* rather than purely on (actuarially determined) cash-payments. Thus,

“In this Statement [i.e., SFAS 87] the Board reaffirms the usefulness of information based on accrual accounting. That does not negate the importance of information about cash flows or the funding of the plan. Accounting recognition of transactions in which cash is disbursed is not controversial. Accrual accounting, however, goes beyond cash transactions to provide information about assets, liabilities, and earnings.” (SFAS 87, 1985, para. 80)

Furthermore, the FASB concluded,

“[...] The question of when to fund the obligation is not an accounting issue. It is a financing question that is properly influenced by many factors (such as

²⁰⁵ Including appendices, the standard consisted of 112 pages.

tax considerations and the availability of attractive alternative investments) that are unrelated to how the pension obligation is incurred.” (SFAS 87, 1985, para. 81)

It is important to note here that SFAS 87 (1985) had traced the path for the issue of IAS 19 (1998) by the IASC (Helbling, Conrad, Lang, Leutwyler, & Walser, 2000; Kvifte, 2003). Furthermore, as outlined in sub-section 3.3.2, ARR 16 (1999) issued by the Commission of Swiss GAAP FER was practically equivalent to IAS 19 (1998) and thus, indirectly, also followed the approach initially developed in SFAS 87 (1985). Notably, for defined contribution pension plans, the standard stipulated an approach practically equivalent to the one of IAS 19 (2004) outlined in sub-section 3.2.5. Accordingly, “[...] the net pension cost for a period shall be the contribution called for in that period.” (SFAS 87, 1985, para. 63). In contrast, for so called *Single-Employer Defined Benefit Pension Plans*, the stipulated accounting treatment was, by and large, in line with the one stipulated by IAS 19 (2004) and outlined in sub-section 3.2.6. In particular, the recognition of *net pension cost (NPC)* was, for the first time, systematically attributed to its components (SFAS 87, 1985, para. 16). Namely, recognized *NPC* had to consist of *service cost* (i.e., current service cost, *CSC*), *interest cost (IC)*, *actual return on plan assets*, *amortization of unrecognized prior service cost (PSC)*, *gain or loss to the extent recognized* (i.e., actuarial gains and losses, *AGL*) and *amortization of the unrecognized net obligation/asset at the date of initial application of the standard* (SFAS 87, 1985, para. 20). The valuation of service cost (i.e., the *projected benefit obligation, PBO*) had to follow an actuarial valuation method applying financial and actuarial assumptions based on the *benefit formula* of the pension plan. For benefit formulas (partly) based on future salaries, the *projected unit credit method (PUCM)* was applicable (SFAS 87, 1985, para. 20). Furthermore, *plan assets (PLA)* had to be measured “[...] at their fair value as of the measurement date.” (SFAS 87, 1985, para. 39) and the *expected return on plan assets (ERR)* was to be “[...] determined based on the expected long-term rate of return on plan assets and the market-related value of plan assets.” (SFAS 87, 1985, para. 49). Regarding actuarial gains and losses (*AGL*), the FASB introduced the Corridor-Method outlined in paragraph 3.2.6.4. Specifically, *AGL* was defined as

“[...] changes in the amount of either the projected benefit obligation [(*PBO*, i.e., *DBO*)] or plan assets [(*PLA*)] resulting from experience different from that assumed and from changes in assumptions.” (SFAS 87, 1985, para. 30).

AGL also had to include the difference between the expected and the actual return on plan assets (SFAS 87, 1985, para. 29). Nevertheless, only the amount of unrecognized *AGL* exceeding 10 percent of the greater of the *PBO* (i.e., *DBO*) or the fair value of plan assets (*PLA*) had to be recognized in profit or loss as part of *NPC* (SFAS 87, 1985, para. 34). Notably, the standard also allowed any accelerated method for the recognition of *AGL* such as e.g., the immediate full recognition (i.e., PL-Method) as outlined in paragraph 3.2.6.4 (SFAS 87, 1985, para. 32). In line with APB 8, as outlined in sub-section 4.3.2, SFAS 87 (1985) also stipulated the recognition of prepaid (accrued) pension costs as assets (liabilities) on the balance-sheet if actual cash-payments were greater (lesser) than periodic net pension cost (SFAS 87, 1985, para. 33). Finally, the shift towards a more balance-sheet oriented approach (i.e., Asset-Liability Approach, ALA) manifested itself in the requirement to recognize a net pension liability (*NPL*) on the balance-sheet if the *accumulated benefit obligation (ABO)* exceeded the fair value of plan assets (SFAS 87, 1985, para. 36). In contrast to the *PBO* (i.e., *DBO*), the *ABO* is determined based on past and current salary levels excluding future (i.e., expected) salary levels (SFAS 87, 1985, para. 18).

It is noteworthy that, apart from the introduction of the Corridor-Method to delay net pension cost recognition, the above-described approach to pension accounting was also inherently inconsistent (Napier, 2009). For example, the determination of net pension cost (*NPC*) to be recognized on the income-statement was mainly based on the *PBO*, which in turn was determined based on expected future compensation levels. In contrast, the net pension liability (*NPL*) to be recognized on the balance-sheet was based on the *ABO*, which was solely based on past and current levels of compensation. Accordingly, it was required that an *intangible asset* of the amount equal to the *NPL* is recognized on the balance-sheet, provided it did not exceed unrecognized prior service costs which represented costs not recognized in relation to the first time application of the standard. Moreover, any amount of the *NPL* exceeding unrecognized prior service costs was required to be accounted for as reduction of equity (SFAS 87, 1985, para. 37). Also noteworthy is the fact that negative net pension liabilities, i.e., net pension *assets* were not allowed to be recognized according to SFAS 87 (1985).

The standard had been highly controversial within the FASB itself. Notably, only four out of the seven board members at the time voted affirmatively. Ironically, one of the board members that dissented was *Robert T. Sprouse*, the early proponent of the Asset-Liability Approach (ALA) discussed in sub-section 4.1.2. In particular, *Sprouse* argued for the consistent recognition of net pension assets analogous to net pension liabilities. Moreover, in his view, the stipulated recognition of intangible assets in order to

offset the net pension liability was not in line with the FASB's conceptual framework (i.e., its definition of assets) and thus, was "[...] unacceptable to him." (SFAS 87, 1985, p. 27). Finally, *Sprouse* also objected the estimation of pension cost based on the projected benefit obligation (*PBO*). According to him "[...] an employer cannot have a present obligation for pension benefits related to salary increases that are contingent upon future events - future inflation, future promotions, future improved productivity." (SFAS 87, 1985, p. 26). Apart from *Sprouse*, one of the other two board members that dissented was *Arthur R. Wyatt*, a distinguished academic in the field of accountancy (*University of Illinois*) as well as a member of the accounting profession (*Arthur Andersen & Co.*) who later also served as the US representative on the International Accounting Standards Committee (IASC), the predecessor of the IASB (see sub-section 3.2.1), from 1990 to 1993 (Wyatt, 2017). In contrast to *Sprouse*, *Wyatt* believed "[...] that the accumulated benefit obligation [(*ABO*)] cannot be a faithful presentation of the pension obligation [...]" (SFAS 87, 1985, p. 27). In his view, excluding future expected salary increases that are partly based on expected future inflation and at the same time discounting at a rate that "[...] incorporates an existing anticipation of future inflation [...]" (SFAS 87, 1985, p. 28) would effectively remove estimated future inflation twice "[...] and therefore is not a faithful measure of a liability [...]" (SFAS 87, 1985, p. 28).

The discontent among board members about the recognition and measurement of pension assets and liabilities outlined above also reflects the shift in pension accounting from the Revenue-Expense (REA) to the Asset-Liability Approach (ALA). Notably, the delayed recognition of actuarial gains and losses (i.e., the Corridor-Method) as well as the above-described inconsistencies with regard to the recognition and measurement of pension assets and liabilities introduced by SFAS 87 (1985) also triggered some of the very first pension value-relevance studies ever conducted (Napier, 2009).²⁰⁶

4.3.4 IFRS and Swiss GAAP FER

As mentioned in sub-section 4.3.3 above, SFAS 87 (1985) had also traced the path for IAS 19 (1998) applicable for financial years beginning on or after January 1, 1999. This standard had evolved from two preceding standards (as outlined in sub-section 3.2.2). IAS 19 (1983), *Accounting for Retirement Benefits in the Financial Statements of Employers*, was issued in 1983 by the IASC and had to be applied for financial years beginning on or after January 1, 1985 (IAS 19, 1983, para. 52). Including explanations and

²⁰⁶ See the literature review discussed in section 5.2.2 for more details.

appendices, the standard consisted of 20 pages and was “[...] oriented towards measuring costs for the income-statement [...]” (Napier, 2009, p. 237). Notably, the standard already distinguished between defined contribution (DC) and defined benefit (DB) pension plans. Accordingly, in terms of DC plans “[...] the employer's contribution applicable to a particular accounting period should be charged against income in that period.” (IAS 19, 1983, para. 46). As outlined in sub-section 3.2.5, this is in line with IAS 19 (2004). In contrast, according to IAS 19 (1983, para. 45 lit. a) pension cost (i.e., current service cost, *CSC*) of DB plans had to be determined actuarially and “[...] charged to income systematically over the expected remaining working lives of the employees [...]” (IAS 19, 1983, para. 45 lit. b). Thence, the IASC also embraced the view that retirement benefits are granted in exchange for labor-service and hence pension costs are to be recognized as deferred payments in the periods the respective services are rendered (IAS 19, 1983, para. 12). However, delayed recognition of past service cost (*PSC*) and actuarial gains and losses (*AGL*) was allowed (IAS 19, 1983, para. 45 lit. c). Moreover, pension assets and liabilities arising from differences between recognized pension cost and cash-payments and/or shortfalls of plan assets (i.e., underfundings) had to be disclosed in the notes (IAS 19, 1983, para. 37 and 50).

IAS 19 (1983) was superseded by IAS 19 (1993), *Retirement Benefit Costs*, issued in 1993 and applicable for financial years beginning on or after January 1, 1995. The standard consisted of 24 pages and still was mainly cost-based (Napier, 2009). The classification of pension plans as either defined contribution (DC) or defined benefit (DB) plans was further refined, but the accounting treatment of DC plans was practically equivalent to IAS 19 (1983) (see e.g., IAS 19, 1993 para. 10-15 and 18-23). In contrast, the actuarial valuation of defined benefit plans was now required to incorporate future salary projections (IAS 19, 1993, para. 46). Lastly, in line with IAS 19 (1983), pension assets and liabilities arising from differences between recognized pension cost and cash-payments had to be disclosed in the notes (IAS 19, 1993, para. 51 lit. g).

In terms of IFRS, the shift away from a mainly cost-based towards a more liability-based approach of pension accounting was marked by the introduction of IAS 19 (1998), *Employee Benefits*, in 1998 applicable for financial periods beginning on or after January 1, 1999 (Baetge & Haenelt, 2006; Napier, 2009). As e.g., Kvifte (2003) notes, even the comparison of the titles of the two standards, *Retirement Benefit Costs* for IAS 19 (1993) and *Employee Benefits* for IAS 19 (1998), reflected the shift of focus. Furthermore, the objective of (IAS 19, 1993) was defined as follows,

“The objective of this Standard is to prescribe when the cost of providing retirement benefits should be recognised as an expense and the amount that should be recognised. It also prescribes the information to be disclosed in the enterprise's financial statements.” (IAS 19, 1993, p. 330)

In comparison, the objective outlined for IAS 19 (1998) reads as follows,

“The objective of this Standard is to prescribe the accounting and disclosure for employee benefits. The Standard requires an enterprise to recognise:

- (a) a liability when an employee has provided service in exchange for employee benefits to be paid in the future; and
- (b) an expense when the enterprise consumes the economic benefit arising from service provided by an employee in exchange for employee benefits.” (IAS 19, 1998, p. 505)

As outlined in sub-section 3.2.2, apart from some minor amendments, as well as the major revision in 2004 that introduced the OCI-Method described in paragraph 3.2.6.4, the accounting approach of (IAS 19, 1998) was practically equivalent to the one of IAS 19 (2004), discussed at length in sub-sections 3.2.5 and 3.2.6. Notably, these rules were all inspired by SFAS 87 (1985).

Finally, as outlined in section 3.3, ARR 16 (1999) had been mainly based on IAS 19 (1998) and thus, also indirectly on SFAS 87 (1985). However, the major revision of 2005 and the introduction of ARR 16 (2005) for financial years beginning on or after January 1, 2006 marked the shift away from the liability-approach of pension accounting followed by IFRS and US GAAP. As a result, ARR 16 (2005) is mainly focused on the consistent recognition of net pension cost (*NPC*) which, in turn is mainly based on the regulatory employer contributions (*EC*) to be annually transferred to the respective Swiss pension plan. In contrast, the recognition of net pension (assets)/liabilities (*NPL*) is smoothed in line with statutory requirements as well as contractual agreements between the reporting firm and the pension plan.

Overall, for the purposes of the study conducted here, IAS 19 (2004) and ARR 16 (2005) may be considered as somewhat more in line with the Asset-Liability (ALA) and the Revenue-Expense Approach (REA), respectively.

5 Research Design

5.1 Research Objective

As outlined in section 4.3, accounting standard setters “[...] have been wrestling with the issue of how to account for pensions [...] for several decades.” (Napier, 2009, p. 231). As e.g., Glaum (2009) notes:

“Pension accounting has caused controversies ever since standard-setters started to regulate the recognition and valuation of pension-related liabilities, assets, and costs.” (Glaum, 2009, p. 273)

The statement above is especially true with regard to the accounting for Swiss pension plans. Since long, pension accounting has been highly controversial in Switzerland (Müller & Wyss, 2015). Overtime, various interest groups such as e.g., accounting academics and professionals, standard-setters, industry associations, preparers and users of financial statements, the mainstream and business press, politics and even trade unions have actively contributed to the debate. As the very title of this dissertation reveals, and as also outlined in sub-section 5.1.3 further below, its is one of the main objectives of this study to contribute to the long-standing controversy about how to best account for Swiss pension plans. Thus, the evolution of this controversy is discussed next.

5.1.1 “The Swiss Pension Accounting Controversy”

5.1.1.1 General

The controversy regarding the financial reporting of Swiss pension plans might best be exemplified through the introduction of an official comment letter sent to the IASB by the *Swiss Association of Actuaries* (SAA) on September 4, 2008. The letter was sent in response to the Discussion Paper *Preliminary Views on Amendments to IAS 19 Employee Benefits* which was published by the IASB in March 2008 to initialize the consultation process for the revision of IAS 19 (2008), which lead to the later enactment of IAS 19 (2011) (also see footnote 70 on page 55). The introduction to the comment letter of the SAA reads as follows:

“The implementation of the IAS 19 standard related to employee benefits was always a controversial issue in Switzerland.

The two main reasons are the following.

The assets of pension funds have to be segregated by law from the assets of the sponsoring company. As a consequence the pension fund is a legally separated entity from the company. This legal independence implies in the view of some people economic independence. As a consequence they see no justification for the pension fund to have an impact on the financial statements of the company.

Secondly the most frequent pension plan in Switzerland is based on individual savings accounts with additional guarantees; the nature and extent of the guarantees varies from one plan to another. The individual savings is increased yearly by a retirement credit defined in the rules of the pension plan. According to Swiss Law and general public consensus such plans are considered as defined contribution type of plans. Therefore the classification of these plans as defined benefit by IAS 19 is controversial and is frequently criticised.

After long and emotional discussions following the implementation of IAS 19 revised in 1998 it is now generally accepted that practically all pension plans in Switzerland are defined benefit for IAS 19 purposes. The issue remains however highly political and emotional.” (SAA, 2008, p. 2)

The above introductory statement of the SAA’s comment letter also summarizes the conclusion outlined in paragraph 3.2.4.1 whereby Swiss pension plans, in general, must be classified as defined benefit plans in line with IAS 19. Namely, although contributions of the employer are (at least temporarily) fixed and transferred to a separate legal entity, there always remains some actuarial and/or investment risk with the employer due to the guarantee of the minimum conversion and interest rate on mandatory benefits (see sub-section 2.2.3). Moreover, since 2005, Swiss law may oblige the employer to fund additional restructuring contributions in the case of an underfunding (see sub-section 2.2.6). As a result, the amount to be received by the employees is not solely dependent on fixed contributions and the legal and/or constructive obligation of the employer is not limited to the fixed contributions it agrees to pay. Hence, as noted by the SAA, although contributory in nature, there is widespread consensus that Swiss pension plans, in general, are to be classified as defined benefit plans in line with IAS 19 (see

footnote 88 on page 61). Nonetheless, as the SAA noted, the issue has been controversial and, at the time of this writing, the debate is still ongoing.

5.1.1.2 In The Early Days

In terms of the wider Swiss public, the debate about how to best account for Swiss pension plans climaxed not long after the enactment of IAS 19 (1998), throughout the year of 2000. Specifically, public outcry was sparked by the announcement of *SAirGroup* (formerly *Swissair*) to recognize a negative net pension liability (*NPL*), i.e., a net pension asset, of about CHFm 890 on its balance-sheet as of December 31, 1999. The recognition was the result of the first time adoption of IAS 19 (1998) and came at a time when the global airline business, and especially *SAirGroup*, was in great turmoil (see e.g., Hebeisen, 2000).²⁰⁷ However, the firm's Swiss pension plan had earned an average annual return of about 12% during the preceding five years (CASH, 2000c). Accordingly, pension assets exceeded pension obligations by about CHFbn 3.30 (i.e., 25%) as of December 31, 1999 (Hebeisen, 2000; SDA, 2000a). *SAirGroup* recognized about a third of this overfunding as net pension asset which increased its ratio of total book value of equity to total book value of assets from about 20 to 24%, accordingly (Greuter, 2000). At the time, similar effects could be observed for a lot of different firms such as e.g., *Novartis* and *Von Roll* (Flubacher, 2000; Sonntagszeitung, 2000a).²⁰⁸ The above-average investment returns during the nineteen-nineties had led to high levels of funding, i.e., overfundings, for many Swiss pension plans (CASH, 2000b). However, the case of *SAirGroup* attracted the lion's share of public attention. In part, this was also due to a rather polemic campaign run by the largest employee organization in Switzerland, the *Swiss Federation of Trade Unions* (*Schweizerischer Gewerkschaftsbund*, SGB) unifying about 380,000 members of 16 different trade unions.²⁰⁹ In a media release shortly after

²⁰⁷ As an aside, for a major part of its history from the founding back in 1931 *Swissair* (later *SAirGroup*) was regarded as one of the most successful airlines worldwide. In the late nineteen-eighties, due to its immense reserves and high liquidity, the airline was even given the nickname "Flying Bank" ("Fliegende Bank"). However, mainly due to strategic faults and mismanagement during the nineteen-nineties the firm finally became insolvent and the fleet of *SAirGroup* was grounded on October 2, 2001. What followed was one of the biggest corporate bankruptcies in the business history of Switzerland. Liquidation proceedings have not yet been fully completed at the time of this writing. See e.g., Enz (2016); *Swissair* (2017b) and *Swissair* (2017a) for more details and a general historical account.

²⁰⁸ Notably, observations for both of these firms are also included in the final sample of this study. See chapter 6 for more details.

²⁰⁹ See e.g., SGB (2017).

the announcement of *SAirGroup*, the SGB condemned such pension accounting as “illegal raids” (“illegale Raubzüge”) and “grasp at the pension casket” (“Griff in die Pensionskassenschatulle” (SDA, 2000b, p. 1)). Moreover, the union even reached out to the Swiss government demanding immediate action in order to ban such (accounting) practices (SDA, 2000b). As a result, some headlines in business and mainstream media read as follows: “Fight for Pension Reserves” (“Kampf um PK-Reserven” (Sonntagszeitung, 2000a, p. 1)), “Swiss Pension Plans Threatened by Schizophrenia” (“Schweizer Pensionskassen droht Schizophrenie” (Truttmann, 2000, p. 1)), “A Fat Cushion Causes Trouble” (“Ein fettes Polster sorgt für Ärger” (Flubacher, 2000, p. 1)), “Rise for the Pension Plan Battle” (“Auf zum Kassenkampf!” (CASH, 2000a)) and “Explosive Pension Plans” (“Zündstoff in Pensionskassen” (Sonntagszeitung, 2000c)).

Triggered by the public outcry about the case of *SAirGroup*, the debate about whether pension accounting in line with international and national standards such as IFRS, US GAAP and Swiss GAAP FER can be regarded as legal with respect to Swiss (pension) law also resonated in Swiss politics. Accordingly, two parliamentary interpellations demanded respective answers from the Swiss government (see Rechsteiner, 2000; Spoerry, 2000). In its answer to the interpellation of Rechsteiner (2000), the Swiss government noted that Swiss pension plans are legally separate from employers and that any accounting treatment of these plans in line with e.g., IFRS, US GAAP and Swiss GAAP FER in the financial statements of the employer never prejudices, for example, the use of an overfunding (i.e., committed funds, see FIGURE 2.5 on page 36) of the pension plan. Also, the Swiss government emphasized that any transfer of funds from the pension plan back to the employer is prohibited by law. Moreover, it was noted that committed funds of the pension plan may only be recognized as assets on the balance-sheet of the employer if the governing board of the pension plan has not decided to use such funds differently. Finally, it was noted that accounting in line with IAS 19 and ARR 16 must always be in line with Swiss law as well as the specific pension plan regulations (Rechsteiner, 2000).²¹⁰

The view of the Swiss government outlined above was also strongly advocated by commentators from the accounting and audit professions, academia as well as the accounting standard-setters themselves. For example, Atteslander, Suter, and Verfürth (2000) noted that the accounting treatment of Swiss pension plans in the financial state-

²¹⁰ Notably, as outlined in paragraph 3.2.6.6 and sub-section 3.3.5, with respect to the overfunding of a Swiss pension plan, economic benefits for the employer can only arise in the form of future contribution reductions.

ments of the employers has no effect on the actual situation of these pension plans, neither factually nor legally. Also, *Prof. Dr. Giorgio Behr*, at the time president of the Commission of Swiss GAAP FER, argued that the accounting for Swiss pension plans in line with e.g., IAS 19 and ARR 16 is always derivative on the stipulations of Swiss law, the specific pension plan regulations as well as decisions taken by the governing board of the pension plan. In particular, there can never be any transfer of funds from a Swiss pension plan back to the employer, and pension accounting standards applied by the employer have no bearing on the use of a pension plan's overfunding nor prejudice any other decision to be taken solely by the plan's governing board (Behr, 2000). Moreover, it was argued that there can be no repercussions from the accounting treatment of a Swiss pension plan in the financial statements of the employer for the legal relation between insurees of the plan and the reporting firm (Atteslander et al., 2000). Lastly, the debate about *SAirGroup* also provoked the Commission of Swiss GAAP FER to officially clarify that, in line with ARR 16 (1999), the overfunding of a Swiss pension plan may only lead to the recognition of an asset by the employer if this is in accordance with Swiss law as well as the specific pension plan regulations and/or the decisions taken by the governing board of the pension plan (Sonntagszeitung, 2000b).²¹¹

5.1.1.3 Battle of the Standards²¹²

As outlined in sub-section 3.2.4, at least since the amendment of Swiss pension law enacted on January 1, 2005, whereby the governing board of a Swiss pension plan may collect additional restructuring funds from employers in the case of an underfunding, there has been widespread consensus that Swiss pension plans are to be classified as defined benefit plans in accordance with IAS 19. As described in sub-section 3.3.2, this amendment of the law was also one of the main reasons triggering the revision of ARR 16 (1999). As mentioned in sub-section 4.3.4, the enactment of ARR 16 (2005), conceptually, moved pension accounting in line with Swiss GAAP FER further away from

²¹¹ Notably, at the time, ARR 16 was conceptually still very much in line with IAS 19. See sub-sections 3.3.2 and 4.3.4 for more details.

²¹² The title is borrowed from an event called *Battle of the Standards Conference* that took place in Zurich on November 6, 2014. The conference was organized by the *CFA Society Switzerland* and, amongst others, featured a speech by *Dr. Lukas Müller* about the differences between IAS 19 and ARR 16. Amongst others, *Stephen Cooper*, member of the IASB, and *Prof. Dr. Giorgio Behr*, president of the Foundation of Swiss GAAP FER, took part in a panel discussion on the differences between IFRS and Swiss GAAP FER. See CFA (2014) for more details.

IAS 19 (i.e., further away from a *pure* liability-approach). Thereafter, the pension accounting controversy more and more shifted towards the debate of whether IAS 19 (2004) or ARR 16 (2005) more faithfully represents the underlying economic phenomenon of Swiss pension plans.

In recent years, an ongoing trend of firms listed in Switzerland voluntarily switching from IFRS to Swiss GAAP FER has further fueled the debate about accounting for Swiss pension plans.²¹³ Notably, between 2008 and 2016, at least 37 firms listed on SIX switched from IFRS to Swiss GAAP FER (see e.g., Eichner & Sager, 2016).²¹⁴ The issue has also resonated in the business press with headlines such as “Flight from the Many Rules” (“Flucht vor den vielen Regeln” (Schmutz, 2012)), “Smooth Switch” (“Problemlose Umstellung” (Kutscher, 2012)) and “Goodbye Champions League” (“Abschied von der Champions League” (Schmutz, 2016a)).²¹⁵ The question of whether pension accounting was one of the key factors driving these switches cannot be fully answered from publicly available information. For example, Glanz (2016) analyzes the disclosures in the publicly available half-year and/or annual reports following the switch of 36 of the above-mentioned 37 firms. Notably, only one firm, *Georg Fischer AG*, actually disclosed the fact that the accounting for its Swiss pension plan was a major factor for the decision to switch to Swiss GAAP FER. Specifically, apart from the rules on the accounting of joint ventures (IFRS 11), the abandonment of the Corridor-Method through the enactment of IAS 19 (2011) for financial years beginning on or after January 1, 2013 triggered the switch.²¹⁶ The respective quote from the firm’s press release on May 15, 2013 reads as follows:

²¹³ Note, as outlined in sub-section 3.1.2, most firms listed on SIX and BX are free to choose between the application of IFRS and Swiss GAAP FER.

²¹⁴ The analysis is based on all 207 firms that are listed in the *Swiss Performance Index* (SPI), which is considered as the overall stock market index of Switzerland (see e.g., SIX (2017e) for more details) as of September 20, 2016 (see Eichner & Sager, 2016, p. 6). Thence, potential switchers from IFRS to Swiss GAAP FER that were delisted before that date are not included, and 37 must be seen as lower bound of the number of switchers during that period. Nevertheless, the finding is in line with e.g., Glanz (2016) who analyzes all firms listed on SIX as of July 25, 2015 and finds 36 switchers from IFRS to Swiss GAAP FER between 2008 and 2014 (see Glanz, 2016, p. 16). Also, e.g., Chassot (2016) speaks of about 40 switchers as of 2016.

²¹⁵ Also see e.g., Berndt, Hochreutener, and Vial (2014); Kutscher (2014) and Schmutz (2013).

²¹⁶ As of January 1, 2013, the full recognition of CHFm 110 of cumulative unrecognized net actuarial losses (*AGLNR*) in equity (i.e., applying the OCI-Method, see paragraph 3.2.6.4) would have led to a respective decrease of the total book value of equity of the firm of 4% (see e.g., Bösigler & Teitler-Feinberg, 2015, p. 560).

“[...] Furthermore, the new IAS 19 revised standard calls for the inclusion of the over- or underfunding of pension funds in a company's equity. Swiss pension funds, however, are basically independent, and their performance is not linked to a company's success. Adding or subtracting their under- or over-coverage would lead to considerable volatility in the equity of Georg Fischer. Under Swiss GAAP FER, those fluctuations are to a large extent eliminated. [...]” (Georg Fischer, 2013, p. 1)

Overall, Glanz (2016) finds the majority of all disclosed justifications for switching to be directly or indirectly related to the increasing complexity of IFRS which, in the view of the switching firms, leads to a better cost-benefit ratio of Swiss GAAP FER compared to IFRS. These findings are in line with other studies. For example, by analyzing the respective press releases, Pfaff and Hermann (2012) investigate the factors behind the switching decision of 16 out of the above-mentioned 37 switches between 2010 and 2012. In line with the findings of Glanz (2016), the two most stated reasons for the switch are the higher application cost of IFRS compared to Swiss GAAP FER as well as the increasing complexity of IFRS. Interestingly, in contrast to Glanz (2016), the authors find pension accounting as the third most stated reason driving the switching decision. For example, Pfaff and Hermann (2012) hint at the case of *Gurit Holding AG* which announced its switch on May 26, 2009. In the press release, the firm explicitly states that it regards the accounting treatment of its Swiss pension plan in accordance with ARR 16 as more faithfully representing economic reality compared to IAS 19 (Gurit, 2009). Furthermore, in contrast to the archival studies outlined above, e.g., Hochreutener and Vial (2014) conduct a survey of 52 Chief Financial Officers (CFO) of firms that are listed on SIX as of October 10, 2013, and which applied IFRS at the time. 20 (i.e., 38.46%) of the CFOs indicated that they had considered switching from IFRS to Swiss GAAP FER during the preceding two years. Furthermore, amongst other reasons, pension accounting was mentioned by three (i.e., 15.00%) of these CFOs and no other specific area of accounting was mentioned more often. Overall, in line with the studies outlined above, the authors find the increasing complexity of IFRS as well as the better cost-benefit ratio of Swiss GAAP FER to be the two reasons that, officially, were stated most often.

The switch that, so far, has attracted the most public attention was the one by *The Swatch Group AG* announced on October 3, 2012.²¹⁷ At the time, the firm was the biggest manufacturer of watches worldwide (see e.g., Bürgler, 2012a). In its press release, the firm stated the following reasons for the switch:

“[...] Swiss GAAP allows the Swatch Group as a Swiss company to use a recognized accounting practice that is ideal for industrial companies such as the Swatch Group. The cost-benefit ratio is reasonable and takes account of the special needs of a Swiss industrial company.

By making this move, the Swatch Group is returning to a more practical and less theoretical accounting practice than is the case with IFRS.” (The Swatch Group AG, 2012b, p. 1)

Apparently, in the press release, the company made no reference to pension accounting, nor to any other specific accounting rules, that might have driven the decision to switch. This also holds for the firm’s annual report for the year of 2013 (see The Swatch Group AG, 2013). Thus, what exactly was meant by “[...] the special needs of a Swiss industrial company.” or “[...] returning to a more practical and less theoretical accounting practice [...]”, as outlined above, remains private information and any attempt to interpret would be mere speculation. Nevertheless, speculations about whether pension accounting had played a role were raised in the business press (see e.g., Bürgler, 2012b). After all, it must be noted that the switch also coincided with the abandonment of the Corridor-Method effective as of January 1, 2013.

Finally, one example of a non-listed firm that switched from IFRS to Swiss GAAP FER due to the different pension accounting treatment of its Swiss pension plan is *RUAG Holding AG*. The company switched to Swiss GAAP FER as of January 1, 2015. At the time, the firm was wholly-owned by the Swiss government and its main corporate mission was to equip the *Swiss Armed Forces*. However, the firm was also operative globally with a focus on aerospace and defence systems (see e.g., RUAG Holding AG, 2015, p. 64). Notably, the firm more or less openly stated that the main reason for the

²¹⁷ Notably, the switch even triggered a consultation process initiated by the *SIX Exchange Regulation* on whether firms applying Swiss GAAP FER shall be excluded from the SMI (see e.g., Neue Zürcher Zeitung, 2013b). Eventually, the regulatory body withdrew its proposal and *The Swatch Group AG* was not excluded from the SMI (see e.g., Neue Zürcher Zeitung, 2013a). Observations of the firm are also included in the final sample of this study. See chapter 6 for more details.

switch to Swiss GAAP FER was the abandonment of the Corridor-Method due to the enactment of IAS 19 (2011). In its 2015 annual report, the firm states the following:

“IAS 19, which was revised in 2011 and was valid as of 1 January 2013, required that any excesses / shortfalls in pension funds be recognized in a company’s comprehensive income. However, Swiss pension funds are largely independent; no return of funds to the employer is possible. Moreover, restructuring contributions by the employer can only be demanded under extraordinary circumstances. [...]

Fully recognizing the excesses / shortfalls as prescribed under IAS 19 resulted in considerable volatility in RUAG’s equity in 2013 and 2014. The application of Swiss GAAP FER will largely eliminate such fluctuations in equity.” (RUAG Holding AG, 2015, p. 64)

The lasting trend of Swiss firms switching from IFRS to Swiss GAAP FER has also been noted by the IASB. In February 2015, *Hans Hoogervorst*, at the time, chairman of the IASB, held a speech on the application of IFRS in Switzerland. He noted:

“[...] there have been some recent examples of Swiss companies moving from IFRS and US GAAP to Swiss GAAP. Most of those companies were SMEs listed on the domestic segment of the stock markets. Some, however, are bigger and one is even listed on the Swiss Market Index. The main motivation seems to be concerns about complexity and disclosure overload. Indeed, some companies switching from IFRS to Swiss GAAP have been able to reduce their disclosures significantly.

So this is something we need to take a look at. Is IFRS indeed too burdensome in terms of its complexity and its disclosure requirements? Have we found the right balance in the trade-off between complexity and completeness, or has the pendulum swung too far in the direction of excessively lengthy disclosure requirements?” (Hoogervorst, 2015b, p. 2)

With regard to pension accounting, the IASB chairman expressed the following view:

“A [...] big difference between Swiss GAAP and IFRS is pension accounting. Under Swiss GAAP, a company has more freedom in its estimation of

its pension liability. I have no doubt this can be more attractive for the reporting company, but there is a price to be paid, which is a loss of comparability. In addition, Swiss GAAP allows more room for smoothing changes in the pension liability. This reduces volatility, but it does not fully reflect the economic reality behind the pension liability. So, again, the comfort provided by Swiss GAAP to the preparer comes at a price to the investor.” (Hoogervorst, 2015b, p. 3)

Hoogervorst confirmed this view in an interview to the *Neue Zürcher Zeitung* (NZZ), one of the major daily newspapers in Switzerland, published on July 14, 2016. According to him, under ARR 16 firms disclose less information about their pension plans than is the case under IAS 19. Accordingly, investors might be unpleasantly surprised if they could take a closer look at the economic reality of the respective pension plans (Schmutz, 2016b).

5.1.2 Objectives of Financial Reporting

5.1.2.1 Concepts vs. Objectives

As outlined above, accounting for Swiss pension plans has been controversial. Also internationally, pension accounting is one of the most controversial subjects within the realm of financial reporting. Moreover, the controversy about pension accounting is embedded within the greater debate about the “right” approach to financial reporting (Fasshauer & Glaum, 2008). As discussed in section 4.2, since the 1970s, standard-setters have gradually shifted their concept of accounting from the Revenue-Expense (REA) to the Asset-Liability (ALA) Approach. Apart from the specific issue of pension accounting, this shift has been controversial in general. For example, according to Dichev (2008) the Asset-Liability Approach (ALA) of financial reporting is at odds with the way most businesses operate. In his words:

“Most firms are essentially sophisticated devices for continually advancing expenses, hoping to earn revenue and earnings. In relation to this fundamental purpose, most assets are just supplementary and temporary devices; one could say that they are props that serve the continual stream of company operations. Notice that once acquired, most assets have little independent existence and value. In other words, the balance sheet approach [i.e., Asset-Liability Approach, ALA] would make sense if firms were “asset greenhouses,”

where the primary mission of the firm is to earn money by acquiring, storing, and growing assets, and earnings represents the realized or unrealized growth in these assets. But most firms are not asset greenhouses; they are more like "asset furnaces," where acquired or internally created assets are continually sacrificed or transformed for the larger goal of producing revenue and earnings. The balance sheet makes it look as if there is a permanent store of assets and asset values, but this impression is illusory because the stock of assets exists only because of the continuous process of assets renewal and sacrifice." (Dichev, 2008, p. 458)

Dichev (2008) also hints at the fact that the Revenue-Expense Approach (REA) has always had strong support from the accounting profession as well as the investment community. Accordingly, especially analysts and investment managers would regard the market value of a firm to be primarily based on its (future) ability to generate income (i.e., *earnings power*) and thus, the primary objective of financial reporting "[...] should be the correct determination of earnings." (Dichev, 2008, p. 458). In contrast, e.g., Solomons (1995) argues that even proponents of the Revenue-Expense Approach (REA) must rely on changes in assets and liabilities to determine revenues and expenses. He further notes:

"If there is not a strict relationship between the process of income determination and changes in owner's equity, debits and credits are apt to creep into the income-statement that do not represent real transactions or the effects on the enterprise of real events and conditions - items like charges for future maintenance, for example. This opens the way for income smoothing, which is probably why preparers tend to prefer the matching approach. Further, the matching approach threatens the integrity of the balance-sheet as a statement of financial position, for it is liable to become a temporary resting place for all kinds of items that are being "carried forward to be matched against future expected benefits," [...]" (Solomons, 1995, p. 46)

In contrast to the controversy outlined above, the *objectives* of financial reporting, generally, have been less controversial than "[...] the *concepts* that flow from the objectives [... *emphasis added*]" (Sundem, 2007, p. 286). Accordingly, different concepts of accounting, such as e.g., REA and ALA, must be judged based on the degree to which they meet agreed-upon objectives of financial reporting (Kvifte, 2008). The same also

holds for the judgement of different approaches to pension accounting (Fasshauer & Glaum, 2008).

The generally accepted and overarching objective of financial reporting is to “[...] facilitate economic decision making by investors and creditors.” (Sundem, 2007, p. 286). Specifically, according to the Conceptual Framework of the IASB issued in 2010:

“The objective of general purpose financial reporting¹ is to provide financial information about the reporting entity that is useful to existing and potential investors, lenders and other creditors in making decisions about providing resources to the entity. Those decisions involve buying, selling or holding equity and debt instruments, and providing or settling loans and other forms of credit. [footnote omitted]” (IASB Conceptual Framework, 2010, para. OB2)²¹⁸

Analogous to the IASB, the Commission of Swiss GAAP FER defines the objective of financial statements as follows,

“The objective of financial statements is to give information about the financial position, the cash flows and the results of operations of organisations in a structured way. This information supports the users of financial statements in their decision-making process.

Financial statements also document the accountability of the responsible body.” (ARR Framework, 2014, para. 5)²¹⁹

²¹⁸ Notably, according to the preceding framework of the IASB, the defined objective of financial statements was “[...] to provide information about the financial position, performance and changes in financial position of an enterprise that is useful to a wide range of users in making economic decisions.” (IASB Framework, 1989, para. 12). Furthermore, “[...] users of financial statements include present and potential investors, employees, lenders, suppliers and other trade creditors, customers, governments and their agencies and the public.” (IASB Framework, 1989, para. 9). As noted in footnote 196 on page 141, the IASB is expected to issue a revised conceptual framework by the end of 2017. The board tentatively decided to carry forward the definition of the objective of financial reporting from the current framework but to additionally emphasize the role of financial reporting in assessing the *stewardship* of management. However, the board also stresses the fact that “[...] increasing the prominence of stewardship within the objective of financial reporting does not imply a preference for a historical cost measurement basis.” (IASB, 2017c, p. 6).

²¹⁹ Notably, Swiss GAAP FER also incorporates the concept of stewardship as parallel objective of financial reporting.

Notably, amongst others, the Commission of Swiss GAAP FER identifies “[...] the effective and potential financiers (owners and creditors, especially banks) [...]” as users of financial statements (ARR 1, 2009, para. 3).

5.1.2.2 Roles and Users of Financial Statements

For the purposes of this study, research evolves around the degree to which financial information on Swiss pension plans, reported by firms in line with IAS 19 (2004) and ARR 16 (2005) as respectively outlined in sections 3.2 and 3.3, meets the above-mentioned objectives as defined by the two standard-setters. Specifically, the scope of research is narrowed to the *decision-usefulness* of the reported information to *investors* of the reporting entities. It has been criticized that such a research focus may neglect other roles of the accounting system such as e.g., contracting and stewardship (Holthausen & Watts, 2001).²²⁰ However, equity investment and stewardship are not necessarily independent of each other. For example, the IASB itself has noted:

“[...] Those users who wish to assess the stewardship or accountability of management do so in order that they may make economic decisions; these decisions may include, for example, whether to hold or sell their investment in the enterprise [...]” (IASC Framework, 1989, para. 14)

Furthermore, as e.g., Barth, Beaver, and Landsman (2001) note, the existence of other roles of financial statements such as e.g., management compensation and debt contracting “[...] in no way diminish the importance of value relevance research, which focuses on equity investment.” (Barth et al., 2001, p. 78).²²¹ Moreover, by conducting research on the decision-usefulness of financial reporting for the use of equity investment, it is not necessarily asserted that such an approach also adequately captures other uses of the information. Nonetheless, again, this does not diminish the importance of such a research approach (Barth et al., 2001).

It has also been criticized that focusing on the holders of equity securities (i.e., investors) neglects the role of financial statements for e.g., debt holders (i.e., creditors;

²²⁰ Concretely, Holthausen and Watts (2001, p. 68) call these “[...] non-valuation roles [...]” of the accounting system.

²²¹ The approach of value-relevance research taken for the purposes of this study is outlined in more detail in subsection 5.2.1 below.

Holthausen & Watts, 2001). However, as e.g., Barth et al. (2001) note, the US accounting standard-setter FASB, receives its authority from the SEC, which in turn, has been mainly responsible for the protection of investors. Further, since long, also the IASB has worked towards the recognition of IFRS by the SEC, which allowed IFRS as applied standard for foreign firms listed in the US in 2007 (see e.g., Deloitte, 2017c). Also, since 2005, firms listed in the *European Union* (EU) are obliged to apply IFRS (see e.g., Deloitte, 2002). Furthermore, also the Commission of Swiss GAAP FER has issued a separate standard (ARR 31 – *Complementary recommendation for listed companies*) in order to fully comply with the regulation of the SIX. Last but not least, a fundamental premise of financial reporting in line with standards such as e.g., IFRS, US GAAP and Swiss GAAP FER is the going concern principle.²²² However, in contrast to investors, creditors are mainly interested in *liquidation values*. These may be inferred from financial statements that are based on going concern only indirectly (Barth et al., 2001).²²³

5.1.3 Research Questions

In section 2.1, it was demonstrated that Swiss pension plans, on the macro-level, are economically and socially relevant. Specifically, between 2004 and 2012, total assets of Swiss pension plans as percentage of GDP had oscillated between 90.15 (in 2008) and 108.39 (in 2006) and only two out of 66 countries (i.e., Iceland and Netherlands) incl. the 20 major economies worldwide (G20), had ratios constantly higher across the sample period (see FIGURE 2.1 on page 14). Furthermore, between 2004 and 2012, the ratio of employees in Switzerland covered by a Swiss pension plan had oscillated between 76.94% (in 2004) and 81.54% (in 2012). Thus, more than three quarters of all employees had been covered by a Swiss pension plan throughout the sample period (see TABLE 2.2 on page 12).

As outlined in section 2.2, contributions paid to a Swiss pension plan must be transferred to an entity which is legally separate from the employer (i.e., the firm). For an average firm, combined employer and employee contributions to a Swiss pension plan are in the range of about 13 to 16% of total annual salaries paid (Helbling et al., 2006).

²²² Users of IFRS and Swiss GAAP FER must report their financial statements on the assumption that business operations will continue for the foreseeable future (e.g., twelve months) and that liquidation values may only be applied if it is intended or must be assumed that the firm will be liquidated in the near future. If so, this change in accounting basis must be disclosed (ARR Framework, 2014, para. 9; IASB Conceptual Framework, 2010, para. 4.1).

²²³ See e.g., Barth, Beaver, and Landsman (1998) for evidence that investors put different valuation weights on book value of equity and net income depending on the financial health of the firm.

Notably, on average, employers financed about 60% of these contributions between 2004 and 2012 (see TABLE 2.4 on page 23). Moreover, by law, registered Swiss pension plans must guarantee the full funding of assumed obligations with respect to mandatory benefits. Since 2005, governing boards of Swiss pension plans even have the legal right to claim additional restructuring contributions from employers and employees in the case of an underfunding. Accordingly, also internationally, Swiss pension plans can be considered as highly funded. Specifically, as depicted in FIGURE 2.6 on page 37, between 2004 and 2012, weighted-average funding ratios of all private Swiss pension plans had oscillated between 96.70% (in 2008) and 113.70% (in 2006). For the same period, average funding ratios of private Swiss pension plans had generally also been higher compared to the pension plans of some of the largest companies worldwide (Fortune 1000 and DAX, see FIGURE 2.7 on page 39). However, it is important to note, mandatory benefits of Swiss pension plans are partly derivative on the minimum interest and conversion rates stipulated by law. As mentioned above, in the case of an underfunding, the firm may also have to pay additional restructuring contributions. Thence, with respect to a Swiss pension plan, there always remains some investment and/or actuarial risk with the employer. Lastly, any refund of plan assets to the employer and/or employees is strictly prohibited by law. Thus, the firm may only benefit from a plan overfunding through future contribution reductions.

As is described in more detail in sub-section 5.2.2 below, studies for other jurisdictions (mainly for the US and also for e.g., Germany and the UK) have found evidence that financial information reported on pension plans is decision-useful to investors of the sponsoring firms. However, as e.g., Helbling et al. (2006) note, there probably is no other area of financial reporting where the economic phenomenon to be reported (i.e., pension plans) is as diverse across different countries and jurisdictions as is the case with pension accounting. Consequently, findings and insights gained from the study of pension accounting with respect to one institutional setting cannot simply be applied to any other setting where different pension regulation is in place (Fasshauer & Glaum, 2008). Therefore, it is the main research objective of this study to investigate whether financial information reported on the highly idiosyncratic occupational pension system of Switzerland can be deemed decision-useful to investors of the sponsoring firms. The first *research question* (*RQ1*) is thus formulated as follows,

RQ(1) Is financial information on Swiss pension plans, reported in line with IAS 19 (2004) and ARR 16 (2005), decision-useful to holders of equity securities of the reporting firms?²²⁴

As the controversy about pension accounting is embedded within the greater debate about the “right” approach to financial reporting, it is especially interesting to investigate which elements of the financial information reported on pension plans is decision-useful to investors (Fasshauer & Glaum, 2008). As described in chapter 4, since the 1970s, the Asset-Liability Approach (ALA) has evolved to become the dominant worldwide accounting doctrine whereas the Revenue-Expense Approach (REA) has been gradually undermined. Accordingly, within their conceptual frameworks, the IASB as well as the Commission of Swiss GAAP FER define revenues and expenses to be derivative on changes in assets and liabilities (see section 4.2). Also with respect to pension accounting, international standard-setting has shifted from a pure cost-based to a more liability-based approach (see section 4.3). In contrast, with respect to Swiss GAAP FER, pension accounting has evolved towards an approach that is strongly focused on the actuarially determined funding status and employer contributions as well as the legal form of a Swiss pension plan. Thence, to enhance the granularity of the analysis, it is asked here whether investors have a preference for financial information on Swiss pension plans recognized on the balance-sheet, on the income-statement or disclosed in the notes. Thus, the second research question (*RQ2*) is formulated as follows,

RQ(2) Which elements of the financial information reported on Swiss pension plans in line with IAS 19 (2004) and ARR 16 (2005) are decision-useful to holders of equity securities of the reporting firms?

Lastly, as outlined in sub-section 5.1.1 above, accounting for Swiss pension plans has been highly controversial at least since the enactment of IAS 19 (1998). In recent years, the debate has gradually shifted towards the issue of whether financial reporting in line with IAS 19 or ARR 16 more faithfully represents the underlying economic phenomenon of Swiss pension plans. The controversy has also been fueled by public and private

²²⁴ As outlined in sub-section 3.1.2, IFRS and Swiss GAAP FER have been the two most widely applied accounting standards of firms listed in Switzerland. Furthermore, as respectively described in sub-sections 3.2.2 and 3.3.2, the application of IAS 19 (2004) and ARR 16 (2005) can be regarded as qualitatively unaltered for financial years between 2004 and 2012. Accordingly, the focus on these two standards is expected to maximize sample size for any analyses conducted. See sub-section 6.1.1 for more details regarding sample selection and data collection.

firms switching from IFRS to Swiss GAAP FER, not the least because of pension accounting.

As outlined in section 3.2, in line with IAS 19 (2004) Swiss pension plans must be accounted for as defined benefit plans, whereas the defined benefit obligation (*DBO*) and the plan assets (*PLA*) must be re-valued annually and the resulting net pension (asset)/liability (*NPL*) has to be recognized on the balance-sheet. Accordingly, net pension cost (*NPC*) to be recognized in profit or loss is entirely derivative on the changes within the *DBO* and the *PLA*. However, during the sample period, firms had the right to choose between recognizing actuarial gains and losses (*AGL*) immediately and directly in profit or loss (PL-Method), recognizing *AGL* immediately and directly in equity (OCI-Method) or delaying the recognition of *AGL* in profit or loss (Corridor-Method).²²⁵

In contrast to IAS 19 (2004), according to ARR 16 (2005) firms account for their Swiss pension plans based on the financial statements of the plan reported in line with ARR 26 (2004) (see section 3.3). Consequently, valuation of the pension obligations usually rests on *static* actuarial valuation methods. Thence, on average, obligations are valued at about 10-20% less compared to the *dynamic* Projected Unit Credit Method (PUCM) to be mandatorily applied in line with IAS 19 (2004) (Helbling et al., 2006). Moreover, the recognition of pension assets and liabilities on the balance-sheet of the reporting firm is dependent on specific laws, pension plan regulations, contractual agreements as well as the intent of the reporting firm. Specifically, a plan surplus may only be recognized if the firm is *permitted* and also *intends* to benefit from future contribution reductions. Conversely, a plan deficit is only recognizable when it fulfills the recognition and measurement criteria for a provision in line with ARR 23 (2009). It is also important to note, since any surplus or deficit of a Swiss pension plan is usually shared between the employer and the employees (and sometimes also the beneficiaries), the reporting firm is not allowed to account for more than its (expected) share of such surpluses or deficits. Moreover, in line with ARR 16 (2005) net pension cost (*NPC*) to be recognized in profit or loss is mainly based on the regulatory employer contributions (*EC*) that must be transferred annually to the Swiss pension plan. Where applicable, changes in recognized pension assets and liabilities are also recognized as part of *NPC*. Last but not least, the disclosure requirements of ARR 16 (2005) are considerably less extensive compared to IAS 19 (2004).

²²⁵ As noted in sub-section 3.2.2, since the enactment of IAS 19 (2011), for financial years beginning on or after January 1, 2013, the Corridor-Method is no longer applicable.

Notwithstanding the differences regarding pension accounting, both the IASB and the Commission of Swiss GAAP FER declare the provision of decision-useful information to investors of the reporting entity as one of the main objectives of financial reporting in line with their respective standards (see paragraph 5.1.2.1). Hence, given the common objective and the fact that both accounting standards evolve around the treatment of the same underlying economic phenomenon (i.e., Swiss pension plans), the third and last research question of this study (*RQ3*) is defined as follows,

RQ(3) Is financial information on Swiss pension plans reported in line with IAS 19 (2004) or ARR 16 (2005) more decision-useful to holders of equity securities of the reporting firms?

5.2 Research Approach and Hypotheses

5.2.1 Value-Relevance of Pension Accounting

5.2.1.1 Concept of Value-Relevance

Within the realm of capital-markets oriented empirical accounting research, the decision-usefulness of pension accounting to investors (i.e., equity holders) has commonly been studied by analyzing the so called *value-relevance* of the pension information reported in line with a specific accounting standard (Glaum, 2009). In general, an accounting amount is considered to be *value-relevant* if it “[...] is associated with some measure of value, e.g., share prices.” (Barth, 2000, p. 16).²²⁶ The important assumption underlying this sort of valuation research of financial reporting is the linkage between *decision-usefulness* and *value-relevance* of accounting information. For example, Barth (2000) describes this link as follows,

“[...] investors are primarily interested in information that can help them assess the value of the firm for purposes of making informed investment choices. Thus, valuation is a key input to and a key output of investors' decisions.” (Barth, 2000, p. 10)

²²⁶ Analogously, e.g., Beaver (2002, p. 459) defines an accounting measure as value-relevant “[...] if it is significantly associated with equity market value.”

Accordingly, accounting information is deemed to be (more) decision-useful to investors when it is associated with market values (more strongly) (see e.g., Lindemann, 2006, pp. 970-972). However, in general, the analysis of value-relevance in so called *association studies* can only provide indirect evidence on the decision-usefulness of reported financial information. In other words, it is not possible to directly test whether investors actually use the respective information for their investment decisions. In contrast, value-relevance tests can only provide evidence on whether the information tested is *consistent* with the *true* but *unobservable* set of information used by investors (Fasshauer & Glaum, 2008). Concretely, oftentimes, there exists a vector of publicly available information which is highly correlated with a specific accounting variable. Moreover, this vector of information is usually out in the public domain before the accounting variable itself is disclosed. Thence, events may be reflected in (equity) security prices before they get actually recognized in the accounting system of a firm. (Beaver, 2002). However, as e.g., Beaver (2002) aptly notes,

“[...] a key role of financial statements is to summarize relevant information parsimoniously and in a manner consistent with the underlying concept. It is informative to know how well accounting numbers play this role, even if vectors of competing proxies for the same underlying construct exist. [...] The balance-sheet and income-statements are not intended to list only those assets, liabilities, revenues, and expenses not preempted by other publicly available information. The financial statements are intended instead to be “complete” within the constraints and definitions of generally accepted accounting principles.” (Beaver, 2002, p. 461)

Accordingly, value-relevance studies evolve around the question of whether specific accounting information is *adequately reflected* in the valuation (i.e., price) of equity securities, and not whether the accounting information *actually affects* the valuation.²²⁷ Thus, by testing accounting measures against the benchmark of market values, the study

²²⁷ According to the conceptualization of Lo and Lys (2001), this is the key distinction between the study of *Value Relevance* on the one hand, and the study of *Valuation Relevance* and *Information Content* on the other hand. The latter two are said to be grounded in the seminal studies conducted by Ball and Brown (1968) as well as Beaver (1968), respectively. In contrast to the association studies of value-relevance (as conducted for the purposes of this study), valuation relevance and information content are usually investigated by so called *event studies*, where the deviations of security prices from prior expectations are predicted to be (partly) caused by the change in or announcement of accounting information. In contrast, the study of value-relevance is free of expectations. See e.g., Lo and Lys (2001) for more details.

of value-relevance is an attempt to operationalize the main objective of accounting standard-setters, as defined in paragraph 5.1.2.1, which is the provision of decision-useful information to investors (Barth et al., 2001).²²⁸ In line with e.g., Lo and Lys (2001), an accounting variable I , observed for firm i at time t , is formally deemed to be value-relevant if the function $g(\cdot)$, outlined in equation (5.1) below, is found to be *non-trivial* (i.e., not a constant; see Lo & Lys, 2001, pp. 6-7). Thus,

$$P_{it} = g(I_{it}) + \eta_{it} \quad (5.1)$$

where, P_{it} and η_{it} denote the share price and the set of all information other than I_{it} reflected in P of firm i at time t , respectively.

Notably, the concept of value-relevance research has not been uncontroversial. For example, Holthausen and Watts (2001) provide a landmark critique of value-relevance studies that are motivated by standard-setting (as is the case with this study). However, equally seminal is the contribution of Barth et al. (2001), where most of the critical arguments put forward by Holthausen and Watts (2001) are countered. In particular, in the view of Holthausen and Watts (2001), value-relevance research can provide only limited implications and few insights for standard-setting because it is not based on a descriptive theory of accounting and standard-setting. In contrast, Barth et al. (2001, p. 78) argue, that there exists “[...] no extant academic theory of accounting or standard setting [...]”, and that standard-setters such as the FASB set out their theories of accounting and standard-setting in their conceptual frameworks. Hence, value-relevance research attempts to operationalize key dimensions of these frameworks in order to assess whether accounting measures are in line with the stated objectives of financial reporting (Barth et al., 2001). Further, as outlined in paragraph 5.1.2.2, Holthausen and Watts (2001) criticize the focus of the value-relevance literature on investors and argue

²²⁸ As noted above, market values are a key output of investors’ decisions. It is also worth noting here that, apart from the *value-relevance*, researches have also investigated the *credit relevance* of pension accounting (see e.g., Hann, Hefflin, et al., 2007). For example, Hann, Hefflin, et al. (2007, p. 343) define credit relevance as “[...] usefulness in predicting creditors’ future cash flows.” Furthermore, they note “[...] the only factor that affects [the creditors’] expected future (nominal) cash flows is the probability of default.” (Hann, Hefflin, et al., 2007, p. 343). Thence, the authors assess the usefulness of pension accounting information “[...] to explain default probabilities.” (Hann, Hefflin, et al., 2007, p. 343). Notably, in general, research on credit relevance of (pension) accounting information is in line with alternative objectives of financial reporting such as e.g., debt contracting. However, as outlined in paragraph 5.1.2.2, such alternative roles of financial statements are not the focus of the research conducted in this study.

that value-relevance “[...] is not a necessary condition for standard setting given the FASB’s broad definition of users and uses [of financial statements].” (Holthausen & Watts, 2001, p. 26). Contrary to this view, Barth et al. (2001) argue that other uses and users of financial reporting, in no way, diminish the importance of value-relevance research. They agree that value-relevance is neither a *necessary* nor a *sufficient* condition for standard setting and state:

“Value relevance research is designed to provide evidence to accounting standard setters that can update their prior beliefs about how accounting amounts are reflected in share prices and, thus, can be informative to their deliberations on accounting standards.” (Barth et al., 2001, pp. 88-89)

Lastly, amongst other points, Holthausen and Watts (2001) also criticize the valuation models most frequently used for the study of value-relevance. For example, the authors argue that capital markets need to be at least reasonably efficient since otherwise share prices would not function as good benchmarks for standard-setting. However, Barth et al. (2001, p. 94) note the following,

“Value relevance research need only assume that share prices reflect investors’ consensus beliefs. Investors’ consensus beliefs are of interest because of the extensive literature, beginning with Ball and Brown (1968), documenting that share prices impound quite accurately the valuation implications of publicly available information. With the assumption that share prices reflect investors’ consensus beliefs, resulting inferences relate to the extent to which the accounting amounts under study reflect the amounts implicitly assessed by investors as reflected in equity prices. Value relevance research does not require assuming market efficiency.”²²⁹

²²⁹ Notably, the authors acknowledge that certain types of value-relevance tests require the assumption of market efficiency. For example, this holds for tests on the difference between estimated and theoretical benchmark coefficients that are “[...] derived from a valuation model based on economic constructs.” (Barth et al., 2001, p. 94). However, for the purposes of this study, no such tests are required.

Overall, in order to maximize comparability with prior research on the value-relevance of pension accounting, the approach of value-relevance research is applied for the purposes of this study.²³⁰

5.2.1.2 Operationalization of Decision-Usefulness

In general, value-relevance research is a way to operationalize the decision-usefulness of financial reporting. Moreover, it is important to note, since standard-setters clearly set out specific criteria for financial information to be deemed decision-useful to investors, value-relevance research need not determine but simply operationalize these criteria (Barth et al., 2001).

According to the IASB, for financial information to be useful “[...] it must be relevant and faithfully represent what it purports to represent.” (IASB Conceptual Framework, 2010, para. QC4). Accordingly, the IASB defines *relevance* and *faithful representation* as the two *fundamental qualitative characteristics* of decision-useful information (IASB Conceptual Framework, 2010, para. QC5). Financial information is considered as relevant if it “[...] is capable of making a difference in the decisions made by users.” (IASB Conceptual Framework, 2010, para. QC6). Further, financial information “[...] is capable of making a difference in decisions if it has predictive value, confirmatory value or both.” (IASB Conceptual Framework, 2010, para. QC7). Notably, financial information has predictive value if it can be used by users to form their own predictions. Thus, financial information must not necessarily be a prediction itself in order to have predictive value (IASB Conceptual Framework, 2010, para. QC8). In contrast to predictive value, financial information is deemed to have confirmatory value if it “[...] provides feedback about (confirms or changes) previous evaluations.” (IASB Conceptual Framework, 2010, para. QC9). Predictive and confirmatory value of financial information are interrelated. For example, current revenue may be used as prediction for future revenue and also as a benchmark to assess prior expectations about current revenue (IASB Conceptual Framework, 2010, para. QC10). Lastly, the IASB also subsumes the qualitative characteristic of *materiality* under relevance. Specifically, financial information is defined as material “[...] if omitting it or misstating it could influence decisions that users make [...]” (IASB Conceptual Framework, 2010, para. QC11). Notably, the board concludes that materiality is an entity-specific qualitative characteristic and thus, it is not able to “[...] specify a uniform quantitative threshold for materiality

²³⁰ A comprehensive review of the pension value-relevance literature is provided in sub-section 5.2.2 further below.

or predetermine what could be material in a particular situation.” (IASB Conceptual Framework, 2010, para. QC11).

According to the IASB, for financial information to be a faithful representation of the respective underlying economic phenomenon, it needs to be *complete*, *neutral* and *free of error* (IASB Conceptual Framework, 2010, para. QC12). Thence, to be complete a “[...] depiction includes all information necessary for a user to understand the phenomenon being depicted [...]” (IASB Conceptual Framework, 2010, para. QC13). Furthermore, a depiction is considered neutral if it “[...] is without bias in the selection or presentation of financial information.” (IASB Conceptual Framework, 2010, para. QC14). Specifically, the board notes,

“A neutral depiction is not slanted, weighted, emphasised, de-emphasised or otherwise manipulated to increase the probability that financial information will be received favourably or unfavourably by users.” (IASB Conceptual Framework, 2010, para. QC14)

Lastly, faithfully represented information needs to be free from error. However, as the IASB notes, this “[...] does not mean perfectly accurate in all respects.” (IASB Conceptual Framework, 2010, para. QC15). In contrast, the board provides the following definition,

“Free from error means there are no errors or omissions in the description of the phenomenon, and the process used to produce the reported information has been selected and applied with no errors in the process.” (IASB Conceptual Framework, 2010, para. QC15)²³¹

²³¹ The IASB also defines four additional qualitative characteristics of financial information, *comparability*, *verifiability*, *timeliness* and *understandability*, which should be maximized since they enhance the decision-usefulness, given the respective information is found to be relevant and a faithful representation of the underlying economic phenomenon (IASB Conceptual Framework, 2010, para. QC33). Nonetheless, the board notes that these enhancing qualitative characteristics, “[...] either individually or as a group, cannot make information useful if that information is irrelevant or not faithfully represented.” (IASB Conceptual Framework, 2010, para. QC33). Thus, these characteristics are not further discussed for the purposes of this study (IASB Conceptual Framework, 2010, para. QC19-QC34). Also, prior to 2010, the IASB used the four primary qualitative characteristics of *understandability*, *relevance*, *reliability* and *comparability* to define decision-usefulness (IASB Framework, 1989, para. 24). Qualitatively, the definition of relevance was equal to the one outlined above. Notably, it also entailed the concept of materiality (IASB Framework, 1989, para. 26-30). In contrast, faithful representation was sub-sumed under reliability (IASB Framework, 1989, para. 31-34). To be reliable, information was required to faithfully represent what

Analogous to the IASB, also the Commission of Swiss GAAP FER stipulates qualitative characteristics for financial information to be reported in line with the standard. Specifically, it is noted that “[...] information has to be *material* for the decision-making process of the user of the financial statements [*emphasis added*].” (ARR Framework, 2014, para. 29). Specifically, the concept is defined as follows,

“[...] Material are all facts that impact the valuation and presentation of the financial statements as a whole or of individual positions of the financial statements such that the assessment of the user of the financial statements would change if such facts would had been considered. [...]” (ARR Framework, 2014, para. 29)

Furthermore, in addition to materiality, financial information is also required to be *reliable* (ARR Framework, 2014, para. 32). Concretely, information is considered reliable “[...] if it is free from distorting influences and arbitrariness” (ARR Framework, 2014, para. 32).²³²

Given the fact that standard-setters clearly outline qualitative requirements for financial information to be decision-useful to investors, it is evident that tests of value-relevance are *joint tests* on whether the respective financial information meets these qualitative characteristics (Barth et al., 2001). Hence, for the purposes of this study, it is tested whether information on Swiss pension plans in line with IAS 19 (2004) is, at least to some extent, *relevant* and *faithfully represents* the economic phenomenon of a Swiss pension plan. Analogously, for financial information on Swiss pension plans in line with ARR 16 (2005), it is tested whether the information is, at least to some extent, *material* and *reliable*, given the other four qualitative characteristics are fulfilled (see footnote 232 on page 180). It is important to note, generally, it is not possible to attribute a lack of value-relevance exactly to any of the outlined qualitative characteristics (Barth et al.,

it purports to represent and also be “[...] free from material error and bias [...]” (IASB Framework, 1989, para. 31). Overall, for the purposes of this study, the requirements for financial information to be decision-useful in line with IFRS are considered to be qualitatively unaltered throughout the sample period of 2004 to 2012. Lastly, it is also noteworthy that the IASB tentatively decided that relevance and faithful representation continue to be the two fundamental qualitative characteristics of decision-useful information in the revised conceptual framework expected to be issued at the end of 2017. See (IASB, 2017c) for more details.

²³² Apart from materiality and reliability, the Commission of Swiss GAAP FER also defines *consistency*, *comparability*, *clarity* as well as *actual situation and outlook* as qualitative requirements for financial information (see ARR Framework, 2014, para. 30, 31, 33 and 34). However, for the purposes of this study, these are not discussed in more detail.

2001). As a result, for the purposes of this study, financial information on Swiss pension plans which is found to be value-relevant is considered to be decision-useful to investors. Correspondingly, information which is not found to be value-relevant is deemed as *not useful* or *not useful enough* to impact investors' decisions. However, the true but unobservable causes of such a lack of decision-usefulness remains a matter of interpretation.

5.2.1.3 Empirical Valuation Model

For the purposes of this study, the value-relevance of pension accounting is analyzed via a *price-levels* rather than a *return* valuation model incorporating book value of equity (EQ) and net income (NI) as the two primary summary measures provided by financial statements related to firm value. This is in line with a comprehensive body of prior research, especially with respect to research questions targeted at the controversy between the Revenue-Expense (REA) and the Asset-Liability Approach (ALA) of pension accounting (Glaum, 2009).²³³ Moreover, the key distinction between the price-levels and the return approaches to valuation is the focus of the latter on research questions related to the *timeliness* of (pension) accounting information. However, as described in footnote 231 on page 179, according to the IASB timeliness is “only” one of the four enhancing qualitative characteristics of decision-usefulness.²³⁴ Thence, applying return models to the study of value-relevance unnecessarily limits the set of possible research questions (Barth et al., 2001).

The valuation approach applied in this study is in line with Barth, Beaver, et al. (1998). Specifically, function $g(\cdot)$ outlined in equation (5.1), which is applied to map accounting information into market values of equity securities, is assumed to be a linear combination of the recognized book value of net assets (i.e., book value of equity, EQ) and the value of unrecognized net assets (UNA). Formally,

$$MKT CAP_{it} = \beta_1 EQ_{it} + \beta_2 UNA_{it} \quad (5.2)$$

²³³ See sub-section 5.2.2 for a review of the respective literature. Notably, in most studies conducted on the value-relevance of financial reporting, information tests are based on the *level* rather than the *change* (i.e., return) of firm value (see e.g., Barth et al., 2001).

²³⁴ Notably, in contrast to the IASB, the Commission of Swiss GAAP FER does not define timeliness as distinct qualitative requirement for decision-useful information. However, the concept is addressed indirectly with respect to the *accrual principle*. Accordingly, in its framework the Commission stipulates “[...] that expenses and income that occur in a given period are accrued and recognized in that period.” (ARR Framework, 2014, para. 11).

where $MKTCAP_{it}$, EQ_{it} and UNA_{it} denote the market capitalization (i.e., market value of equity), the book value of recognized net assets (i.e., book equity) and the value of unrecognized net assets of firm i at time t , respectively. Examples of net assets reflected by UNA are expenditures for research and development ($R\&D$), advertising costs, technological competencies, customer loyalty and growth opportunities (Barth, Beaver, et al., 1998). Notably, prior studies have found significant relations between market value and unrecognized net assets such as $R\&D$ expenditures (see e.g., Sougiannis, 1994), brand values (see e.g., Barth, Clement, Foster, & Kasznik, 1998) and human capital (see e.g., Ballester, Livnat, & Sinha, 2002; Lajili & Zéghal, 2005).²³⁵

The intuition behind model (5.2) is based on a simplistic setting where it is assumed that all recognized assets and liabilities (i.e., EQ) of firm i are measured at fair-values. Moreover, it is assumed that all of these fair-values are well-defined and observable in perfect and complete markets. Lastly, it is also assumed that UNA of firm i is observable and measurable without any error. Given these assumptions, coefficients β_1 and β_2 in equation (5.2) would both be expected to equal one. However, in any scenario more realistic than the simplistic setting described above, it is unlikely that UNA is directly observable. Accordingly, net income (NI) of firm i , measured for period t , is used as proxy for UNA at time t (Barth, Beaver, et al., 1998). This is in line with most pension value-relevance studies discussed in sub-section 5.2.2 below, and follows the notion that revenues and expenses related to unrecognized assets and liabilities are potentially reflected in net income (see e.g., Barth & Landsman, 1995; Ohlson, 1995). Thus, by implementing NI as proxy for UNA , equation (5.2) is formulated as follows,

$$MKTCAP_{it} = \beta_1 EQ_{it} + \beta_2 NI_{it} \quad (5.3)$$

where $MKTCAP_{it}$ and EQ_{it} are defined as in (5.2) and NI_{it} denotes the net income of firm i , recognized for period t . Notably, β_2 in equation (5.3) “[...] reflects the valuation effects of that portion of net income which is incremental [...] to book value of equity [...]” (Barth, Beaver, et al., 1998, p. 6). Nonetheless, in a setting more realistic than the simplistic one outlined above, it is unlikely that NI measures UNA without error. More-

²³⁵ As outlined in the literature review in sub-section 5.2.2, the intangible asset of human capital is also expected to be closely linked to all pension accounting information. This issue is also addressed in more detail in paragraph 6.2.3.5.

over, it is also not common that all recognized assets and liabilities (i.e., EQ) are measured at well-defined and observable fair-values. Lastly, in reality, the market capitalization (i.e., $MKTCAP$) of a firm may also reflect additional information not (yet) reflected in EQ and NI . Accordingly, to reflect measurement error and omitted information an intercept term, β_0 , as well as an error term, u , are additionally included in the model as follows (Barth, Beaver, et al., 1998),

$$MKTCAP_{it} = \beta_0 + \beta_1 EQ_{it} + \beta_2 NI_{it} + u_{it} \quad (5.4)$$

Model (5.4) is the benchmark model used in this study. As mentioned above and outlined in more detail in sub-section 5.2.2 below, this is in line with prior pension value-relevance research.²³⁶ In general, the basic structure of most models tested in the pension value-relevance literature is as follows,

$$MKTCAP_{it} = \beta_0 + \beta_1 EQbNPL_{it} + \beta_2 NibNPC_{it} + \beta_3 NPL_{it} + \beta_4 NPC_{it} + u_{it} \quad (5.5)$$

where $MKTCAP_{it}$ is defined as above and $EQbNPL_{it}$, $NibNPC_{it}$, NPL_{it} and NPC_{it} denote the book value of equity (EQ) net of (i.e., *before*) the recognition of the net pension liability (NPL), net income (NI) net of (i.e., *before*) the recognition of net pension cost (NPC), the net pension liability (NPL) as well as the net pension cost (NPC) of firm i , recognized for period t , respectively. The estimation of model (5.5) shows whether the net pension liability (NPL) as well as the net pension cost (NPC) are found to be value-relevant *incremental* to non-pension book equity ($EQbNPL$) and non-pension net income ($NibNPC$), respectively (Glaum, 2009).²³⁷ Implicit to equation (5.5) is the assumption that all pension assets (e.g., plan assets, PLA) and pension liabilities (e.g., defined benefit obligation, DBO) as well as all pension income (e.g., expected return, ER) and

²³⁶ Examples of value-relevance studies unrelated to pension accounting that test (variants of) model (5.4) are Collins, Maydew, and Weiss (1997); Collins, Pincus, and Xie (1999) and Burgstahler and Dichev (1997). Notably, e.g., Barth, Beaver, et al. (1998) find evidence that the incremental explanatory power of EQ (NI) in model (5.4) is higher (lower) for firms in financial distress confirming the hypothesis that the balance-sheet's primary role is to convey liquidation values compared to the income-statement's role to reflect (future) earnings power.

²³⁷ The applied methodology to estimate empirical versions of models (5.4) and (5.5) is outlined in more detail in section 6.2.

pension cost components (e.g., current service cost, *CSC*) have the same true but unobservable valuation coefficients, respectively. However, by disaggregating *NPL* and *NPC* into its components, it is possible to make the analysis more granular and gain insights regarding the incremental value-relevance of different pension accounting components (see e.g., Barth et al., 1993).

Following the classification of e.g., Holthausen and Watts (2001), studies that test the incremental value-relevance of different (pension) accounting measures, as outlined above, may be classified as *incremental association studies*. In contrast, so called *relative association studies* are applied to investigate the overall difference in explanatory power between different accounting variables. Concretely, in incremental association studies it is tested whether single accounting measures, such as e.g., *NPL* and *NPC*, are incrementally value-relevant, given other information included in the valuation model (e.g., *EQbNPL* and *NlbNPC*). A variable is deemed to be value-relevant if its valuation coefficient β is found to be significantly different from zero, in a statistical sense. In contrast, in relative association studies, it is tested whether the summary statistic R^2 is significantly different between models estimated for different accounting variables.²³⁸

It is important to note, the theoretical underpinning of the study of pension value-relevance based on (variants of) model (5.4), oftentimes, is attributed to the valuation framework developed by Ohlson (1995) (see e.g., Glaum, 2009). Ohlson (1995) developed a valuation model where the market value (i.e., share price) of a firm is defined by a linear combination of book value of equity (*EQ*), earnings (i.e., net income, *NI*), dividends (*DIV*) and all “other” information not (yet) reflected by the accounting variables, *v*. Specifically, the model is derived from the basic premise that share prices are defined by the *present value of all expected future dividends* (PVED). Relying on the so called *clean surplus relation* (CSR), that the change in book value of equity during an accounting period is solely based on earnings and net dividends (i.e, dividends minus capital contributions), as well as on a regularity condition that the book value of equity is growing at a rate inferior to the applied discount rate, PVED can mathematically be reformulated to the *residual income valuation model* (RIV). According to RIV, the share price is defined as a linear combination of the current book value of equity and the present value of all expected future abnormal earnings (Lo & Lys, 2000). Apparently, RIV has

²³⁸ Often, in value-relevance studies researchers apply a test procedure developed by Vuong (1989) to statistically test the difference in R^2 of different models. See footnote 251 on page 195 for more details. Nonetheless, for the purposes of this study, no such tests are applied.

been known, at least, since the 1930s.²³⁹ Thus, the important contribution of Ohlson (1995) is to embed RIV into a time-series framework where the abnormal earnings and other information, v , are modelled as auto-regressive processes (Lo & Lys, 2000). This so called *linear information model* (LIM) ensures that the RIV can be re-expressed in terms of current accounting and other information (i.e., EQ , NI , DIV and v).²⁴⁰ As mentioned above, in (pension) value-relevance studies, researches often apply variants of model (5.4) referring to the Ohlson model. However, empirically testing the Ohlson model via some variant of model (5.4) may severely alter its empirical implications (Ohlson, 2001). For example, Hand and Landsman (1998) show that omitting dividends (DIV) and other information (v) from model (5.4) potentially inflates the magnitude and changes the predicted signs of the coefficients of EQ (β_1) and NI (β_2), respectively. Hence, given the fact that model (5.4) lacks key components of the original model derived by Ohlson (1995), for the purposes of this study, variants of model (5.4) are applied based on the theoretical underpinning of recognized and unrecognized net assets (i.e., EQ and UNA) as discussed by e.g., Barth, Beaver, et al. (1998) and outlined above.

It is also worth to note, compared to the valuation approach of Ohlson (1995), the approach chosen for the purposes of this study (i.e., valuation based on recognized and unrecognized net assets) somewhat more naturally relates to research questions that evolve around the controversy between the Revenue-Expense (REA) and Asset-Liability Approach (ALA) discussed in section 4.1. Concretely, e.g., Barth and Landsman (1995) show that, in a simplistic setting of perfect and complete markets, measurement and realization of income (i.e., the income-statement) is redundant (i.e., irrelevant for valuation) if a firm recognizes all relevant assets and liabilities at well-defined and observable fair-values. In that case, the balance-sheet (implicitly) also reflects all relevant unrecognized (intangible) assets such as e.g., management skills. Hence, in equation (5.2) above, market capitalization ($MKTCAP$) would then equal book value of recognized net assets (EQ) and the value of unrecognized net assets (UNA) would be zero (see Barth & Landsman, 1995, pp. 99-100). Nonetheless, as discussed above, under real conditions assumptions made for the simplistic setting do not hold and UNA has to be approximated by e.g., NI and empirical models to be tested need to incorporate an intercept and an error term as defined in equation (5.4). Differences in the values and the statistical

²³⁹ For example, Bernard (1995, p. 741) refers to Preinreich (1938) and other sources hinting at the fact that RIV had been applied as early as the 1920s.

²⁴⁰ See e.g., Ohlson (1995), Lo and Lys (2000), Myers (1999) and Parienté (2003) for more details.

significance between the coefficients of balance-sheet variables (e.g., *EQ*) and the coefficients of income-statement variables (e.g., *NI*) may then be interpreted as evidence for or against the Revenue-Expense (REA) and the Asset-Liability Approach (ALA), respectively.²⁴¹

5.2.2 Literature Review

The value-relevance literature is vast.²⁴² Considerably smaller but still comprehensive is the part of the value-relevance literature that evolves around pension accounting. This sub-section provides an overview of the studies that, in the view of the author, are most closely related to the research questions formulated in sub-section 5.1.3. Thence, it is not intended here to provide an all-inclusive and complete review of the pension value-relevance literature.

In line with Glaum (2009), the studies reviewed are classified according to the empirical model specifications applied. Concretely, in a handful of studies, authors apply *earnings discount models* (ED). In contrast, authors of other studies implement *balance-sheet models* (BS) related to a basic model structure first applied by Landsman (1986). However, a majority of the empirical investigations on pension value-relevance is based on a combination of earnings discount (ED) and balance-sheet (BS) models as defined in equation (5.1). Notably, authors of these studies oftentimes refer to the valuation framework of Ohlson (1995) for the theoretical underpinnings of their empirical models. However, as outlined in paragraph 5.2.1.3, such models neglect key components of the Ohlson (1995) approach. Thus, for the purposes of this study, such model specifications are categorized as *unrecognized net assets models* (UNA). As discussed in paragraph 5.2.1.3, apart from recognized assets and liabilities, such models incorporate income and cost components in order to account for the market value of a firm's unrecognized

²⁴¹ See e.g., Fasshauer and Glaum (2008). Ironically, as is often the case, the authors derive their conclusions based on model (5.4), but nevertheless, refer to the valuation approach of Ohlson (1995).

²⁴² As of 2001, e.g., Holthausen and Watts (2001) list and classify 62 value-relevance studies in the period between 1972 and 2000. According to the authors, all of these studies are either explicitly or implicitly motivated by standard-setting (see e.g., Holthausen & Watts, 2001, pp. 8-10). Oftentimes, the origins of empirical value-relevance research is attributed to the seminal studies of Beaver (1968) and Ball and Brown (1968) (see e.g., Lindemann, 2006). Both of these studies are event studies evolving around the relation between earnings announcements and stock price changes. In line with Lo and Lys (2001), these studies may be classified as Information Relevance and Valuation Relevance studies, respectively. Although, according to Barth et al. (2001), the first study to explicitly use the term "value relevance" is Amir, Harris, and Venuti (1993). Also see e.g., Beisland (2008) for a comprehensive review of the value-relevance literature up to the year of 2008.

net assets. Furthermore, for each category of model specification, studies are presented below in chronological order.²⁴³

5.2.2.1 Earnings Discount Models

According to e.g., Glaum (2009), most pension value-relevance studies are based on US data, starting with the studies of Oldfield (1977) and Feldstein and Seligman (1981). Specifically, for a sample of 166 US firms for the financial year of 1974, and a sample of 117 as well as 193 US firms for the years of 1976 and 1977, respectively, these authors find the *unfunded vested pension obligation* reported in line with APB 8 (1966) to be significantly and adequately reflected in share prices applying an earnings discount model based on Modigliani and Miller (1958, 1966).

Daley (1984) conducts the first pension value-relevance study from an explicit accounting perspective. For a sample of 153 US industrial firms for the years of 1975-1979, the author applies an earnings discount model of the general form as defined in equation (5.6) below (Glaum, 2009),

$$MKT CAP_{it} = \beta_0 + \beta_1 NibNPC_{it} + \beta_2 NPC_{it} + u_{it} \quad (5.6)$$

where $MKT CAP_{it}$, $NibNPC_{it}$ and NPC_{it} denote the market capitalization (i.e., market value of equity), the book value of net income net of (i.e., *before*) net pension cost ($NibNPC$) and net pension cost (NPC) of firm i at time t , respectively. The author finds after-tax pension expense reported in line with APB 8 (1966) to be adequately reflected in market value of equity, thus coefficient β_2 in (5.6) is estimated to have a negative sign and to be significantly different from zero. Moreover, coefficients β_1 and β_2 in (5.6) are not found to be significantly different from each other, hence implying that non-pension income and pension expense are equally priced by investors. Furthermore, Daley (1984) also finds negative coefficients significantly different from zero when pension expense (NPC) is replaced by the unfunded vested pension obligation and the un-

²⁴³ Note, apart from model specifications, the methodology that is applied in the different studies reviewed here is not systematically discussed throughout sub-section 5.2.2. However, in section 6.2, references are made to various studies included in the literature review with regard to the implementation of the research methodology that is applied for the purposes of this study.

funded prior service cost (*PSC*) reported in line with APB 8 (1966), respectively. However, results suggest that these pension components are priced differently from their expected theoretical valuation weight of minus one.

For the fiscal years of 1986 to 1988, Barth et al. (1992) investigate a sample of 592 firm-year observations on 300 US firms. The authors implicitly refine the approach of Daley (1984) outlined above by disaggregating net income (*NI*) into revenues and non-pension expense as well as net pension cost (*NPC*). Furthermore, *NPC* is disaggregated into its five components reported in line with SFAS 87 (1985). Generally, the authors find evidence that net pension cost (*NPC*) as well as its components have the predicted signs and are significantly different from zero. However, for service cost (i.e., current service cost, *CSC*), the estimated coefficient is found to be positive albeit insignificant. Thence, the authors test whether service cost fails to adequately measure the pension liability but find no confirming evidence for this hypothesis “[...] leaving unresolved the anomalous finding for its coefficient.” (Barth et al., 1992).²⁴⁴ Further, results also suggest that the estimated coefficients for the components of *NPC* are significantly different from one another. This confirms the authors’ hypothesis that the level of persistence differs across the different components. Overall, coefficients on *NPC* and its components are also found to be significantly higher compared to the coefficients on non-pension revenue and expense. According to Barth et al. (1992), this finding suggests that market participants attach less risk (i.e., lower discount rates) to pension compared to non-pension assets and liabilities.

Lastly, for a sample of 774 observations on 256 US firms applying SFAS 87 (1985) across the sample period of 1998 to 2001, Davis-Friday et al. (2005) estimate a variant of model (5.6). Specifically, the authors find the *NPC* components interest cost (*IC*) and the expected rate of return on plan assets (*ER*) to be value-relevant. Notably, although estimated coefficients on *IC* are found to be significantly different from zero, they all have a positive sign opposite to expectations.

5.2.2.2 Balance-Sheet Models

In contrast to the studies outlined above, Landsman (1986) was the first to apply a balance-sheet rather than an earnings discount model to investigate the value-relevance of

²⁴⁴ As outlined below, this unpredicted result has since been confirmed by numerous other studies and has come to be known as the *service cost anomaly*.

pension accounting information. Concretely, the author applies a valuation model of the following basic structure (Glaum, 2009),

$$MKTCAP_{it} = \beta_0 + \beta_1 TAbPA_{it} + \beta_2 TLbPL_{it} + \beta_3 PA_{it} + \beta_4 PL_{it} + u_{it} \quad (5.7)$$

where, $TAbPA_{it}$, $TLbPL_{it}$, PA_{it} and PL_{it} denote total assets recognized on the balance-sheet net of (i.e., *before*) the recognition of pension assets, total liabilities recognized on the balance-sheet net of (i.e., *before*) the recognition of pension liabilities, pension assets and pension liabilities recognized on the balance-sheet of firm i for period t , respectively. If model (5.7) is correctly specified and market participants value pension assets and liabilities as corporate assets and liabilities, coefficients β_3 and β_4 have predicted values of one and minus one, respectively (Landsman, 1986). The sample consists of 235, 621 and 624 observations of US firms for the fiscal years of 1979, 1980 and 1981, respectively. Pension information is accounted for in line with the Statement of Financial Accounting Standards Nr. 36 *Disclosure of Pension Information* (FAS 36), an amendment of APB 8 (1966) issued by the FASB in May 1980 (FAS 36, 1980). Landsman (1986) finds all estimated coefficients for the pension liabilities (PL) to be negative and significantly different from zero. Coefficients for pension assets (PA) are all found to be positive. However, only half of the estimates are significantly different from zero. Notably, the difference between all estimated pension coefficients and their predicted theoretical values of one and minus one are not found to be significantly different from zero. It is also noteworthy that the author finds relatively large and significant values for the intercept term possibly due to measurement error and/or omitted variable bias. Also, relatively high standard errors are estimated for the pension variables possibly caused by high multicollinearity between all covariates. Accordingly, Landsman (1986) suggests to incorporate pension variables on a net basis only in order to mitigate the effects of multicollinearity.²⁴⁵

Based on the balance-sheet model applied by Landsman (1986), Barth (1991) investigates the measurement errors between the estimated pension variables coefficients (β_3 and β_4 in model (5.7)) and their theoretical values of one and minus one, respectively. The author investigates a sample of 150, 702 and 1,082 US firms applying SFAS

²⁴⁵ The diagnostics as well as the methodological remedies applied for the purposes of this study in order to mitigate possibly adverse effects of measurement error, multicollinearity, and omitted variables are discussed in more detail in section 6.2.

87 (1985) for the fiscal years of 1985, 1986 and 1987, respectively. Results show that different measures of pension assets and liabilities in line with SFAS 87 (1985) are significantly related to the market values of the sample firms. However, in some cases, the level and/or the sign of the coefficient estimate is different from their theoretical values, suggesting measurement errors causing coefficient bias. Barth (1991) finds less measurement errors for the fair value of plan assets and the pension liabilities (either accumulated, vested or projected) disclosed in the notes than for the net pension (asset)/liabilities (*NPL*) recognized on the balance-sheet. According to the author, this suggests that investors view pension assets and liabilities as corporate assets and liabilities and adopt a view of economic substance rather than one of legal form with respect to pension plans.

Gopalakrishnan and Sugrue (1993) investigate a sample of 659 and 739 US firms that apply SFAS 87 (1985) for the fiscal years of 1987 and 1988, respectively. The authors apply the general form of the model used by Landsman (1986) and Barth (1991) as defined in equation (5.7). Furthermore, Gopalakrishnan and Sugrue (1993) decompose the projected benefit obligation (*PBO*) into the vested and non-vested obligation as well as the component of salary projections. In line with the studies outlined above, results suggest that the fair-values of plan assets (*PLA*) and the *PBO* are value-relevant. The estimated coefficients have the predicted signs and are significantly different from zero. However, potentially due to measurement errors, they are found to be different from their theoretical values of one and minus one, respectively. Moreover, for all three components of the *PBO*, the authors find the estimated coefficients to be negative and significantly different from zero, respectively. Accordingly, this suggests that investors not only value the vested but also the non-vested pension obligation as well as projected future salary increases as corporate liabilities.

For a sample of 10,891 firm-year observations on firms listed in the US applying SFAS 87 (1985), Brown (2004) tests the value-relevance of pension assets and liabilities estimating variants of model (5.7) across the sample period of 1991 to 2002. Overall, for all model specifications, the author finds estimated coefficients on plan assets (*PLA*) and defined benefit obligations (*DBO*) to have the expected signs and to be significantly different from zero. Notably, Brown (2004) also provides evidence that the value-relevance of the *DBO* does not differ between firms with over- and underfunded pension plans.

Eventhough the authors of the following two studies do not estimate variants of model (5.7), their research approach is nonetheless closely related to the balance-sheet

approach of investigating pension value-relevance (Glaum, 2009). Dhaliwal (1986) examines the relation between systematic firm risk and the unfunded vested pension obligation accounted for in accordance with APB 8 (1966). For a sample of 55 firms observed over the period of 1976 to 1979, the author estimates a model of the following basic structure

$$\beta_i = b_0 + b_1\beta_{A,i} + b_2\beta_{A,i}(1 - \tau_i) \left(\frac{D_i}{EQ_i} \right) + b_3\beta_{A,i}(1 - \tau_i) \left(\Delta \frac{D_i}{EQ_i} \right) + u_i \quad (5.8)$$

where, compared to the model definitions discussed thus far, the regression coefficients are denoted by b and β_i and $\beta_{A,i}$ denote the average levered systematic (i.e., operating) and the average unlevered operating risk of firm i across the sample period, respectively. Dhaliwal (1986) proxies for the unobserved operating risk with the “[...] covariability of a firm’s accounting earnings before interest and taxes [i.e., EBIT] with the accounting earnings of the market portfolio [...]” (Dhaliwal, 1986, p. 3). Accordingly, the author denotes the operating risk factor as *accounting beta* (β_A). Further, the terms $\left(\frac{D_i}{EQ_i} \right)$ and $\left(\Delta \frac{D_i}{EQ_i} \right)$ denote the leverage of the firm, estimated as ratio between total debt (D_i) and equity (EQ_i) recognized on the balance-sheet, as well as the incremental leverage of the unfunded vested pension liability not recognized but disclosed in the notes for firm i , respectively. Estimating model (5.8) using different tax rates, the author finds coefficient b_3 to be positive and significantly different from zero. Thus, results confirm the hypothesis that market participants view the unfunded vested pension obligation not recognized on the balance-sheet but disclosed in the notes as corporate debt contributing to the financial risk (i.e., leverage) of a firm.

The results of Dhaliwal (1986) are corroborated by the more recent study of Jin et al. (2006) who estimate models of the following basic structure,

$$\beta_{E+D,it} = b_0 + b_1\beta_{pension,it} + \sum_{c=1}^C b_c Control_{c,it} + u_{it} \quad (5.9)$$

where, $\beta_{E+D,it}$ and $\beta_{pension,it}$ denote the operating risk as well as the pension risk of firm i at time t estimated in the context of the *capital asset pricing model* (CAPM) of

Sharpe (1964), respectively.²⁴⁶ *Control* denotes a vector of different control variables incorporated to increase the robustness of the estimations. Overall, for a sample of 4,008 firm-year observations on US firms accounting for their pension plans in line with SFAS 87 (1985) across the sample period of 1993 to 1998, the coefficient b_1 in model (5.9) is found to be positive and significantly different from zero across all estimated model variants. Thence, according to the authors, these results confirm the hypothesis that equity betas of firms seem to adequately reflect pension risk despite opaque and highly complex pension accounting rules.

5.2.2.3 Unrecognized Net Assets Models

According to e.g., Glaum (2009), most recent studies on the value-relevance of pension accounting apply some variation of the following basic model structure,

$$MKT CAP_{it} = \beta_0 + \beta_1 EQbNPL_{it} + \beta_2 NibNPC_{it} + \beta_3 PLA_{it} + \beta_4 DBO_{it} + \beta_5 NPC_{it} + u_{it} \quad (5.10)$$

where $MKT CAP_{it}$ is defined as above and $EQbNPL_{it}$, $NibNPC_{it}$, NPL_{it} and NPC_{it} denote the book value of equity (EQ) net of (i.e., *before*) the recognition of the net pension liability (NPL), net income (NI) net of (i.e., *before*) the recognition of net pension cost (NPC), net pension liability (NPL) as well as net pension cost (NPC) of firm i recognized for period t , respectively. Notably, model (5.10) corresponds to model (5.5) defined in paragraph 5.2.1.3 as the basic empirical valuation model applied for the purposes of this study, whereas the net pension (asset)/liability (NPL) is disaggregated into plan assets (PLA) and the defined benefit obligation (DBO), respectively.

For a sample of 1,050 firm-year observations based on 300 US firms applying SFAS 87 (1985), Barth et al. (1993) extend the study of Barth et al. (1992). Specifically, the authors estimate annual regressions for a variant of model (5.6) across the sample period of 1987 to 1990. Results corroborate the findings of Barth et al. (1992) as outlined above. Specifically, the estimation yields positive and significant coefficients for net

²⁴⁶ The authors define pension risk as weighted average *net risk* stemming from the pension plan in line with the following identity $\beta_{pension} = \frac{\beta_{PLA} PLA}{E+D} - \frac{\beta_{DBO} DBO}{E+D}$, where E , D , PLA and DBO denote the total book values of equity, debt, plan assets and the defined benefit obligation, respectively. Furthermore, β_{PLA} and β_{DBO} are estimated as weighted average of assumed betas and the sample average allocation across different asset classes as well as an estimated beta from 30-year Treasury bond rates, respectively.

income net (i.e., *before*) net pension cost, *NibNPC*, and negative and significant coefficients for interest costs (*IC*). Furthermore, coefficients of *IC* are found to be larger than those estimated for *NibNPC* confirming the authors' hypothesis that investors perceive pension interest cost as less risky, i.e., attach a lower discount rate to it, compared to non-pension income and cost. Moreover, estimated coefficients for service cost (i.e., current service cost, *CSC*) are not found to be significantly different from zero and also positive for one of the four financial years investigated. This also confirms the service cost anomaly documented by Barth et al. (1992). Also, coefficients on the return on plan assets are found to be positive, significant and larger than their counterparts regarding non-pension income. Again, investors appear to attach lower risk to pension asset returns compared to non-pension returns. The authors hypothesize that this is due to the relatively high share of fixed income securities pension assets had been invested in during the sample period. Most notably, Barth et al. (1993) expand their model to incorporate non-pension and pension assets and liabilities and test a variant of model (5.10) outlined above. Concretely, the net pension (asset)/liability (*NPL*) is split into plan assets (*PLA*) and the present value of the pension obligation (i.e., *DBO*) disclosed in the notes. Again, net pension cost (*NPC*) is decomposed in its different income and cost components. In general, the estimated coefficients for the pension assets and liabilities have the predicted signs and are found to be significantly different from zero. In contrast, the same does not hold for the coefficients on the pension income and cost components. Accordingly, the authors hypothesize that market participants essentially value pension assets and liabilities as financial assets and liabilities (which usually are not associated with any relevant intangible assets) and hence, investors view pension income and cost as somewhat redundant information.

Subramanyam and Zhang (2001) analyze a sample of 5,954 firm-years based on 1,198 US firms applying SFAS 87 (1985) for the sample period of 1991-1997. Notably, the authors find higher explanatory powers for their model specification including asset and liability as well as income and cost covariates compared to models that include non-pension net income and pension income and cost components only. Specifically, by splitting net pension cost (*NPC*) into the two separate covariates service cost (i.e., current service cost, *CSC*) and the residual of *NPC*, Subramanyam and Zhang (2001) explicitly address the service cost anomaly first documented by Barth et al. (1992). By including adequate control variables to capture the value of human capital (i.e., size of assembled workforce and employee productivity), the authors find the estimated coefficient on *CSC* to be negative and significantly different from zero. In contrast, for all model specifications excluding these controls, the coefficient on *CSC* is positive and

significant i.e., confirming the service cost anomaly. The authors hypothesize that their results are due to the fact that, if not controlled for, service cost is a proxy that also captures the value of human capital reflected within the market value of a firm.²⁴⁷ Furthermore, Subramanyam and Zhang (2001) also find estimated coefficients for plan assets (*PLA*) and defined benefit obligations (*DBO*) to have the expected signs and to be significantly different from zero. Finally, the authors also provide evidence that the part of the full pension obligation which is attributable to *future* rather than *past* and *current* employee service is incrementally value-relevant for investors suggesting that the *DBO* understates the true economic pension obligation.

Coronado and Sharpe (2003) apply a similar approach as Barth et al. (1993) and investigate 4,359 firm-year observations on US firms that apply SFAS 87 (1985) and which are included in the *S&P 500*® index for the sample period of 1993 to 2001.²⁴⁸ The basic structure of the valuation model applied corresponds to model (5.10) defined above. However, the authors incorporate pension assets and liabilities on a net basis, i.e., the funding status (*FS*), and use analysts' forecasts of current year earnings as proxy for net income (*NI*). Specifically, the authors include non-pension net income as the analysts' forecast net of (i.e., *before*) all pension income and cost components except service cost (i.e., current service cost, *CSC*). Thus, in the view of the authors, *CSC* is part of the core (i.e., operating) earnings of a firm. Accordingly, net pension cost (*NPC*) included in the model is comprised of interest cost (*IC*), expected return on plan assets (*ER*) and other pension cost components in line with SFAS 87 (1985). The authors contrast estimation results of the model excluding and including net pension cost (*NPC*). Overall, the results of Coronado and Sharpe (2003) suggest that the estimated coefficient on the funding status (*FS*) is not significantly different from zero if net pension cost (*NPC*) is included in the model specification. Accordingly, the authors suggest that investors had been “fooled” by the pension accounting rules of SFAS 87 (1985) insofar that they valued the somewhat *opaque* net pension cost (*NPC*), incorporating an assumed expected return on plan assets and smoothing of actuarial gains and losses (*AGL*),

²⁴⁷ The approach to control for the service cost anomaly followed by Subramanyam and Zhang (2001) has also been applied in subsequent studies such as e.g., Hann, Heflin, et al. (2007, see below). The respective remedy applied for the purposes of this study are outlined in more detail in paragraph 6.2.3.5.

²⁴⁸ The *S&P 500*® index is provided by S&P Dow Jones Indices (a division of S&P Global) and comprises 500 top companies of leading industries of the US economy and accounts for approximately 80% of total US market capitalization. See e.g., S&P 500 (2017) for more details.

instead of the *transparent* marked-to-market value of the funding status (*FS*) of the pension plan.²⁴⁹ Notably, the results of Coronado and Sharpe (2003) contrast the findings of Barth et al. (1993) discussed above and suggest that investors focus on reported pension income and cost rather than pension assets and liabilities. Thence, the authors advocate pension accounting rules that lead to the reporting of non-smoothed, i.e., marked-to-market, net pension cost (*NPC*).

As an exception to the majority of pension value-relevance studies based on US data, Wiedman and Wier (2004) analyze a sample of 256 firm-year observations based on 128 Canadian firms that sponsor defined benefit pension plans and account for at least USDm 10 of plan assets in line with the Handbook Section 3461 *Employee Future Benefits* issued by the *Canadian Institute of Chartered Accountants* (CICA).²⁵⁰ For the sample period of 2000-2001, the authors estimate a combination of the basic structures of the models (5.6) and (5.7) defined above, incorporating the split of net pension cost (*NPC*) into its different components in line with Barth et al. (1993). Overall, for the year of 2000, estimated coefficients on pension assets and liabilities show predicted signs and are found to be significantly different from zero. In contrast, this does not hold for the pension income and cost components. Thus, results corroborate the findings of Barth et al. (1993) and contrast results of Coronado and Sharpe (2003). However, for the year of 2001, also the coefficients for pension assets and liabilities are not found to be significantly different from zero. Notably, Wiedman and Wier (2004) extend prior research by investigating whether the value-relevance of the funding status (*FS*) of defined benefit pension plans differs between firms with over- and firms with underfunded plans. Interestingly, results suggest that pension plan deficits are more strongly associated with market values of equity compared to plan surpluses. Moreover, the authors find that pension plan surpluses do not seem to contribute to the market value of the sponsoring

²⁴⁹ The distinction between the so called *transparent* and *opaque models* of pension valuation is based on Gold (2003). Specifically, the author argues that in line with traditional pension finance theory occupational pension plans have been viewed and valued as “[...] financial subsidiaries of the sponsoring corporations, assuming that corporate managers, financial analysts and shareholders will see the plan this way and act accordingly.” (Gold, 2003, p. 2). In contrast, pension accounting rules such as SFAS 87 (1985) and IAS 19 (2004) allow the recognition of expected returns (*ER*) on pension assets and the delayed recognition of actuarial gains and losses (*AGL*) leading to a rather opaque disclosure of the true market values of pension plans in the financial statements of the sponsoring firms. Hence, Gold (2003) suggests that investors most likely apply an accounting (i.e., opaque) view to corporate pension plans and thus may fail to adequately derive the true (i.e., fair) values of pension plans.

²⁵⁰ In line with SFAS 87 (1985) and IAS 19 (2004), Section 3461 (2000) allows considerable smoothing of actuarial gains and losses (*AGL*) and requires extensive respective disclosures in the notes (see e.g., Wiedman & Wier, 2004, p. 230).

firm at all. Thence, Wiedman and Wier (2004) conclude that their findings are in line with a labour economics perspective of corporate pension plans whereas plan surpluses are attributable to plan participants (i.e., insurees) and plan deficits fall back onto the sponsoring firm. Hence, the authors conclude:

“Given that a firm can at least partially recover plan surplus through reduced future funding to the plan, the consistent lack of valuation of plan surpluses by market participants indicates that the market discounts any anticipated funding holidays deeply, either perceiving them to be too far in the future or too subject to uncertainty to increase current firm value.” (Wiedman & Wier, 2004, p. 238)

In line with Barth et al. (1993), Hann, Hefflin, et al. (2007) test a model of the basic structure as defined in equation (5.10). However, the authors include pension assets and liabilities as net amount (i.e., *NPL*) and split net pension cost (*NPC*) into a recurring and a non-recurring component. Specifically, the recurring component of *NPC* consists of current service cost (*CSC*) and interest cost (*IC*) as well as of the expected return on plan assets (*ER*). In contrast, components such as actuarial gains and losses (*AGL*) as well as prior service cost (*PSC*) are combined into the non-recurring component of *NPC*. Moreover, Hann, Hefflin, et al. (2007) estimate their model using two different sets of pension information. In essence, the authors contrast estimation results for *NPL* and *NPC* as recognized (i.e., smoothed) in line with SFAS 87 (1985) and respective fair-value amounts of *NPL* and *NPC* as disclosed in the notes. For a sample of 13,601 observations on 2,258 US firms across the sample period of 1991 to 2002, coefficients on the smoothed (i.e., as-recognized) *NPL* and *NPC* show the predicted signs and are found to be significantly different from zero. With the exception of the non-recurring component of *NPC*, the same also holds for the estimations using fair-value amounts, as disclosed in the notes. The authors hypothesize that the insignificant coefficient on fair-value actuarial gains and losses (*AGL*), prior service cost (*PSC*) and other non-recurring components of *NPC* is due to their low persistence opposite to recurring elements of *NPC*. Nevertheless, by applying a Vuong (1989) test, Hann, Hefflin, et al. (2007) find no significant difference between the explanatory power (i.e., R^2) of the smoothed and the fair-value models.²⁵¹

²⁵¹ Vuong (1989) derives a likelihood ratio test indicating which of two competing and non-nested regression models more closely explains the “true” data generating process of the observed independent variable (e.g., share

Similar to Hann, Heflin, et al. (2007), Hann, Lu, et al. (2007) investigate a sample of 12,567 observations on 1,707 US firms applying SFAS 87 (1985) across the sample period of 1991-2003. The authors estimate a model with a basic structure similar to model (5.7) outlined above. However, contrary to the “pure” balance-sheet approach of Landsman (1986), Hann, Lu, et al. (2007) also include net income (*NI*) as separate covariate. Nevertheless, net pension cost (*NPC*) is not incorporated separately into the model. Results show that the estimated coefficients for pension assets and liabilities have the predicted signs and are significantly different from zero. This holds irrespective of whether the pension benefit obligation (i.e., *DBO*) as disclosed in the notes in line with SFAS 87 (1985) or an estimate based on industry median actuarial assumptions (such as e.g., discount rates and future salary growth rates) is applied as proxy for the market value of the pension liability. Moreover, the authors find the difference between the reported *DBO* and the *DBO* estimated based on industry median assumptions to be incrementally value-relevant suggesting that “[...] discretionary choices made by managers in selecting pension assumptions provide valuable information to the market about the underlying economics of the pension obligation.” (Hann, Lu, et al., 2007, p. 119).

Kiosse et al. (2007) estimate model (5.10) but incorporate pension assets and liabilities on a net basis (i.e., *NPL*). The authors investigate a sample of 3,388 firm-years based on US firms applying SFAS 87 (1985) for the sample period of 1998-2005. Results suggest that all pension variables have the predicted sign and are significantly different from zero. Notably, this also holds for models where *NPC* is disaggregated into its separate components such as current service cost (*CSC*), interest cost (*IC*) and expected return on plan assets (*ER*). Kiosse et al. (2007) also contrast their estimation results of net pension cost (*NPC*) as recognized in line with SFAS 87 (1985) to more fair-value-based measures of *NPC* incorporating full actuarial gains and losses (*AGL*) including the difference between the expected and the actual return on plan assets. Overall, the findings of Kiosse et al. (2007) suggest that market participants perceive as-recognized (i.e., smoothed) net pension cost (*NPC*) to be more value-relevant compared to the more volatile fair-value measures incorporating full actuarial gains and losses (*AGL*) confirming results of prior studies such as e.g., Barth et al. (1992) and Hann, Heflin, et al. (2007). The authors hypothesize that this might be due to the fact that investors perceive net pension cost (*NPC*) to be a more permanent component of net income (*NI*),

prices) under the null hypothesis that neither of the two models is true. See e.g., Dechow (1994, Appendix 2) for a concise outline of the test procedure.

thus indirectly justifying the smoothing approach of pension accounting stipulated by SFAS 87 (1985).

Coronado et al. (2008) extend the analyses of Coronado and Sharpe (2003) as outlined above by including observations for the financial years of 2002 to 2005. Hence, the sample consists of 7,290 observations on US firms listed on the S&P 500 index for the sample period of 1993-2005. According to the authors, this sample period is particularly interesting since it covers “[...] the boom, bust, and subsequent recovery of the equity market [...]”(Coronado et al., 2008, p. 265) related to the *new economy boom* and the subsequent *dot-com crisis* at the end of the nineteen-nineties and the early two-thousands.²⁵² Overall, the findings of Coronado et al. (2008) corroborate the results of Coronado and Sharpe (2003). Specifically, the estimated coefficients on net pension cost (*NPC*), excluding current service cost (*CSC*), always have the predicted sign and are significantly different from zero whereas this does not hold for the estimated coefficients on the funding status (*FS*) of pension plans disclosed in the notes. Based on their results, the authors conclude that investors had continued to misprice the pension plans of the investigated firms, despite strong distortions to the funding statuses (*FS*) of these plans in the aftermath of the stock market crash in 2001, and heightened public interest in the shortfalls of smoothing net pension cost (*NPC*) in line with SFAS 87 (1985).

Fasshauer and Glaum (2008) are the first to empirically test the value-relevance of pension accounting for a sample of German firms (Wagenhofer, 2008). Specifically, the authors estimate different variants of models (5.6) and (5.10) disaggregating net pension (asset)/liability (*NPL*) and net pension cost (*NPC*) into its different components disclosed in the notes. The sample consists of 503 observations based on 101 firms listed in the prime segment of the *Deutsche Börse* spanning the sample period of 1999 to 2005. Specifically, 350 (i.e., 69.58%) and 153 (i.e., 30.42%) observations are attributable to firms applying IAS 19 (2004) and SFAS 87 (1985), respectively. The authors find the coefficients on net pension (asset)/liability (*NPL*), the funding status (*FS*), the plan assets (*PLA*), the defined benefit obligation (*DBO*) as well as the unrecognized net pension (asset)/liability (*NPLNR*, i.e., unrecognized actuarial gains and losses (*AGLNR*) and past service cost (*PSC*), see TABLE 3.1 on page 89) to have the predicted signs and to be significantly different from zero. Notably, the same does not hold for the estimated coefficients of net pension cost (*NPC*). Fasshauer and Glaum (2008) find *NPC* to be significantly different from zero and to have the predicted negative sign only for a model

²⁵² See e.g., Inc. (2017) for brief historical account of the new economy boom and the bursting of the dot-com bubble.

specification excluding any pension asset and liability variables. In contrast, as soon as models incorporate proxies for the above-mentioned recognized and/or disclosed pension assets and liabilities, the estimated coefficients of *NPC* either show a positive sign, are not found to be significantly different from zero or both. The authors also split their sample into sub-samples of firms applying IAS 19 (2004) and SFAS 87 (1985), respectively. For the IFRS-observations, results corroborate the findings for the pooled sample. However, for the US-GAAP-observations, pension information is not found to be value-relevant potentially due to the small sample size. More interestingly, the authors find *NPLNR* to be value-relevant for the sub-sample of firms opting for the Corridor-Method. In contrast, for firms applying the OCI- or the PL-Method of recognizing actuarial gains and losses (*AGL*), this component is not found to be value-relevant. This finding is in line with the authors' expectation that unrecognized actuarial gains and losses (*AGLNR*) convey economically relevant information to market participants. Overall, the results of Fasshauer and Glaum (2008) also confirm the service cost anomaly first documented by Barth et al. (1992). More importantly, the authors argue that their results support the shift of pension accounting, especially with regard to IAS 19 (2004), from the Revenue-Expense Approach (REA) to the Asset-Liability Approach (ALA) insofar that they find pension assets and liabilities to be value-relevant in contrast to net pension cost (*NPC*).

Fasshauer and Glaum (2009) extend their analysis outlined above. Specifically, the authors include one more year of observation on their sample of 101 German listed firms, that either apply IAS 19 (2004) or SFAS 87 (1985), increasing their final sample to a total of 598 observations across the sample period of 1999 to 2006. Again, the authors apply variants of model (5.10) and results corroborate the findings of Fasshauer and Glaum (2008), whereas all estimated coefficients for the net pension (asset)/liability (*NPL*), the funding status (*FS*), the plan assets (*PLA*), the defined benefit obligation (*DBO*) as well as the unrecognized net pension (asset)/liability (*NPLNR*) are found to have the expected signs and to be significantly different from zero. In contrast, for net pension cost (*NPC*), the estimated coefficient shows a negative sign and is significantly different from zero only for a model specification that excludes any proxy variables for pension assets and liabilities. As soon as covariates such as *NPL*, *FS*, *PLA*, *DBO* and *NPLNR* are included in the models, the estimated coefficient for *NPC* is not significant and mostly shows a positive sign thus confirming the service cost anomaly first documented by Barth et al. (1992). Overall, the results corroborate the findings of Barth et al. (1993) that market participants value pension assets and liabilities as financial assets and liabilities with the consequence that information on pension income and cost becomes somewhat redundant. Lastly, model specifications including the fair-value based

net pension (asset)/liability (*NPL*), i.e., the funding status (*FS*) or its components plan assets (*PLA*) and defined benefit obligation (*DBO*), are not found to have a significantly higher explanatory power compared to models that recognize the smoothed *NPL* on the balance-sheet. Nonetheless, *NPLNR*, that mainly includes unrecognized actuarial gains and losses (*AGLNR*) due to the Corridor-Method, is found to be value-relevant for investors. Overall, according to Fasshauer and Glaum (2009), results support the abandonment of the Corridor-Method and the shift towards a full recognition approach such as e.g., the OCI- and the PL-Method.

For a sample of 1,189 firm-year observations based on the largest 200 firms of the *Fortune 500*, Werner (2011) investigates the value-relevance of pension information in line with SFAS 87 (1985) for the sample period of 1998 to 2005.²⁵³ Concretely, the author estimates different model specifications following the basic structure of model (5.10). Overall, results suggest that aggregated pension information is more value-relevant compared to disaggregated information. Moreover, the author provides evidence that fair-value based pension accounting does not increase the value-relevance of pension information compared to smoothed pension accounting as stipulated by SFAS 87 (1985). Notably, the estimated coefficient on net pension (asset)/liability (*NPL*) recognized on the balance-sheet is not found to be significant once the off-balance-sheet unrecognized net pension (asset)/liability (*NPLNR*) is included in a model. Thus, based on the finding that investors appear to value *NPLNR* as disclosed in the notes, the author suggests that moving towards a more fair-value based pension accounting approach, such as e.g., the OCI-Method in contrast to the Corridor-method, may not significantly increase the value-relevance of pension information. Finally, also the results of Werner (2011) confirm the service cost anomaly since the estimated coefficient for net pension cost (*NPC*) is found to be positive and significantly different from zero for all respective model specifications tested.

Based on the same sample as analyzed by Fasshauer and Glaum (2009), Fasshauer and Glaum (2012) extend the investigation by disaggregating net pension cost (*NPC*) into its different components. However, as for *NPC*, results suggest that neither of the components current service cost (*CSC*), interest cost (*IC*), expected return on plan assets (*ER*), actuarial gains and losses (*AGL*) and past service cost (*PSC*) is found to be value-relevant. Moreover, estimated coefficients on *IC* and *ER* show signs opposite to expectations in all model specifications.

²⁵³ Fortune 500 comprises the 500 largest companies (measured in terms of revenue) operating in the US. See e.g., Fortune (2017) for more details.

For a sample of 350 firm-year observations based on 70 UK firms listed on the *FTSE 100* index, Kirkpatrick (2012) investigates the value-relevance of pension accounting in line with IAS 19 (2004) across the sample period of 2006 to 2010.²⁵⁴ Concretely, the author estimates various different model specifications based on the *transparent* as well as the *opaque* base case versions introduced by Coronado and Sharpe (2003, see above). For the pooled sample, results suggest that the net pension (asset)/liability (*NPL*) is significantly different from zero. This holds whether net pension cost (*NPC*, excluding current service cost, *CSC*) is included as separate covariate (*opaque view*) or not (*transparent view*). Also, the author finds *NPC* to be significantly different from zero. However, for both covariates *NPL* and *NPC* estimated signs are opposite to expectations. In terms of net pension cost (*NPC*), this might be interpreted in the context of the well documented service cost anomaly. In the view of the author, the curious result with regard to *NPL* could be interpreted as investors strongly discounting the negative (positive) effects of net pension liabilities (assets) recognized in line with IAS 19 (2004), viewing them as too long-term and too volatile estimates. Overall, results are unaltered for model specifications where *NPL* and *NPC* are disaggregated into plan assets (*PLA*) and defined benefit obligations (*DBO*) as well as different income and cost components, respectively. Notably, the only component of *NPC* that is found to be significantly different from zero is actuarial gains and losses (*AGL*). However, also the estimated coefficients for *AGL* show unpredicted signs. Across all specifications, models incorporating both proxies for pension assets and liabilities as well as net pension cost (*NPC*) show slightly higher explanatory power compared to models without cost coefficients (i.e., *transparent* models).

Yu (2013) investigates the value-relevance of pension accounting based on 7,887 firm-year observations on 991 US firms applying SFAS 87 (1985) during the sample period of 1999 to 2007. Specifically, the author applies model specifications in line with the basic structure as defined in equation (5.10). However, Yu (2013) incorporates the net pension (asset)/liability (*NPL*) as well as the unrecognized part of *NPL*, (i.e., *NPLNR*) as separate covariates. Notably, estimation results suggest that coefficients for *NPL* are estimated to have the predicted signs and to be significantly different from zero. In contrast to the findings of e.g., Werner (2011), the same does not hold for *NPLNR* and net pension cost (*NPC*). For both covariates, estimated coefficients in all model specifications are not found to be significantly different from zero and often also show

²⁵⁴ The *Financial Times Stock Exchange 100* share index (FTSE 100) comprises the 100 largest and most actively traded companies listed on the London Stock Exchange. See e.g., FTSE 100 (2017) for more details.

a sign opposite to expectations. Overall, results are unaltered for model specifications that include control variables for institutional ownership, analyst coverage and dummy variables accounting for the fact that, since 2006 firms accounting in line with US GAAP must apply the OCI-Method of recognizing actuarial gains and losses (*AGL*).²⁵⁵ Nevertheless, the analysis of Yu (2013) provides some evidence that the share prices of firms with a higher ratio of institutional ownership (i.e., higher investor sophistication) or more analyst coverage (i.e., better information environment) “[...] are more likely to reflect disclosed pension liabilities, and are less likely to be affected by the subsequent recognition of off-balance-sheet pension liabilities.” (Yu, 2013, p. 1109).

Last but not least, the most recent study included in this review is conducted by Chen et al. (2015). For a sample of 1,465 observations on 160 US firms applying SFAS 87 (1985), the authors investigate the stand-alone value-relevance of *single-employer defined benefit pension plans* (SEPP) as well as so called *multi-employer defined benefit pension plans* (MEPP) across the sample period of 2000 to 2012, respectively. The authors apply variants of the model specification (5.10) but do not incorporate net pension cost (*NPC*) as separate covariate. Instead, the funding statuses (*FS*) of a firm’s SEPP and MEPP are included in the models. Results suggest that market participants perceive both the funding status (*FS*) on single-employer (SEPP) as well as multi-employer pension plans (MEPP) to be value-relevant. Estimated coefficients show the expected signs and are found to be significantly different from zero.

5.2.2.4 Summary

TABLE 5.1 provides a full list of the studies outlined above including information on sample demographics and main results. Overall, the 26 studies included in the literature review comprise 19 papers (P) published in finance and accounting research journals, six unpublished working papers (WP) as well as one publicly accessible PhD thesis (PhD). The studies discussed were conducted between 1977 and 2015 and cover an overall sample period of 1974 to 2012. The mean (median) number of firm-year observations analyzed in these studies is 3,185 (1,294) spanning from a minimum of 55 to a maximum of 13,601. In most studies reviewed, authors investigate samples based on US firms applying US GAAP. In contrast, in only five (i.e., 19.23%) of the 26 studies discussed, authors analyze non-US samples.

²⁵⁵ See e.g., Statement of Financial Accounting Standards No. 158 *Employers’ Accounting for Defined Benefit Pension and Other Postretirement Plans* (SFAS 158, 2006) for more details regarding the respective amendment of SFAS 87 (1985).

TABLE
5.1 Review of Pension Value-Relevance Literature

Study	Period	n ^a	Standard	Region	Model Specification ^b				Form ^c
					ED	BS	UNA	Other	
Oldfield (1977)	1974	166	APB 8 (1966)	US	x				P
Feldstein and Seligman (1981)	1976-1977	310	APB 8 (1966)	US	x				P
Daley (1984)	1975-1979	153	APB 8 (1966)	US	x				P
Landsman (1986)	1979-1981	1,480	FAS 36 (1980)	US		x			P
Dhaliwal (1986)	1976-1979	55	APB 8 (1966)	US				x	P
Barth (1991)	1985-1987	1,934	SFAS 87 (1985) ^d	US		x			P
Barth, Beaver, and Landsman (1992)	1986-1988	592	SFAS 87 (1985)	US	x				P
Gopalakrishnan and Sugrue (1993)	1987-1988	1,398	SFAS 87 (1985)	US		x			P
Barth, Beaver, and Landsman (1993)	1987-1990	1,050	SFAS 87 (1985)	US	x		x		P
Subramanyam and Zhang (2001)	1991-1997	5,954	SFAS 87 (1985)	US					WP
Coronado and Sharpe (2003)	1993-2001	4,359	SFAS 87 (1985)	US		x	x		P
Brown (2004)	1991-2002	10,891	SFAS 87 (1985)	US		x			WP
Wiedman and Wier (2004)	2000-2001	256	Sec. 3461 (2000) ^e	CAD			x		P
Davis-Friday, Miller, and Mittelstaedt (2005)	1998-2001	774	SFAS 87 (1985)	US	x				WP
Jin, Merton, and Bodie (2006)	1993-1998	4,008	SFAS 87 (1985)	US				x	P
Hann, Heflin, and Subramanyam (2007)	1991-2002	13,601	SFAS 87 (1985)	US			x		P
Hann, Lu, and Subramanyam (2007)	1991-2003	12,567	SFAS 87 (1985)	US		x	x		P
Kiosse, Lubberink, and Peasnell (2007)	1998-2005	3,388	SFAS 87 (1985)	US			x		WP
Coronado, Mitchell, Sharpe, and Blake Nesbitt (2008)	1993-2005	7,290	SFAS 87 (1985)	US			x		P
Fasshauer and Glaum (2008)	1999-2005	503	IAS 19 (2004)	DE	x		x		P
Fasshauer and Glaum (2009)	1999-2006	598	IAS 19 (2004)	DE	x		x		WP
Werner (2011)	1998-2005	1,189	SFAS 87 (1985)	US			x		P

(continued on next page)

TABLE (continued)

Study	Period	<i>n</i> ^a	Standard	Region	Model Specification ^b				Form ^c
					ED	BS	UNA	Other	
Fasshauer and Glaum (2012)	1999-2006	598	IAS 19 (2004) SFAS 87 (1985)	DE	x		x		WP
Kirkpatrick (2012)	2006-2010	350	IAS 19 (2004)	UK		x	x		PhD
Yu (2013)	1999-2007	7,887	SFAS 87 (1985)	US			x		P
Chen, Martin, Mashruwala, and Mashruwala (2015)	2000-2012	1,465	SFAS 87 (1985)	US			x		P

Note. The TABLE depicts all pension value-relevance studies discussed in sub-section 5.2.2. The list is sorted chronologically. CAD, GER, UK and US indicate Canada, Germany, United Kingdom and United States, respectively.

^a *n* denotes the total number of firm-year observations included in the final sample.

^b Model specifications are categorized into earnings discount models (ED) related to equation (5.6), balance-sheet models (BS) related to equation (5.7), unrecognized net assets (UNA) models in line with equation (5.8) as well as any other form of model specification. x indicates the application of respective model specifications.

^c Studies are classified into the three different forms of published paper (P), unpublished working paper (WP) and PhD thesis (PhD), respectively.

^d Note, after its enactment in 1985, SFAS 87 had also been amended subsequently. However, for the purposes of this study, respective amendments are not discussed separately and SFAS 87 (1985) denotes the standard *as issued* and *as amended*, interchangeably.

^e The domestic Canadian pension accounting standard, the Handbook Section 3461 *Employee Future Benefits*, was issued by the Canadian Institute of Chartered Accountants (CICA) and became effective as of January 1, 2000.

Specifically, Fasshauer and Glaum (2008, 2009, 2012) as well as Kirkpatrick (2012) investigate the value-relevance of IAS 19 (2004) for firms listed in Germany and the UK, respectively. In contrast, the study conducted by Wiedman and Wier (2004) is the only work discussed here where authors investigate the value-relevance of pension accounting in line with a purely domestic standard, namely the Canadian pension accounting standard Section 3461 (2000). Also notable is the fact that none of the studies discussed here explicitly contrasts the value-relevance of pension plans between financial services and non-financial (i.e., industry) firms. With respect to the applied empirical models, in 14 (i.e., 53.85%) of the studies discussed authors apply some form of unrecognized net assets (UNA) models defined as in equation (5.10). In contrast, earnings discount (ED) as well as balance-sheet (BS) models are applied in 9 (34.62%) and 7 (26.92%) of the studies reviewed, respectively. Although related to the balance-sheet approach originated by Landsman (1986), Dhaliwal (1986) and Jin et al. (2006) are the only two (i.e., 7.69%) of the studies discussed here, where authors apply some other form of empirical models directly relating pension obligations to systematic (i.e., operating) firm risk.

Overall, the literature reviewed provides strong, albeit indirect, evidence for the value-relevance of pension plans. Specifically, in all studies discussed, authors find all or some of the pension accounting information to be significantly associated with the market value of equity of respective firms. Thence, in line with the research approach outlined in sub-section 5.2.1, results suggests that pension accounting conveys decision-useful information to market participants. Notwithstanding this overall conclusion, the evidence is somewhat equivocal with respect to the more specific research question of whether pension assets and liabilities or pension income and cost components are more value-relevant. For example, Barth et al. (1993) find pension income and cost components to be value-relevant only if pension assets and liabilities are not controlled for in their model specifications. Thence, the authors suggest that investors value pension assets and liabilities as financial instruments that are marked-to-market, and accordingly view pension income and cost components as somewhat redundant information. In contrast, for example Coronado and Sharpe (2003) as well as Coronado et al. (2008) show pension assets and liabilities to be value-relevant only if pension income and cost components are not accounted for in their empirical models. Based on these results, the authors argue that market participants take on a so called *opaque view* of corporate pension plans and accordingly regard smoothed net pension cost (*NPC*) as more decision-useful than the fair-values of pension assets and liabilities i.e., they do not adopt a *transparent view* of pension plans. In terms of IAS 19 (2004), findings of e.g., Fasshauer and Glaum

(2008, 2009, 2012) corroborate the results of Barth et al. (1993) insofar that pension assets and liabilities are found to be value-relevant whereas this does not hold for pension income and cost components. In contrast, for example Kirkpatrick (2012) provides evidence for the value-relevance of both the net pension (asset)/liability (*NPL*) as well as the net pension cost (*NPC*) accounted for in line with IAS 19 (2004). Furthermore, for example Fasshauer and Glaum (2008, 2009, 2012) and Werner (2011) also find the unrecognized net pension (asset)/liability (*NPLNR*) disclosed in the notes to be value-relevant for investors. In contrast, for example Yu (2013) does not find *NPLNR* to be incrementally value-relevant to *NPL* and results of e.g., Coronado and Sharpe (2003), Coronado et al. (2008) and Kiosse et al. (2007) suggest that market participants perceive smoothed (i.e., as-recognized) net pension cost (*NPC*) to be more value-relevant compared to fair-value pension income and cost measures including e.g., *AGL*. Thence, the literature reviewed provides no clear evidence regarding the question of whether the Revenue-Expense (REA) or the Asset-Liability (ALA) Approach of pension accounting is more decision-useful to investors.

Apart from the controversy between the Revenue-Expense and the Asset-Liability Approach, the literature reviewed also provides somewhat ambiguous results with respect to other research questions. For example, Daley (1984) finds no differences between the estimated coefficients of non-pension and pension income and cost components. In contrast, e.g., Barth et al. (1992) find coefficients on pension income and cost components to be significantly higher compared to non-pension income and cost. The authors suggest that investors perceive pension income and cost to be more persistent and, thus, attach lower risks to these components compared to non-pension income and cost figures. Furthermore, for example Brown (2004) finds no difference in the value-relevance of over- and underfunded pension plans whereas e.g., Wiedman and Wier (2004) show that pension deficits are more strongly associated with market values of equity than pension plan surpluses.

Lastly, in contrast to the results outlined above, the studies discussed present rather unequivocal evidence in terms of the so called *service cost anomaly*. Specifically, most authors that incorporate current service cost (*CSC*) as separate covariate into their empirical models find its coefficient to be positive and oftentimes also significantly different from zero. For example, Subramanyam and Zhang (2001) suggest that this rather anomalous result might be due to the fact that pension information in general, and service cost in particular, also proxy for the value of human capital reflected in the market value of a firm. Correspondingly, the authors estimate a negative and significant coefficient for *CSC* by incorporating adequate control variables for the value of human capital

into their models. Accordingly, this result is then in line with the expectations derived in the context of the empirical valuation model defined in paragraph 5.2.1.3, which is applied for the purposes of this study.

5.2.3 Research Hypotheses

In order to empirically investigate the three research questions $RQ(1)$, $RQ(2)$ and $RQ(3)$ derived in sub-section 5.1.3, specific research hypotheses are formulated next. The formulations take into account the evidence provided by prior literature as reviewed in sub-section 5.2.2. The hypotheses are directly testable by applying the research approach outlined in sub-section 5.2.1.

In the first research question $RQ(1)$, formulated in sub-section 5.1.3, it is asked whether investors of the sponsoring firms deem financial information on Swiss pension plans reported in line with IAS 19 (2004) and ARR 16 (2005) to be decision-useful. Given the relevance of Swiss pension plans for the Swiss economy and society at large, as well as the evidence provided by prior literature on the value-relevance of pension plans in other jurisdictions, $RQ(1)$ is translated into the first testable research hypothesis, $H(1)$, formulated as follows:

H(1) *Value-Relevance of Swiss Pension Plans:* For Swiss pension plans, financial information reported in line with IAS 19 (2004) or ARR 16 (2005) is value-relevant i.e., significantly associated with the market value of equity of the reporting firms.

As outlined in sub-section 5.1.3, in research question $RQ(2)$ it is asked more specifically which elements of the financial information reported on Swiss pension plans in line with IAS 19 (2004) and ARR 16 (2005) are decision-useful to investors of the reporting firms. Notably, $RQ(2)$ is embedded within the greater debate about the “right” approach to financial reporting (Fasshauer & Glaum, 2008). Specifically, the question aims at the shift in paradigm in pension accounting from the Revenue-Expense (REA) to the Asset-Liability Approach (ALA) outlined in section 4.3. As discussed in paragraph 5.2.2.4, prior literature delivers equivocal evidence on whether pension assets and liabilities or pension income and costs are more value-relevant to investors. The same also holds for the question of whether smoothed or fair-value pension accounting information is more decision-useful to the holders of equity securities of the reporting firms. Nevertheless, in line with $H(1)$ outlined above, the following research hypotheses are formulated in order to enhance the granularity of the analysis and to provide some answers to $RQ(2)$:

- H(2a)** *Value-Relevance of NPL*: For Swiss pension plans, the net pension (asset)/liability (*NPL*), recognized in line with IAS 19 (2004) or ARR 16 (2005), is value-relevant i.e., significantly associated with the market value of equity of the reporting firms.
- H(2b)** *Value-Relevance of NPC*: For Swiss pension plans, the net pension (income)/cost (*NPC*), recognized in line with IAS 19 (2004) or ARR 16 (2005), is value-relevant i.e., significantly associated with the market value of equity of the reporting firms.
- H(2c)** *Value-Relevance of EC*: For Swiss pension plans, the employer contributions (*EC*), recognized in line with IAS 19 (2004) or ARR 16 (2005), are value-relevant i.e., significantly associated with the market value of equity of the reporting firms.

As outlined in chapter 3, in line with both IAS 19 (2004) and ARR 16 (2005), assets and liabilities as well as income and cost related to Swiss pension plans may not be recognized in full at their respective fair-values. In contrast, in line with IAS 19 (2004), recognition of actuarial gains and losses (*AGL*) as well as past service cost (*PSC*) may be delayed and the corresponding amounts disclosed in the notes of the reporting firms. Furthermore, in line with ARR 16 (2005), recognition of assets and liabilities as well as income and cost arising from Swiss pension plans is smoothed along the statutory funding ratio as illustrated in FIGURE 3.7 (see page 123). Accordingly, investigating the value-relevance of the financial pension information not recognized but disclosed in the notes of the reporting firms may provide further insights with regard to *RQ(2)*. Concretely, if market participants perceive this information to be decision-useful, this indicates their preference for the full recognition of assets and liabilities arising from Swiss pension plans on the balance-sheet of the sponsoring firms. In other words, they then would favor the Asset-Liability (ALA) over the Revenue-Expense Approach (REA) with regard to the accounting for Swiss pension plans. The corresponding research hypothesis *H(2d)* is formulated as follows,

- H(2d)** *Value-Relevance of Disclosures*: For Swiss pension plans, financial information not recognized but disclosed in the notes in line with IAS 19 (2004) or ARR 16 (2005) is value-relevant i.e., significantly associated with the market value of equity of the reporting firms.

It must be noted, with regard to Swiss pension plans, answers to *RQ(2)* may also be strongly dependent on the specific institutional setting. Concretely, Swiss pension plans are highly funded and legally separate from the sponsoring firms. Moreover, any refund to the sponsoring firm out of a plan surplus is prohibited by law. Thence, firms may only benefit from an overfunded pension plan through future contribution reductions. Also, the financial burden of deficits in Swiss pension plans is usually shared between the employer and the employees (see sub-section 2.2.6). As a result, the net pension (asset)/liability (*NPL*) to be recognized by the reporting firms arising from Swiss pension plans may be less material compared to pension plans in other jurisdictions. Furthermore, respective employer contributions to Swiss pension plans must be transferred annually to the legally separate entity and, thus, are persistently recognized in profit or loss of the reporting firms.

With regard to the funding ratio of pension plans, prior literature provides only equivocal evidence. For example, Brown (2004) finds no difference in the value-relevance of over- and underfunded pension plans sponsored by US firms. In contrast, for a sample of Canadian firms e.g., Wiedman and Wier (2004) find pension plan deficits to be value-relevant whereas results suggest that the same does not hold for plan surpluses. Based on their results, the authors suppose that future benefits that potentially arise from a pension plan surplus are more strongly discounted by market participants compared to future costs stemming from a pension plan deficit. Moreover, prior literature reviewed in sub-section 5.2.2 also provides equivocal evidence regarding the value-relevance of financial pension information disclosed in the notes. For example, Werner (2011) finds the unrecognized net pension liability (*NPLNR*) to be significantly associated with the market value of equity of the reporting firms. In contrast, e.g., Yu (2013) finds *NPLNR* not to be incrementally value-relevant to the net pension (asset)/liability (*NPL*) recognized on the balance-sheet of reporting firms. Also, whereas for example Barth et al. (1993) provide evidence that market participants adopt a so called *transparent view* in that, they value assets and liabilities arising from pension plans as financial instruments that are marked-to-market, e.g., Coronado and Sharpe (2003) and Coronado et al. (2008) find smoothed and as-recognized pension information to be more value-relevant than fair-value amounts. Thence, the authors argue that investors adopt an *opaque view* of corporate pension plans not fully accounting for the true fair-values of these plans in their valuations.

Lastly, given the long-standing controversy regarding the accounting for Swiss pension plans discussed in sub-section 5.1.1, research question *RQ(3)* aims at asking whether financial information on Swiss pension plans reported in line with IAS 19

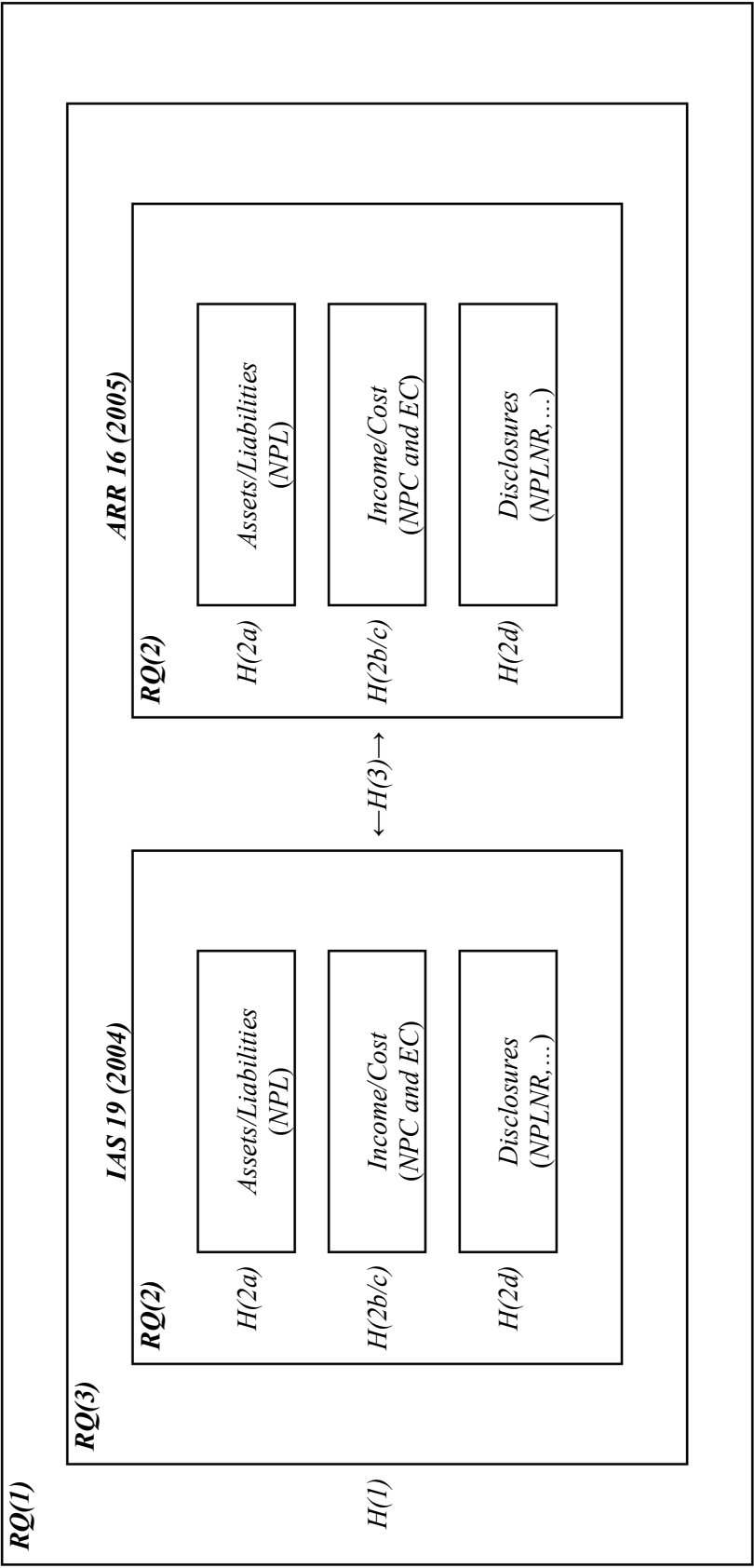
(2004) or ARR 16 (2005) is *more* decision-useful to investors. Notably, as described in sub-sections 3.3.2 and 4.3.4, the Commission of Swiss GAAP FER departed from the pension accounting approach followed by the IASB when it enacted ARR 16 (2005) for financial years beginning on or after January 1, 2006 (early application permitted). Also, in recent years there has been a lasting trend of firms in Switzerland that voluntarily switch from the application of IFRS to Swiss GAAP FER. As outlined in paragraph 5.1.1.3, for some of these firms the different accounting treatment of their Swiss pension plans in line with ARR 16 (2005) compared to IAS 19 (2004) was a major factor driving the decision to switch. Hence, given that both accounting standard-setters define the provision of decision-useful information to investors as one of their main objectives, as well as the fact that ARR 16 (2005) had been issued specifically to account for the idiosyncracies of Swiss pension plans, the following research hypothesis is tested in order to provide more insights regarding *RQ(3)*.

H(3) *Value-Relevance of Standards:* For Swiss pension plans, financial information reported in line with ARR 16 (2005) is more value-relevant i.e., more strongly and significantly associated with the market value of equity of the reporting firms than financial information reported in line with IAS 19 (2004).

Within the context of *H(3)*, it is also notable that, for example, Wiedman and Wier (2004) find financial information reported on pension plans in line with the Canadian domestic accounting standard to be value-relevant. Moreover, e.g., Fasshauer and Glaum (2008) compare the value-relevance of IAS 19 (2004) and SFAS 87 (1985) with regard to German pension plans. Nevertheless, in none of the studies reviewed in sub-section 5.2.2 is the value-relevance of pension accounting information explicitly contrasted between an international standard such as e.g., IAS 19 (2004) as well as a domestic accounting standard such as e.g., ARR 16 (2005).

The interrelationships between the three research questions *RQ(1)*, *RQ(2)* and *RQ(3)* outlined in sub-section 5.1.3, the corresponding six hypotheses formulated above, as well as the different categories of financial information on Swiss pension plans, that are either recognized (*Assets/Liabilities* and *Income/Cost*) or disclosed (*Disclosures*) by the reporting firms, are conceptualized graphically in FIGURE 5.1 below. Note, investigating research question *RQ(2)* also directly translates to answering *RQ(1)* and *RQ(3)*, respectively. Thus, by testing research hypotheses *H(2a)*-*H(2d)*, the remaining two research hypotheses *H(1)* and *H(3)* are tested simultaneously and, thence, evidence

FIGURE
5.1 Research Questions and Hypotheses



Note. The FIGURE conceptualizes the interrelationships between the three research questions *RQ(1)*, *RQ(2)* and *RQ(3)*, outlined in sub-section 5.1.3, the corresponding six research hypotheses *H(1)*-*H(3)*, formulated in sub-section 5.2.3, as well as the different categories of financial information on Swiss pension plans that are either recognized (*Assets/Liabilities* and *Income/Cost*) or disclosed (*Disclosures*) by the reporting firms.

for or against $H(2a)$ - $H(2d)$ may also be interpreted as evidence for or against $H(1)$ and $H(3)$, respectively. Nevertheless, in order to gain insights with regard to $RQ(1)$ and $RQ(3)$, the evidence provided must be interpreted holistically across all four hypotheses $H(2a)$ - $H(2d)$.

5.3 Research Gap and Contribution

Back in 2004, e.g., H. Zimmermann (2004) aptly asked whether accounting in line with IAS 19 resolves the issue of accurately valuing a Swiss pension plan within the context of business valuation? The author notes that more transparent accounting per se does not necessarily lead to more value-relevant information for the *marginal* investor (i.e., the investor determining the current share price). Nevertheless, H. Zimmermann (2004) advocates the value-relevance of Swiss pension plans, irrespective of the specific pension accounting standard applied by the sponsoring firms. Although in line with the social and economic relevance of Swiss pension plans outlined in section 2.1, this view has not yet been explicitly scrutinized in empirical studies. After all, the existent body of empirical pension accounting research is mainly based on US firms sponsoring US pension plans (Glaum, 2009). Concretely, this also holds for the pension value-relevance literature reviewed in sub-section 5.2.2. Furthermore, as already noted in sub-section 5.1.3, pension systems are highly idiosyncratic across different jurisdictions and thus, findings of pension value-relevance research conducted within one specific institutional setting may not be generally applicable to any other institutional setting (Fasshauer & Glaum, 2008; Helbling et al., 2006). Notably, at the time of this writing, not a single empirical study has been identified where the research is explicitly aimed at the value-relevance of Swiss pension plans. Thus, in the view of the author, there currently exists an obvious research gap with respect to the value-relevance of Swiss pension plans. Given their social and economic relevance as well as the long-standing and ongoing controversy about how to best account for these plans in the financial statements of the sponsoring firms (see sub-section 5.1.1), the time seems ripe to further contribute to the closing of this gap.

Given the research gap identified above, it is the foremost aim of the empirical study conducted here to contribute to the pension accounting standard-setting process with respect to Swiss pension plans. Notably, at the time of this writing, neither the IASB nor the Commission of Swiss GAAP FER have initiated any major research or standard-

setting projects aiming at a fundamental revision of IAS 19 or ARR 16, respectively.²⁵⁶ Nevertheless, in June 2015, the IASB published an exposure draft (ED) on proposed amendments to IAS 19 and IFRIC 14 regarding the remeasurement on plan amendments, curtailments or settlements as well as the availability of refunds from defined benefit plans. Notably, the board proposes to amend IFRIC 14 so that “[...] a future refund should not include amounts that other parties (for example, the plan trustees) can use for other purposes [...]” (IASB, 2015, p. 5). Moreover, the board proposes to amend IFRIC 14 to ensure that in determining the availability of a plan surplus the reporting firm shall also consider “[...] the statutory requirements that are substantively enacted, as well as the terms and conditions that are contractually agreed and any constructive obligations.” (IASB, 2015, p. 5). Accordingly, from a Swiss perspective, the proposed amendments to IFRIC 14 seem to somewhat further align IFRS pension accounting with the institutional setting of Swiss pension plans, as well as the accounting approach outlined in ARR 16.²⁵⁷ Also notable in that respect are two current research projects on the accounting for so called *hybrid pension plans*. Hybrid pension plans incorporate components of both defined benefit as well as defined contribution plans (EFRAG, 2017a). Accordingly, as outlined in sub-section 3.2.4, Swiss pension plans may also be defined as hybrid plans. One of the projects is conducted by the IASB itself in order to assess the feasibility of developing an accounting approach for pension plans where benefits are (partly) dependent on future expected returns on plan assets, as is also the case with regard to Swiss pension plans. Concretely, the approach to be developed would be focused on the relationship between the cash-flows as well as the discount rate to be applied for the measurement of such benefits. The second project is currently conducted by the *European Financial Reporting Advisory Group* (EFRAG) and also aims at developing potential amendments to IAS 19 in relation to hybrid pension plans where future benefits are (partly) linked to the returns earned on the plan assets.²⁵⁸ At the time of

²⁵⁶ Regularly updated information about completed and ongoing research as well as standard-setting projects of the IASB and the Commission of Swiss GAAP FER may be found on IASB (2017e) and FER (2017a), respectively.

²⁵⁷ Also see IASB (2017e) for more details on the two maintenance projects regarding IAS 19 and IFRIC 14. Note, the board expects to issue the corresponding amendments in December 2017 as well as during the first half of 2018, respectively, i.e., after the editorial deadline of the study conducted here.

²⁵⁸ EFRAG is a private association consisting of European stakeholders interested in developing and promoting European views on financial reporting such as the *European Banking Federation* (EBF) and *Accountancy Europe* (ACE) as well as the national accounting standard-setting bodies of countries such as Germany, France, the UK and others. Specifically, EFRAG advises the *European Commission* (EC) on whether newly issued or amended IFRS meet the necessary criteria to be endorsed for use throughout the European Union (EU). Furthermore, the

this writing, neither of the two projects has been finalized yet.²⁵⁹ Apart from these on-going research projects, the findings of the empirical study conducted here may also provide new insights for standard-setting bodies such as the IASB and the Commission of Swiss GAAP FER on how to further develop the accounting approach for hybrid pension plans in general, as well as for Swiss pension plans in particular.

Apart from potential contributions to pension accounting standard-setting, the study conducted here may also provide new insights to stakeholders, such as e.g., investors and analysts, interested in the valuation of firms sponsoring Swiss pension plans. First, the detailed description outlined in chapter 2 may contribute to these stakeholders' general understanding of the Swiss occupational pension system. Furthermore, chapter 3 may also contribute to their understanding of how Swiss pension plans are accounted for in line with IAS 19 (2004) and ARR 16 (2005), and thence, may increase their awareness of the financial impact such pension plans have on the sponsoring firms. Also, chapter 4 may enhance those stakeholders' comprehension of the theoretical underpinnings of pension accounting, how it evolved over time, and where pension accounting standard-setting is heading to in the foreseeable future. Moreover, sub-section 5.1.1 informs those stakeholders about the long-standing and ongoing controversy about how to best account for Swiss pension plans, potentially sensitizing them more for the particularities of the Swiss occupational pension system. Lastly, the results of the empirical analysis of the value-relevance of Swiss pension plans may show to these stakeholders if, and how, Swiss pension plans are reflected within the market value of equity of sponsoring firms, and whether this is also dependent on industry classification (i.e., industry vs. financial) or the specific accounting standard applied, i.e., IAS 19 (2004) or ARR 16 (2005).

Last but not least, it is also worth noting, the study here is conducted at a time during which the Swiss occupational pension system is, once again, under public scrutiny. Specifically, on September 24, 2017, the Swiss electorate voted against a major joint reform of the first and second pillar of the Swiss social welfare system, as it is described in section 2.1.²⁶⁰ Amongst other things, the reform would have led to an increase of the mandatory age of retirement for women, from currently 64 to 65, as well as a decrease

body promotes European views directly to the IASB throughout the standard-setting process (see e.g., EFRAG, 2017b for more details).

²⁵⁹ See e.g., IASB (2017e) and EFRAG (2017a) for regularly updated information on the two projects.

²⁶⁰ Overall, 52.7% of Swiss voters voted against the reform (see e.g., BSV, 2017b for more details).

in the conversion rate for mandatory benefits payable by Swiss pension plans from currently 6.8% to 6.0%. Thus, one of the main objectives of the reform was to account for the ever-increasing life expectancy of insurees and, thence, further enhancing the sustainability of the funding of Swiss pension plans (see footnote 38 on page 38 for more details). Also, a recent representative survey among 1,000 adults has shown that the sustainability of the first and second pillar of the Swiss social welfare system is currently *the* main worry of citizens in Switzerland, even more relevant than concerns about unemployment and immigration.²⁶¹ Thus, overall, contributing to the continual improvement of the accounting approach for Swiss pension plans may not only be in the best interest of e.g., standard-setters, investors and management of sponsoring firms but, in the end, may also be relevant for policy makers as well as for the wider public in Switzerland alike. After all, as the current chairman of the IASB, Hans Hoogervorst, once noted with respect to pensions: “Bad accounting breeds bad policies.” (Hoogervorst, 2015a, p. 2).

²⁶¹ Since more than 40 years, the so called *Worry Barometer* is a survey published annually by *Credit Suisse*, where Swiss citizens are asked to mention their current concerns about the life and politics in Switzerland (see e.g., Golder et al., 2017 for more details).

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6 Value-Relevance of Swiss Pension Plans

6.1 Sample Data

6.1.1 Sample Selection and Data Collection

To investigate the value-relevance of Swiss pension plans as discussed in chapter 5, sample selection is focused on firms listed in Switzerland. As outlined in sub-section 3.1.2, there exist two authorized domestic stock exchanges in Switzerland, *SIX Swiss Exchange AG* (SIX) and *BX Swiss AG* (BX). As of August 3, 2015, there is a total of 264 equity instruments listed on SIX compared to 26 securities listed on BX.²⁶² Thus, to control for unobserved heterogeneity between issuers of securities on different stock exchanges, the relatively small number of firms listed on BX is excluded from further analyses.

Panel A of TABLE 6.1 depicts the selection process for the full data set of SIX sample firms. In order to control for unobserved heterogeneity in corporate governance and tradability, all non-voting shares as well as all non-primary listings are excluded.²⁶³ Also, at the time, *The Swatch Group AG* (ISIN: CH0012255151) had two different types of voting shares primarily listed on SIX. As of December 31, 2012, listed bearer shares account for more than 60% of total market capitalization (see e.g., The Swatch Group AG, 2012a, p. 216). Moreover, during the sample period, average daily trading volume is more than 30% higher for bearer shares than for the registered shares.²⁶⁴ Hence, the listing of registered shares is excluded from further analyses. Overall, a total of 227 firms remains in the sample. According to the *Industry Classification Benchmark* (ICB), 152 (66.96%) and 75 (33.04%) of these sample firms are classified as non-financial (i.e., industry, IND) and financial services (hereafter financial, *FS*) firms, respectively.²⁶⁵

²⁶² The cutoff date of August 3, 2015 was chosen since it was the date closest to the commencement of the data collection process. Regularly updated lists can be downloaded on SIX (2017b) and BX (2017), respectively. For the purposes of this study, securities are identified via their *International Securities Identification Number* (ISIN).

²⁶³ For example, also Fasshauer and Glaum (2008) exclude all firms that only list preferred shares from their analysis.

²⁶⁴ Between January 5, 2004 and December 28, 2012, average daily trading volume was CHF 213,201 and CHF 163,467 for bearer shares (ISIN: CH0012255151) and registered shares (ISIN: CH0012255144), respectively (SIX, 2017f).

²⁶⁵ For the purposes of this study, industry classification is based on ICB which is in line with the classification used by SIX (see e.g., ICB, 2015, for more details).

TABLE
6.1 Sample Selection

Panel A: Sample Firms

	Firms	
	Industry (IND)	Financial (FS)
Equity securities listed on SIX on Aug. 3, 15	181	83
less: Non-voting shares	(5)	(4)
less: Secondary listings	(23)	(4)
less: Double listings	(1)	(0)
Sample Firms	152	75
		227

Panel B: Final Sample

	Firms										Firm-Years	
	2004	2005	2006	2007	2008	2009	2010	2011	2012		Pooled	%
Sample Firms	227	227	227	227	227	227	227	227	227		2,043	100.00
less: AR na	(124)	(76)	(49)	(39)	(31)	(22)	(14)	(13)	(10)		(378)	(18.50)
less: Early adoption of IAS 19 (2011)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(1)	(10)		(11)	(0.54)
less: US GAAP	(6)	(6)	(8)	(8)	(9)	(9)	(10)	(10)	(9)		(75)	(3.67)
less: No Swiss pension plans	(26)	(30)	(26)	(28)	(29)	(30)	(30)	(30)	(30)		(259)	(12.68)
less: FY-end other than 31.12.	(10)	(14)	(15)	(16)	(16)	(17)	(18)	(17)	(17)		(140)	(6.85)
less: Missing data	(5)	(17)	(20)	(24)	(22)	(18)	(21)	(20)	(13)		(160)	(7.78)
less: PL-Method (IAS 19 (2004))	(0)	(2)	(3)	(2)	(1)	(1)	(0)	(0)	(0)		(9)	(0.44)
less: <i>1 NOSYEAREND</i>	(8)	(7)	(11)	(11)	(14)	(9)	(15)	(10)	(16)		(101)	(4.94)
Final Sample	48	75	95	99	105	121	119	126	122		910	44.59

Note. Panel A depicts the selection of 227 sample firms listed on SIX as of August 3, 2015. Listings of non-voting shares, as well as secondary listings are excluded. For the double listing of The Swatch Group AG, only the listing of bearer shares (ISIN: CH0012255151) is included. Panel B shows the selection of the final sample of firm-year observations. From 1,665 available annual reports, those observations where IAS 19 (2011), US GAAP or the PL-Method of IAS 19 (2004) is applied are excluded. Furthermore, observations without Swiss pension plans, with a fiscal year-end other than 31.12., with missing data or with a significant year-on-year change in *NOSYEAREND* are also excluded. The final sample is an unbalanced panel data set of 910 firm-year observations consisting of 149 firms across 9 years. The full list of sample firms is shown in TABLE A.1 in Appendix A.1. na indicates *not available*.

Panel B of TABLE 6.1 illustrates the selection process for the final sample of firm-year observations. For the purposes of this study, the period of 2004 to 2012 was chosen as sample period because first, this is the longest period possible where sample firms were permitted to apply any of the three methods Corridor, PL and OCI in line with IAS 19 (2004). Moreover, during the same period, firms applying FER had to apply the newly introduced concept of ARR 16 (2005), whereby it was no longer required to classify Swiss pension plans as either defined benefit or defined contribution pension plans, but the accounting for economic benefits and obligations had to be based on the pension plans' financial statements in accordance with ARR 26 (2004). Overall, as outlined in chapter 3, for the purposes of this study, pension accounting in accordance with IAS 19 (2004) and ARR 16 (2005) can be considered as qualitatively unaltered between financial years ending on December 31, 2004 and December 31, 2012.

For the sample period, all available annual reports were collected from the 227 sample firms. If reports could not be accessed via company websites, investor relations offices were contacted directly. In total, 1,665 annual reports were collected. For those firms that did not respond to any request, or were either not listed or not yet founded in any given sample year, respective annual reports are *not available* (na). Thus, 378 (18.50%) firm-year observations are excluded from the final sample. Also, in order to preserve homogeneity with regard to IFRS-pension accounting, 11 (0.54%) firm-year observations where IAS 19 (2011) was adopted early, are excluded. Next, 75 (3.67%) firm-year observations of firms applying US GAAP are also excluded. Further, in order to investigate the value-relevance of Swiss pension plans, 259 (12.68%) observations where firms do not sponsor such plans are not included. Specifically, for a given sample year, these firms either do not employ any personnel (e.g., are pure holding companies), clearly indicate that no employee is entitled to benefits from a Swiss pension plan, or, in accordance with IAS 19, account for defined contribution plans only.²⁶⁶ To control for unobserved *within-year firm effects*, 140 (6.85%) observations where the financial

²⁶⁶ As discussed in sub-section 3.2.4, in line with IAS 19 (2004), Swiss pension plans had to be classified and accounted for as defined benefit plans. Thus, for the purposes of this study, if a firm applying IFRS accounts for defined contribution plans only, it is assumed that this firm is not covered by any Swiss pension plan.

year does not end on December 31 are excluded.²⁶⁷ In addition, 160 (7.83%) observations with missing data items are excluded.²⁶⁸ Due to the small number of firms applying the PL-Method to account for actuarial gains and losses (*AGL*), as outlined in paragraph 3.2.6.4, all 9 (0.44%) of these firm-year observations are excluded. Thence, the application of the PL-Method in line with IAS 19 (2004) is excluded from any further analyses hereafter. Lastly, response variables in this study are based on market capitalization *three* months after fiscal year-end, defined as follows,

$$MKTCAP_{it+0.25} = P_{it+0.25} \times NOS_{it} \quad (6.1)$$

where $P_{it+0.25}$ is the closing share price in CHF on March 31, or first trading day thereafter, of firm i in year $t+1$ and NOS_{it} is defined as,

$$NOS_{it} = \frac{NOSYEAREND_{it} + NOSYEAREND_{it+1}}{2} \quad (6.2)$$

where $NOSYEAREND_{it}$ is the number of outstanding shares as of 31.12. of year t as reported in the annual report of firm i . Since the information is based on annual reports, if $NOSYEAREND_i$ changes from one period to the next, NOS_i , as defined in (6.2), is only an approximation of the actual number of outstanding shares at any point in time within year t . Thence, in order to control for measurement error in $MKTCAP_{it+0.25}$, as defined in (6.1), 101 (4.94%) firm-year observations are excluded from the final sample for which the absolute change in $NOSYEAREND$ between year t and $t+1$,

²⁶⁷ This approach is in line with e.g., Davis-Friday, Folami, Liu, and Mittelstaedt (1999) and Fasshauer and Glaum (2008). In contrast, for example Coronado et al. (2008); Coronado and Sharpe (2003) or Kirkpatrick (2012) include observations with different year-end dates in their pension value-relevance studies. However, to control for unobserved within-year shocks that potentially affect stock market prices of sample firms differently, only those observations with financial year-end on 31.12. are included here (see e.g., Davis-Friday et al., 1999).

²⁶⁸ Data is either missing due to incomplete or ambiguous presentation in annual reports, or due to incomplete secondary data bases. All data sources used other than annual reports are outlined in sub-sections 6.1.2 and 6.1.3 below.

$\Delta NOSYEAREND$, exceeds the .9-Quantile.²⁶⁹ As the result of the sample selection process outlined above, the final sample is an unbalanced panel data set of 149 firms across 9 years, totaling 910 firm-year observations. The full list of firms included in the final sample is depicted in TABLE A.1 in Appendix A.1.

TABLE 6.2 depicts the industry composition of the pooled final sample. Overall, 74.51% and 25.49% of firm-year observations belong to industry and financial firms (ICB: 8000), respectively. Within industry firms, 43.36% of observations (32.31% in total) belong to *Industrials* (ICB: 2000). The rest is distributed across the industries of *Health Care* (ICB: 4000, 13.86% within and 10.33% in total), *Consumer Services* (ICB: 5000, 11.95% and 8.90%), *Consumer Goods* (ICB: 3000, 9.44% and 7.03%), *Basic Materials* (ICB: 1000, 7.96% and 5.93%), *Technology* (ICB: 9000, 7.23% and 5.38%), *Utilities* (ICB: 7000, 4.87% and 3.63%) and, with the smallest share of industry observations (as well as of total observations), *Telecommunications* (ICB: 6000, 1.33% and 0.99%).

Most of the data items used for the analyses conducted in this study are *hand-collected* from audited annual reports (henceforth annual reports).²⁷⁰ As mentioned in subsection 6.1.1, 1,665 annual reports were analyzed in order to select the final sample and to collect the respective data. 1,605 (96.40%) of these reports could be gathered electronically as PDF-documents. The rest (60 reports, 3.60%) was obtained from companies as hard-copies.²⁷¹ Between August 2015 and May 2016, approximately 69,500 data points were hand-collected from the annual reports. However, certain data items could not be collected from annual reports and secondary data sources had to be used instead. First, information regarding the listing of sample firms, the industry classification and the International Securities Identification Number (ISIN) of securities was obtained from SIX.²⁷² Next, most information regarding the stock market prices and also, if it

²⁶⁹ For the respective 1,011 firm-year observations, the .9-Quantile of $\Delta NOSYEAREND$ is estimated to be 0.1130, based on the median-unbiased definition recommended by Hyndman and Fan (1996).

²⁷⁰ As outlined in chapter 3, in line with IAS 19 (2004) and ARR 16 (2005), most accounting information regarding (Swiss) pension plans had to be disclosed in the notes of the financial statements of the reporting firms. Therefore, the required data items for this study were collected manually from each available annual report. Simultaneously, the collected data was put into an *Excel*® 2013 spreadsheet specifically modified via programming in *Visual Basic for Applications* (VBA) in order to facilitate the collection process. For example, also Chen et al. (2015); Davis-Friday et al. (1999); Fasshauer and Glaum (2008, 2009, 2012); Hann, Heflin, et al. (2007); Kiosse et al. (2007) and Werner (2011) use hand-collected data from financial reports to study the value-relevance of pension accounting information.

²⁷¹ All documents are available from the author upon request.

²⁷² See footnote 262 on page 215 for more details.

TABLE
6.2 Sample Industries

Industry	ICB	Firm-Years	%-Within	%-Total
<i>Basic Materials</i>	1000	54	7.96	5.93
<i>Industrials</i>	2000	294	43.36	32.31
<i>Consumer Goods</i>	3000	64	9.44	7.03
<i>Health Care</i>	4000	94	13.86	10.33
<i>Consumer Services</i>	5000	81	11.95	8.90
<i>Telecommunications</i>	6000	9	1.33	0.99
<i>Utilities</i>	7000	33	4.87	3.63
<i>Technology</i>	9000	49	7.23	5.38
<i>Industry</i>	na	678	100.00	74.51
<i>Financials</i>	8000	232	na	25.49
		N = 910	na	100.00

Note. The TABLE depicts the industry composition of the final sample as described in TABLE 6.1. Classification is based on the Industry Classification Benchmark (ICB) as applied by SIX (see footnote 265 on page 217). Differences may be due to rounding.

could not be sourced from annual reports, the number of outstanding shares at year-end (*NOSYEAREND*) was obtained from the *Merged Global Security Daily File* of Compustat, accessed via *Wharton Research Data Services* (WRDS).²⁷³

Altogether, more than 8,200 data points were collected from Compustat. Furthermore, information about dividends and the number of employees of sample firms was obtained from the database of *Swiss Companies Guide* (*Aktienführer*), provided by *Verlag Finanz und Wirtschaft*.²⁷⁴ Over 4,000 data points were gathered from SIX and the Swiss Companies Guide database, respectively. Lastly, information regarding foreign exchange (FX) rates was obtained from the *Swiss National Bank* (SNB).²⁷⁵

²⁷³ Compustat (also *Capital IQ* from Standard & Poor's) is provided by *S&P Global Market Intelligence*, a division of *S&P Global* (formerly *McGraw Hill Financial*, NYSE: SPGI). Wharton Research Data Services (WRDS) is provided by *The Wharton School of the University of Pennsylvania*.

²⁷⁴ See Appendix A.2 for more details.

²⁷⁵ See paragraph 6.1.3.1 for more details.

6.1.2 Response Variables

As already succinctly outlined in sub-section 6.1.1 above, the main response variable used to investigate the value-relevance of pension accounting in this study is market capitalization three months after the end of fiscal year t (i.e., on March 31, or first trading day thereafter). Specifically, $MKTCAP_{t+0.25}$ is defined as follows,

$$MKTCAP_{t+0.25} = P_{t+0.25} \times NOS_t \quad (6.3)$$

where $P_{t+0.25}$ is the closing share price in CHF on March 31, or first trading day thereafter, of year $t+1$ obtained from Compustat (data item PRCCD, #13) and NOS_t is defined as,

$$NOS_t = \frac{NOSYEAREND_t + NOSYEAREND_{t+1}}{2} \quad (6.4)$$

where $NOSYEAREND_t$ is the number of outstanding shares as of 31.12. of year t , as reported in the annual report.²⁷⁶ If $NOSYEAREND_t$ could not be obtained from annual reports, this item was gathered from Compustat (data item CSHOC, #8). As described in sub-section 6.1.1, NOS_t defined in (6.4) is only a proxy variable for the actual number of outstanding shares. If $NOSYEAREND$ changes between t and $t+1$, (6.4) either under- or overestimates the actual number of outstanding shares as of $t+0.25$. However, as above-mentioned, in order to reduce resulting measurement error in $MKTCAP_{t+0.25}$, observations for which the absolute year-on-year change in the number of outstanding shares ($\Delta NOSYEAREND$) is higher than the .9-Quantile of all relevant observations are excluded from the final sample.²⁷⁷

Measuring the response variable three months after the measurement date of the covariates is common in value-relevance studies (Wagenhofer, 2008). For example, Coronado et al. (2008); Coronado and Sharpe (2003); Fasshauer and Glaum (2008, 2009, 2012); Hann, Hefflin, et al. (2007); Kirkpatrick (2012); Werner (2011); Wiedman

²⁷⁶ In order to reduce clutter, the firm index i is suppressed for the definitions of response variables as well as for the definitions of all covariates in sub-section 6.1.3 below.

²⁷⁷ See footnote 269 on page 219 for more details.

and Wier (2004) and Yu (2013) find evidence that pension accounting information is reflected adequately in share prices two to seven months after the reporting date.²⁷⁸ Moreover, for example, Cormier, Magnan, and Morard (2000) and Lapointe-Antunes, Cormier, Magnan, and Gay-Angers (2006) find evidence for the value-relevance of accounting information for firms listed in Switzerland using stock market prices six months after the reporting date. In contrast, others such as e.g., Barth (1991); Barth et al. (1993); Brown (2004); Chen et al. (2015); Daley (1984); Hann, Lu, et al. (2007); Kiosse et al. (2007); Landsman (1986) and Subramanyam and Zhang (2001) find evidence that pension accounting information is already reflected in share prices as of the reporting date. However, at large, it seems questionable whether detailed information, such as the one related to pension accounting, is obtainable for the public before (i.e., *ex ante*) the publication of the annual report (Barth et al., 1992).

Given the comments above, and in line with tests of robustness applied in prior research (see e.g., Barth et al. (1992) and Brown (2004)), the response variable is measured alternatively at fiscal year-end and six months after fiscal year-end. Hence,

$$MKTCAP_t = P_t \times NOSYEAREND_t \quad (6.5)$$

where P_t is the closing share price in CHF on December 31 of year t as provided in the annual report. If the information was not reported by the firm, data was obtained from Compustat. $NOSYEAREND_t$ is defined as described above. Furthermore,

$$MKTCAP_{t+0.5} = P_{t+0.5} \times NOS_t \quad (6.6)$$

where $P_{t+0.5}$ is the closing share price in CHF on June 30, or first trading day thereafter, of year $t+1$ obtained from Compustat, and NOS_t is defined as in (6.4). Comments made above regarding the potential measurement error in $MKTCAP_{t+0.25}$ analogously hold for $MKTCAP_{t+0.5}$. TABLE 6.3 summarizes the definitions of the response variables discussed above.

²⁷⁸ For the purposes of this study, *reporting date* refers to the balance-sheet date of the respective financial statements. Notably, reporting date does not refer to the *publication date* of the annual report.

TABLE
6.3 Definition of Response Variables

Variable	Definition	Source
P_t	Closing share price in CHF on December 31 of year t , or first trading day thereafter, of year $t+1$.	Annual Report Compustat
$P_{t+0.25}$	Closing share price in CHF on March 31, or first trading day thereafter, of year $t+1$.	Compustat
$P_{t+0.5}$	Closing share price in CHF on June 30, or first trading day thereafter, of year $t+1$.	Compustat
$NOSYEAREND_t$	Number of outstanding shares as of December 31, of year t .	Annual Report Compustat
NOS_t	$\frac{NOSYEAREND_t + NOSYEAREND_{t+1}}{2}$	na
$MKTCAP_t$	$P_t \times NOSYEAREND_t$	na
$MKTCAP_{t+0.25}$	$P_{t+0.25} \times NOS_t$	na
$MKTCAP_{t+0.5}$	$P_{t+0.5} \times NOS_t$	na

Note. The TABLE depicts the definitions of the response variables as well as the respective data sources. To reduce clutter, the firm index i is suppressed. $MKTCAP$ = market capitalization, $NOSYEAREND$ = number of outstanding shares at fiscal year-end, NOS = average number of outstanding shares, P = daily closing share price, t = fiscal year-end, $t+0.25$ = three months after fiscal year-end and $t+0.5$ = six months after fiscal year-end. na indicates *not applicable*.

6.1.3 Covariates

All covariates used in this study are only surrogates for the true (i.e., actual) measures used by investors to value firms, and thus, potentially suffer from measurement error (Landsman, 1986). As a consequence, the directly observable values of the market capitalization ($MKTCAP$) and the covariates may, economically, not be aligned as well as possible. For example, information reported on a consolidated basis may include both Swiss and non-Swiss pension plans. In order to mitigate potential measurement errors, *raw data* as reported by firms is adjusted using *auxiliary variables* in order to construct covariates used in subsequent analyses. Below, the raw variables are defined first and applied auxiliary variables as well as covariates are described thereafter.

6.1.3.1 Raw Data

First, raw data was either hand-collected from annual reports or sourced directly from the Swiss Companies Guide database. Thus, hereafter, all variables marked with * denote such raw (i.e., unadjusted) data. Specifically, only audited annual reports were used and, if available, data is always based on consolidated accounts. Moreover, all monetary data was converted to CHF if the firm's reporting currency differed.²⁷⁹

All of the following variables were hand-collected from annual reports:

EQ_t^* Total book value in CHF of equity incl. minority interests recognized on the balance-sheet as of December 31 of year t .

$P_EQ_t^*$ Total book value in CHF of equity attributable to the shareholders of the *parent* company recognized on the balance-sheet as of December 31 of year t .

SC_t^* Total *nominal* value in CHF of share capital attributable to the shareholders of the *parent* company disclosed in the notes as of December 31 of year t .

$L_SC_t^*$ Total *nominal* value in CHF of *publicly* listed share capital attributable to the shareholders of the *parent* company disclosed in the notes as of December 31 of year t .

NI_t^* Total book value in CHF of net income/(loss) incl. minority interests recognized on the income-statement for year t .

$P_NI_t^*$ Total book value in CHF of net income/(loss) attributable to the shareholders of the *parent* company recognized on the income-statement for year t .

²⁷⁹ FX-rates used for conversion are based on the bid price in CHF for one unit of the foreign currency in the interbank market at 11 a.m. on the last trading day of December of fiscal year t , as reported on SNB (2017).

If there was a negative net income (i.e., a net loss) recognized, the data point is put in the data set as a negative (< 0) value.

NPL_t^* Total book value in CHF of net pension (asset)/liability incl. *funded* and *unfunded* pension plans recognized on the balance-sheet as of December 31 of year t .

NPL_t^* is defined in accordance with IAS 19 (2004) and ARR 16 (2005), as outlined in paragraph 3.2.6.5 and sub-section 3.3.5, respectively. If there was a negative net pension liability (i.e., a net pension asset) recognized, the data point is put in the data set as a negative (< 0) value.²⁸⁰

DBO_t^* Total book value in CHF of defined benefit obligation incl. *funded* and *unfunded* pension plans disclosed in the notes as of December 31 of year t .

$F_DBO_t^*$ Total book value in CHF of *funded* defined benefit obligation disclosed in the notes as of December 31 of year t .

DBO_t^* and $F_DBO_t^*$ are defined in accordance with IAS 19 (2004) as outlined in paragraph 3.2.6.1. Moreover, where applicable, $F_DBO_t^*$ denotes the part of the DBO_t^* attributable to partly or wholly funded defined benefit pension plans in line with IAS 19 (2004, para. 120A lit. d).

PLA_t^* Total book value in CHF of plan assets corresponding to DBO_t^* disclosed in the notes as of December 31 of year t .

PLA_t^* are defined in accordance with IAS 19 (2004) as outlined in paragraph 3.2.6.2.

²⁸⁰ Note, where firms accounted for patronage, welfare or similar funds related to other employee benefits separately, if possible, this information was excluded from the data.

$NPLNR_t^*$ Total book value in CHF of unrecognized net pension (asset)/liability disclosed in the notes as of December 31 of year t .

According to IAS 19 (2004), $NPLNR_t^*$ is defined as the part of the funding status (FS , i.e., $DBO_t^* - PLA_t^*$, see paragraph 6.1.3.3 below) which is not recognized within NPL_t^* on the balance-sheet of the reporting firm. Specifically, if the reporting firm applies the Corridor-Method, $NPLNR_t^*$ consists of the cumulative unrecognized net actuarial gains and losses ($AGLNR$, see below) as well as of the cumulative unrecognized net past service cost (PSC , see below) reported as of the balance-sheet date. In contrast, if the reporting firm applies the OCI-Method, $NPLNR_t^*$ solely entails the cumulative unrecognized net past service cost (PSC) reported on the balance-sheet date (see paragraph 3.2.6.5 for details). For firms applying ARR 16 (2005), $NPLNR_t^*$ is defined as the difference between the pension plan (surplus)/deficit and NPL_t^* as disclosed in the notes of the reporting firm on the reporting date (see sub-section 3.3.8 and paragraph 6.1.3.3 for more details). Irrespective of the accounting standard applied, if there was a negative unrecognized net pension liability (i.e., an unrecognized net pension asset) disclosed in the notes, the data point is put in the data set as a negative (< 0) value.

$AGLNR_t^*$ Total book value in CHF of cumulative unrecognized net actuarial (gains)/losses disclosed in the notes as of December 31 of year t .

This variable was only collected for firms applying the Corridor-Method in line with IAS 19 (2004). Specifically, as outlined in paragraphs 3.2.6.4 and 3.2.6.5, $AGLNR_t^*$ is defined as the cumulative unrecognized net actuarial gains and losses (AGL) reported on the reporting date. Note, as such, $AGLNR_t^*$ is part of $NPLNR_t^*$ as defined above. If there was a negative cumulative unrecognized net actuarial loss (i.e., a cumulative unrecognized net actuarial gain) disclosed in the notes, the data point is put in the data set as a negative (< 0) value.

ECR_t^* Total book value in CHF of employer contribution reserves recognized on the balance-sheet as of December 31 of year t .

This variable was only collected for firms applying ARR 16 (2005). As outlined in sub-sections 3.3.6 and 3.3.8, ECR_t^* is recognized as asset from employer contribution reserves on the balance-sheet of the reporting firm.

NPC_t^* Total book value in CHF of net pension (income)/cost corresponding to NPL_t^* recognized on the income-statement as of December 31 of year t .

As outlined in paragraph 3.2.6.7, in line with IAS 19 (2004), NPC_t^* is composed of current service cost (CSC), interest cost (IC), expected return on plan assets (ER), (amortization of) past service cost (PSC) and effects from curtailments and settlements (CS). Moreover, if the firm applies the Corridor-Method, amortization of actuarial gains and losses (AGL) as well as effects from the application of the asset ceiling outlined in paragraph 3.2.6.6 may also be recognized in NPC_t^* . In contrast, as outlined in paragraph 3.2.6.7, if the OCI-Method is applied, effects from the asset ceiling as well as AGL are recognized immediately and directly in equity. However, to facilitate data collection, PSC , CS and the effects from the asset ceiling are all pooled in one residual variable, RPC_t , which is defined in paragraph 6.1.3.3 further below. Thence, for the purposes of this study, NPC_t^* includes (excludes) actuarial gains and losses (AGL) for firms applying the Corridor-Method (OCI-Method).

The different components of NPC_t^* are defined below. For the firms applying ARR 16 (2005), NPC_t^* consists of the employer contributions payable (incl. any release from ECR_t^* , see above) as well as the change in NPL_t^* , as defined above, during the reporting period. Where applicable, NPC_t^* also entails interest accrued on the recognized ECR_t^* (see sub-section 3.3.7 for more details). Irrespective of the accounting standard applied, if there was a negative net pension cost (i.e., a net pension income) recognized, the data point is put in the data set as a negative (< 0) value.

CSC_t^* Total book value in CHF of current service cost corresponding to DBO_t^* disclosed in the notes as of December 31 of year t .

This variable was only collected for firms applying IAS 19 (2004). CSC_t^* is defined as the expected benefits earned by employees during the current reporting period t as expected at the beginning of t (see paragraph 3.2.6.3 for more details). Notably, where applicable, CSC_t^* was adjusted for employee contributions disclosed (i.e., these were deducted).

IC_t^* Total book value in CHF of interest cost corresponding to DBO_t^* disclosed in the notes as of December 31 of year t .

This variable was only collected for firms applying IAS 19 (2004). IC_t^* is defined as the interest accrued on the DBO_t^* , as defined above, during the current reporting period t as expected at the beginning of t (see paragraph 3.2.6.3 for more details).

ER_t^* Total book value in CHF of expected return corresponding to PLA_t^* disclosed in the notes as of December 31 of year t .

This variable was only collected for firms applying IAS 19 (2004). ER_t^* is defined as the return accrued on the PLA_t^* , as defined above, during the current reporting period t as expected at the beginning of t (see paragraph 3.2.6.3 for more details).

AGL_t^* Total book value in CHF of net actuarial (gains)/losses corresponding to NPL_t^* disclosed in the notes as of December 31 of year t .

This variable was only collected for firms applying IAS 19 (2004). As described in paragraph 3.2.6.3, AGL_t^* is defined as differences between the measurement of DBO_t^* and PLA_t^* at the beginning and the end of the current reporting period t . These differences are caused by changes in actuarial assumptions and/or differences between expected and actual developments in DBO_t^* and PLA_t^* . If the reporting firm applies the Corridor-Method, AGL_t^* consists of any amortizations of cumulative unrecognized net actuarial gains and losses ($AGLNR$) estimated as of the beginning of the current reporting period

t . These must be recognized in profit or loss as part of NPC_t^* defined above. In contrast, if the reporting firm applies the OCI-Method, AGL_t^* consists of the actuarial gains and losses (AGL) occurring during the current reporting period and are recognized immediately and directly in equity. Thus, in line with the OCI-Method, AGL_t^* is not part of NPC_t^* as defined above (see paragraphs 3.2.6.4 and 3.2.6.7 for more details). If there was a negative net actuarial loss (i.e., a net actuarial gain) disclosed in the notes, the data point is put in the data set as a negative (< 0) value.

EC_t^* Total book value in CHF of employer contributions corresponding to NPL_t^* disclosed in the notes as of December 31 of year t .

For firms applying IAS 19 (2004), EC_t^* is defined as the employer contributions to the defined benefit pension plans paid during the current reporting period t as disclosed for the reconciliation of the PLA_t^* defined above (see paragraph 3.2.6.8 for more details). For firms applying ARR 16 (2005), EC_t^* consists of the disclosed employer contributions payable for the current reporting period t incl. any release from the ECR_t^* as defined above (see sub-section 3.3.7 for more details).

$TAXRATE_t^*$ Expected applicable tax-rate in % disclosed in the notes as of December 31 of year t .

For firms that did not disclose the expected tax-rate, the actual tax-rate applicable for the current reporting period t was collected. Specifically, firms reported actual taxes paid either as percentage of *earnings before taxes* (EBT) or as absolute value. In these cases, the rate is estimated by dividing the actual taxes paid by EBT.

For reasons of practicability, the next variable was sourced directly from the Swiss Companies Guide database.²⁸¹ Data was reconciled with the final sample based on the ISIN of each sample firm.

²⁸¹ This variable was obtained during a second phase of data-collection after the hand-collection process from annual reports had already been finalized. However, due to the known reliability and quality as well as the clear focus on firms listed in Switzerland, it was decided to rely on this database. For example, Cormier et al. (2000)

DPS_t^*	Total book value in CHF of dividend <i>proposed</i> per outstanding share disclosed in the notes as of December 31 of year t .
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After the collection of the raw variables outlined above, the actual covariates used in the analyses had to be derived. For this, certain auxiliary variables had to be defined first. These are discussed next.

6.1.3.2 Auxiliary Variables and Data Adjustments

Apart from Switzerland, many of the firms in the final sample have operations abroad. Thus, it cannot be assumed that pension information recognized and disclosed in the consolidated financial statements is based exclusively on Swiss pension plans (see e.g., Suter, 2008, p. 54). However, during the sample period, almost no sample firm had disclosed pension information separately for different geographical regions.²⁸² Furthermore, reporting about the share of operations abroad, for instance in terms of employees, sales, assets, equity or equivalent measures, was not found to be consistent enough across all observations in order to be relied upon as proxy to estimate what share of reported pension information is attributable to Swiss pension plans only.

Given the comments above, the share of reported pension information attributable to Swiss pension plans must be approximated through an auxiliary variable based on the reported pension information itself. Namely, as discussed in sub-section 2.2.2 and paragraph 3.2.6.2, by law, Swiss pension plans must be funded. Moreover, as outlined in paragraph 3.2.6.8, firms applying IAS 19 (2004) are required to disclose the shares of the reported defined benefit obligation (*DBO*) attributable to wholly *unfunded* as well as partly and wholly *funded* defined benefit pension plans, respectively.²⁸³ Therefore, for the purposes of this study, it is assumed that pension information reported for wholly unfunded defined benefit pension plans is attributable to non-Swiss plans only. In other words, it is assumed that pension information reported for partly and wholly funded

and Lapointe-Antunes et al. (2006) also rely on data from the Swiss Companies Guide database to study the value-relevance of accounting information for firms listed in Switzerland.

²⁸² One of the exceptions is *UBS AG* (ISIN: CH0024899483), which, for example, reported pension information separately for *Swiss* and *International* pension plans in 2010 (see UBS AG, 2010, pp. 345-350).

²⁸³ Note, as discussed in sub-section 3.2.4, in line with IAS 19 (2004) Swiss pension plans must be classified and accounted for as defined benefit plans. Furthermore, as described in sub-section 6.1.1, firms applying IFRS that account for defined contribution plans only are excluded from the final sample. Thence, regarding the sample firms applying IFRS, data to be analyzed is based exclusively on defined benefit pension plans.

defined benefit plans is, at least partially, attributable to Swiss pension plans. Accordingly, to approximate the share of IFRS pension information attributable to Swiss pension plans, all raw variables related to pension information are adjusted by multiplying with the ratio of partly and wholly funded to total (i.e., partly and wholly funded as well as wholly unfunded) pension plans. Specifically, for firms applying IAS 19 (2004), the auxiliary variable is defined as follows,

$$FUNDING_t = \frac{L_DBO_t^*}{DBO_t^*} \quad (6.7)$$

with DBO_t^* and $L_DBO_t^*$ as defined in paragraph 6.1.3.1. 42.39% of all IFRS-observations in the final sample have $FUNDING_t < 1$. However, the mean (median) share of the partly and wholly funded to the total DBO is .9636 (1.0000).

For firms applying ARR 16 (2005), $FUNDING_t$ is defined as in (6.7) but based on either NPL_t^* , $NPLNR_t^*$, NPC_t^* , ECR_t^* or EC_t^* as defined in paragraph 6.1.3.1. Namely, as outlined in sub-section 3.3.8, firms must disclose certain pension information separately for pension plans *with* and *without* own assets. Thus, where applicable, these disclosures are used for the estimation of $FUNDING_t^*$. However, only three (1.66%) of all FER-observations in the final sample have $FUNDING_t < 1$. Further, the mean (median) share of pension plans with own assets to total pension plans is 0.9960 (1.0000) and thus, even higher than for the IFRS-observations. The three observations are attributable to *BVZ Holding AG* (ISIN: CH0008207356) for the years 2010, 2011 and 2012. The firm discloses pension information including a non-consolidated entity. BVZ Holding AG's share of the pension information oscillates between 75.00% and 78.14% during the period of 2010 to 2012 (BVZ Holding AG, 2010, 2011, 2012).

It must be noted, even after adjusting all pension variables by multiplication with $FUNDING_t$, as defined above, the analyzed data is still only an approximation of the actual accounting information related to Swiss pension plans. First of all, also non-Swiss pension plans may be partly or wholly funded and, thus, included in the analyzed data. Moreover, not all pension variables are necessarily equally proportionate to $FUNDING_t$. For example, if the ratio of the partly and wholly funded to the total defined benefit obligation (DBO) is 50% as of the reporting date, the true share of net actuarial gain or loss for the reporting period attributable to the partly and wholly funded plans could still

be either higher or lower than 50%. Since consolidated pension information is cumulated across different (partly) funded and unfunded as well as Swiss and non-Swiss pension plans, it is not possible to disaggregate this kind of information in order to isolate the accounting data solely attributable to Swiss pension plans.²⁸⁴ Nonetheless, as outlined above, wholly unfunded pension plans account for a very small portion of reported pension information in the final sample. Moreover, as indicated in sub-section 6.1.1, all sample firms are primarily listed in Switzerland and all observations where it is clearly indicated that there are no Swiss pension plans are excluded from the final sample. Overall, for the purposes of this study, it is assumed that pension variables adjusted for $FUNDING_t$, as outlined above, are the best proxies obtainable from publicly available information with respect to the Swiss pension plans of the sample firms.

Apart from $FUNDING_t$, the raw variables defined in paragraph 6.1.3.1 must also be adjusted to reflect information net of minority interests.²⁸⁵ However, firms usually report shares attributable to minority interests only for a small set of specific variables such as e.g., total book value of equity (EQ_t^*) or total book value of net income (NI_t^*). For example, it is not possible to directly observe what portion of any pension variable is attributable to minority and parent interests, respectively. Thus, to adjust for minority interests, all asset and liability variables are multiplied by the share of total book equity which is attributable to the shareholders of the *parent* company. This is defined as follows,

$$PAREQ_t = \frac{P_EQ_t^*}{EQ_t^*} \quad (6.8)$$

with EQ_t^* and $P_EQ_t^*$ as defined in paragraph 6.1.3.1. Accordingly, all income and cost variables are multiplied by the share of total net income/(loss) attributable to *parent* company shareholders. Thence,

$$PARNI_t = \frac{P_NI_t^*}{NI_t^*} \quad (6.9)$$

²⁸⁴ See e.g., Suter (2008, p. 54) who also advocates this view.

²⁸⁵ This is in line with prior (pension) value-relevance research. See e.g., Babalyan (2001); Bauer and Lake (2016); Beisland (2008) and Schiebel (2007).

with NI_t^* and $P_NI_t^*$ as defined in paragraph 6.1.3.1. For the final sample, mean (median) values of $PAREQ_t$ and $PARNI_t$ are 0.9765 (0.9987) and 0.9526 (1.0000), respectively. Thus, average measurement error induced by minority interests is expected to be moderate.

It is also important to note, some sample firms do not list their entire share capital, list different securities simultaneously or both.²⁸⁶ Thus, information recognized on the consolidated balance-sheet and in the consolidated income-statement as well as disclosed in the notes is not necessarily fully attributable to the parent company's publicly listed share capital. Hence, in order to further reduce potential measurement error, all asset and liability as well as all income and cost variables are multiplied with the portion of total share capital of the *parent* company that is attributable to the shares *listed* under the respective ISIN included in the final sample. Formally,

$$SCR_t = \frac{L_SC_t^*}{SC_t^*} \quad (6.10)$$

with SC_t^* and $L_SC_t^*$ as defined in paragraph 6.1.3.1. Mean (median) SCR_t of the final sample is 0.9469 (1.0000). As is the case regarding minority interests, measurement error caused by non-listed share capital is also expected to be moderate.

Last but not least, in order to mitigate potential measurement error from tax effects, in addition to the adjustments outlined above, all pension income and cost variables are also tax-adjusted. Since employer contributions (EC_t^*) are used as alternative proxy for pension cost, this raw variable is adjusted accordingly. Concretely, the respective variables are adjusted to be on an *after-tax basis* by multiplication with $(1 - TR_s)$, where

$$TR_s = \widetilde{TAXRATE}_t^* \quad (6.11)$$

and $\widetilde{TAXRATE}_t^*$ is estimated as the final sample median of $TAXRATE_t^*$ defined in paragraph 6.1.3.1. TR_s for the final sample is estimated to be 22.00%.

²⁸⁶ As e.g., indicated by the example of The Swatch Group AG outlined in sub-section 6.1.1.

In general, the tax-adjustment is in line with prior pension value-relevance research such as e.g., Coronado and Sharpe (2003); Fasshauer and Glaum (2008, 2009, 2012); Hann, Hefflin, et al. (2007) and Kiosse et al. (2007). However, in all of these studies, authors apply a standard tax-rate of either 30.00% or 35.00%. Nonetheless, during the sample period of 2004 to 2012, the mean (median) corporate income tax rate in Switzerland was 21.55% (21.17%).²⁸⁷ Apparently, this rate is very much in line with the above-mentioned median tax-rate estimated for the final sample of this study.

6.1.3.3 Adjusted Variables

The raw variables outlined in paragraph 6.1.3.1 are adjusted as discussed in paragraph 6.1.3.2 above. The definition of the adjusted covariates is summarized in TABLE 6.4. All of the subsequent analyses conducted in this study are based on these covariates as well as on the response variables defined in TABLE 6.3. Moreover, some of the covariates are themselves derived from other covariates defined in TABLE 6.4. These are discussed next.

$$FS_t = DBO_t - PLA_t \quad (6.12)$$

(6.12) is only defined for firms applying IAS 19 (2004). The funding status FS_t is derived from DBO_t and PLA_t as outlined in paragraph 3.2.6.5. If there results a negative funding status (i.e., $DBO_t < PLA_t$) the data point is put in the data set as a negative (< 0) value. With respect to firms applying ARR 16 (2005), FS_t is defined as follows,

$$FS_t = NPL_t + NPLNR_t - ECR_t \quad (6.13)$$

where NPL_t , $NPLNR_t$ and ECR_t are defined as outlined in paragraph 6.1.3.1, respectively.

$$RNPLNR_t = NPLNR_t - AGLNR_t \quad (6.14)$$

²⁸⁷ Data is based on the *Corporate income tax rate* database provided by OECD accessed via OECD (2017a).

TABLE
6.4 Definition of Covariates

Variable	Definition	Source
EQ_t	$EQ_t^* \times PAREQ_t \times SCR_t$	Annual Report
$EQbNPL_t$	$EQ_t + NPL_t$	na
$EQbFS_t$	$EQ_t + FS_t$	na
$EQbECR_t$	$EQ_t + ECR_t$	na
NI_t	$NI_t^* \times PARNI_t \times SCR_t$	Annual Report
$NIbNPC_t$	$NI_t + NPC_t$	na
$NIbEC_t$	$NI_t + EC_t$	na
DIV_t	$DPS_t^* \times NOSYEAREND_t$	Swiss Companies Guide Annual Report Compustat
$DIVbNPC_t$	$DIV_t + (NPC_t \times DPR_s)$	na
$DIVbEC_t$	$DIV_t + (EC_t \times DPR_s)$	na
NPL_t	$NPL_t^* \times FUNDING_t \times PAREQ_t \times SCR_t$	Annual Report
DBO_t	$DBO_t^* \times FUNDING_t \times PAREQ_t \times SCR_t$	Annual Report
PLA_t	$PLA_t^* \times FUNDING_t \times PAREQ_t \times SCR_t$	Annual Report
FS_t	$DBO_t - PLA_t$ or $NPL_t + NPLNR_t - ECR_t$	na
$NPLNR_t$	$NPLNR_t^* \times FUNDING_t \times PAREQ_t \times SCR_t$	Annual Report
$AGLNR_t$	$AGLNR_t^* \times FUNDING_t \times PAREQ_t \times SCR_t$	Annual Report
$RNPLNR_t$	$NPLNR_t - AGLNR_t$	na
ECR_t	$ECR_t^* \times FUNDING_t \times PAREQ_t \times SCR_t$	Annual Report
NPC_t	$NPC_t^* \times FUNDING_t \times PARNI_t \times SCR_t \times (1 - TR_s)$	Annual Report
CSC_t	$CSC_t^* \times FUNDING_t \times PARNI_t \times SCR_t \times (1 - TR_s)$	Annual Report
IC_t	$IC_t^* \times FUNDING_t \times PARNI_t \times SCR_t \times (1 - TR_s)$	Annual Report

(continued on next page)

TABLE (continued)

Variable	Definition	Source
ER_t	$ER_t^* \times FUNDING_t \times PARNI_t \times SCR_t \times (1 - TR_s)$	Annual Report
AGL_t	$AGL_t^* \times FUNDING_t \times PARNI_t \times SCR_t \times (1 - TR_s)$	Annual Report
RPC_t	$RPC_t^* \times FUNDING_t \times PARNI_t \times SCR_t \times (1 - TR_s)$	Annual Report
EC_t	$EC_t^* \times FUNDING_t \times PARNI_t \times SCR_t \times (1 - TR_s)$	Annual Report

Note. The TABLE depicts the definitions of the covariates as well as the respective data sources. To reduce clutter, the firm index i is suppressed. $DIVbNPC_t$ and $DIVbEC_t$ are set to zero if derived values are negative (< 0). na indicates *not applicable*.

(6.14) is only defined for firms applying the Corridor-Method in line with IAS 19 (2004). The residual unrecognized net pension (asset)/liability ($RNPLNR_t$) is defined as the part of $NPLNR_t$ which is not attributable to the cumulative unrecognized net actuarial gains and losses ($AGLNR_t$), as defined in paragraph 6.1.3.1. As discussed in paragraph 3.2.6.5, this variable consists of cumulative unrecognized net past service cost (PSC). If there results a negative residual unrecognized net pension liability (i.e. a residual unrecognized net pension asset), the data point is put in the data set as a negative (< 0) value.

$$RPC_t = NPC_t - CSC_t - IC_t + ER_t - AGL_t \quad (6.15)$$

Also (6.15) is only defined for firms applying IAS 19 (2004). Specifically, for firms applying the Corridor-Method, the residual net pension (income)/cost (RPC_t), is potentially comprised of the amortization of unrecognized past service cost (PSC), as well as the effects from curtailments and settlements (CS) and from the application of the asset ceiling. In contrast, for firms applying the OCI-Method, RPC_t does not include effects from the application of the asset ceiling since these must be recognized immediately and directly in equity (see paragraph 3.2.6.7 for more details). If there results a negative residual net pension cost (i.e., a residual net pension income), the data point is put in the data set as a negative (< 0) value.

The following variables are defined for all sample firms applying either IAS 19 (2004) or ARR 16 (2005). Total book value of equity net of (i.e., *before*) the net pension (asset)/liability is defined as,

$$EQbNPL_t = EQ_t + NPL_t \quad (6.16)$$

Accordingly, total book value of net income/(loss) before net pension (income)/cost is estimated as,

$$NlbNPC_t = NI_t + NPC_t \quad (6.17)$$

and applying employer contributions instead of net pension (income)/cost,

$$NlbEC_t = NI_t + EC_t \quad (6.18)$$

In order to use dividends instead of net income/(loss) as alternative measure of earnings power and cash-flows to equity holders, the following definition of total book value of dividends proposed is applied,

$$DIV_t = DPS_t^* \times NOSYEAREND_t \quad (6.19)$$

Dividends proposed before net pension (income)/cost and before employer contributions, in principle, are defined in accordance with *NI* above. However, firms usually do not pay out all net income as dividends and thus, *gross* estimates of dividends proposed should be proportionate to *dividend payout ratios*. Analogous to the applied tax-adjustment outlined in paragraph 6.1.3.2, the final sample median dividend payout ratio is estimated as,

$$DPR_s = \left(\frac{\widetilde{DIV_t}}{[NI_t^* \times SCR_t]} \right) \quad (6.20)$$

Note, total book value of dividends (DIV_t), by definition, is attributable to the listed share capital only. However, as outlined in paragraph 6.1.3.2, total book value of net income (NI_t) might also be attributable to non-listed share capital or any secondary listings of the reporting firm. Thence, total net income is adjusted by multiplication with

the ratio of share capital attributable to the shares listed under the respective ISIN included in the final sample (SCR_t). DPR_s for the final sample is estimated to be 0.3005.²⁸⁸ Accordingly, total book value of dividends proposed before net pension (income)/cost is estimated as,

$$DIVbNPC_t = DIV_t + [NPC_t \times DPR_s] \quad (6.21)$$

and using employer contributions instead of net pension (income)/cost,

$$DIVbEC_t = DIV_t + [EC_t \times DPR_s] \quad (6.22)$$

Notably, for the variables defined in (6.21) and (6.22), data points are put in the data set as zero (= 0) if derived values are negative (< 0).²⁸⁹

In contrast to the variables defined above, the following three variables are defined for all sample firms applying ARR 16 (2005) only. Total book value of equity net of (i.e., *before*) the funding status, is defined as,

$$EQbFS_t = EQ_t + FS_t \quad (6.23)$$

Lastly, total book value of equity net of (i.e., *before*) the employer contribution reserves is analogously defined as,

$$EQbECR_t = EQ_t - ECR_t \quad (6.24)$$

²⁸⁸ Notably, this is line with prior research. For example, for the sample period of 1986 to 2003, Stacescu (2006) finds a mean dividend payout ratio of 30.99% for a sample of 175 non-financial and non-utility firms listed in Switzerland. This finding is corroborated by e.g., ap Gwilym, Seaton, Suddason, and Thomas (2006) who find a mean dividend payout ratio of 27.00% for the Swiss observations included in their final sample analyzed over the period of 1973 to 2004.

²⁸⁹ Note, for example, within the valuation framework of Ohlson (1995), described in paragraph 5.2.1.3, negative dividends imply capital contributions made to the firm by investors. However, since data gathered from the Swiss Companies Guide database either entails zero or positive dividend values only, this approach is not followed here.

6.1.3.4 Expected Signs

As described in sub-section 5.2.1, the value-relevance of the pension covariates defined above is analyzed empirically by investigating the degree as well as the *direction* of association between those variables and the market value of equity (i.e., the market capitalization, *MKTCAP*). Accordingly, within the framework of the empirical valuation model outlined in paragraph 5.2.1.3, expectations about the directions of the individual associations can be formulated.

The expected signs of the associations between the covariates and the response variable *MKTCAP* are depicted in TABLE 6.5 below. Specifically, a positive (negative) sign is expected for covariates that are assumed to be associated with an increase (decrease) of the market value of equity. Thence, apart from the book value of equity (*EQ*), the book value of net income (*NI*) as well as all adjusted variables based on these two summary measures of firm value (e.g., *EQbNPL* or *NibNPC*), all covariates that proxy for either assets or income are also expected to have a positive association with *MKTCAP*. Conversely, all covariates that proxy for liabilities or cost are assumed to be negatively associated with *MKTCAP*. Notably, the pension covariates that are disclosed only (i.e., *NPLNR*, *AGLNR* and *RNPLNR*) are all expected to show a positive sign, since an increase in those variables correspondingly decreases the net pension (asset)/liability (*NPL*) to be recognized on the balance-sheet. Also, the employer contribution reserve (*ECR*), recognized by firms applying ARR 16 (2005), is expected to have a negative sign, although it actually is an asset of the reporting firm. This follows from the definition (6.13) of *FS* for firms applying ARR 16 (2005), as outlined in paragraph 6.1.3.3. Accordingly, *NPL* of these firms may be defined as follows,

$$NPL_t = FS_t - NPLNR_t + ECR_t \quad (6.25)$$

Note, *ECR* is only included in empirical models where the total book value of equity net of (i.e., *before*) the net pension (asset)/liability (*EQbNPL_{it}*) is included simultaneously (see paragraph 6.4.2.2 for more details). Thence, within the valuation framework outlined in paragraph 5.2.1.3, it is expected that *ECR* shows a negative sign.

6.1.4 Illustrative Example

To give an illustrative example of the definitions and adjustments outlined in sub-sections 6.1.2 and 6.1.3, the observation of *Schindler Holding AG* (ISIN CH0024638212)

TABLE
6.5 Expected Signs of Covariates

Variable	Expected Sign	Variable	Expected Sign
EQ_t	+	FS_t	-
$EQbNPL_t$	+	$NPLNR_t$	+
$EQbFS_t$	+	$AGLNR_t$	+
$EQbECR_t$	+	$RNPLNR_t$	+
NI_t	+	ECR_t	-
$NIbNPC_t$	+	NPC_t	-
$NIbEC_t$	+	CSC_t	-
DIV_t	+	IC_t	-
$DIVbNPC_t$	+	ER_t	+
$DIVbEC_t$	+	AGL_t	-
NPL_t	-	RPC_t	-
DBO_t	-	EC_t	-
PLA_t	+		

Note. The TABLE depicts the expected signs for all covariates defined in TABLE 6.4. + and – indicates a positive and negative expected association between the covariate and the market capitalization (*MKTCAP*), respectively.

for the financial year of 2007 is discussed in more detail below. Where not indicated otherwise, data was sourced from the 2007 consolidated financial statements (see Schindler Holding AG, 2007, for more details).

As of December 31, 2007, Schindler Holding AG had 71,768,950 registered shares outstanding (excl. treasury shares, $NOSYEAREND_{07}$). These are the shares listed on SIX under ISIN CH0024638212 (see e.g., Schindler Holding AG, 2007, p. 67). As of December 31, 2008, the number of outstanding shares (excl. treasury shares, $NOSYEAREND_{08}$) was 70,448,304 (see e.g., Schindler Holding AG, 2008, p. 63). As a result, the average number of outstanding shares for the year 2007 (NOS_{07} , see definition

(6.4) on page 223) is estimated to be 71,108,627.²⁹⁰ With the year-end share price (P_{07}) of CHF 73, sourced from the annual report (see Schindler Holding AG, 2007, p. 67), as well as the share prices three ($P_{07+0.25} = \text{CHF } 73.50$) and six ($P_{07+0.5} = \text{CHF } 76.50$) months after fiscal year-end collected from Compustat, the following response variables are estimated in line with the definitions shown in TABLE 6.3 (all values in CHFm):

$MKTCAP_{07} = 5,239.13$, $MKTCAP_{07+0.25} = 5,226.48$ and $MKTCAP_{07+0.5} = 5,439.81$ (also see Panel A of TABLE 6.6 below).

As of December 31, 2007, total book value of equity (EQ_{07}^*) is reported to be CHFm 2,100, including minority interests of CHFm 125. Thus, applying definition (6.8) on page 234, the share of total equity attributable to the shareholders of the *parent* company, $PAREQ_{07}$, is estimated to be 0.9405. Analogously, for 2007 total book value of net income (NI_{07}^*) is reported to be CHFm 278, including minority interests of CHFm 24. Hence, applying equation (6.9) on page 234 yields a share of total net income attributable to the *parent* company's shareholders, $PARNI_{07}$, of 0.9137. Furthermore, as of December 31, 2007, total nominal value of the share capital attributable to the shareholders of the parent company (SC_{07}^*) is reported as CHFm 12.45. This amount is split into CHFm 7.36 worth of share capital attributable to the registered shares listed under ISIN CH0024638212 ($L_SC_{07}^*$) as well as CHFm 5.10 attributable to bearer participation certificates listed under ISIN CH0024638196. Holders of such bearer certificates have no voting-rights (see e.g., Schindler Holding AG, 2007, p. 69). As outlined in sub-section 6.1.1, these observations are not included in the final sample. Hence, according to equation (6.10) on page 235, the ratio of the parent company's nominal share capital attributable to the registered shares *listed* under ISIN CH0024638212 (SCR_{07}) is estimated to be 0.5909. Also, as of December 31, 2007, the company reports a total book value of the defined benefit obligation (DBO_{07}^*) of CHFm 2,406, including CHFm 381 attributable to non-Swiss pension plans.²⁹¹ Applying definition (6.7) on page 233, $FUNDING_{07}$ is thence estimated to be 0.8416. Last but not least, as defined in the paragraphs 6.1.3.2 and 6.1.3.3, the final sample median tax-rate,

²⁹⁰ Note, the year-on-year change of the number of outstanding shares ($\Delta NOSYEAREND$) between 2007 and 2008 is estimated to be -1.84%. In absolute terms, this is clearly below the threshold of 11.30% defined in footnote 269 on page 219. Hence, the 2007 observation of Schindler Holding AG is not excluded from the final sample.

²⁹¹ Schindler Holding AG reports CHFm 2,025, CHFm 246 and CHFm 135 as defined benefit plans for the three categories of "Funded", "Unfunded" and "Others", respectively (see Schindler Holding AG, 2007, p. 40). For the purposes of this study, as discussed in paragraph 6.1.3.2, all pension plans other than funded are considered to be non-Swiss plans and excluded from the analyses accordingly.

TABLE

6.6 Response Variables and Covariates of Schindler Holding AG for 2007

Variable	Raw Data (*)	Adjusted Data
Panel A: Response Variables		
$MKTCAP_{07}$	5,239.13	na
$MKTCAP_{07+0.25}$	5,226.48	na
$MKTCAP_{07+0.5}$	5,439.81	na
Panel B: Covariates		
EQ_{07}	2,100.00	1,167.06
NI_{07}	278.00	150.09
DIV_{07}^a	114.83	114.83
DBO_{07}	2,406.00	1,125.32
NPL_{07}	245.00	114.59
NPC_{07}	77.00	27.29
EC_{07}	76.00	26.94
$EQbNPL_{07}$	2,345.00	1,281.65
$NIbNPC_{07}$	355.00	177.38
$DIVbEC_{07}$	137.67	122.93

Note. The TABLE illustrates a selection of the response variables (Panel A) as well as the raw data and the adjusted covariates (Panel B) for the 2007 observation of Schindler Holding AG (ISIN: CH0024638212). All variables are estimated in line with the respective definitions outlined in TABLE 6.3 and 6.4 and are denoted in CHFm.

^a DIV_{07} is estimated based on dividend per outstanding share (DPS_{07}^*) of CHF 1.60 as sourced from the Swiss Companies Guide database.

TR_s , as well as the final sample median dividend payout ratio, DPR_s , are estimated as 0.2200 and 0.3005, respectively.

Panel B of TABLE 6.6 depicts an illustrative selection of the covariates entering the analyses for the 2007 observation of Schindler Holding AG. The raw data (*) is adjusted

applying the respective definitions outlined in TABLE 6.4. The applied auxiliary variables are estimated as described above. Notably, the differences between the raw and the adjusted variables are mainly driven by the relatively small value of SCR_{07} (0.5909). As mentioned in paragraph 6.1.3.2, mean (median) SCR across all 910 observations in the final sample is 0.9469 (1.0000). Moreover, only 17.58% of all observations have $SCR < 1$. Thus, the 2007 observation for Schindler Holding AG falls into the bottom quartile of all observations with respect to SCR and hence, all else equal, the consequential impact on the adjusted data is quite large. In contrast, values for $PAREQ$, $PARNI$ and $FUNDING$ are much closer to the overall means (0.9744, 0.9526 and 0.9701) and also much closer to one. Thus, compared to SCR , the impact of these auxiliary variables in estimating the adjusted data shown in Panel B of TABLE 6.6 is less pronounced. Furthermore, the adjusted values of the covariates NPC_{07} and EC_{07} (and consequently also of $NIBNPC_{07}$ and $DIVbEC_{07}$) are additionally affected by the applied tax-adjustment of $(1 - TR_s)$.

Overall, for the purposes of this study, it is assumed that the illustrated adjustments of the raw data mitigate measurement error and thus, *ceteris paribus*, the adjusted covariates are economically more aligned with the response variables. Hence, all of the analyses discussed henceforth are based exclusively on response variables and covariates as defined in TABLE 6.3 and 6.4, respectively.

6.2 Empirical Methodology

6.2.1 Data Structure

The final sample of 910 firm-year observations is an unbalanced subset of the fixed panel consisting of the 227 sample firms observed throughout the sample period of 2004 to 2012. Concretely, the final sample consists of observations from $I = 149$ firms across $T = 9$ years. Note, if it was balanced, there would be a total of 2,043 firm-year observations included in the final sample. However, the unbalance is caused by the sample selection process discussed in sub-section 6.1.1 and illustrated in TABLE 6.1. Thus, the total number of observations n (i.e., years) per firm i is not equal across all firms in the final sample.²⁹² Formally,

²⁹² See TABLE A.1 in Appendix A.1 for a full list of the 149 final sample firms incl. the respective number of observations per firm, n_i .

$$n_i \neq n_j \text{ for all or some } i \neq j \quad (6.26)$$

Furthermore, *within-firm* observations need not necessarily be sequential. In other words, there might be gaps in the sequence of within-firm observations. For example, there are seven observations in total for the firm *Adval Tech Holding AG* (ISIN: CH0008967926) included in the final sample. Specifically, there is one observation for each of the following periods: 2005, 2006, 2008, 2009, 2010, 2011 and 2012. However, there is no observation included for the year 2007. The reason for this gap is as follows: during the financial year of 2008, the firm issued 365,000 new registered shares on top of the 365,000 registered shares already outstanding as of December 31, 2007 (see e.g., *Adval Tech Holding AG*, 2007, pp. 26-27; 2008, pp. 31-32). This issuance led to a corresponding increase in the number of outstanding shares at year-end (*NOSYEAREND*) of 100.00%. However, as outlined in sub-section 6.1.1, to mitigate measurement error in *MKTCAP*, as defined by (6.1) on page 220, observations for which the year-on-year change in *NOSYEAREND* exceeds the threshold of 11.30% are excluded from the final sample. Hence, the observation of *Adval Tech Holding AG* for the year 2007 is excluded from any analyses. In general, this illustrates how within-firm gaps might be introduced to the final sample as a result of any of the exclusion conditions applied for the sample selection process described in sub-section 6.1.1.

Overall, the final sample to be analyzed can be considered as typical *microeconomic panel*, where the data structure is of unbalanced form, including gaps (see e.g., Hoechle, 2007).

6.2.2 Econometric Model

For the purposes of this study, *Multiple Linear Regression Analysis* (MLR) is applied in order to estimate different variants of the empirical valuation model outlined in sub-section 5.2.1.3. In general, the linear econometric models to be estimated are of the following form,

$$y = X\beta + u \quad (6.27)$$

Given the number of observations N and the number of covariates K , the response variable y and the error term u represent $(N \times 1)$ -vectors, respectively. Further, the covariates X are modelled as a $N \times (K + 1)$ -matrix and the $K + 1$ model parameters (including an intercept), β , are in the form of a $(K + 1) \times 1$ -vector (Fahrmeir, Kneib, Lang, & Marx, 2013).

As outlined in sub-section 6.2.1 above, the sample data is structured as a panel of I firms across T years. Accordingly, in matrix notation, model (6.27) is defined as follows,

$$\begin{bmatrix} y_{1,1} \\ \vdots \\ y_{i,t} \\ \vdots \\ y_{I,T} \end{bmatrix} = \begin{bmatrix} 1 & x_{1,1,1} & \cdots & x_{1,1,k} & \cdots & x_{1,1,K} \\ \vdots & \vdots & \ddots & \vdots & \ddots & \vdots \\ 1 & x_{i,t,1} & \cdots & x_{i,t,k} & \cdots & x_{i,t,K} \\ \vdots & \vdots & \ddots & \vdots & \ddots & \vdots \\ 1 & x_{I,T,1} & \cdots & x_{I,T,k} & \cdots & x_{I,T,K} \end{bmatrix} \times \begin{bmatrix} \beta_0 \\ \vdots \\ \beta_k \\ \vdots \\ \beta_K \end{bmatrix} + \begin{bmatrix} u_{1,1} \\ \vdots \\ u_{i,t} \\ \vdots \\ u_{I,T} \end{bmatrix} \quad (6.28)$$

for $i \in \{1, \dots, I\}$, $t \in \{1, \dots, T\}$ and $k \in \{1, \dots, K\}$. Analogously, for a single observation of firm i in year t , model (6.27) is defined as,

$$y_{it} = \beta_0 + \sum_{k=1}^K \beta_k x_{itk} + u_{it} \quad (6.29)$$

In terms of the final sample depicted in TABLE 6.1, model (6.27) is defined as,

$$\begin{bmatrix} y_{1,5} \\ \vdots \\ y_{i,t} \\ \vdots \\ y_{149,9} \end{bmatrix} = \begin{bmatrix} 1 & x_{1,5,1} & \cdots & x_{1,5,k} & \cdots & x_{1,5,K} \\ \vdots & \vdots & \ddots & \vdots & \ddots & \vdots \\ 1 & x_{i,t,1} & \cdots & x_{i,t,k} & \cdots & x_{i,t,K} \\ \vdots & \vdots & \ddots & \vdots & \ddots & \vdots \\ 1 & x_{149,9,1} & \cdots & x_{149,9,k} & \cdots & x_{149,9,K} \end{bmatrix} \times \begin{bmatrix} \beta_0 \\ \vdots \\ \beta_k \\ \vdots \\ \beta_K \end{bmatrix} + \begin{bmatrix} u_{1,5} \\ \vdots \\ u_{i,t} \\ \vdots \\ u_{149,9} \end{bmatrix} \quad (6.30)$$

for $i \in \{1, \dots, 149\}$, $t \in \{1, \dots, 9\}$ and $k \in \{1, \dots, K\}$. Note, model (6.30) corresponds to the final sample first sorted alphabetically in terms of firm names and, in a second step, sorted chronologically along within-firm observations. Thus, in general, (6.27) can be thought of as stacked observations $i = 1, \dots, I$ which, within each firm i , are ordered chronologically (Wooldridge, 2010). Notably, due to the unbalanced form of the panel data set described in sub-section 6.2.1, the first observation in model (6.30)

belongs to firm $i = 1$ (of the alphabetic order) for year $t = 5$ (i.e., for year 2008) rather than for year $t = 1$ (i.e., for year 2004).

6.2.3 Estimation and Inference

6.2.3.1 Ordinary Least Squares

For the estimation of empirical variants of model (6.27), the method of *Ordinary Least Squares* (OLS) is applied.²⁹³ Hence, the $(K + 1) \times 1$ -vector of the model parameters β is estimated as,

$$\hat{\beta}_{OLS} = (X'X)^{-1}X'y \quad (6.31)$$

and the $(K + 1) \times 1$ -vector of the expected values of $\hat{\beta}_{OLS}$, conditional on the $N \times (K + 1)$ -matrix of covariates, X , is defined as,

$$E(\hat{\beta}_{OLS}|X) = \beta \quad (6.32)$$

Analogously, the $(K + 1) \times (K + 1)$ -variance-covariance matrix of $\hat{\beta}_{OLS}$, conditional on X , is defined as follows,

$$COV(\hat{\beta}_{OLS}|X) = V(\hat{\beta}_{OLS}) = (X'X)^{-1}[X'\Omega X](X'X)^{-1} \quad (6.33)$$

²⁹³ Where not indicated otherwise, the following comments regarding OLS as well as all equations from (6.31) through (6.36) are based on Wooldridge (2016). More details regarding the general application of OLS can also be found in e.g., Fahrmeir et al. (2013) and von Auer (2016). Examples of other pension value-relevance studies where OLS is applied are Barth (1991); Barth et al. (1992, 1993); Brown (2004); Chen et al. (2015); Coronado et al. (2008); Coronado and Sharpe (2003); Fasshauer and Glaum (2008, 2009, 2012); Gopalakrishnan and Sugrue (1993); Hann, Heflin, et al. (2007); Kiosse et al. (2007); Kirkpatrick (2012); Landsman (1986); Mitra and Hossain (2009); Subramanyam and Zhang (2001); Werner (2011); Wiedman and Wier (2004) and Yu (2013).

where $\Omega = \sigma^2 I_N$ denotes the $(K + 1) \times (K + 1)$ -variance-covariance matrix of the error terms u , and I_N denotes a $(N \times N)$ -identity matrix.²⁹⁴ Furthermore, in line with OLS, the unbiased estimator of (6.33) is given by,

$$\hat{V}_{OLS} = (X'X)^{-1} \left[X' \left(\frac{\sum_{i=1}^I \sum_{t=1}^T \varepsilon_{it}^2}{N - K - 1} \right) I_N X \right] (X'X)^{-1} \quad (6.34)$$

where I_N , again, denotes a $(N \times N)$ -identity matrix, and the residual ε_{it} is derived as follows,

$$\varepsilon_{it} = y_{it} - \hat{y}_{it} = y_{it} - \hat{\beta}_0 - \sum_{k=1}^K \hat{\beta}_k x_{itk} \quad (6.35)$$

where $\hat{\beta}_0$ and $\hat{\beta}_k$ denote the OLS-estimations, as defined by (6.31), for the intercept as well as the other model coefficients, respectively.²⁹⁵

Lastly, the assumptions of the *Classical Linear Model* (CLM) can be succinctly summarized as follows,

$$y|X \sim \Phi(X\beta, \sigma^2 I_N) \quad (6.36)$$

where Φ stands for the normal distribution, and I_N denotes a $(N \times N)$ -identity matrix.

Overall, given (6.36), $\hat{\beta}_{OLS}$ is the *Best Linear Unbiased Estimator* (BLUE) of β , and statistical inference based on ordinary t -tests is asymptotically valid (Wooldridge,

²⁹⁴ Note, the general form of (6.33) has come to be known as the *sandwich estimator*, whereby the middle part in squared brackets is described as the *meat* in-between two slices of *bread* i.e., $(X'X)^{-1}$ (see e.g., Hayes & Cai, 2007, p. 712).

²⁹⁵ Note, in equation (6.34), $N = (I \times T)$ holds when the panel data set is balanced. However, if the panel is of unbalanced form, as is the case here, $N < (I \times T)$, and the sum of squared residuals (ε_{it}^2), as the numerator of (6.34), is based on the total number of observations of the unbalanced panel.

2016).²⁹⁶ However, for the statistical properties of OLS to hold, it is also necessary that the analyzed econometric models, as formulated in (6.27), are “[...] otherwise *correctly specified* [italic in original];” (Fahrmeir et al., 2013, p. 116). For the purposes of this study, and in line with the pension value-relevance literature outlined in sub-section 5.2.2, the econometric models analyzed in this study are assumed to be correctly specified with regard to the population relationships of interest (Wooldridge, 2016).

6.2.3.2 Heteroskedasticity

One major econometric issue related to the estimation of valuation models is the potential presence of *heteroskedasticity* (Landsman, 1986). As outlined in paragraph 6.2.3.1, by applying OLS it is assumed that the unobserved error terms, u , of the model (6.27) are *homoskedastic*, i.e., have an equal and constant variance σ^2 across all the different segments of the covariates X . Hence, the assumption implies that σ^2 , entering the definition of the OLS-variance-covariance matrix of the model coefficients, $V(\hat{\beta}_{OLS})$, as defined in (6.33), is unrelated to any covariates or any linear combination of covariates. Heteroskedasticity can be of different forms and may be the result of different causes such as e.g., different forms of misspecification of the economic and/or econometric valuation models (see below), and the inclusion of bounded or limited variables in the estimated models. It is important to note, when the assumption of *homoskedasticity* fails, $\hat{\beta}_{OLS}$, as defined in (6.31), is still an unbiased and consistent estimator of β , provided the estimated model is otherwise correctly specified. However, the sum of squared residuals, $\sum_{i=1}^I \sum_{t=1}^T \varepsilon_{it}^2$, no longer delivers an unbiased estimate of the error variance σ^2 . As a result, \hat{V}_{OLS} , as defined in (6.34), is a biased and inconsistent estimator of $V(\hat{\beta}_{OLS})$ and, thus, related hypothesis tests become invalid (Hayes & Cai, 2007; von Auer, 2016; Wooldridge, 2016).

In his seminal work, White (1980) presents an estimator of $V(\hat{\beta}_{OLS})$ which is consistent in the presence of *heteroskedasticity of unknown form*. The estimator is defined as follows,

²⁹⁶ It is also worth noting here, even if the *normality assumption* formulated in (6.36) is not upheld, $\hat{\beta}_{OLS}$ is still BLUE, provided the estimated model is otherwise correctly specified. Moreover, if the additional assumption of normality holds, it can be shown that $\hat{\beta}_{OLS}$ is the *Best Unbiased Estimator* (BUE), even amongst all *non-linear* estimators (see e.g., von Auer, 2016, p. 84).

$$\hat{V}_{WHITE} = (X'X)^{-1}[X' \text{diag}(\varepsilon_{it}^2)X](X'X)^{-1} \quad (6.37)$$

where, $\text{diag}(\varepsilon_{it}^2)$ denotes a symmetric $(N \times N)$ -matrix with the elements of the main diagonal set to the squared residuals as defined in equation (6.35), and all off-diagonal elements set to zero (see e.g., Hayes & Cai, 2007, p. 712).²⁹⁷

White (1980) also proposed a procedure to formally test for the presence of heteroskedasticity of unknown form. A special case of the test is implemented by executing the following steps:²⁹⁸

1. Estimate any model of the form (6.27) via OLS as outlined in paragraph 6.2.3.1.
2. Estimate model (6.38) below, again via OLS, using the squared residuals (ε^2) as well as the fitted values (\hat{y}), and squared fitted values (\hat{y}^2) estimated in Step 1.

$$\varepsilon^2 = \delta_0 + \delta_1 \hat{y} + \delta_2 \hat{y}^2 + \omega \quad (6.38)$$

Note, ε^2 , \hat{y} and \hat{y}^2 denote $(N \times 1)$ -vectors, respectively. ω denotes the $(N \times 1)$ -vector of the errors of model (6.38). δ_0 , δ_1 and δ_2 denote the *true* (i.e., actual) model coefficients (incl. the intercept) of model (6.38).

3. In order to run a F -test, estimate the F -statistic defined as follows,

$$F = \frac{R^2_{\varepsilon^2}}{2} \times \frac{(N - 3)}{(1 - R^2_{\varepsilon^2})} \quad (6.39)$$

where $R^2_{\varepsilon^2}$ and N denote the coefficient of determination and the number of observations of model (6.38) as estimated in Step 2, respectively.

²⁹⁷ In empirical work, standard errors based on \hat{V}_{WHITE} are usually referred to as *White standard errors*. However, some researchers also refer to them as *Huber standard errors* or *Eicker standard errors* or some combination of White, Huber and Eicker, because the work of White (1980) is partly based on Huber (1967) and Eicker (1967) (see e.g., Wooldridge, 2016, p. 246). Also, see e.g., Hayes and Cai (2007) for a discussion of heteroskedasticity-robust standard errors that have superior finite sample properties than the “plain vanilla” White standard errors discussed here. However, due to the application of cluster-robust standard errors discussed in paragraph 6.2.3.3 below, these standard errors are not applied for the purposes of this study.

²⁹⁸ The test procedure outlined here is based on Wooldridge (2016, pp. 252-254) and von Auer (2016, pp. 434-436).

4. Under the null hypothesis of homoskedasticity, the F -statistic estimated in Step 3 approximately follows a $F_{2,n-3}$ -distribution. Accordingly, the null hypothesis is rejected at either the 10, 5 or 1%-level, if the F -statistic is found to be significantly different from zero.

Although the White standard errors outlined above are robust to heteroskedasticity of unknown form, for the purposes of this study, statistical inference is not based on such standard errors.²⁹⁹ This is because they are not robust to serial correlation in the model errors u . However, applicable standard errors that are robust to both heteroskedasticity of unknown form as well as correlated errors, are closely linked to the White standard errors outlined above. These so called *cluster-robust standard errors* are discussed next.

6.2.3.3 Autocorrelation

As outlined in paragraph 6.2.1, the sample data to be analyzed in this study has the structure of an unbalanced panel. A major econometric issue arising from this sort of sample data is the *autocorrelation*, or sometimes called *serial correlation*, of the error terms (u) of the econometric models to be estimated. Specifically with regard to financial data, two forms of within-observation dependence are most common. First, errors for a specific firm i may be correlated across different years $t \neq h$. Henceforth, such within-firm dependence is called *firm effect*. Second, errors for a given year t might be correlated across different firms $i \neq j$. Analogously, this sort of dependence is called *time effect*. It is important to note, as is the case with regard to heteroskedasticity, even in the presence of a firm and/or time effect in the sample data, $\hat{\beta}_{OLS}$, as defined in (6.31), is still an unbiased and consistent estimator of β , provided the estimated model is otherwise correctly specified. However, in that case, neither OLS nor White standard errors are consistent and hence, respective statistical inference is invalid (Cameron & Miller, 2015; Petersen, 2009; von Auer, 2016).

The econometric issue of autocorrelated errors can be illustrated by the sample variance-covariance matrix of residuals, $\hat{\Omega}$, depicted schematically in TABLE 6.7 below. For the calculation of the standard OLS-estimate of the variance-covariance matrix of $\hat{\beta}_{OLS}$, \hat{V}_{OLS} , the squared residuals (ε_{it}^2) in the main diagonal of $\hat{\Omega}$ (black shaded cells of TABLE 6.7) are simply summed up, and divided by $N - K - 1$ (see equation (6.34))

²⁹⁹ Examples of pension value-relevance studies where authors apply White standard errors for statistical inference are Brown (2004); Hann, Heflin, et al. (2007); Hann, Lu, et al. (2007); Kiosse et al. (2007); Werner (2011) and Wiedman and Wier (2004).

TABLE
6.7 Sample Variance-Covariance Matrix of Residuals

	Firm 1	...	Firm I
Firm 1	ε_{11}^2 \vdots $\varepsilon_{1T}\varepsilon_{11}$	\dots ε_{1t}^2 \dots	$\varepsilon_{11}\varepsilon_{1T}$ \vdots $\varepsilon_{1T}\varepsilon_{11}$
...	\vdots	\ddots	\vdots
Firm I	$\varepsilon_{I1}\varepsilon_{11}$ \vdots $\varepsilon_{IT}\varepsilon_{11}$	\dots $\varepsilon_{It}\varepsilon_{1t}$ \dots	$\varepsilon_{I1}\varepsilon_{1T}$ \vdots $\varepsilon_{IT}\varepsilon_{1T}$

Note. The TABLE is based on Petersen (2009, p. 441) and schematically illustrates the $(N \times N)$ -sample variance-covariance matrix of residuals ($\hat{\Omega}$) for a panel data set of I firms across T years. The elements of the main diagonal (black-shaded) are the squared terms of the standard OLS-residuals (ε_{it}^2) as defined in (6.35). The grey-shaded elements illustrate the bivariate products of residuals for all observations of the same firm i , across all years t . The black-framed elements correspond the bivariate products of residuals for all observations within the same year t , across all firms i . The white and non-framed elements stand for all the bivariate products of residuals of every possible combination of two firms $i \neq j$ in different years $t \neq h$. Assumptions about the elements of $\hat{\Omega}$ and which of them are zero are the source of the differences between the standard-OLS, the White as well as the cluster-robust standard errors discussed throughout this sub-section (Petersen, 2009).

above). In other words, all off-diagonal terms (i.e., non-black shaded cells) of $\hat{\Omega}$ are assumed to be zero. This is equivalent to assuming that observations of the same sample firm are independent across different years (i.e., no firm effect) as well as observations of the same sample year are independent across different firms (i.e., no time effect). Moreover, the estimation of OLS-standard errors also implies that any observation of a specific sample firm i in any specific sample year t is independent of the observation of any other sample firm $j \neq i$ in any other year $h \neq t$ (Petersen, 2009). Notably, the same reasoning also applies to the estimation of the White standard errors. As defined in equation (6.37), to calculate \hat{V}_{WHITE} , all elements of $\hat{\Omega}$ except the squared residuals in the

main diagonal are set to zero (White, 1980). However, in any typical finance panel data set, the assumption of independent observations across the firm and time dimension is unlikely to hold. In contrast, it is more likely that market-wide shocks or events occurring at some point in time affect all sample firms. Analogously, it is also likely that firm-specific effects are persistent over time and affect all or some observations of the same firm across different years. Finally, for example, business cycles may also affect different firms in different years (Thompson, 2011).³⁰⁰

One approach to remedy the econometric issue of autocorrelation is the application of cluster-robust standard errors for statistical inference. Thence, in order to account for the existence of a firm-effect, the assumption that observations of the same firm are independent across different time periods (i.e., years) can no longer be upheld. Specifically, the within-firm dependence of the error terms u must be assumed to be non-zero. Accordingly, the estimation of the variance-covariance matrix of the OLS-model parameters, $V(\hat{\beta}_{OLS})$, must include the *within-firm* off-diagonal elements of $\hat{\Omega}$, depicted as grey-shaded cells in TABLE 6.7. Thence, $\hat{\Omega}$ has now a block-diagonal structure, where all elements other than the black- and grey-shaded cells in TABLE 6.7 are assumed to be zero. Conceptually, observations of the same firm i across different years $t \neq h$ are now assumed to be dependent whereas observations of different firms $i \neq j$ are still assumed to be independent of each other (Cameron & Miller, 2015; Petersen, 2009). The autocorrelation-robust estimate of the variance-covariance matrix $V(\hat{\beta}_{OLS})$ *clustered by firm* is defined as follows,

$$\hat{V}_{FIRM} = (X'X)^{-1} \left[\sum_{i=1}^I \sum_{t=1}^T \sum_{h=1}^T x_{it} x_{ih}' \varepsilon_{it} \varepsilon_{ih} \right] (X'X)^{-1} \quad (6.40)$$

where x_{it} denotes a $(K + 1) \times 1$ -vector of the covariates corresponding to the observation of firm i in year t and x_{ih}' denotes a $1 \times (K + 1)$ -vector of the covariates of the observation of firm i in year h . Further, ε_{it} and ε_{ih} denote the respective residuals as defined in (6.35) (see e.g., Cameron & Miller, 2015, p. 323).

³⁰⁰ For example Thompson (2011, p. 1) describes factors inducing correlation between observations of different firms in different years as “[...] persistent common shocks [...]”. However, in order to keep calculations feasible, for the purposes of this study, it is assumed that no such persistent common shocks induce correlation between observations of the sample data. See e.g., Thompson (2011) for more details regarding the estimation of standard errors that are robust to such persistent common shocks.

Analogous to (6.40), the estimate of the variance-covariance matrix of $\hat{\beta}_{OLS}$ may also be *clustered by year* (i.e., time), rather than firm. Conceptually, it is now assumed that observations within the same year t are dependent whereas observations of different years $t \neq h$ are independent. Thence, apart from the elements in the main diagonal of $\hat{\Omega}$ (black-shaded cells in TABLE 6.7), also the elements corresponding to observations within the same year must be included for the estimation of $V(\hat{\beta}_{OLS})$. These elements correspond to the black-framed cells of TABLE 6.7. In contrast, all within-firm observations are now, again, assumed to be independent and hence all grey-shaded cells of TABLE 6.7 are set to zero. The autocorrelation-robust estimate of the variance-covariance matrix $V(\hat{\beta}_{OLS})$ *clustered by year* is defined as follows,

$$\hat{V}_{YEAR} = (X'X)^{-1} \left[\sum_{t=1}^T \sum_{i=1}^I \sum_{j=1}^J x_{it} x_{jt}' \varepsilon_{it} \varepsilon_{jt} \right] (X'X)^{-1} \quad (6.41)$$

where x_{it} denotes a $(K + 1) \times 1$ -vector of the covariates corresponding to the observation of firm i in year t and x_{jt}' denotes a $1 \times (K + 1)$ -vector of the covariates of the observation of firm j in year t . Further, ε_{it} and ε_{jt} denote the respective residuals as defined in (6.35) (see e.g., Cameron & Miller, 2015, p. 323).

Clustering standard errors by firm (year) implies independence between different firms $i \neq j$ (years $t \neq h$). However, if both firm and time effects, are present in the sample data simultaneously, statistical inference should be based on standard errors clustered by both dimensions (Thompson, 2011). The respective estimator is defined as a combination of the estimators discussed above. Namely,

$$\hat{V}_{FIRM-YEAR} = \hat{V}_{FIRM} + \hat{V}_{YEAR} - \hat{V}_{WHITE} \quad (6.42)$$

where \hat{V}_{FIRM} , \hat{V}_{YEAR} and \hat{V}_{WHITE} are defined as in (6.40), (6.41) and (6.37), respectively (see e.g., Thompson, 2011, p. 2). Note, in terms of the sample variance-covariance matrix of residuals, $\hat{\Omega}$, the estimation of (6.42) leads to the summation of all elements of the within-firm block matrices as well as all elements within the same year. Graphically, this corresponds to the sum of all grey-shaded and black-framed cells of TABLE 6.7. Moreover, the black-shaded cells in the main diagonal are summed twice (i.e., double

counted). This is the reason why \hat{V}_{WHITE} is subtracted in (6.42). Since all off-diagonal elements of \hat{V}_{WHITE} are set to zero, algebraically, the subtraction leads to the elimination of the double counting of the main diagonal elements, i.e., the terms of the squared residuals, ε_{it}^2 . As a result, $\hat{V}_{FIRM-YEAR}$, as defined in (6.42), accounts for all dependencies between observations of the same firm across different years as well as for all dependencies between observations of the same year across different firms. However, observations of different firms in different years are still assumed to be independent of each other. Thus, all of these elements of $\hat{\Omega}$ are set to zero. These correspond to the white and non-framed cells of TABLE 6.7 (Thompson, 2011). In other words, applying $\hat{V}_{FIRM-YEAR}$ for statistical inference rules out the existence of any persistent common shocks (see footnote 300 on page 254 above).

Overall, the inclusion of more than just the main diagonal elements of $\hat{\Omega}$ (black-shaded cells of TABLE 6.7) for the estimation of cluster-robust estimates of the variance-covariance matrix provides some intuition on why, with regard to panel data, OLS- and White standard errors are usually biased downward. In general, the difference between non-clustered (e.g., \hat{V}_{OLS} or \hat{V}_{WHITE}) and cluster-robust standard errors such as \hat{V}_{FIRM} , \hat{V}_{YEAR} and $\hat{V}_{FIRM-YEAR}$ is mainly dependent on the within-cluster correlation between the covariates (X) and between the residuals (ε) as well as on the average number of observations per cluster, e.g., \bar{T} or \bar{I} (Cameron & Miller, 2015).³⁰¹ It is also important to note, \hat{V}_{FIRM} , \hat{V}_{YEAR} and $\hat{V}_{FIRM-YEAR}$ are all heteroskedasticity-robust estimators (Cameron & Miller, 2015). This is because all of these estimators incorporate the same elements of the main diagonal (i.e., squared residuals, ε_{it}^2) of $\hat{\Omega}$, as is the case with respect to \hat{V}_{WHITE} .³⁰² This is why the cluster-robust estimators discussed here are sometimes also called “[...] *heteroskedasticity and autocorrelation-consistent* [italic in original], or HAC, standard errors.” (Wooldridge, 2016, p. 389).

Statistical inference based on cluster-robust standard errors is asymptotically valid, if it can be assumed that the number of clusters, e.g., firms or years, rather than the

³⁰¹ It is also possible that, for a given sample, cluster-robust standard errors turn out to be smaller than their standard-OLS or White counterparts. This could be due to negative within-cluster correlations, the effect of heteroskedasticity and/or noise (Cameron & Miller, 2015). See e.g., Moulton (1986) for a discussion on how the bias of non-clustered standard errors is dependent on the within-cluster correlations.

³⁰² This can also be illustrated formally. Concretely, if there is only one observation per cluster, algebraically, \hat{V}_{FIRM} and \hat{V}_{YEAR} reduce to \hat{V}_{WHITE} . Specifically, if there is only one observation per firm i , equation (6.40) reduces to equation (6.37) for $N = I$ total observations. Analogously, if there is only one observation per year t , (6.41) reduces to (6.37) for $N = T$ total observations (Cameron & Miller, 2015).

number of observations (i.e., firm-years) goes to infinity. With respect to $\hat{V}_{FIRM-YEAR}$, consistency relies on the assumption that the number of clusters of the dimension with fewer clusters (either firm or time) goes to infinity. Thence, two-way clustering is appropriate if both dimension have many clusters (Cameron & Miller, 2015). For example, applying Monte Carlo simulations, Thompson (2011) shows that two-way clustering delivers adequate statistical inference as long as the firm and time dimensions both consist of a minimum of 25 clusters. Also, simulations run by Petersen (2009) show that, if there are only few clusters in one dimension standard errors clustered on the other dimension (e.g., firm) are almost identical to the standard errors clustered on both dimensions. Furthermore, his results also show that, if there is only a firm but no time effect present in the data, alternatives such as OLS, White, *Newey-West* or *Fama-MacBeth* standard errors are biased compared to \hat{V}_{FIRM} . This holds whether the firm effect is modelled as permanent or temporary effect (i.e., decreasing as the time-lag between within-firm observations increases). Moreover, if there is only a time effect but no firm effect present in the data, the simulation results show \hat{V}_{YEAR} to be biased if there are too few clusters in the time dimension (e.g., ten years in the case of Petersen, 2009).

As an alternative to two-way clustering, the dimension with fewer clusters could be accounted for parametrically by including fixed effects (e.g., year dummy variables). This way, it is assumed that the time effect is fixed across different firms, and that this effect is completely absorbed by the year-dummies. If the true time effect is not fixed, the standard errors clustered by firm will be biased (Petersen, 2009). However, simulations run by Petersen (2009) suggest that, in a panel setting where there are considerably higher within-firm than within-year correlations of covariates and residuals, clustering standard errors by firm and including year-dummies yields almost identical results as clustering standard errors by both firm and year.

In order to analyze the potential presence and magnitude of firm and time effects in the sample data outlined in section 6.1, an approach similar to the one applied by Petersen (2009) is followed here. Concretely, for the final sample *within-firm* bivariate correlations are estimated for all covariates defined in TABLE 6.4. Thence, the final sample data is first sorted alphabetically by firm name, and then, within each firm-cluster, data is sorted chronologically by year. Subsequently, *Spearman's rho* (r_s) is calculated for all sets of possible combinations (n) of within-firm observations for lag $l = \{1, \dots, 8\}$, respectively.³⁰³ Schematically, correlations are estimated as follows,

³⁰³ Petersen (2009) estimates within-firm and within-year correlations for twelve lags in a panel data set of a corporate finance application. Obviously, the maximum lag must be one less than the total number of years in the

$$COR_{x_k, firm, l} = r_s[x_{itk}, x_{it-lk}] \quad (6.43)$$

Note, due to the unbalanced form of the sample data, including gaps, n is not necessarily decreasing in lags l steadily.

For the estimation of within-year bivariate correlations, the sample data is first sorted by year and then, within each year-cluster, data is sorted by *industry*, *supersector*, *sector* and *subsector*, sequentially (i.e., within each of these levels, data is sorted by the next lower level). By applying this sorting, chances for observing within-year bivariate correlations are assumed to be higher than, for example, if firms were ordered completely randomly within each year.³⁰⁴ Once the data is sorted, the estimation of within-year bivariate correlations is analogous to the procedure outlined above. Hence, for every lag $l = \{1, \dots, 8\}$,

$$COR_{x_k, year, l} = r_s[x_{itk}, x_{i-ltk}] \quad (6.44)$$

Note, with regard to within-firm bivariate correlations formulated in (6.43), lag l refers to the *time* lag between observations of the same firm i . In contrast, with respect to within-year bivariate correlations as defined in (6.44), lag refers to the *firm* lag between observations of the same year t (i.e., within-year observations are matched that are l entries apart from each other relative to the order of the data as described above). For comparability, the number of lags is chosen to be equal, i.e., eight. Nonetheless, since the number of within-year observations goes up to a maximum of 126 (for year 2011) in the final sample (see TABLE 6.1), within-year bivariate correlations could be estimated for considerably more than eight lags.³⁰⁵

sample data. Hence, in this study $\max[l] = 8$. Also, *Spearman's rank correlation coefficient* (Spearman, 1904) is applied, since it is generally more robust to outliers than the *correlation coefficient* r by *Bravais-Pearson* (Croux & Dehon, 2010). See e.g., Toutenburg, Heumann, Schomaker, and Wissmann (2008a) for the mathematical expressions and detailed examples.

³⁰⁴ As described in footnote 265 on page 215, for the purposes of this study, industry classification is based on ICB (2015). In comparison, Petersen (2009, p. 471 and 474) first sorts data by month and then by industry (i.e., four digit SIC code).

³⁰⁵ For example, in order to detect within-year correlations mainly due to other factors than industry classification, one could also run simulations (e.g., 1,000 runs) whereby data is randomly permuted within each year (either with

Panel A of FIGURE 6.1 below depicts $COR_{x_k, firm, l}$, as defined in (6.43), estimated for all covariates defined in TABLE 6.4 on page 237 which could be collected for the full final sample (i.e., for all IFRS and FER-observations combined). All values and respective significance levels are depicted in TABLE A.2 in Appendix A.3. Apparently, there clearly is a firm effect present in all covariates analyzed with the exception of *NPL* and *NPLNR* (see black lines in Panel A of FIGURE 6.1). Specifically, across all lags $l = \{1, \dots, 8\}$, Spearman correlation coefficients estimated for *EQ*, *EQbNPL*, *NI*, *NIbNPC*, *NIbEC*, *DIV*, *DIVbNPC*, *DIVbEC*, *NPC* and *EC* oscillate between 0.7009 (*NI*, $l=3$) and 0.9946 (*EQ*, $l=1$). Notably, all of these values are significantly different from zero on a 1%-level (see TABLE A.2 in Appendix A.3). In line with the effect size index of Cohen (1992, p. 157), all of these correlations are considered to be *large* (> 0.5 , see black dashed-lines in FIGURE 6.1). This also holds with respect to *NPL*, for which five out of the eight estimated correlations are greater than 0.5. Overall, across all lags, the correlations of *NPL* are significant on a 1%-level and oscillate between 0.4226 ($l=5$) and 0.8488 ($l=1$). In contrast, correlations estimated for *NPLNR* are clearly decreasing in lag l and even become negative for the eight lag. Moreover, all correlations for $l = \{5, \dots, 8\}$ are either estimated to be not significantly different from zero or significant on a 10%-level only (see TABLE A.2).

Panel B of FIGURE 6.1 depicts $COR_{x_k, year, l}$, as defined in (6.44), for the same covariates as outlined above. Again, all values and respective significance levels are found in TABLE A.3 in Appendix A.3. In contrast to the within-firm correlations discussed above, the within-year correlations do not hint at the presence of a (medium or large) time effect with regard to the analyzed covariates. Overall, across all analyzed covariates and lags l , the estimated within-year Spearman correlation coefficients oscillate between -0.0780 (*NPL*, $l=5$) and 0.2071 (*EQ*, $l=1$). Furthermore, 45 (i.e., 46.88%) of these 96 estimates are not found to be significantly different from zero on a 1%-level or higher (see TABLE A.3). Thus, in line with the effect size index of Cohen (1992, p. 157), there is no medium or large time effect observed with respect to the analyzed covariates.

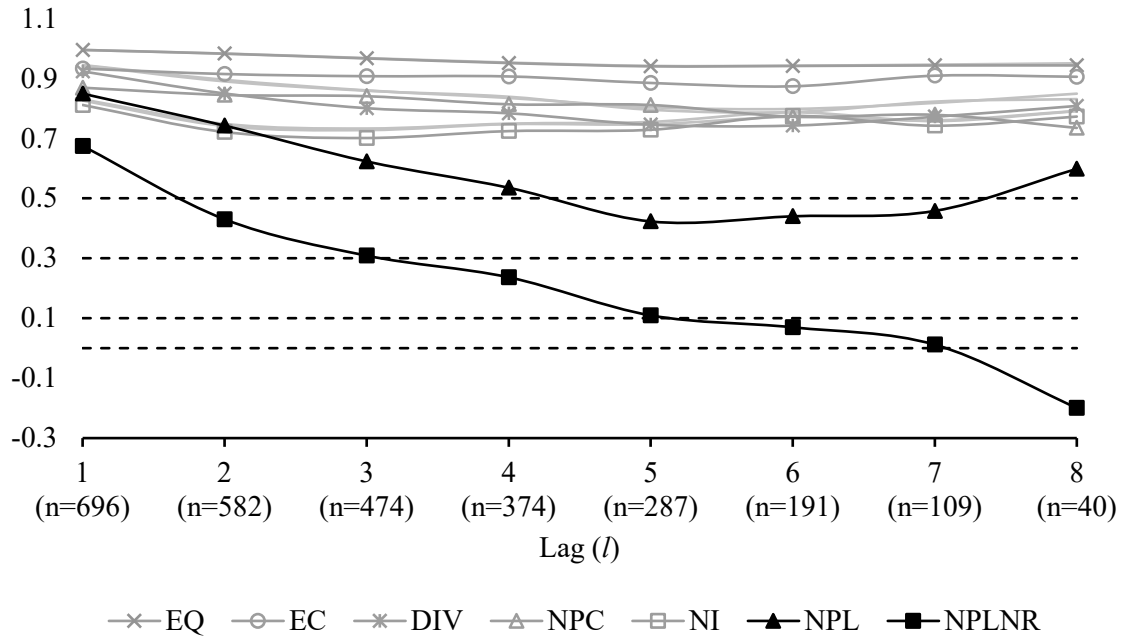
As mentioned above, statistical inference based on two-way clustered standard errors is expected to be valid when there are at least 25 clusters in both dimensions (Thompson, 2011). However, as described in sub-section 6.2.1, the final sample consists of a total of 149 firms and 9 years. Thence, two-way clustering is not applied for subse-

or without preserving industry clustering) before estimating (6.44). This more robust but computationally costly approach is not followed here.

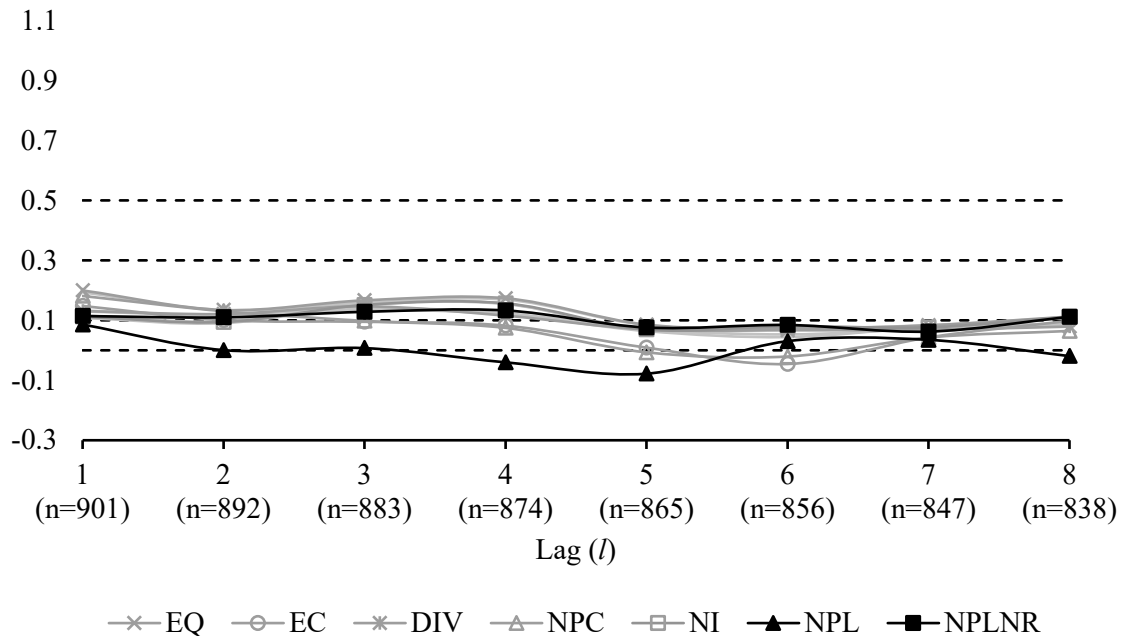
FIGURE

6.1 Autocorrelation Analysis of Covariates – Final Sample

Panel A: Within-Firm



Panel B: Within-Year



Note. The FIGURE is based on Petersen (2009, p. 471 and 474) and depicts within-firm (Panel A) as well as within-year (Panel B) autocorrelation of all covariates, as defined in TABLE 6.4, observable for the full final sample ($N = 910$). The Spearman correlation coefficients (r_s) are estimated for all possible combinations (n) of within-firm and within-year observations based on lag $l = \{1, \dots, 8\}$, respectively. See TABLES A.2 and A.3 in Appendix A.3 for all estimations and respective significant levels. The dashed black lines indicate zero as well as large (> 0.5), medium (0.3-0.5) and small (0.1-0.3) effect sizes in line with Cohen (1992), respectively.

quent analyses. Furthermore, the results of Petersen (2009) indicate that cluster-robust standard errors clustered by firm, i.e., based on \hat{V}_{FIRM} , are less biased than alternatives such as OLS, White, *Newey-West* or *Fama-McBeth* standard errors when there is a firm but no time effect present in the data. Finally, the results of Petersen (2009) also suggest that clustering standard errors by firm and simultaneously account for a potential time effect parametrically, i.e., by including year-fixed effects, is almost identical to clustering standard errors on both dimensions for panel data sets where there exist considerably stronger within-firm than within-year bivariate correlations for covariates. These findings also apply to the final sample of this study. As the autocorrelation analyses outlined above indicates, for the majority of covariates defined in TABLE 6.4 the effect size of significant Spearman correlation coefficients is considerably greater for within-firm than for within-year bivariate correlations (see FIGURE 6.1).³⁰⁶

Last but not least, it is also important to note that there exists no formal test on the level on which to cluster standard errors. For example, clustering could be done in terms of firms or, alternatively, it could be done in terms of industries. In the latter case, on average, clusters would be larger but fewer. There is a bias-variance tradeoff when it comes to the decision on what level to cluster. Specifically, to estimate cluster-robust standard-errors within-cluster estimates are averaged across clusters. Hence, the larger the clusters (and the lower the number of clusters), the less bias is in the estimates but the more variable is the average and vice versa (Cameron & Miller, 2015).

Considering the data structure of the final sample in the light of the comments as well as the autocorrelation analysis outlined throughout this paragraph, it is assumed here that statistical inference with respect to the testing of econometric models of the form (6.27) shall be based on heteroskedasticity and autocorrelation consistent (i.e., HAC) standard errors clustered by firm only, i.e., on \hat{V}_{FIRM} . Furthermore, in order to account for a potential time effect, year-dummies shall be included parametrically in each model to be estimated. More details regarding implementation are discussed in paragraph 6.2.3.6 further below.³⁰⁷

³⁰⁶ It must be noted, as above-mentioned, the other main source of within-cluster correlation is the correlation between the error terms, u , of the econometric models to be estimated. However, as is depicted in FIGURE 6.1, there clearly is autocorrelation detected in most covariates used. Thence, for the purposes of this study, the autocorrelation of residuals (ε) is not analyzed in addition for each model estimated in section 6.4, respectively.

³⁰⁷ Examples of pension value-relevance studies where authors base statistical inference on cluster-robust standard errors clustered by firm or industry and simultaneously account for potential time effects by including year-fixed effects are Chen et al. (2015); Fasshauer and Glaum (2008, 2009, 2012) and Kiosse et al. (2007). In contrast, for example Coronado et al. (2008) apply two-way clustering, i.e., cluster standard errors by both firm and year.

6.2.3.4 Multicollinearity

A major econometric issue that regularly arises in the context of (pension) value-relevance studies is *multicollinearity* among covariates, i.e., among individual column vectors of the $N \times (K + 1)$ -matrix X . Specifically, bivariate correlations between pension and non-pension accounting variables such as equity, net income, plan assets and pension obligations as well as pension income and cost components oftentimes exceed 0.9 (Glaum, 2009). Nevertheless, it is important to note, OLS gives the best linear unbiased estimator (BLUE) even in the presence of high multicollinearity, provided the econometric model is otherwise correctly specified. Thus, statistical inference based on $\hat{\beta}_{OLS}$ and \hat{V}_{OLS} , as defined in equations (6.31) and (6.34), is asymptotically valid even in the presence of high multicollinearity amongst covariates.³⁰⁸ However, *ceteris paribus*, the higher the multicollinearity, the higher is \hat{V}_{OLS} and, hence, the less reliable (although asymptotically valid) is the respective statistical inference.³⁰⁹ Also, high multicollinearity potentially inflates the *Coefficient of Determination* (R^2), even if some or all covariates are found to be statistically insignificant.³¹⁰ Lastly, multicollinearity often also causes high sensitivity of OLS-coefficient estimates, i.e., $\hat{\beta}_{OLS}$, to specific sets of sample data and/or covariates (Landsman, 1986; von Auer, 2016).

In order to diagnose multicollinearity, bivariate correlations for all covariates of a model can be estimated. TABLE 6.8 below depicts the Correlation-Matrix for all covariates defined in TABLE 6.4 based on the 910 observations of the final sample. For completeness, also the response variables $MKTCAP_t$, $MKTCAP_{t+0.25}$ and $MKTCAP_{t+0.5}$ are included. Pearson and Spearman correlation coefficients (r and r_s) are shown in the lower and upper diagonal, respectively.³¹¹ Overall, there is a high degree of (statistically significant) correlation between many of the covariates. Mean (median) Pearson and

³⁰⁸ In fact, only *perfect* multicollinearity among covariates makes estimation and inference based on OLS impossible, since $\hat{\beta}_{OLS}$ and \hat{V}_{OLS} can no longer be estimated mathematically (see e.g., von Auer, 2016, pp. 566-567).

³⁰⁹ Notably, since multicollinearity in X is not directly linked to the sample variance-covariance matrix of residuals ($\hat{\Omega}$) this also holds with regard to the heteroskedasticity-robust estimator \hat{V}_{WHITE} and the cluster-robust estimators \hat{V}_{FIRM} , \hat{V}_{YEAR} and $\hat{V}_{FIRM-YEAR}$, as defined in paragraphs 6.2.3.2 and 6.2.3.3, respectively.

³¹⁰ In general, R^2 provides a measure of how much of the total variation in the response variable y can be explained by the variation in the covariates X . By definition, this statistic is bound by 0 and 1 (see e.g., von Auer, 2016, pp. 66-72). For the purposes of this study, the so called *Adjusted R-squared* ($adj. R^2$) is applied, since it is generally more robust to multiple covariates (see e.g., Wooldridge, 2016, p. 182).

³¹¹ See e.g., Toutenburg et al. (2008a) for mathematical formulas and detailed examples.

TABLE
6.8 Correlation-Matrix - Final Sample

	$MKTCAP_t$	$MKTCAP_{t+0.25}$	$MKTCAP_{t+0.5}$	EQ	$EQbNPL$	NI	$NIbNPC$	$NIbEC$
$MKTCAP_t$								
$MKTCAP_{t+0.25}$	0.9958***			0.9194***	0.9204***	0.8525***	0.8622***	0.8604***
$MKTCAP_{t+0.5}$	0.9973***	0.9944***		0.9159***	0.9169***	0.8486***	0.8587***	0.8570***
EQ	0.9182***	0.9981***	0.9953***	0.9143***	0.9155***	0.8523***	0.8624***	0.8602***
$EQbNPL$	0.9169***	0.9121***	0.9114***		0.9995***	0.8049***	0.8208***	0.8164***
NI	0.8442***	0.9120***	0.9109***	0.9987***		0.8042***	0.8201***	0.8159***
$NIbNPC$	0.8485***	0.8261***	0.8344***	0.8357***	0.8421***	0.9997***	0.9955***	0.9924***
$NIbEC$	0.8517***	0.8308***	0.8388***	0.8429***	0.8492***	0.9990***	0.9995***	0.9968***
DIV	0.8875***	0.8346***	0.8420***	0.8465***	0.8528***	0.8090***	0.8102***	0.8144***
$DIVbNPC$	0.8923***	0.8777***	0.8790***	0.8427***	0.8527***	0.8131***	0.8148***	0.8191***
$DIVbEC$	0.8927***	0.8827***	0.8837***	0.8506***	0.8603***	0.8127***	0.8145***	0.8197***
NPL	0.4003***	0.8835***	0.8842***	0.8518***	0.8616***	0.4992***	0.5004***	0.5028***
$NPLNR$	0.2668***	0.4185***	0.4113***	0.4385***	0.4832***	0.1962***	0.2101***	0.2160***
NPC	0.6729***	0.2761***	0.2739***	0.3925***	0.3709***	0.6064***	0.6241***	0.6301***
EC	0.6183***	0.6775***	0.6705***	0.7683***	0.7680***	0.5426***	0.5555***	0.5790***
		0.6256***	0.6137***	0.6739***	0.6760***			

(continued on next page)

TABLE (continued)

	<i>DIV</i>	<i>DIVbNPC</i>	<i>DIVbEC</i>	<i>NPL</i>	<i>NPLNR</i>	<i>NPC</i>	<i>EC</i>
<i>MKTCAP_t</i>	0.8211***	0.8695***	0.8708***	0.3119***	0.1201***	0.6822***	0.7248***
<i>MKTCAP_{t+0.25}</i>	0.8177***	0.8656***	0.8669***	0.3090***	0.1282***	0.6855***	0.7255***
<i>MKTCAP_{t+0.5}</i>	0.8167***	0.8650***	0.8657***	0.3144***	0.1234***	0.6823***	0.7235***
<i>EQ</i>	0.7976***	0.8538***	0.8545***	0.2863***	0.1641***	0.7267***	0.7699***
<i>EQbNPL</i>	0.7959***	0.8532***	0.8539***	0.3039***	0.1618***	0.7291***	0.7723***
<i>NI</i>	0.8352***	0.8422***	0.8465***	0.2496***	0.0629*	0.5851***	0.6377***
<i>NIbNPC</i>	0.8392***	0.8510***	0.8546***	0.2573***	0.0687**	0.6214***	0.6683***
<i>NIbEC</i>	0.8376***	0.8482***	0.8568***	0.2531***	0.0654**	0.6132***	0.6748***
<i>DIV</i>		0.9802***	0.9769***	0.2614***	0.1058***	0.5675***	0.6127***
<i>DIVbNPC</i>	0.9998***		0.9964***	0.2727***	0.1264***	0.6498***	0.6901***
<i>DIVbEC</i>	0.9992***	0.9996***		0.2671***	0.1278***	0.6436***	0.7013***
<i>NPL</i>	0.5658***	0.5668***	0.5669***		-0.0531	0.2593***	0.2374***
<i>NPLNR</i>	0.1065***	0.1207***	0.1268***	-0.2049***		0.1745***	0.1633***
<i>NPC</i>	0.5413***	0.5593***	0.5642***	0.3483***	0.6133***		0.9078***
<i>EC</i>	0.5577***	0.5702***	0.5901***	0.3482***	0.4868***	0.7928***	

Note. The TABLE depicts bivariate correlations for the response variables, as defined in TABLE 6.3, and all covariates, as defined in TABLE 6.4, for the final sample ($N = 910$). Pearson and Spearman correlation coefficients are shown in the lower and upper diagonal, respectively. For notational reasons, figures are rounded to two decimals. *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

Spearman correlations are found to be 0.6903 (0.8127) and 0.6592 (0.8049), respectively. Furthermore, only four of the total of 210 estimated correlation coefficients (i.e., 1.91%) are not found to be statistically different from zero on a 1%-level or higher. Specifically, these belong to the estimated Spearman correlation coefficients of *NPLNR*. The bivariate Spearman correlations between *NPLNR* and *NibNPC* as well as *NibEC* are found to be statistically different from zero on a 5%-level, respectively. Between *NPLNR* and *NI*, the significance is on the 10%-level only. Moreover, the bivariate Spearman correlation between *NPLNR* and *NPL* is not found to be statistically different from zero on a 10%-level or higher (see TABLE 6.8). In general, as above-mentioned, the high degree of multicollinearity is typical for (pension) value-relevance studies. In fact, since different accounting variables reported in the financial statements (i.e., recognized on the balance-sheet and in the income-statement as well as disclosed in the notes) of one and the same firm are economically strongly interdependent, it would rather be surprising if the results depicted in TABLE 6.8 were different. This holds even more so with respect to covariates composed of other covariates such as e.g., *EQbNPL* which, by definition, is derived from *EQ* and *NPL* (see TABLE 6.4).

Another statistic commonly applied to diagnose multicollinearity is the so called *Variance Inflation Factor* (VIF). The VIF is calculated for a single coefficient estimate, $\hat{\beta}_{OLS,k}$ (Wooldridge, 2016). Specifically, the variance of $\hat{\beta}_{OLS,k}$ is defined as follows,

$$VAR(\hat{\beta}_{OLS,k}) = \frac{\sigma^2}{[x_k'x_k - (N \times \bar{x}_k^2)]} \times VIF_k \quad (6.45)$$

where x_k' and x_k denote a $(1 \times N)$ - and a $(N \times 1)$ -vector of the N observations of covariate k , respectively. Further, σ^2 stands for the assumed constant variance of the error terms u (see paragraph 6.2.3.2). In turn, the variance inflation factor of covariate k is defined as,

$$VIF_k = \frac{1}{(1 - R^2_{k,K-1})} \quad (6.46)$$

(von Auer, 2016; Wooldridge, 2016). Note, $VAR(\hat{\beta}_{OLS,k})$, as defined in (6.45), is the $(k + 1)th$ -element of the main diagonal of the OLS variance-covariance-matrix

$V(\hat{\beta}_{OLS})$, as defined in (6.33). In turn, $R^2_{k,K-1}$, is the coefficient of determination of the OLS-estimation of the following model,

$$x_k = \gamma_0 + \sum_{q=1}^{K-1} \gamma_q x_q + v \quad (6.47)$$

where covariate k is regressed on all of the other covariates $q \in \{1, \dots, K-1\}$, included in the original model to estimate $\hat{\beta}_{OLS,k}$, and v denotes a $(N \times 1)$ -vector of errors. γ_0 and γ_q denote the *true* (i.e., actual) model coefficients (incl. the intercept) of model (6.47) (von Auer, 2016).

Equations (6.45) through (6.47) provide some intuition why multicollinearity among covariates potentially leads to unreliable statistical inference. Namely, when the other covariates have little to no explanatory power with respect to covariate k , $R^2_{k,K-1}$ approaches zero, hence, VIF_k approaches one and thus, has little to no influence on $VAR(\hat{\beta}_{OLS,k})$. In contrast, when x_k is highly correlated with the linear combination of the other covariates, $R^2_{k,K-1}$ approaches one and in turn, VIF_k may increase to very high levels. As a consequence, $VAR(\hat{\beta}_{OLS,k})$ increases accordingly and thus, statistical inference based on any unbiased and consistent estimator of $VAR(\hat{\beta}_{OLS,k})$, most likely, becomes unreliable.³¹² For example, even if $\hat{\beta}_{OLS,k}$ is estimated to be very different from zero, a high value of $\widehat{VAR}(\hat{\beta}_{OLS,k})$ may still lead to a small t -value, and potentially to a false non-rejection of the *Null hypothesis* (i.e., to a *Type II error*). Overall, VIF_k , as defined in (6.46), provides a measure of the magnitude by which $VAR(\hat{\beta}_{OLS,k})$, as defined in (6.45), is inflated due to multicollinearity between the covariate k and the other covariates $K-1$ (Fahrmeir et al., 2013; von Auer, 2016). Lastly, it is important to note, there is no generally accepted indicator value for VIF_k , by which one can declare mul-

³¹² In the extreme case of perfect multicollinearity, $R^2_{k,K-1}$ is 1 and thus, VIF_k “[...] explodes towards infinity $[\infty]$ ” (Fahrmeir et al., 2013, p. 158).

ticollinearity as serious issue for statistical inference. However, a value of 10 (corresponding to $R^2_{k,K-1} = 0.9$) maybe applied to declare multicollinearity as severe (Fahrmeir et al., 2013; Wooldridge, 2016).³¹³

In general, if the model to be estimated is otherwise correctly specified, there exist no econometric remedies to mitigate or eliminate the adverse consequences of multicollinearity. Basically, multicollinearity is nothing more than a *lack of information* in the sample data which leads to unreliable statistical inference as outlined above. Thus, the only real remedy is the collection of more data, i.e., the increase of the sample size. However, usually, as is the case with respect to this study (see sub-section 6.1.1), this option is either not available or very costly. Moreover, it is well possible that the newly collected data would suffer from the same degree of multicollinearity. Some researches simply drop certain covariates from their econometric models in order to reduce multicollinearity. However, if the model had been correctly specified, the exclusion of relevant parameters would lead to biased coefficient estimates and accordingly invalid statistical inference (von Auer, 2016).

A common remedy for multicollinearity applied in the realm of (pension) value-relevance studies is the netting of covariates. For example, with regard to IFRS-observations, instead of including the defined benefit obligation (*DBO*) and the plan assets (*PLA*), as defined in TABLE 6.4, one could simply include the funding status (*FS*), which by definition, is derived from the other two covariates (see TABLE 3.1 on page 89). From a conceptual point of view, netting presumes that the true model coefficients of *DBO* and *PLA* (β_{DBO} and β_{PLA}) have different signs but are equal in magnitude (Glaum, 2009). However, this must not necessarily be true (Landsman, 1986). Moreover, netting of pension variables precludes any direct comparison of the value-relevance of gross and net terms e.g., whether the *DBO* and *PLA* or the *FS* is more value-relevant, i.e., decision-useful to investors (Glaum, 2009). Nevertheless, for the purposes of this study, in order to mitigate the adverse effects of multicollinearity, estimation and inference is always based on net rather than gross covariates, if applicable. Furthermore, the degree of multicollinearity is estimated via bivariate correlation coefficients, as depicted in TABLE 6.8, as well as via the variance inflation factors, as defined in (6.46) above.

³¹³ Examples of pension value-relevance studies where authors explicitly apply variance inflation factors to estimate the magnitude of multicollinearity are Davis-Friday et al. (2005); Fasshauer and Glaum (2009) and Fasshauer and Glaum (2012).

6.2.3.5 Measurement Error, Omitted Variables and Scale

Market values for all of the covariates X implemented in models of the form (6.27) are not directly observable. Thence, $\hat{\beta}_{OLS}$, as defined in (6.31), may be biased due to *measurement errors* in X (Landsman, 1986). Specifically, in value-relevance studies $\hat{\beta}_{OLS}$ often does not correspond closely to the expected theoretical coefficient values. Moreover, the intercept term, $\hat{\beta}_0$, is regularly found to be large and significantly different from zero, although the theoretical models predict no intercept term, i.e., $\beta_0 = 0$.³¹⁴ Furthermore, measurement error may also occur with respect to the response variable y (see e.g., von Auer, 2016, pp. 397-402; Wooldridge, 2016, pp. 287-289). As discussed in sub-section 6.1.2, in order to mitigate measurement error in the response variable $MKTCAP$, observations with extraordinary year-on-year changes in the number of outstanding shares ($\Delta NOSYEAREND$) are excluded from the final sample. Furthermore, to mitigate measurement error in covariates, as well as to economically better align the response variable and the covariates, raw variables are adjusted as discussed in sub-section 6.1.3.

Another important issue that is specific to the study of pension value-relevance, and which is mainly related to *omitted variables bias*, is the so called *service cost anomaly*, first documented by Barth et al. (1992). This refers to the anomalous finding of positive and significant correlations between service cost, in line with IAS 19 (2004) referred to as *current service cost* (CSC , see paragraph 3.2.6.3), and the market value of equity (Hann, Hefflin, et al., 2007). Subsequently, positive (significant and insignificant) regression coefficients related to CSC have also been reported by e.g., Barth et al. (1993); Hann, Hefflin, et al. (2007) and Subramanyam and Zhang (2001). Moreover, e.g., Fasshauer and Glaum (2008, 2009) report positive coefficients for net pension cost (NPC) of which service cost is one of the main components (see paragraph 3.2.6.7). For example, Barth et al. (1993) hypothesize that the anomalous result might be due to high multicollinearity between different pension income and cost components. In contrast, Subramanyam and Zhang (2001) argue that, economically, service cost is also a proxy

³¹⁴ This indicates that the empirical models tested, i.e., (6.27), are not correctly specified. For example, this could be due to measurement error or omitted covariates (Glaum, 2009). However, as outlined at the end of paragraph 6.2.3.1, in order to empirically test the theoretical economic models defined in sub-section 5.2.1.3, the econometric models tested here are assumed to be otherwise correctly specified. In particular, this is assumed to hold with regard to their *functional form*. See e.g., von Auer (2016, pp. 333-358) for more details on functional misspecification.

for the *value of human capital*.³¹⁵ Thus, the authors include the total number of employees (*EMP*) as control variable into their regression models. According to Subramanyam and Zhang (2001, p. 17), *EMP* “[...] measures the size of human resources deployed by the firm, [however] it does not capture cross-sectional variation in employee productivity (i.e., per-capita employee value).” Hence, the authors also include expenses for research and development (*R&D*) as well as advertisement expenses as control variables in order to proxy for the intangible values created by the workforce.³¹⁶ As result, Subramanyam and Zhang (2001) are able to estimate a negative and statistically significant regression coefficient for service cost. Subsequently, the inclusion of *EMP* as well as *R&D* has commonly been applied as remedy to control for the service cost anomaly in pension value-relevance studies.³¹⁷ However, with respect to this study, the inclusion of *R&D* as separate covariate into estimated econometric models is not applicable. The cause of this limitation is the fact that, during the sample period of 2004 to 2012, sample firms accounting in line with IFRS and Swiss GAAP FER were not required to recognize expenses for *R&D* and/or advertisements separately on the face of the income-statement, nor disclose these separately in the notes.³¹⁸ Thus, these variables could not be collected accurately. For example, the same limitation applies to the study of Fasshauer and Glaum (2012). Hence, as an alternative to *R&D*, the authors include *sales growth* as separate covariate into their models.³¹⁹ However, it must be noted, the estimation of growth rates of sales requires at least two adjacent observations for each sample firm *i*. Thus, all observations of the first year (i.e., 2004) would have to be dropped from the

³¹⁵ For example, Ballester et al. (2002) incorporate labor cost reported under US GAAP into the valuation framework of Ohlson (1995). Accordingly, for a sample panel data set of US firms observed across the period of 1978 to 1997, the authors estimate the mean value of the intangible asset *human capital* to be 5% of the market value of equity as well as 16% of the difference between market and book value of equity, respectively. Also, e.g., Lajili and Zéghal (2005) find labor cost reported separately and voluntarily by firms applying US GAAP to be positively related to share prices.

³¹⁶ For example, for a sample of large US corporations, Sougiannis (1994) finds evidence for positive relations between *R&D* expenses and earnings as well as market values of equity. Specifically, “[...] on average, a one-dollar increase in *R&D* investment leads to a two-dollar increase in profit over a seven-year period and a five-dollar increase in market value.” (Sougiannis, 1994, p. 65).

³¹⁷ See e.g., Chen et al. (2015); Hann, Hefflin, et al. (2007); Hann, Lu, et al. (2007); Kiosse et al. (2007) and Yu (2013).

³¹⁸ See e.g., IAS 1 (2004, para. 86-95; 2012, para. 97-105) and ARR 3 (2014, para. 7-9).

³¹⁹ Notably, sales growth might also be a proxy for (future) growth opportunities not (yet) reflected in current financial statements. For that, this variable has been used as control variable in prior pension value-relevance studies such as e.g., Brown (2004); Chen et al. (2015); Hann, Lu, et al. (2007) and Yu (2013).

final sample. Moreover, as outlined in sub-section 6.2.1, the final sample has the structure of an unbalanced panel incl. sample firms for which there is only one single observation included as well as gaps along the time dimension. Hence, overall, for only 696 (i.e., 76.48%) of all 910 observations included in the final sample it is possible to estimate an one-year growth rate of sales.³²⁰ As a result, the other 214 (i.e., 23.52%) observations could not be used for the estimation of any econometric models including sales growth as separate covariate. Hence, in order to not further reduce the final sample size, this approach is not followed here. Instead, the total number of employees (*EMP*) is used as single proxy to account for the value of human capital and accordingly, to control for the service cost anomaly outlined above. The variable is defined as follows,

EMP_t^*	Total number of employees disclosed in the notes as of December 31 of year t .
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In line with the total book value of dividends proposed (DPS_t^*), outlined in paragraph 6.1.3.1, EMP_t^* was also sourced from the Swiss Companies Guide database. To reduce clutter, henceforth, this variable is simply denoted as *EMP* without *.

Oftentimes, bias in $\hat{\beta}_{OLS}$ also arises due to cross-sectional scale, i.e., size, differences, across sample firms (Christie, 1987). In the words of Barth and Kallapur (1996, p. 555): “[...] large firms have large values of most variables and small firms have small values, and these magnitude differences often are unrelated to the research question.” In line with e.g., Easton (1998, p. 237), this phenomenon may also be called *scale effect*.³²¹ However, as Barth and Clinch (2009, p. 268) note: “[...] size variation, *per se*, does not mean that scale effects exist [*italic in original*].”. Nevertheless, in pension value-relevance studies, it is common practice to introduce separate scale proxies to econometric models in order to control for potential scale effects. For example, response variables and covariates are deflated by the number of outstanding shares, i.e., *NOSYEAR-END* or *NOS*, as defined in sub-section 6.1.2.³²² However, for example Easton (1998)

³²⁰ Notably, to estimate average growth rates across more than two years, this number would be further reduced accordingly.

³²¹ Scale effects, oftentimes, also cause heteroskedasticity (Barth & Kallapur, 1996).

³²² See e.g., Barth et al. (1992); Fasshauer and Glaum (2008, 2012); Hann, Hefflin, et al. (2007); Kiosse et al. (2007); Kirkpatrick (2012) and Werner (2011).

shows that, with regard to price-levels regression, deflation by the number of outstanding shares may lead to spurious correlation. In the view of the author, this result might be due to management's discretion over the number of outstanding shares and hence, price-levels regressions based on per share variables suffer from spurious correlation induced by scale effects. Therefore, this scale proxy is not applied here.

Two other commonly applied scale proxies are *total assets* and *sales*.³²³ Accordingly, in addition to the variables outlined in paragraph 6.1.3.1, the following two variables were hand-collected from annual reports for each sample firm. They are defined as follows,

TA_t^*	Total book value in CHF of assets incl. minority interests recognized on the balance-sheet as of December 31 of year t .
$SALES_t^*$	Total book value in CHF of net sales or equivalent incl. minority interests recognized in the income-statement for year t . ³²⁴

In line with TABLE 6.8, TABLE 6.9 depicts the correlation-matrix of the covariates EQ as defined in TABLE 6.4, as well as TA , $SALES$ and EMP as defined above, for the 910 observations included in the final sample. The mean (median) Pearson and Spearman correlations are estimated to be 0.6331 (0.6674) and 0.7801 (0.7748), respectively. Note, all of the correlation coefficients are significantly different from zero on a 1%-level or higher. Overall, the Pearson and Spearman correlations oscillate between 0.2660 (EMP and TA) and 0.9320 (EMP and $SALES$) as well as between 0.6143 (TA and EMP) and 0.9407 (EQ and TA), respectively. Furthermore, the Pearson and Spearman correlations of EQ oscillate between 0.5176 (with TA) and 0.8903 (with $SALES$) as well as between

³²³ For example, Chen et al. (2015); Hann, Lu, et al. (2007); Landsman (1986) and Yu (2013) use sales and Coronado et al. (2008) and Daley (1984) use total assets to scale their empirical models. Examples of pension-value relevance studies where researchers include either sales, total assets or both as separate covariates in their regression models, either as exclusive remedy for scale effects or in addition to deflation, are Brown (2004); Chen et al. (2015); Coronado et al. (2008) and Fasshauer and Glaum (2012).

³²⁴ Where applicable, net sales were used as data item. Otherwise, the reported top-line measure (i.e., gross sales) was used. However, where reported, other operating income, changes in inventory of finished and unfinished goods as well as unbilled goods and services were excluded. For banks, this covariate corresponds to the sum of *net interest income*, *net fee and commission income* as well as *net trading income*. For insurance companies, *net premiums written* were used as data item.

TABLE
6.9 Correlation-Matrix – Scale Proxies

	<i>EQ</i>	<i>TA</i>	<i>SALES</i>	<i>EMP</i>
<i>EQ</i>		0.9407***	0.7921***	0.6635***
<i>TA</i>	0.5176***		0.7574***	0.6143***
<i>SALES</i>	0.8903***	0.3754***		0.9123***
<i>EMP</i>	0.8172***	0.2660***	0.9320***	

Note. The TABLE depicts bivariate correlations for the total book value of equity (*EQ*), as defined in TABLE 6.4, as well as for the total book value of assets (*TA*), the total book value of sales (*SALES*) and the total number of employees (*EMP*), as defined in paragraph 6.2.3.5, respectively. Estimates are based on the final sample ($N = 910$). Pearson and Spearman correlation coefficients are shown in the lower and upper diagonal, respectively. *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

0.6635 (with *EMP*) and 0.9407 (with *TA*), respectively. Apparently, with regard to the final sample, *EQ* itself is a decent proxy of scale.

The discussion above results in two important implications for the formulation of the economic model outlined in sub-section 5.2.1.3. First, *EQ* is an appropriate proxy for firm size and, thus, the introduction of other scale proxies such as e.g., *TA* and *SALES* as separate covariates would simply lead to a potential increase of the level of multicollinearity. And second, *EQ* and *EMP* also show strong and significantly positive bivariate correlations. Thence, including *EMP* as separate covariate to control for the service cost anomaly would also potentially increase multicollinearity and, hence, may lead to less reliable inference. Given these two implications, for the purposes of this study, the following approach is applied to mitigate the adverse effects of omitted variables bias (i.e., the service cost anomaly) on the one hand, and scale effects on the other: all of the econometric models to be estimated include either *EQ* or one of the two derivative covariates *EQbNPL* and *EQbFS*. Thence, no additional scale proxy is included separately. Furthermore, where applicable, the model (i.e., the response variables and all covariates) are deflated by *EMP* in order to control for the service cost anomaly. Otherwise, models are estimated in undeflated form, i.e., excluding *EMP*. Notably, deflation by *EMP* alters the economic interpretation of the econometric models to be estimated. Namely, the market value of the firm *per capita* (i.e., *per employee*) is estimated as linear function of the covariates *per capita* (i.e., *per employee*). Deflating pension variables by *EMP* is expected to “deflate away” their proxy function for the value of human capital.

As a final comment, it must be noted that e.g., Barth and Kallapur (1996) and Barth and Clinch (2009) show that the deflation of price-levels regression models can have unpredictable effects on coefficient bias and heteroskedasticity. However, as discussed in paragraph 6.2.3.3, the latter is controlled for by the application of cluster-robust standard errors. In contrast, the introduction of, or increase in, existing coefficient bias caused by deflation must be seen as one of the methodological limitations of this study. Nevertheless, as outlined above, deflation is a well-established and widely applied procedure in pension value-relevance studies.

6.2.3.6 Technical Note

For the purposes of this study, most statistical analyses, incl. the autocorrelation as well as the multicollinearity analyses, discussed in paragraphs 6.2.3.3, 6.2.3.4 and 6.2.3.5 were conducted with the open source statistical software *R* (version: 3.3.2) and the open *R* editor *RStudio* (version: 1.0.136).³²⁵ All scripts (i.e., programs) were written by the author himself for the specific purposes of this study. Program code is based on open source information from the internet as well as literature such as e.g., Kruschke (2011, 2015). More often than not, this code is also the result of trial and error. All of the respective scripts are available from the author upon request.

As outlined in paragraph 6.2.3.3, in order to account for the potential presence of constant time effects in the sample panel data, the econometric models to be estimated, i.e., models of the form (6.27), incorporate year-fixed effects. Thus, generically, for a single observation of firm i in year t , all models to be estimated are defined as follows,

$$y_{it} = \alpha_1 + \sum_{d=2}^T \alpha_d D_{itd} + \sum_{k=1}^K \beta_k x_{itk} + u_{it} \quad (6.48)$$

where α_1 denotes the intercept term for the reference category, i.e., the sub-sample of all observations corresponding to year $t = 1$ (e.g., 2004) of the respective sub-sample, and α_d denotes the intercept terms of all categories, i.e., years, other than the reference category $d \in \{2, \dots, T\}$. Correspondingly, the binary (i.e., *dummy*) variables D_{itd} are defined as,

³²⁵ See e.g., R (2017) and RStudio (2017). Some explorative analyses were also conducted with the statistical software package JMP® (version: 12.0.1) provided by SAS Institute Inc. See e.g., JMP (2017).

$$D_{itd} = \begin{cases} 0, d \neq t \\ 1, d = t \end{cases} \quad (6.49)$$

where, $t \in \{1, \dots, T\}$ and $d \in \{2, \dots, T\}$. Generally, to reduce clutter, all estimated model coefficients for the year-fixed effects (i.e., α_2 to α_T) are not reported separately. Also, as outlined in paragraph 6.2.3.5, where applicable, all models of the form (6.48) (i.e., the response variable and all covariates but the year-dummies) are deflated by the total number of employees (EMP) in order to control for the service cost anomaly.

All estimated models are tested for the presence of heteroskedasticity by applying the special case of the test proposed by White (1980), discussed in paragraph 6.2.3.2. Further, as outlined in paragraph 6.2.3.4, the degree of multicollinearity is estimated by inspection of bivariate Pearson and Spearman correlation coefficients of covariates as well as the estimation of respective variance inflation factors. To reduce clutter, only the maximum VIF_k per estimated model is reported. Furthermore, to account for within-firm autocorrelation, i.e., for the potential presence of a constant firm effect as outlined in paragraph 6.2.3.3, statistical inference is based on heteroskedasticity and autocorrelation-consistent (i.e., cluster-robust or HAC) standard errors. Specifically, for the estimation of the variance-covariance matrix of model coefficients, estimated residuals (ε_{it}) are clustered by firm. Thus, \hat{V}_{FIRM} is estimated analogous to equation (6.40) on page 254. The respective R -code is based on the function *clx* for one-way clustering developed by Arai (2015). Notably, the following degree of freedom correction is applied to the standard errors clustered by firm,

$$\frac{I}{I-1} \times \frac{N-1}{N - rank(X)} \quad (6.50)$$

where I denotes the number of firms (i.e., clusters), N is the total number of observations and the rank of X accounts for the number of covariates (K), the (reference) intercept term (α_1) as well as the number of dummy variables ($T-1$). Thus,

$$rank(X) = K + 1 + [T - 1] = K + T \quad (6.51)$$

(see Arai, 2015, p. 3). The degree of freedom correction defined in (6.50) is applied to reduce typical downward bias in \hat{V}_{FIRM} , arising due to the finite number of clusters I (i.e., firms). Yet, usually, downward bias is not fully eliminated (Cameron & Miller, 2015).

6.3 Descriptive Analysis

6.3.1 Sub-Samples

As outlined in sub-section 6.1.1, all nine firm-year observations where firms applied the PL-Method in line with IAS 19 (2004) are excluded from the final sample. Thus, the following discussions are focused on the application of the Corridor- and the OCI-Method, both in line with IAS 19 (2004), as well as on the application of ARR 16 (2005). However, as discussed in detail in chapter 3, there exist important differences between the application of the Corridor- and the OCI-Method in line with IAS 19 (2004) on the one hand, as well as between the application of IAS 19 (2004) and ARR 16 (2005) on the other hand. Therefore, for the purposes of this study, the different sub-samples of observations attributable to these three different pension accounting methods are analyzed separately. Moreover, the different sub-samples are split into industry and financial firms. First, this is expected to mitigate heterogeneity with respect to institutional factors, since regulations specific to financial firms may affect the relationship between their share prices and accounting variables (see e.g., Davis-Friday et al., 1999). Second, the separate analysis of industry and financial data provides the opportunity to investigate potential differences in the value-relevance of Swiss pension plans between industry and financial firms. It is worth noting, within the realm of the pension value-relevance literature reviewed in sub-section 5.2.2, it is common practice to exclude observations on financial firms from any analyses.³²⁶ Thus, by splitting the sub-samples to be analyzed in this study into industry and financial firms, results on the industry sub-samples are expected to be more comparable to the findings of other pension value-relevance studies, than if observations were pooled. Moreover, although in the context of Swiss pension plans, separate results for financial firms provide evidence that goes beyond the common practice potentially providing general implications for the value-relevance of pension plans with respect to financial firms.

³²⁶ See e.g., Chen et al. (2015); Davis-Friday et al. (1999); Fasshauer and Glaum (2008, 2009, 2012); Hann, Heflin, et al. (2007); Hann, Lu, et al. (2007); Kiosse et al. (2007); Kirkpatrick (2012) and Yu (2013).

TABLE 6.10 below depicts the split of the full final sample into six sub-samples along the two dimensions of pension accounting method as well as industry classification. Specifically, observations are first split into three sub-samples of firms that apply the Corridor-Method (CORR), the OCI-Method (OCI) and ARR 16 (FER), respectively. Subsequently, these three sub-samples are then split into observations from firms classified as industry firms (IND) and financial firms (FS), respectively. As outlined in sub-section 6.1.1, industry classification is in line with the *Industry Classification Benchmark* (ICB). Overall, with 597 (65.60%) of all 910 observations included, observations where firms apply the Corridor-Method clearly dominate the final sample data set. In contrast, observations where firms apply the OCI-Method and ARR 16 make up 14.51% (132) and 19.89% (181), respectively. Along the dimension of industry classification, observations of industry and financial firms account for 74.51% (678) and 25.49% (232) of all observations, respectively. This corresponds to the distribution of sample industries depicted in TABLE 6.2 on page 222. If both dimensions, pension accounting method and industry classification, are combined, the largest sub-sample is comprised of observations where industry firms apply the Corridor-Method. With 454 observations, INDCORR makes up 49.89% of all final sample observations. Correspondingly, the 143 observations attributable to financial firms applying the Corridor-Method make up the rest, i.e., 23.95%, of all 597 CORR observations. Overall, FSCORR accounts for 15.71% of total observations. With 66.96% of all industry observations, INDCORR also clearly dominates those observations where industry firms apply either the OCI-Method (118, 17.40%) or ARR 16 (106, 15.63%). Overall, INDOCI and INDFER make up 12.97% and 11.65% of total observations, respectively. As is the case with regard to the Corridor-Method, also with respect to all observations where firms apply the OCI-Method and ARR 16, the number of industry observations dominates the number of observations from financial firms. Specifically, with 14 observations, FSOCI accounts for only 10.61% and 1.54% of all OCI- as well as total observations, respectively. Analogously, the 75 observations of FSFER make up 41.44% and 8.24% of all FER-observations and total observations, respectively.

FIGURE 6.2 below illustrates the shares of firms (in %) applying the Corridor-Method (CORR), the OCI-Method (OCI) and ARR 16 (FER) for each sample year, respectively. Specifically, data is shown separately for industry firms (Panel A) and financial firms (Panel B). As described in sub-section 6.2.1, the data structure of the final panel data set is of unbalanced form. Thence, the number of observations per year oscillates between 41 (2004) and 93 (2011) for industry firms and between 7 (2004) and 35 (2012) for financial firms. This is the result of the sample selection process outlined in

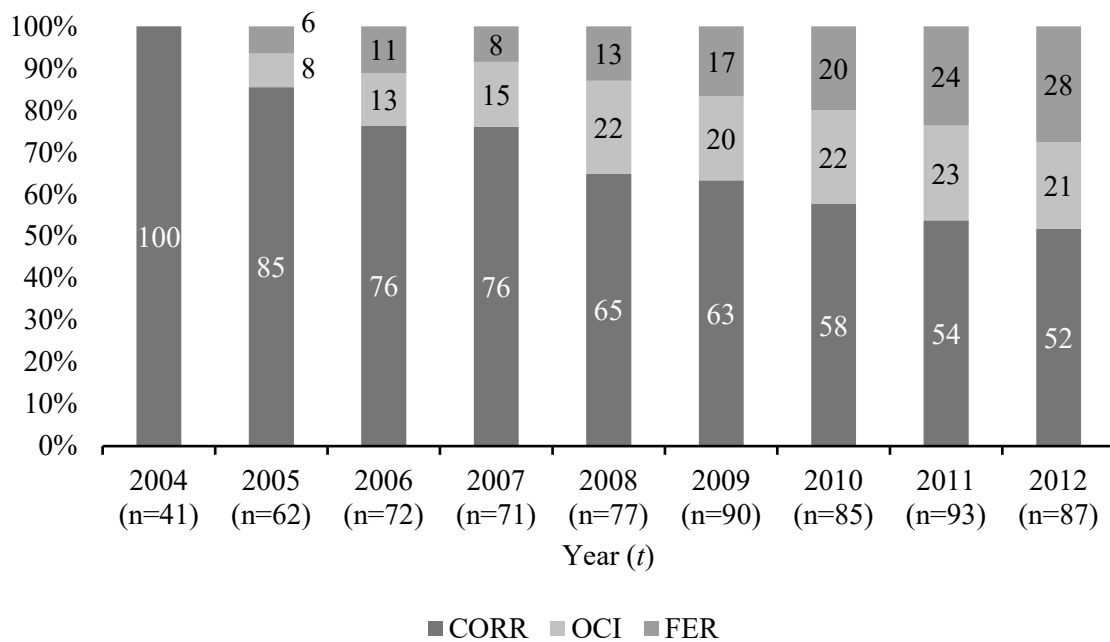
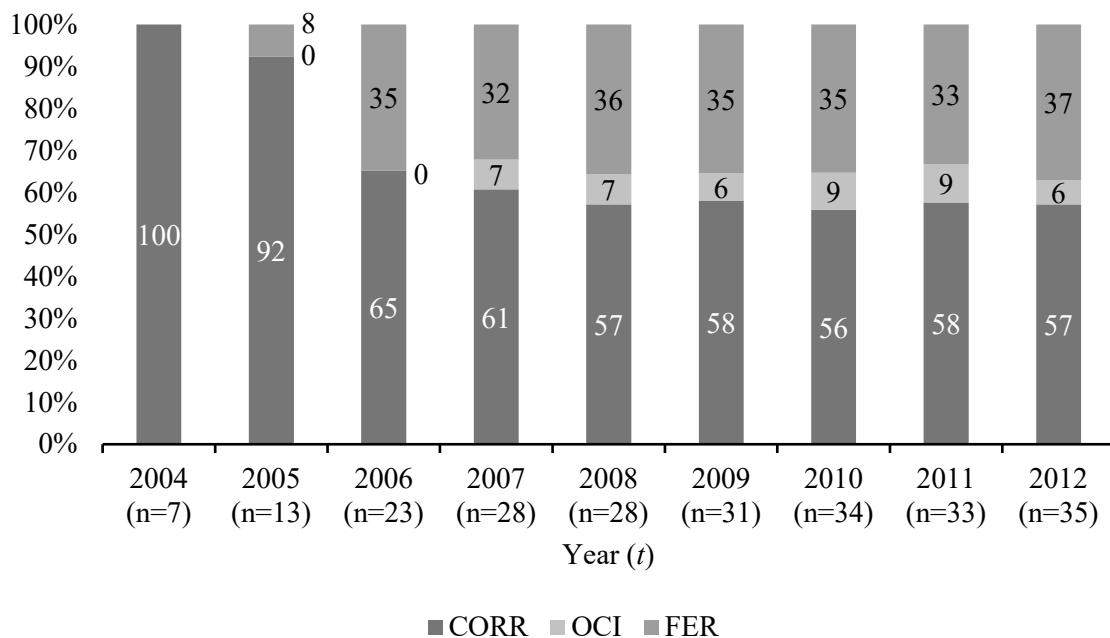
TABLE
6.10 Sub-Samples

	IND	%	FS	%	Total
CORR	454		143		597
	(49.89%)	66.96	(15.71%)	61.64	(65.60%)
%	76.05		23.95		
OCI	118		14		132
	(12.97%)	17.40	(1.54%)	6.03	(14.51%)
%	89.39		10.61		
FER	106		75		181
	(11.65%)	15.63	(8.24%)	32.33	(19.89%)
%	58.56		41.44		
Total	678		232		910
	(74.51%)		(25.49%)		(100.00%)

Note. The TABLE depicts the split of the total firm-year observations included in the final sample ($N = 910$) into sub-samples along the two dimensions of pension accounting method as well as industry classification. The total number of firm-year observations included in each sub-sample is printed in bold figures. Each sub-sample's percentage share of the total observations ($N = 910$) is indicated in parentheses. The distributions across the three pension accounting methods CORR (Corridor-Method), OCI (OCI-Method) and ARR 16 (2005, FER) as well as the two industry categories (IND = Industry and FS = Financials) are indicated as percentage shares in italics in the columns to the right and rows beneath the absolute values, respectively.

sub-section 6.1.1. Nonetheless, with respect to the final sample, the relative importance of the Corridor-Method had decreased and shifted towards the OCI-Method and ARR 16 throughout the sample period. This holds irrespective of industry classification. Overall, between 2004 and 2012, the shares of industry firms applying the Corridor-Method, the OCI-Method and ARR 16 oscillate between 52% (2012) and 100% (2004), 0% (2004) and 23% (2011) as well as 0% (2004) and 28% (2012), respectively. For financial firms, the respective shares oscillate between 56% (2010) and 100% (2004), 0% (2004) and 9% (2010 and 2011) as well as 0% (2004) and 37% (2012). Apparently, for the final sample, the application of the OCI-Method and ARR 16 had gradually increased with regard to industry firms. In contrast, for financial firms, the shares of firms applying one of the three different pension accounting methods had been relatively stable between 2006 and 2012. Apart from the sample selection process, one important reason for this discrepancy between industry and financial firms is the fact that there is only one switch of pension accounting methods observed for financial firms compared to 32 switches observed for industry firms.

FIGURE

*6.2 Application of Pension Accounting Methods***Panel A: Industry Firms (IND, $n = 678$)****Panel B: Financial Firms (FS, $n = 232$)**

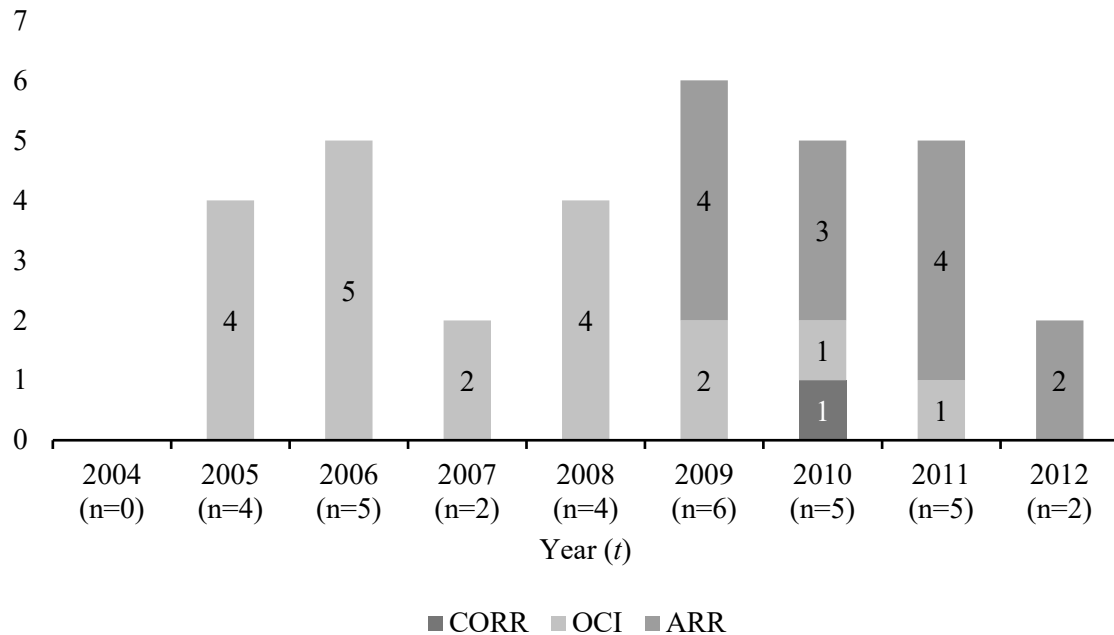
Note. For the sample period of 2004 to 2012, the FIGURE depicts the shares (in %) of firms in the final sample that apply the Corridor-Method (CORR), the OCI-Method (OCI) and ARR 16 (FER). Panel A and B are based on all observations of industry (IND) and financial (FS) firms, respectively. n indicates the total of observations included for the respective year.

FIGURE 6.3 below depicts the total number of switches observed for the final sample across the period of 2004 to 2012. Specifically, for each year of the sample period, the FIGURE depicts the number of firms for which the switch is observed for the first time. Overall, the total number of 33 observed switches corresponds to 31 (i.e., 20.81%) of the 149 firms included in the final sample. 30 (i.e., 90.91%) of the observed Switches are from the Corridor-Method to either the OCI-Method or to ARR 16. Concretely, 19 switches from the Corridor- to the OCI-Method as well as 11 switches from the Corridor- to ARR 16 (i.e., from IFRS to FER) are observed. Furthermore, there are two switches observed from the OCI-Method to ARR 16, totaling the observed switches from IFRS to FER to 13. Notably, the two switches from the OCI-Method to ARR 16 are attributable to two firms for which preceding switches from the Corridor- to the OCI-Method are also observed. This is the reason why the 33 observed switches are attributable to only 31 firms. Concretely, for *Dätwyler Holding AG* (ISIN: CH0030486770), the switch from the Corridor- to the OCI-Method is observed in 2007 and the subsequent switch to ARR 16 is observed in 2010.³²⁷ The same holds with regard to *Siegfried Holding AG* (ISIN: CH0014284498), for the years 2006 and 2012, respectively. Furthermore, there is only one switch observed to the Corridor-Method. The observation is attributable to *Meyer Burger Technology AG* (ISIN: CH0108503795) in year 2010. In particular, this is also the only switch from FER to IFRS observed in the final sample.³²⁸ Lastly, as above-mentioned, there is only one switch observed for a financial firm. The observation is attributable to *Zurich Insurance Group AG* (ISIN: CH0011075394). The company switched from the application of the Corridor- to the OCI-Method in 2007. Thence, the other 32 switches are observed for firms classified as industry firms.

Overall, with respect to the final sample, the relative importance of the Corridor-Method had been decreasing and the relative importance of the OCI-Method as well as ARR 16 had been increasing from the beginning of the sample period in 2004 to the end in 2012. As the Corridor-Method was no longer applicable for financial years beginning on or after January 1, 2013, many of the sample firms voluntarily switched away from this pension accounting method earlier. Also, whereas 13 switches from IFRS to FER are observed with regard to the final sample, only one switch is observed vice versa.

³²⁷ Note, the firm initially switched from the Corridor- to the OCI-Method as of January 1, 2006 (see e.g., *Dätwyler Holding AG*, 2006, p. 48). However, due to the sample selection process, there is no respective observation included in the final sample for 2006. Thus, with respect to the final sample, the switch is observed in 2007. Such inaccuracy may hold for any of the observed switches.

³²⁸ Note, the firm initially switched from Swiss GAAP FER to IFRS in 2009 (see e.g., *Meyer Burger Technology AG*, 2009, p. 64). However, with respect to the final sample, the switch is observed in 2010.

FIGURE**6.3 Switches in Pension Accounting Methods**

Note. For the sample period of 2004 to 2012, the FIGURE depicts the total number of switches to the Corridor-Method (CORR), the OCI-Method (OCI) and ARR 16 (ARR) observed for the final sample. n indicates the total number of observed switches for the respective year.

Notably, after its switch from FER to IFRS in 2010, *Meyer Burger Technology AG* (ISIN: CH0108503795) subsequently switched back to FER in 2013 (see e.g., Meyer Burger Technology AG, 2013, p. 2)

The sub-samples of firms applying the Corridor-method (INDCORR and FSCORR) are discussed in more detail next. The sub-samples of firms applying the OCI-Method (INDOCI and FSOI) and ARR 16 (INDFER and FSFER) are discussed subsequently.

6.3.2 INDCORR and FSCORR

6.3.2.1 Data Structure

The sub-sample INDCORR consists of $n = 454$ firm-year observations and, as is the case with respect to the full final sample (see sub-section 6.2.1), has the structure of an unbalanced panel data set. Concretely, the sub-sample is based on pooled observations on $I = 88$ firms across $T = 9$ years (2004 to 2012). Thence, the average number of observations per firm i is five, oscillating between one and nine observations per firm. The coefficient of variation v (see footnote 20 on page 22) of the number of observations

per firm is estimated as 0.50. Furthermore, the lower half of firms accounts for about 28.63% of all 454 observations. Thus, the upper half of firms accounts for about 71.37% of all observations in the sub-sample.³²⁹ Correspondingly, the average number of observations per year t is 50, oscillating between a minimum of 41 (2004) and a maximum of 57 (2009). For the number of observations per year, v is estimated as 0.10. Apparently, for the number of observations per firm, the *standard deviation* (STD) is greater, relative to the mean value ($v = 0.50$), than is the case for the number of observations per year ($v = 0.10$). Thus, the number of observations per year oscillate more closely around their mean than the number of observations per firm. As result, the sub-sample INDCORR is more balanced in terms of observations per year (i.e., along the time dimension) than in terms of observations per firm (i.e., along the firm dimension).

The sub-sample FSCORR consists of $n = 143$ firm-year observations based on $I = 23$ firms across $T = 9$ years (2004 to 2012). Thence, the average number of observations per firm i is six, oscillating between two and nine observations per firm. The coefficient of variation v of the number of observations per firm is estimated as 0.37. Overall, the lower half of firms accounts for about 32.87% of all 143 observations. Thus, the upper half of firms accounts for about 67.13% of all observations in the sub-sample. Correspondingly, the average number of observations per year t is 16, oscillating between a minimum of 7 (2004) and a maximum of 20 (2012). For the number of observations per year, v is estimated as 0.26. Thus, as in the case of INDCORR, also FSCORR is more balanced along the time than the firm dimension. Moreover, FSCORR is also slightly more balanced compared to INDCORR with regard to the number of observations per firm. Whereas the lower half of firms accounts for only 28.63% of total observations of INDCORR, this share is slightly higher in the case of FSCORR (i.e., 32.87%).

6.3.2.2 Supersectors

TABLE 6.11 below depicts the distribution of firm-year observations of INDCORR across the different *supersectors* defined in line with ICB (2015). The TABLE is sorted in ascending order of each supersectors' share of total observations. Notably, the two

³²⁹ The shares for the lower and upper halves of firms are estimated by first sorting all firms of the sub-sample in terms of their number of observations from lowest to highest. Subsequently, within each cluster of number of observations (i.e., 1, 2, ..., 8, 9) all firms are sorted alphabetically. The share of the lower half is then calculated by summing across all numbers of observations for the lower half of firms and dividing this sum by the total number of observations in the sub-sample (i.e., 454). The share for the upper half of firms is thus defined as one minus the share for the lower half.

TABLE
6.11 Supersectors of INDCORR

Supersector	ICB	Firm-Years	%-Total
<i>Automobiles & Parts</i>	3300	2	0.44
<i>Basic Resources</i>	1700	7	1.54
<i>Telecommunications</i>	6500	7	1.54
<i>Personal & Household Goods</i>	3700	12	2.64
<i>Media</i>	5500	13	2.86
<i>Travel & Leisure</i>	5700	13	2.86
<i>Food & Beverage</i>	3500	18	3.96
<i>Retail</i>	5300	29	6.39
<i>Utilities</i>	7500	33	7.27
<i>Chemicals</i>	1300	34	7.49
<i>Technology</i>	9500	43	9.47
<i>Construction & Materials</i>	2300	44	9.69
<i>Health Care</i>	4500	61	13.44
<i>Industrial Goods & Services</i>	2700	138	30.40
<i>n = 454</i>			<i>100.00</i>

Note. The TABLE depicts the supersector composition of the sub-sample INDCORR. Classification is based on ICB (2015). Differences may be due to rounding.

supersectors *Industrial Goods & Services* (ICB: 2700) and *Health Care* (ICB: 4500) account for about 43.84% of all observations included in INDCORR. About 74.63% of the observations attributable to firms classified as *Industrial Goods & Services* firms stem from firms that are operative in manufacturing either *Industrial Machinery* (ICB: 2757) or *Electrical Components & Equipment* (ICB: 2733). For example, this includes observations on *Schindler Holding AG* (ISIN: CH0024638212), which was used as illustrative example for the variables definitions in sub-section 6.1.4. At the time, the company had been “[...] one of the world’s leading suppliers of elevators, escalators, and moving walks.” (Schindler Holding AG, 2012, p. 10). On the other hand, for example, this also includes observations on *Comet Holding AG* (ISIN: CH0003825756). At the time, the company was

“[...] one of the world’s leading manufacturers of systems and components for non-destructive testing, security applications, and plasma excitation in the fabrication of memory chips, flat screens and solar panels.” (Comet Holding AG, 2012, p. 35)

With respect to observations attributable to firms classified as *Health Care* firms, about 67.21% are based on firms operative in either the field of *Biotechnology* (ICB: 4573) or *Medical Supplies* (ICB: 4537). For example, this includes observations on *Lonza Group AG* (ISIN: CH0013841017) which, at the time, was “[...] the global leader in the production and support of chemical and biological active pharmaceutical ingredients.” (Lonza Group AG, 2012, p. 77). In terms of *Medical Supplies*, INDCORR includes, for example, observations on *Straumann Holding AG* (ISIN: CH0012280076) which, at the time, was “[...] a global leader in implant and restorative dentistry and oral tissue regeneration.” (Straumann Holding AG, 2012, p. 8). Apart from *Industrial Goods & Services* as well as *Health Care*, all other supersectors remain below 10% of total observations of INDCORR. As illustrated in TABLE 6.11, this includes twelve other supersectors ranging from *Construction & Materials* (ICB: 2300) to *Automobiles & Parts* (ICB: 3300).

Analogously, TABLE 6.12 depicts the distribution of firm-year observations across different supersectors for FSCORR. 61.54% of observations are attributable to firms classified as *Financial Services* (ICB: 8700) firms. The rest of the observations is almost evenly spread across *Banks* (ICB: 8300) and *Insurance* (ICB: 8500) companies, with respective shares of 18.18% and 20.28%. Within *Financial Services*, observations on firms operative in the *subsector* of *Real Estate Holding & Development* (ICB: 8733) account for 40.91% of all observations. For example, this includes observations on *Allreal Holding AG* (ISIN: CH0008837566). At the time, the firm’s operations predominantly included the development and management of its own real estate portfolio as well as offering such services to third parties (see e.g., Allreal Holding AG, 2012, p. 60). In contrast, for example, the observations included for *Swiss Prime Site AG* (ISIN: CH0008038389) are attributable to a firm that, at the time, was mainly focused on strategic investments in other firms operative in the field of real estate (see e.g., Swiss Prime Site AG, 2012, p. 61). Furthermore, 26.14% of *Financial Services* observations are attributable to *Investment Services* (ICB: 8777) firms. For example, this includes *Swissquote Group Holding Ltd* (ISIN: CH0010675863), at the time, a major provider of online financial services in Switzerland (see e.g., Swissquote Group Holding AG, 2012, p. 16). The rest of the *Financial Services* observations are almost evenly spread across the subsectors of *Specialty Finance* (ICB: 8775) and *Asset Managers* (ICB: 8771), with respective shares of 17.05% and 15.91%. In terms of *Banks*, observations include for example *UBS AG* (ISIN: CH0024899483), at the time, one of the leading financial institutions worldwide (see e.g., UBS AG, 2010, p. 11). Finally, 68.97% of observations on *Insurance* are attributable to *Full Line Insurance* (ICB: 8532)

TABLE

6.12 Supersectors of FSCORR

Supersector	ICB	Firm-Years	%-Total
<i>Banks</i>	8300	26	18.18
<i>Insurance</i>	8500	29	20.28
<i>Financial Services</i>	8700	88	61.54
		<i>n = 143</i>	<i>100.00</i>

Note. The TABLE depicts the supersector composition of the sub-sample FSCORR. Classification is based on ICB (2015). Differences may be due to rounding.

including, for example, observations on *Zurich Insurance Group AG* (ISIN: CH0011075394). As mentioned in sub-section 6.3.1, *Zurich Insurance Group AG* switched from the Corridor- to the OCI-Method in 2007. Thence, FSCORR includes no observations on this firm later than 2006. At the time, *Zurich Insurance Group AG* was a major global insurance company (see e.g., Zurich Insurance Group AG, 2006, p. 55). In contrast, 31.03% of *Insurance* observations stem from *Life Insurance* (ICB: 8575) firms such as e.g., *Swiss Life Holding AG* (ISIN: CH0014852781). At the time, the company was “[...] one of Europe’s leading comprehensive life and pensions and financial solutions providers.” (Swiss Life Holding AG, 2012, p. 113).

6.3.2.3 Response Variables and Non-Pension Covariates

TABLE 6.13 below depicts descriptive summary statistics for INDCORR (Panel A, $n = 454$) and FSCORR (Panel B, $n = 143$), respectively. Specifically, the table shows the arithmetic mean (Mean), standard deviation (STD), skewness (Skew), 25%-Quantile (Q-1), median (Median), 75%-Quantile (Q-3) and the spread (i.e., the difference) between the maximum and the minimum values (Range) for all response variables (i.e., $MKTCAP_t$, $MKTCAP_{t+0.25}$ and $MKTCAP_{t+0.5}$), as defined in TABLE 6.3 on page 225, as well as for all non-pension covariates, as defined in TABLE 6.4 on page 237.³³⁰ Summary statistics are also presented for the three variables of *total book value of assets* (*TA*), *total book value of sales* (*SALES*) and the *total number of employees* (*EMP*). Statistics for *TA*, *SALES* and *EMP* are all based on the raw (i.e., unadjusted) data as

³³⁰ Note, not all covariates included in TABLE 6.13 are completely unrelated to pensions. For example, *EQbNPL* is defined as $EQ + NPL$ as in equation (6.16) on page 235.

TABLE

6.13 Descriptive Statistics of Non-Pension Variables for INDCORR and FSCORR

Variable	Mean	STD	Skew	Q-1	Median	Q-3	Range
Panel A: INDCORR ($n = 454$)							
$MKTCAP_t$	3.5761*	12.0638	9.3232	0.2470	0.7217***	2.7647	152.5615
$MKTCAP_{t+0.25}$	3.6750*	12.0896	9.1754	0.2730	0.7244***	2.9632	149.3661
$MKTCAP_{t+0.5}$	3.6560	12.3417	9.3664	0.2782	0.7339***	3.0911	148.2076
EQ	1.5541***	4.6044	6.7931	0.1486	0.4203***	1.1093	49.8398
$EQbNPL$	1.5663***	4.5744	6.7008	0.1508	0.4218***	1.1479	49.5240
NI	0.2121**	0.7859	6.9732	0.0085	0.0390***	0.1471	9.3200
$NIbNPC$	0.2263**	0.8222	7.0141	0.0098	0.0430***	0.1518	9.7720
$NIbEC$	0.2303**	0.8327	6.9696	0.0099	0.0430***	0.1553	10.1068
DIV	0.0677**	0.1914	7.0468	0.0016	0.0110***	0.0505	2.5482
$DIVbNPC$	0.0719**	0.1985	6.8104	0.0029	0.0128***	0.0536	2.6005
$DIVbEC$	0.0732**	0.2026	6.6480	0.0030	0.0126***	0.0533	2.6029
TA	3.7489***	10.1216	5.8327	0.3015	0.8948***	2.5933	103.3887
$SALES$	2.9976	7.3152	8.0248	0.3318	0.7481	2.8712	91.0750
EMP	8,439*	20,802	7.6286	833	2,152***	7,912	249,992
Panel B: FSCORR ($n = 143$)							
$MKTCAP_t$	6.1181*	16.7464	5.7722	0.7241	2.1794***	3.9543	143.6629
$MKTCAP_{t+0.25}$	6.3590*	17.0679	5.4196	0.7061	2.1971***	4.3560	139.3456
$MKTCAP_{t+0.5}$	6.1629	16.7760	5.6937	0.6697	2.1813***	4.0664	141.7602
EQ	4.2448***	9.1152	3.8963	0.3348	1.3961***	3.6976	53.3994
$EQbNPL$	4.3577***	8.9992	3.7258	0.3361	1.3888***	3.9019	51.0323
NI	0.4989**	1.5529	5.0064	0.0494	0.1200***	0.3170	14.9925
$NIbNPC$	0.5331**	1.6101	5.0052	0.0504	0.1301***	0.3506	14.8322
$NIbEC$	0.5509**	1.6469	4.8648	0.0506	0.1453***	0.3532	14.7920
DIV	0.1530**	0.4598	7.2144	0.0182	0.0697***	0.1283	4.2698
$DIVbNPC$	0.1633**	0.4764	7.0464	0.0210	0.0755***	0.1395	4.3805
$DIVbEC$	0.1686**	0.4841	6.8141	0.0219	0.0789***	0.1437	4.3805
TA	88.6958***	314.4727	5.2793	1.3169	4.7148***	35.9523	2,396.2986
$SALES$	4.2124	9.5238	3.5748	0.1480	0.6467	4.6236	53.1651
EMP	5,813*	14,361	3.6817	169	1,023***	4,594	78,138

Note. The TABLE depicts the descriptive summary statistics arithmetic mean (Mean), standard deviation (STD), skewness (Skew), 25%-Quantile (Q-1), median (Median), 75%-Quantile (Q-3) and spread (i.e., difference) between the maximum and the minimum values (Range) of the response variables, non-pension related covariates as well as total book value of assets (TA), total book value of sales ($SALES$) and total number of employees (EMP) for the two sub-samples INDCORR (Panel A, $n = 454$) and FSCORR (Panel B, $n = 143$), respectively. Quantiles are estimated in line with the median-unbiased definition recommended by Hyndman and Fan (1996). Skew is estimated by G_I as recommended by Joanes and Gill (1998). All values are denoted in CHFbn (except for EMP and Skew). Summary statistics for TA , $SALES$ and EMP are based on raw (i.e., unadjusted) data as sourced from annual reports and the Swiss Companies Guide database (EMP). Differences in means are tested via a parametric t -test applying a *Welch degrees of freedom approximation*. Differences in medians are tested via a non-parametric *Wilcoxon rank sum test* equivalent to a *Mann-Whitney test* (see e.g., Wollschläger, 2012). *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

sourced from the annual reports (*TA* and *SALES*) as well as the Swiss Companies Guide database (*EMP*). Further, all quantiles, i.e., 25%-quantiles (Q-1), 50%-quantiles (Median) and 75%-quantiles (Q-3) are estimated in line with the median-unbiased definition recommended by Hyndman and Fan (1996). In turn, skewness (Skew) is estimated in line with the G_I measure for which e.g., Joanes and Gill (1998) find that it has a smaller mean-squared error for samples from strongly skewed distributions compared to other widely used measures. Also, *, **, *** for estimated means indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively, of parametric *t*-tests applying a *Welch degrees of freedom approximation* (i.e., without assuming homogeneity in variances; see e.g., Wollschläger, 2012, pp. 215-216), which are run on the differences in means between INDCORR and FSCORR for all variables depicted in TABLE 6.13. Correspondingly, *, **, *** for estimated medians indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively, of run non-parametric *Wilcoxon rank sum tests* for unpaired samples, equivalent to *Mann-Whitney tests* (see e.g., Wollschläger, 2012, pp. 317-318).³³¹ Lastly, with the exception of the values for *EMP* as well as the values for skewness (Skew), all values depicted in TABLE 6.13 are denoted in CHFbn.

For the three different response variables market capitalization at fiscal year-end, $MKTCAP_t$, market capitalization three months after fiscal year-end, $MKTCAP_{t+0.25}$, and market capitalization six months after fiscal year-end, $MKTCAP_{t+0.5}$, the estimated mean (median) values in CHFbn are found to be 3.58 (0.72), 3.68 (0.72) and 3.66 (0.73) for INDCORR and 6.12 (2.18), 6.36 (2.20) and 6.16 (2.18) for FSCORR, respectively. Differences in mean values for $MKTCAP_t$ and $MKTCAP_{t+0.25}$ are significantly different from zero on a 10%-level (p -values = 0.09 and 0.08), whereas the mean values for $MKTCAP_{t+0.5}$ are not found to be significantly different on a 10%-level or higher (p -value = 0.10). In contrast to the mean values, for all three response variables, differences in median values are found to be significantly different from zero on a 1%-level or higher (all p -values < 0.01). For all three response variables, and both sub-samples, the estimated distributions are right-skewed (Skew = 9.32, 9.18 and 9.37 for INDCORR and 5.77, 5.42 and 5.69 for FSCORR). In absolute terms, the variation (Range) in response variables oscillates between CHFbn 148.20 ($MKTCAP_{t+0.5}$) and CHFbn 152.56 ($MKTCAP_t$) for the industry firms and between CHFbn 139.35 ($MKTCAP_{t+0.25}$) and CHFbn 143.66 ($MKTCAP_t$) for the financial firms, respectively.

³³¹ Note, *paired* or *one sample* tests run on different variables are based on either two-tailed parametric *t*-tests applying a *Welch degrees of freedom approximation* for mean values or two-tailed non-parametric *Wilcoxon signed rank tests* for median values (see e.g., Wollschläger, 2012, pp. 212-213, 216, 316-317 and 319).

For the total book value of equity, EQ , mean (median) values are estimated to be CHFbn 1.55 (0.42) and CHFbn 4.24 (1.40) for INDCORR and FSCORR, respectively. Both differences in mean and median values are found to be significantly different from zero on a 1%-level or higher (both p -values < 0.01). For both sub-samples, the distribution of EQ is skewed to the right (Skew = 6.79 and 3.90). Moreover, absolute variation (Range) in EQ is estimated as CHFbn 49.84 and CHFbn 53.40 for INDCORR and FSCORR, respectively.

The mean (median) values of the total book value of equity net (i.e., *before*) the net pension (asset)/liability (NPL), $EQbNPL$, are CHFbn 1.57 (0.42) and CHFbn 4.36 (1.39) for INDCORR and FSCORR, respectively. Notably, for both sub-samples, median values are found to be significantly different between EQ (as described above) and $EQbNPL$ (both p -values < 0.01). In contrast, only for FSCORR but not for INDCORR is the difference in mean values found to be significantly different from zero (p -values = 0.01 and 0.22). Nonetheless, in line with EQ , both differences in mean and median values between the two sub-samples are significantly different from zero on a 1%-level or higher (both p -values < 0.01). Both distributions of $EQbNPL$ are right-skewed (Skew = 6.70 and 3.73) and the absolute variation (Range) is CHFbn 49.52 and CHFbn 51.03 for INDCORR and FSCORR, respectively.

For INDCORR and FSCORR, estimated means (medians) for the total book value of net income/(loss), NI , are CHFbn 0.21 (0.04) and CHFbn 0.50 (0.12), respectively. Mean values are found to be significantly different on a 5%-level (p -value = 0.04). Median values are found to be significantly different on a 1%-level or higher (p -value < 0.01). For both INDCORR and FSCORR, the distribution of NI is skewed to the right (Skew = 6.97 and 5.01) and the absolute variations (Range) are CHFbn 9.32 and CHFbn 14.99, respectively.

For the total book value of net income/(loss) net (i.e., *before*) net pension cost (NPC), $NibNPC$, mean (median) values are estimated to be CHFbn 0.23 (0.04) and CHFbn 0.53 (0.13) for INDCORR and FSCORR, respectively. For both sub-samples, the mean and median values of NI and $NibNPC$ are found to be significantly different on a 1%-level or higher (all p -values < 0.01). Furthermore, as is the case for NI , the mean values of $NibNPC$ for INDCORR and FSCORR are significantly different on a 5%-level (p -value = 0.03). Moreover, the difference in median values is statistically different from zero on a 1%-level or higher (p -value < 0.01). Both distributions are right-skewed (Skew = 7.01 and 5.01) and the absolute variation (Range) in $NibNPC$ is found to be CHFbn 9.77 and CHFbn 14.83 for INDCORR and FSCORR, respectively.

All findings with regard to the total book value of net income/(loss) net (i.e., *before*) employer contributions (*EC*), *NibEC*, are in line with the findings for *NibNPC*. Specifically, the mean and median values of *NI* and *NibEC* are found to be significantly different on a 1%-level or higher (all p -values < 0.01). Also, the mean values of *NibEC* for INDCORR and FSCORR of CHFbn 0.23 and CHFbn 0.55 are found to be significantly different on a 5%-level (p -value = 0.03). Further, the median values of CHFbn 0.04 and CHFbn 0.15 are significantly different on a 1%-level or higher (p -value < 0.01). Notably, for INDCORR, the mean value of *NibEC* is found to be significantly greater than for *NibNPC* on a 1% level or higher (p -value < 0.01). In contrast, the median value of *NibNPC* is found to be significantly greater than for *NibEC* on a 1%-level or higher (p -value < 0.01). For FSCORR, neither mean nor median values of *NibNPC* and *NibEC* are significantly different on a 10%-level or higher (p -value = 0.11 and 0.45). Furthermore, both distributions are skewed to the right (Skew = 6.97 and 4.86) and have absolute variations (Range) of CHFbn 10.11 and CHFbn 14.79 for INDCORR and FSCORR, respectively.

For the total book value of dividends proposed, *DIV*, mean (median) values of INDCORR and FSCORR are found to be CHFbn 0.07 (0.01) and CHFbn 0.15 (0.07), respectively. Notably, for both sub-samples, the mean and median values of *NI* are found to be significantly greater than the respective values of *DIV* on a 1%-level or higher (all p -values < 0.01). Hence, as discussed in paragraph 6.1.3.3, firms usually do not pay out all net income as dividends. The mean and median values of *DIV* for INDCORR and FSCORR are significantly different on a 5%- and 1%-level or higher, respectively (p -value = 0.03 and p -value < 0.01). Both distributions are right-skewed (Skew = 7.05 and 7.21) and have absolute variations (Range) of CHFbn 2.55 and CHFbn 4.27, respectively.

The mean (median) values of total book value of dividends proposed net of (i.e., *before*) the net pension cost (*NPC*), *DIVbNPC*, are estimated to be CHFbn 0.07 (0.01) and CHFbn 0.16 (0.08) for INDCORR and FSCORR, respectively. The mean and median values of *DIV* and *DIVbNPC* are found to be significantly different on a 1%-level for both sub-samples (all p -values < 0.01). Moreover, the mean and median values of *DIVbNPC* for INDCORR and FSCORR are significantly different on a 5%- and 1%-level or higher, respectively (p -value = 0.03 and p -value < 0.01). Also, both distributions are skewed to the right (Skew = 6.81 and 7.05) with absolute variations (Range) estimated as CHFbn 2.60 and CHFbn 4.38 for INDCORR and FSCORR, respectively.

Findings for the total book value of dividends proposed net (i.e., *before*) the employer contributions (*EC*), *DIVbEC*, are by and large similar to the findings for *DIVbNPC*.

Namely, for INDCORR and FSCORR are the mean and median values of *DIV* and *DIVbEC* found to be significantly different on a 1%-level or higher (all p -values < 0.01). Furthermore, mean values of *DIVbEC* between INDCORR (CHF 0.07 bn) and FSCORR (CHF 0.17 bn) are significantly different on a 5%-level (p -value = 0.02). The difference in median values of CHFbn 0.01 for INDCORR and CHFbn 0.08 for FSCORR is found to be significantly different from zero on a 1%-level or higher (p -value < 0.01). Notably, for INDCORR, the mean value of *DIVbEC* is found to be significantly greater than for *DIVbNPC* on a 1% level or higher (p -value < 0.01). In contrast, the median value of *DIVbNPC* is found to be significantly greater than for *DIVbEC* on a 1%-level or higher (p -value < 0.01). For FSCORR, neither mean nor median values of *DIVbNPC* and *DIVbEC* are significantly different on a 10%-level or higher (p -value = 0.11 and 0.45). Also, both distributions of *DIVbEC* are right-skewed (Skew = 6.65 and 6.81). Last but not least, the absolute variations (Range) are CHFbn 2.60 for INDCORR and CHFbn 4.38 for FSCORR, respectively.

For the total book values of assets, *TA*, mean (median) values are found to be CHFbn 3.75 (0.90) and CHFbn 88.70 (4.72) for INDCORR and FSCORR, respectively. Differences for both mean and median values, are significantly different from zero on a 1%-level or higher (all p -values < 0.01). Both distributions are skewed to the right (Skew = 5.83 and 5.28). Also, the absolute variations (Range) are estimated as CHFbn 103.39 and CHFbn 2,396.30 for INDCORR and FSCORR, respectively.

Mean (median) values for the total book values of sales, *SALES*, are estimated as CHFbn 3.00 (0.75) for INDCORR and as CHFbn 4.21 (0.65) for FSCORR. Notably, *SALES* is the only variable depicted in TABLE 6.13 for which there is no significant difference found between INDCORR and FSCORR, neither with regard to mean (p -value = 0.16) nor median values (p -value = 0.17). Both distributions are skewed to the right (Skew = 8.02 and 3.57) with absolute variations (Range) of CHFbn 91.08 and CHFbn 53.17, respectively.

Finally, the total number of employees, *EMP*, is the only variable depicted in TABLE 6.13, for which the mean and median values of INDCORR are found to be significantly greater than the respective values for FSCORR. Specifically, the mean values of 8,439 and 5,813 are significantly different on a 10%-level (p -value = 0.09). Correspondingly, the median values of 2,152 and 1,023 are significantly different on a 1%-level or higher (p -value < 0.01). Both distributions of *EMP* are right-skewed (Skew = 7.63 and 3.68) with absolute variations (Range) found to be 249,992 and 78,138 for INDCORR and FSCORR, respectively.

6.3.2.4 Pension Covariates

Analogous to TABLE 6.13, TABLE 6.14 below depicts descriptive summary statistics of all *pure* pension-related covariates for INDCORR (Panel A, $n = 454$) and FSCORR (Panel B, $n = 143$), respectively. All variables are defined as outlined in TABLE 6.4 on page 237. With the exception of skewness (Skew), all values depicted in TABLE 6.14 are denoted in CHF bn.

The mean (median) values of the total book value of the net pension (asset)/liability, NPL , are estimated as CHFbn 0.01 (0.00) and CHFbn 0.11 (0.00) for INDCORR and FSCORR, respectively. More precisely, for INDCORR, the values are CHFm 12.20 and CHFm 0.62 for the mean and median, respectively. Correspondingly, for FSCORR, the respective values are CHFm 112.94 and CHFm 1.04. Notably, the mean value for INDCORR is not found to be significantly different from zero on a 10%-level or higher (p -value = 0.22). In contrast, the mean value for FSCORR (p -value = 0.01) as well as the median values for both sub-samples are significantly different from zero on a 1%-level or higher (both p -values < 0.01). Moreover, the mean values of the two sub-samples are found to be significantly different on a 5%-level (p -value = 0.03). In contrast, the difference between the two median values is not found to be significantly different from zero on a 10%-level or higher (p -value = 0.16). Also, for INDCORR the shares of observations with $NPL < 0$, $NPL = 0$ and $NPL > 0$ are 33.48%, 9.03% and 57.49%, respectively. Correspondingly, for FSCORR the values are found to be 25.87%, 11.19% and 62.94%, respectively. Notably, for INDCORR the distribution of NPL is skewed to the left (Skew = -11.91), whereas for FSCORR the distribution is slightly right-skewed (Skew = 0.06). Apparently, the distribution for INDCORR is strongly affected by negative outliers. For example, the minimum value of NPL for INDCORR is found to be CHF -3.78 bn. Thence, this *negative* net pension liability is recognized as an asset on the balance-sheet. The observation is attributable to *Novartis AG* (ISIN: CH0012005267) for the year 2004. At the time, the firm was a leading global player in the pharmaceutical industry, employing 74,060 employees worldwide with a total market capitalization ($MKTCAP_{t+0.25}$), a total book value of assets (TA), a total book value of equity (EQ) as well as total book value of sales ($SALES$) of CHF 132.88 bn, CHF 61.65 bn, CHFbn 38.24 and CHFbn 31.97, respectively. The material amount of the recognized net pension asset, which comprised 9,87% of EQ , was mainly the result of a cumulative net actuarial loss of CHFbn 2.44 which, in line with the Corridor- Method, was not recognized on the balance-sheet of the firm (Novartis AG, 2004). Overall, 152 (i.e., 33.48%) of all 454 observations included in INDCORR are attributable to firms accounting for a negative NPL , i.e., a net pension asset. For FSCORR, this ratio is found

TABLE

6.14 Descriptive Statistics of Pension Variables for INDCORR and FSCORR

Variable	Mean	STD	Skew	Q-1	Median	Q-3	Range
Panel A: INDCORR ($n = 454$)							
<i>NPL</i>	0.0122**	0.2129	-11.9066	-0.0010	0.0006	0.0094	4.7922
<i>NPLNR</i>	0.0595*	0.2701	5.4389	-0.0010	0.0028	0.0277	3.1139
<i>FS</i>	0.0717***	0.2965	4.7055	0.0000	0.0060	0.0444	3.9810
<i>DBO</i>	0.7928*	2.0231	6.5923	0.0494	0.1467	0.9343	21.8182
<i>PLA</i>	0.7211	1.8407	7.1092	0.0446	0.1266*	0.8580	19.9107
<i>AGLNR</i>	0.0812*	0.2870	6.9118	0.0004	0.0068	0.0352	3.1684
<i>RNPLNR</i>	-0.0217	0.0786	-5.9622	-0.0070	0.0000	0.0000	0.9131
<i>NPC</i>	0.0142**	0.0414	7.5521	0.0009	0.0032	0.0119	0.5010
<i>EC</i>	0.0182**	0.0599	7.8283	0.0012	0.0034	0.0121	0.8274
<i>CSC</i>	0.0134**	0.0351	6.8793	0.0012	0.0039	0.0130	0.4016
<i>IC</i>	0.0219*	0.0630	7.3022	0.0011	0.0033	0.0214	0.7188
<i>ER</i>	0.0258	0.0762	8.1372	0.0011	0.0038*	0.0262	0.9454
<i>AGL</i>	0.0038	0.0267	7.1435	0.0000	0.0000	0.0021	0.4544
<i>RPC</i>	0.0000	0.0000	-2.7087	0.0000	0.0000	0.0000	1.0000
Panel B: FSCORR ($n = 143$)							
<i>NPL</i>	0.1129**	0.5338	0.0636	0.0000	0.0010	0.0060	4.4051
<i>NPLNR</i>	0.1517*	0.5860	5.1019	-0.0004	0.0033	0.0358	4.7324
<i>FS</i>	0.2646***	0.6420	2.9096	0.0007	0.0059	0.0970	3.4746
<i>DBO</i>	1.4582*	3.9026	3.8687	0.0262	0.0693	1.3685	21.2171
<i>PLA</i>	1.1936	3.5617	4.1637	0.0223	0.0723*	0.6431	19.0431
<i>AGLNR</i>	0.1850*	0.6263	4.5443	0.0005	0.0043	0.0625	4.5839
<i>RNPLNR</i>	-0.0332	0.1776	-8.2638	-0.0044	0.0000	0.0000	1.7661
<i>NPC</i>	0.0342**	0.0900	4.0143	0.0006	0.0016	0.0303	0.5594
<i>EC</i>	0.0520**	0.1873	6.7515	0.0008	0.0020	0.0226	1.8087
<i>CSC</i>	0.0275**	0.0708	3.8831	0.0009	0.0021	0.0251	0.4341
<i>IC</i>	0.0403*	0.1141	3.9191	0.0005	0.0016	0.0345	0.6750
<i>ER</i>	0.0429	0.1377	4.3119	0.0006	0.0021*	0.0254	0.8498
<i>AGL</i>	0.0068	0.0296	4.4327	0.0000	0.0000	0.0006	0.2919
<i>RPC</i>	0.0000	0.0000	6.2186	0.0000	0.0000	0.0000	1.0000

Note. The TABLE depicts the descriptive summary statistics arithmetic mean (Mean), standard deviation (STD), skewness (Skew), 25%-Quantile (Q-1), median (Median), 75%-Quantile (Q-3) and spread (i.e., difference) between the maximum and the minimum values (Range) of the pension related covariates for the two sub-samples INDCORR (Panel A, $n = 454$) and FSCORR (Panel B, $n = 143$), respectively. Quantiles are estimated in line with the median-unbiased definition recommended by Hyndman and Fan (1996). Skew is estimated by G_I as recommended by Joanes and Gill (1998). All values are denoted in CHFbn (except for Skew). Differences in means are tested via a parametric *t*-test applying a *Welch degrees of freedom approximation*. Differences in medians are tested via a non-parametric *Wilcoxon rank sum test* equivalent to a *Mann-Whitney test* (see e.g., Wollschläger, 2012). *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

to be 25.87% (i.e., 37 of 143 observations). The estimated absolute variations (Range) in *NPL* are CHFbn 4.79 and CHFbn 4.41 for INDCORR and FSCORR, respectively. Lastly, the mean (median) value of *NPL as percentage of EQ* is estimated to be 1.23% (0.40%) for INDCORR and 2.46% (0.14%) for FSCORR.³³²

For the total book value of the unrecognized net pension (asset)/liability, *NPLNR*, mean (median) values are CHFbn 0.06 (0.00) and CHFbn 0.15 (0.00) for INDCORR and FSCORR, respectively. Specifically, for INDCORR, the values are CHFm 59.51 and CHFm 2.81 for the mean and median, respectively. Correspondingly, for FSCORR, the respective values are CHFm 151.72 and CHFm 3.25. For both sub-samples, mean and median values are all found to be statistically different from zero on a 1%-level or higher (all *p*-values < 0.01). Notably, for INDCORR, the mean and median values of *NPLNR* are found to be significantly greater than the respective values of *NPL* (*p*-value = 0.01 and 0.08). In contrast, the same does not hold for FSCORR (*p*-value = 0.61 and 0.69). Furthermore, the mean values of *NPLNR* are found to be significantly different between the two sub samples on a 10%-level (*p*-value = 0.07). However, the same does not hold for the median values (*p*-values = 0.47). Both distributions are right-skewed (Skew = 5.44 and 5.10) and have absolute variations (Range) of CHFbn 3.11 and CHFbn 4.73, respectively. Finally, the mean (median) value of *NPLNR as percentage of EQ* is estimated to be 1.41% (1.55%) for INDCORR and 1.09% (0.58%) for FSCORR.

The mean (median) values of the funding status, *FS*, are estimated as CHFbn 0.07 (0.01) and CHFbn 0.27 (0.01) for INDCORR and FSCORR, respectively. More precisely, for INDCORR, the mean and median values correspond to CHFm 71.72 and CHFm 5.97, respectively. For FSCORR, the respective values are CHFm 264.65 and CHFm 5.88. Notably, for both sub-samples, the mean and median values are found to be significantly different from zero on a 1%-level or higher (all *p*-values < 0.01). Further, for both sub-samples, mean and median values of *FS* are significantly greater than the respective values of *NPL* on a 1%-level or higher (all *p*-values < 0.01). The same holds for the median values of *FS* and *NPLNR* with regard to INDCORR (*p*-value < 0.01) as well as for the mean and median values of *FS* and *NPLNR* for FSCORR (*p*-value = 0.01 and < 0.01). In contrast, for INDCORR, the mean values of *FS* and *NPLNR* are not found to be significantly different on a 10%-level or higher (*p*-value = 0.22). Furthermore, the difference in mean values between the two sub-samples is found to be

³³² Concretely, first, the ratio of *NPL* and *EQ* is calculated for each observation included in the respective sub-sample. Subsequently, the mean and median values for these ratios are estimated accordingly. This approach is applied henceforth.

significantly different from zero on a 1%-level or higher (p -value < 0.01). In contrast, this does not hold for the difference in median values (p -value = 0.10). Apparently, both distributions of FS are skewed to the right (Skew = 4.71 and 2.91) with absolute variations (Range) of CHFbn 3.98 and CHF 3.47, respectively. Lastly, the mean (median) value of FS as percentage of EQ is estimated to be 2.65% (2.53%) for INDCORR and 3.55% (1.02%) for FSCORR.

For the total book value of the defined benefit obligation, DBO , mean (median) values are estimated to be CHFbn 0.79 (0.15) and CHFbn 1.46 (0.07) for INDCORR and FSCORR, respectively. Specifically, for INDCORR, the values are CHFm 792.82 and CHFm 146.65 for the mean and median, respectively. Correspondingly, for FSCORR, the respective values are CHFm 1,458.24 and CHFm 69.30. Mean values of the two subsamples are significantly different on a 10%-level (p -value = 0.05). In contrast, the same does not hold for the median values (p -value = 0.27). Apparently, both distributions of DBO are right-skewed (Skew = 6.59 and 3.87) with absolute variations (Range) of CHFbn 21.82 and CHFbn 21.22, respectively. Finally, the mean (median) value of DBO as percentage of EQ is estimated to be 68.37% (42.36%) for INDCORR and 18.80% (12.19%) for FSCORR.

Mean (median) values of the total book value of plan assets, PLA , are CHFbn 0.72 (0.13) and CHFbn 1.19 (0.07) for INDCORR and FSCORR, respectively. More precisely, for INDCORR, the values are CHFm 721.11 and CHFm 126.62 for the mean and median, respectively. Correspondingly, for FSCORR, the respective values are CHFm 1,193.59 and CHFm 72.30. Notably, for INDCORR, mean and median values of DBO are found to be significantly greater than the respective values of PLA on a 1%-level or higher (all p -values < 0.01). The same holds for the mean values of FSCORR (p -value < 0.01). However, the median value of DBO is significantly smaller than the respective value of PLA (p -value < 0.01). Furthermore, the difference in mean values of PLA between INDCORR and FSCORR is not significantly different from zero on a 10%-level or higher (p -value = 0.13). However, median values are significantly different on a 10%-level (p -value = 0.07). Also, both distributions of PLA are skewed to the right (Skew = 7.11 and 4.16) with absolute variations (Range) of CHFbn 19.91 and CHFbn 19.04 for INDCORR and FSCORR, respectively. Lastly, the mean (median) value of PLA as percentage of EQ is estimated to be 65.73% (40.38%) for INDCORR and 15.25% (9.71%) for FSCORR.

For the total book value of cumulative unrecognized net actuarial (gains)/losses, $AGLNR$, mean (median) values are estimated as CHFbn 0.08 (0.01) and CHFbn 0.19

(0.00) for INDCORR and FSCORR, respectively. Specifically, for INDCORR, the values are CHFm 81.22 and CHFm 6.82 for the mean and median, respectively. Correspondingly, for FSCORR, the respective values are CHFm 184.95 and CHFm 4.34. Notably, for both sub-samples, mean and median values are positive (i.e., > 0) and thus correspond to cumulative unrecognized net actuarial losses. Furthermore, for both sub-samples are the mean and median values found to be significantly different from zero on a 1%-level or higher (all p -values < 0.01). For INDCORR, the mean and median values of *AGLNR* and *NPL* are significantly different on a 1%-level or higher (both p -values < 0.01). However, this does not hold for FSCORR (p -value = 0.36 and 0.23). Moreover, for both sub-samples are the differences in mean and median values of *AGLNR* and *NPLNR* found to be significantly different from zero (both p -values < 0.01 for INDCORR and p -value = 0.03 and < 0.01 for FSCORR). In terms of the differences in mean and median values between *AGLNR* and *FS*, these are not found to be significantly different from zero for INDCORR (p -value = 0.38 and 0.65). However, this does not hold for FSCORR (p -value = 0.09 and < 0.01). Also, the mean values of *AGLNR* are found to be significantly different between the two sub-samples (p -value = 0.06). However, the same does not hold for the median values (p -values = 0.86). Both distributions are right-skewed (Skew = 6.91 and 4.54) and have absolute variations (Range) of CHFbn 3.17 and CHFbn 4.58. Finally, the mean (median) value of *AGLNR* as percentage of *EQ* is estimated to be 3.87% (2.10%) for INDCORR and 1.58% (0.81%) for FSCORR.

Mean (median) values of the total book value of the residual unrecognized net pension (asset)/liability, *RNPLNR*, are found to be CHFbn -0.02 (0.00) and CHFbn -0.03 (0.00) for INDCORR and FSCORR, respectively. More precisely, for INDCORR, the mean and median values correspond to CHFm -21.71 and CHFm 0.00, respectively. For FSCORR, the respective values are CHFm -33.23 and CHFm 0.00. Notably, the mean values are negative (i.e., < 0) and, thus, correspond to residual unrecognized net pension assets. For both sub-samples are the mean and median values found to be significantly different from zero (both p -values < 0.01 for INDCORR and p -value = 0.03 and < 0.01 for FSCORR). Moreover, for INDCORR and FSCORR are the mean and median values of *RNPLNR* found to be significantly different from the respective values of *NPL*, *NPLNR*, *FS* and *AGLNR* (all p -values < 0.01). However, neither mean nor median values are significantly different between INDCORR and FSCORR (p -value = 0.45 and 0.14). Both distributions are skewed to the left (Skew = -5.96 and -8.26) and show absolute variations (Range) of CHFbn 0.91 and CHF 1.77 bn. Finally, the mean (median) value of *RNPLNR* as percentage of *EQ* is estimated to be -2.45% (0.00%) for INDCORR and -0.49% (0.00%) for FSCORR.

In terms of *flow measures* related to pensions, estimated mean (median) values of the total book value of net pension (income)/cost, *NPC*, are CHFbn 0.01 (0.00) and CHFbn 0.03 (0.00) for INDCORR and FSCORR, respectively. Specifically, for INDCORR, the values are CHFm 14.21 and CHFm 3.22 for the mean and median, respectively. Correspondingly, for FSCORR, the respective values are CHFm 34.21 and CHFm 1.60. Notably, for both sub-samples, mean and median values of *NPC* are found to be significantly different from zero on a 1%-level or higher (all p -values < 0.01). Whereas the mean values of *NPC* are significantly different between INDCORR and FSCORR on a 5%-level (p -value = 0.01), this does not hold for the median values (p -value = 0.61). With estimated values for the skewness (Skew) of 7.55 and 4.01, the distribution of *NPC* is right-skewed for both sub-samples. The absolute variation (Range) in *NPC* is estimated as CHFbn 0.50 and CHFbn 0.56 for INDCORR and FSCORR, respectively. Lastly, the mean (median) value of *NPC* as percentage of *NI* is estimated to be 12.65% (5.00%) for INDCORR and 7.19% (2.28%) for FSCORR. Correspondingly, the mean (median) ratio of *NPC* and *DIV* is 16.52% (6.10%) for INDCORR and 4.70% (2.07%) for FSCORR.³³³

For the total book value of employer contributions, *EC*, mean (median) values are CHFbn 0.02 (0.00) and CHFbn 0.05 (0.00) for INDCORR and FSCORR, respectively. Specifically, for INDCORR, the values are CHFm 18.22 and CHFm 3.38 for the mean and median, respectively. Correspondingly, for FSCORR, the respective values are CHFm 52.03 and CHFm 2.03. Notably, for both sub-samples, mean and median values of *EC* are found to be significantly different from zero on a 1%-level or higher (all p -values < 0.01). Also, for INDCORR, the mean and median value of *EC* are found to be significantly different from the respective values of *NPC* (both p -values < 0.01). In contrast, this does not hold FSCORR (p -value = 0.11 and 0.45). Furthermore, whereas the mean values of *EC* are significantly different between the two sub-samples on a 5%-level (p -value = 0.04), this does not hold for the median values (p -value = 0.86). Both distributions are skewed to the right (Skew = 7.83 and 6.75) with absolute variations (Range) of CHFbn 0.83 and CHFbn 1.81 for INDCORR and FSCORR, respectively. Finally, the mean (median) value of *EC* as percentage of *NI* is estimated to be 17.55% (5.63%) for INDCORR and 29.44% (2.65%) for FSCORR. Correspondingly, the mean

³³³ Note, in order to estimate the ratios of *NPC* to *DIV*, *NPC* is first multiplied by the final sample median dividend payout ratio (DPR_s) of 0.3005, as outlined in paragraph 6.1.3.3. Furthermore, mean and median values only include observations for which $DIV > 0$. This approach is applied henceforth.

(median) ratio of *EC* and *DIV* is 30.16% (6.72%) for INDCORR and 23.48% (2.20%) for FSCORR.

With respect to the components of *NPC*, the mean (median) values of the total book value of the current service cost, *CSC*, are found to be CHFbn 0.01 (0.00) and CHFbn 0.03 (0.00) for INDCORR and FSCORR, respectively. More precisely, for INDCORR, the values are CHFm 13.44 and CHFm 3.89 for the mean and median, respectively. Correspondingly, for FSCORR, the respective values are CHFm 27.49 and CHFm 2.09. Notably, for both sub-samples, mean and median values of *CSC* are found to be significantly different from zero on a 1%-level or higher (all *p*-values < 0.01). Moreover, the mean values of *CSC* are significantly different for INDCORR and FSCORR on a 5%-level (*p*-value = 0.02). However, this does not hold for the median values (*p*-value = 0.86). Also, both distributions of *CSC* are right-skewed (Skew = 6.88 and 3.88) with absolute variations (Range) estimated as CHFbn 0.40 and CHFbn 0.43 for INDCORR and FSCORR, respectively. Lastly, the mean (median) value of *CSC* as percentage of *NI* is estimated to be 15.55% (5.54%) for INDCORR and 6.29% (2.58%) for FSCORR. The corresponding mean (median) ratio of *CSC* and *DIV* is 25.50% (6.77%) for INDCORR and 3.92% (2.19%) for FSCORR.

For the total book value of the interest cost, *IC*, mean (median) values are estimated as CHFbn 0.02 (0.00) and CHFbn 0.04 (0.00) for INDCORR and FSCORR, respectively. Specifically, for INDCORR, the values are CHFm 21.88 and CHFm 3.33 for the mean and median, respectively. Correspondingly, for FSCORR, the respective values are CHFm 40.35 and CHFm 1.63. Notably, for both sub-samples, mean and median values of *IC* are found to be significantly different from zero on a 1%-level or higher (all *p*-values < 0.01). Further, for INDCORR, the mean and median value of *IC* are found to be significantly greater and smaller than the respective values for *CSC* on a 1%-level or higher (all *p*-values < 0.01). This also holds for FSCORR with respect to the mean values of *IC* and *CSC* (*p*-value < 0.01). However, the median values of *IC* and *CSC* are not found to be significantly different on a 10%-level or higher for FSCORR (*p*-value = 0.56). Moreover, the mean values of *IC* are significantly different for INDCORR and FSCORR on a 10%-level (*p*-value = 0.07) whereas this does not hold for the median values (*p*-value = 0.19). Also, both distributions of *IC* are skewed to the right (Skew = 7.30 and 3.92) with absolute variations (Range) of CHFbn 0.72 and CHFbn 0.68 for INDCORR and FSCORR, respectively. Finally, the mean (median) value of *IC* as percentage of *NI* is estimated to be 22.96% (6.07%) for INDCORR and 6.01% (1.83%) for FSCORR. The corresponding mean (median) ratio of *IC* and *DIV* is 41.74% (7.79%) for INDCORR and 4.11% (1.04%) for FSCORR.

The mean (median) values of the total book value of the expected return, *ER*, are found to be CHFbn 0.03 (0.00) and CHFbn 0.04 (0.00) for INDCORR and FSCORR, respectively. More precisely, for INDCORR, the values are CHFm 25.77 and CHFm 3.84 for the mean and median, respectively. Correspondingly, for FSCORR, the respective values are CHFm 42.90 and CHFm 2.11. Notably, for both sub-samples, mean and median values of *ER* are found to be significantly different from zero on a 1%-level or higher (all p -values < 0.01). Also, for INDCORR, the mean and median value of *ER* are found to be significantly greater than the respective values of *CSC* on a 1%-level or higher (both p -values < 0.01). However, for FSCORR, this holds only for the mean but not the median value of *ER* (p -value < 0.02 and $= 0.66$). Furthermore, for INDCORR, mean and median values of *ER* are significantly greater than the respective values of *IC* on a 1%-level or higher (both p -values < 0.01). In contrast, for FSCORR, this holds only for the median but not the mean value of *ER* (p -value < 0.01 and $= 0.42$). Moreover, the mean values of *ER* are not significantly different for INDCORR and FSCORR on a 10%-level or higher (p -value $= 0.16$). However, the difference in median values is found to be significantly different from zero on a 10%-level (p -value $= 0.05$). Both distributions of *ER* are right-skewed (Skew = 8.14 and 4.31) with absolute variations (Range) of CHFbn 0.95 and CHFbn 0.85 for INDCORR and FSCORR, respectively. Lastly, the mean (median) value of *ER* as percentage of *NI* is estimated to be 27.91% (7.81%) for INDCORR and 5.65% (1.90%) for FSCORR. The corresponding mean (median) ratio of *ER* and *DIV* is 55.58% (9.84%) for INDCORR and 3.73% (1.31%) for FSCORR.

For the total book value of the net actuarial (gains)/losses, *AGL*, the mean (median) values are CHFbn 0.00 (0.00) and CHFbn 0.01 (0.00) for INDCORR and FSCORR, respectively. Specifically, for INDCORR, the values are CHFm 3.76 and CHFm 0.04 for the mean and median, respectively. Correspondingly, for FSCORR, the respective values are CHFm 6.84 and CHFm 0.02. Notably, for both sub-samples, mean and median values of *AGL* are found to be significantly different from zero on a 5%-level or higher (all p -values $=$ or < 0.01). Moreover, for both sub-samples, mean and median values of *AGL* are significantly smaller than the respective values of *CSC*, *IC* and *ER* on a 1%-level or higher (all p -values < 0.01). Furthermore, neither mean nor median values are found to be significantly different between INDCORR and FSCORR on a 10%-level or higher (p -value $= 0.27$ and 0.26). Both distributions of *AGL* are skewed to the right (Skew = 7.14 and 4.43) with absolute variations (Range) of CHFbn 0.45 and CHFbn 0.29 for INDCORR and FSCORR, respectively. Finally, the mean (median) value of *AGL* as percentage of *NI* is estimated to be 4.20% (0.07%) for INDCORR and

1.04% (0.00%) for FSCORR. The corresponding mean (median) ratio of *AGL* and *DIV* is 6.53% (0.20%) for INDCORR and 0.56% (0.02%) for FSCORR.

Last but not least, mean (median) values of the total book value of the residual net pension (income)/cost, *RPC*, are CHFbn 0.00 (0.00) and CHFbn 0.00 (0.00) for INDCORR and FSCORR, respectively. More precisely, for INDCORR, the values are CHFm 0.90 and CHFm 0.00 for the mean and median, respectively. Correspondingly, for FSCORR, the respective values are CHFm 2.43 and CHFm 0.00. In contrast to all other pension cost variables discussed thus far, for both sub-samples, mean values of *RPC* are not significantly different from zero on a 10%-level or higher (p -value = 0.50 and 0.48). The same holds for the median value with regard to FSCORR (p -value = 0.82). However, for INDCORR, the median value is found to be significantly different from zero on a 5%-level (p -value = 0.01). Moreover, for both sub-samples, mean and median values of *RPC* are significantly smaller than the respective values of *CSC*, *IC* and *ER* on a 1%-level or higher (all p -values < 0.01). Also the difference in median values between *AGL* and *RPC* is significantly different from zero on a 5%-level or higher (p -value < 0.01 and = 0.02). In contrast, this does not hold for the difference in mean values of *AGL* and *RPC* (p -value = 0.23 and 0.33). Furthermore, neither mean nor median values are found to be significantly different between INDCORR and FSCORR on a 10%-level or higher (p -value = 0.68 and 0.30). The distribution of *RPC* is left-skewed for INDCORR and right-skewed for FSCORR (Skew = -2.71 and 6.22) with an equal absolute variation (Range) of CHFbn 1.00 for both sub-samples. Lastly, the mean (median) value of *RPC* as percentage of *NI* is estimated to be -2.16% (0.00%) for INDCORR and -0.50% (0.00%) for FSCORR. The corresponding mean (median) ratio of *AGL* and *DIV* is -0.16% (0.00%) for INDCORR and 0.56% (0.02%) for FSCORR.

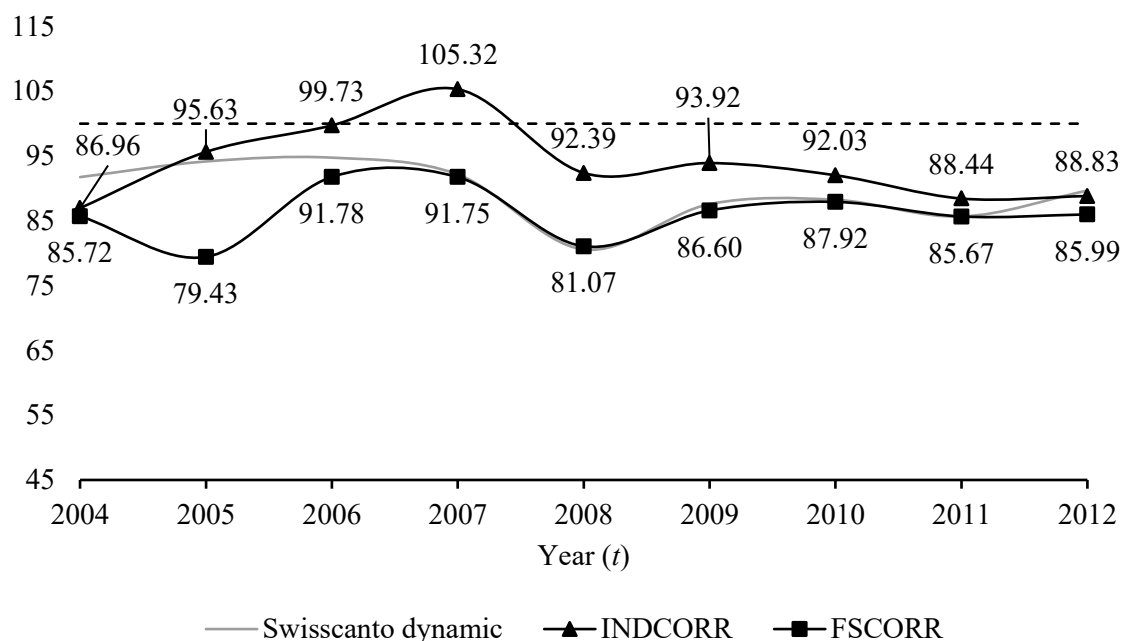
6.3.2.5 Time-Series Properties

In the following paragraph, different time-series properties of the two sub-samples INDCORR and FSCORR are discussed with respect to the sample period of 2004 to 2012. However, once again, it is important to highlight the fact that both sub-samples have the structure of unbalanced panels. Thus, annual summary statistics estimated across the sample period are based on different cross-sections of firms. This must be taken into account with respect to the interpretations of the results presented below.

FIGURE 6.4 below depicts the annual average funding ratios (*FR*) for INDCORR and FSCORR, respectively. The funding ratio is defined analogously to the statutory funding ratio of Swiss pension plans (see equation (2.1) on page 35) as ratio of the total

FIGURE

6.4 Mean Funding Ratios of INDCORR and FSCORR



Note. For the sample period of 2004 to 2012, the FIGURE depicts annual average funding ratios (in %). Data of the Swisscanto survey is shown as grey line and is identical to the data shown in FIGURE 2.7 (page 39). As described in sub-section 2.2.5, this data is *dynamized* by multiplication with the factor 0.83, which corresponds to a 20% increase in pension liabilities (*PL*). Data for INDCORR and FSCORR is shown as black lines with different markers, respectively. Funding ratios are defined as *PLA* divided by the *DBO*. For INDCORR, annual averages are based on $n = 41$ (2004), 53 (2005), 55 (2006), 54 (2007), 50 (2008), 57 (2009), 49 (2010), 50 (2011) and 45 (2012) observations, respectively. For FSCORR, the respective number of observations are $n = 7$ (2004), 12 (2005), 15 (2006), 17 (2007), 16 (2008), 18 (2009), 19 (2010), 19 (2011) and 20 (2012). The dashed black line indicates a funding ratio of 100%.

book value of plan assets (*PLA*) and the total book value of the defined benefit obligation (*DBO*) as defined in equation (6.52) below.

$$FR = \frac{PLA}{DBO} \quad (6.52)$$

The grey line in FIGURE 6.4 shows the annual weighted-average funding ratios of the Swiss pension plans surveyed by Swisscanto, as depicted in FIGURE 2.7 on page 39. Notably, for comparison with IFRS, the annual weighted-averages of the statutory funding ratios surveyed by Swisscanto are *dynamized* by multiplication with the factor 0.83. This corresponds to an increase of the pension liabilities (*PL*) of 20% which can be

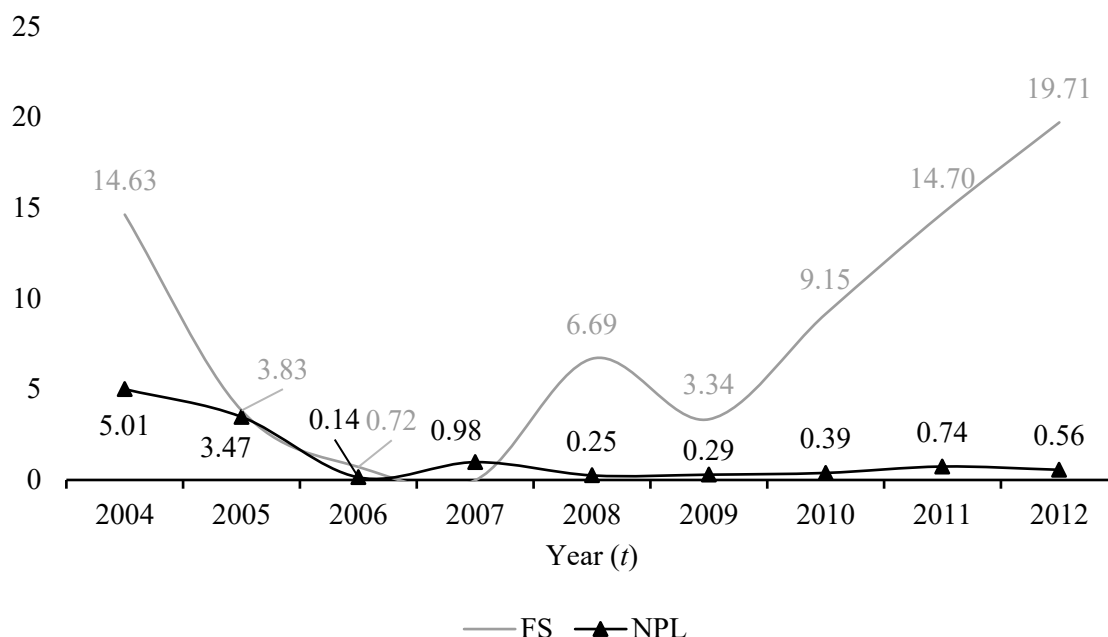
regarded as common difference between the static and dynamic valuation of the obligations of Swiss pension plans (see sub-section 2.2.5).

Apparently, between 2004 and 2012, the funding ratios of INDCORR and FSCORR had been moving closely in line with the dynamized funding ratios of Swiss pension plans surveyed by Swisscanto. This holds especially for annual average funding ratios of FSCORR between 2007 and 2011. Notably, the annual average funding ratios of the two sub-samples, generally, are also moving on higher levels than the respective ratios for the Fortune 1000 and DAX indices (see FIGURE 2.7 on page 39).³³⁴ For both sub-samples, funding ratios had been increasing between 2004 and 2007 followed by a phase of generally lower ratios between 2008 and 2012. FIGURE 6.4 clearly illustrates the impact of the coordinated collapse of global financial markets caused by the unfolding of the subprime crisis in 2008. Furthermore, the data also indicates the dip of funding ratios in 2011, the year where the euro-debt crisis caused some major turmoil on financial markets. Overall, the funding ratios of INDCORR and FSCORR oscillate between 86.96% (in 2004) and 105.32% (in 2007) as well as between 79.43% (in 2005) and 91.78% (in 2006), respectively. It must also be noted, the differences between the annual mean funding ratios of INDCORR and FSCORR are not found to be significantly different from zero on a 10%-level or higher (all p -values between 0.10 and 0.79) with the exception of 2005 (p -value = 0.07).

FIGURE 6.5 below depicts the annual median net pension (asset)/liability (NPL) as well as the annual median funding status (FS) for the sub-sample INDCORR across the sample period of 2004 to 2012. Notably, at the beginning of the sample period in 2004, industry firms applying the Corridor-Method included in the final sample still disclosed a considerable median amount of cumulative unrecognized net actuarial losses ($AGLNR$) in the aftermath of the *dot-com crisis* evolving throughout the early two-thousands. Apparently, the median amount of $AGLNR$ decreased steadily between 2004 and 2007 and hence, the median recognized NPL as well as the median disclosed funding status (FS) were aligned more closely during that period. In contrast, starting with the outbreak of the sub-prime crisis in 2008, the median amount of cumulative unrecognized net actuarial losses ($AGLNR$) began to increase again and correspondingly, the median funding status (FS) steadily increased from 3.34 CHFm in 2009 up to 19.71 CHFm until the end of the sample period in 2012. However, during the same period, the median recognized net pension (asset)/liability (NPL) had remained fairly constant oscillating between a

³³⁴ For the purposes of this study, this is taken as somewhat confirmatory evidence that the data adjustments outlined in paragraph 6.1.3.2, by and large, correctly account for the Swiss pension plans of the sample firms.

FIGURE
6.5 Median FS and NPL of INDCORR

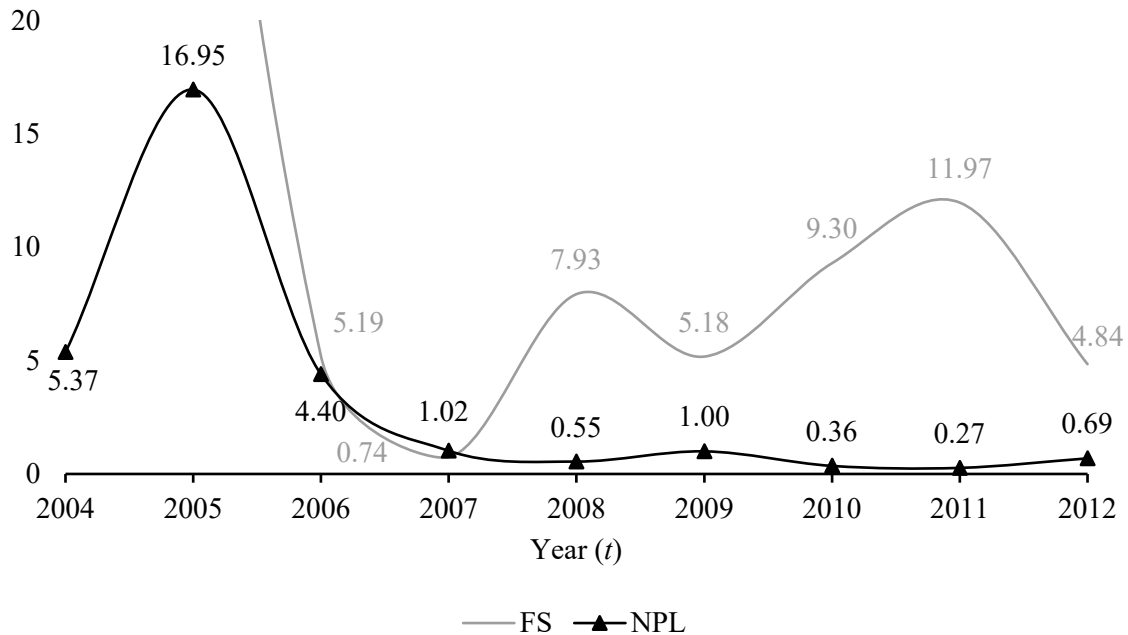


Note. For the sample period of 2004 to 2012, the FIGURE depicts the annual median funding status (*FS*, grey line) as well as the annual median net pension (asset)/liability (*NPL*) recognized in line with the Corridor-Method of IAS 19 (2004; marked black line) as defined in TABLE 6.4 (see page 237). All values are denoted in CHFm. For INDCORR, annual medians are based on $n = 41$ (2004), 53 (2005), 55 (2006), 54 (2007), 50 (2008), 57 (2009), 49 (2010), 50 (2011) and 45 (2012) observations, respectively.

minimum of 0.29 CHFm in 2009 and a maximum of 0.74 CHFm in 2011. This clearly illustrates the application of the Corridor-Method in line with IAS 19 (2004), whereas the recognition of actuarial gains and losses (*AGL*) arising from defined benefit plans is smoothed and thus, the net pension (asset)/liability (*NPL*) recognized on the balance-sheet may not fully account for the actual funding status (*FS*) of the respective pension plans.

FIGURE 6.6 below illustrates the annual median recognized net pension (asset)/liability (*NPL*) as well as the annual median funding status (*FS*) of the financial sample firms applying the Corridor-Method (FSCORR), analogous to FIGURE 6.5 for INDCORR described above. Notably, for illustrative purposes the median values of the funding status (*FS*) for 2004 and 2005 are not depicted since these correspond to values of 414.30 CHFm and 51.89 CHFm, respectively. These outlying values are mainly driven by the relatively small number of observations included for 2004 ($n=7$) and 2005 ($n=12$). Moreover, four of the seven firms included for 2004 disclosed a funding status (*FS*) of between 414.30 CHFm and 3,101.06 CHFm. These values are attributable to the

FIGURE

6.6 Median *FS* and *NPL* of *FSCORR*

Note. For the sample period of 2004 to 2012, the FIGURE depicts the annual median funding status (*FS*, grey line) as well as the annual median net pension (asset)/liability (*NPL*) recognized in line with the Corridor-Method of IAS 19 (2004; marked black line) as defined in TABLE 6.4 (see page 237). All values are denoted in CHFm. For *FSCORR*, annual medians are based on $n = 7$ (2004), 12 (2005), 15 (2006), 17 (2007), 16 (2008), 18 (2009), 19 (2010), 19 (2011) and 20 (2012) observations, respectively.

observations on *Bâloise Holding AG* (ISIN: CH0012410517), *Swiss Life Holding AG* (ISIN: CH0014852781), *UBS AG* (ISIN: CH0024899483) and *Zurich Insurance Group AG* (ISIN: CH0011075394, in ascending order), which, at the time, had all been major financial or insurance companies, respectively. Although less pronounced, the same also holds for the annual median funding status (*FS*) observed for 2005 with the exception that there is no corresponding observation included in the final sample for *UBS AG*. For the period of 2006 to 2012, the annual median recognized net pension (asset)/liability (*NPL*) as well as the annual median funding status (*FS*) observed for *FSCORR* correspond to the median values of *INDCORR* depicted in FIGURE 6.5 above. Apparently, between 2006 and 2007, median *NPL* and *FS* had also been relatively closely aligned and these firms did not disclose significant cumulative unrecognized net actuarial gains and losses (*AGLNR*). In contrast, between 2008 and 2012 the median *NPL* and *FS* oscillate between CHFm 0.27 in 2011 and CHFm 1.00 in 2009 as well as between CHFm 4.84 in 2012 and CHFm 11.97 in 2011, respectively. Again, this illustrates the application of the Corridor-Method and the corresponding smoothing of the recognition of net

actuarial losses (*AGL*) arising during the turbulent times in the aftermath of the sub-prime crisis in 2008 and the euro-debt crisis in 2011.

Analogous to the description of *NPL* and *FS* outlined above, FIGURE 6.7 below depicts the annual median values for the recognized net pension (income)/cost (*NPC*) as well as the disclosed employer contributions (*EC*) to the respective Swiss pension plans of the industry firms included in the final sample that apply the Corridor-Method in line with IAS 19 (2004). Notably, median values for *NPC* and *EC* are closely aligned across the sample period of 2004 to 2012. Considering the fact that, in line with IAS 19 (2004) the defined benefit obligation (*DBO*) attributable to Swiss pension plans is valued at about 10-20% higher compared to ARR 26 (2004) on average (see paragraph 2.2.5), one would expect the respective mean (median) net pension (income)/cost (*NPC*) recognized in line with IAS 19 (2004) to be above the regulatory employer contributions (*EC*). However, as depicted in FIGURE 6.7, based on the observations included in INDCORR, the delayed and often only partial recognition of actuarial gains and losses (*AGL*) in line with the Corridor-Method had even lead to median recognized *NPC* below the respective annual median values for *EC* in five out of nine sample years.

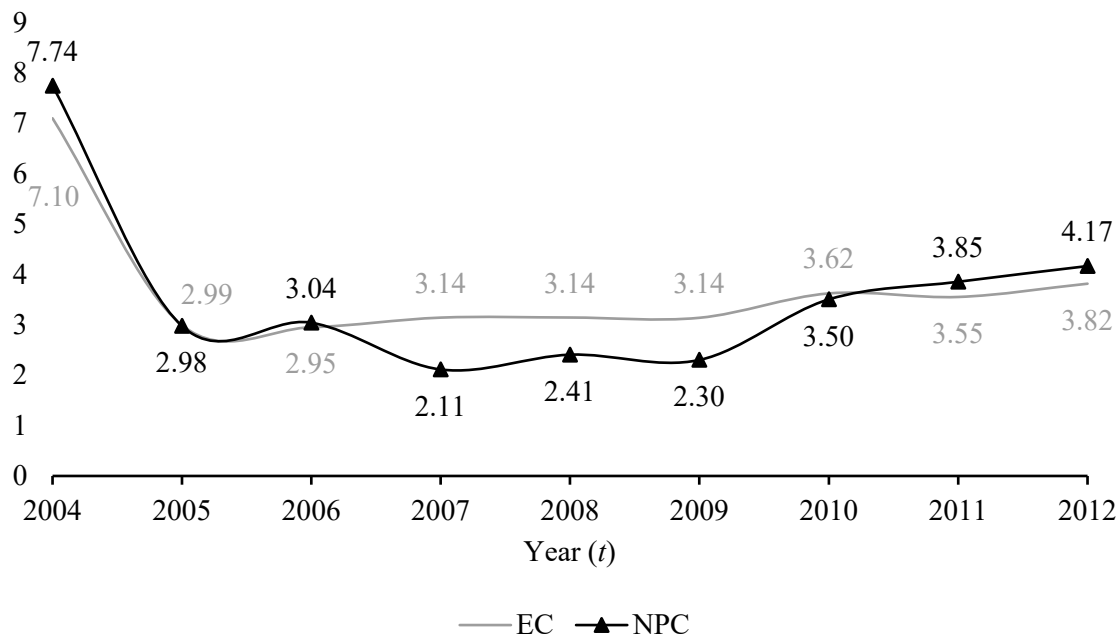
In line with FIGURE 6.7, FIGURE 6.8 illustrates the annual median values of *NPC* and *EC* for the sub-sample of financial firms applying the Corridor-Method (FSCORR). Again, for illustrative purposes, the medians for 2004 and 2005 are not depicted since these correspond to values of 45.23 CHFm and 36.36 CHFm, respectively. As outlined for *NPL* and *FS* above, these outlying values are mainly driven by the relatively small number of observations included for 2004 ($n=7$) and 2005 ($n=12$) in combination with observations on firms that fund large Swiss pension plans such as e.g., *UBS AG* (ISIN: CH0024899483) and *Zurich Insurance Group AG* (ISIN: CH0011075394). Even more pronounced compared to INDCORR, the annual median values of *NPC* are found to be below the annual medians of *EC* in all but the sample years of 2004 and 2009. Again, this is most likely due to the application of the Corridor-Method.

6.3.2.6 Bivariate Correlations

As outlined in paragraph 6.2.3.4, TABLE 6.15 further below depicts the bivariate Pearson and Spearman correlation coefficients for the response variable $MKTCAP_{t+0.25}$ as well as for all covariates defined for INDCORR in the lower and upper diagonal, respectively. The mean (median) Pearson and Spearman correlations among covariates are found to be 0.53 (0.69) and 0.49 (0.60), respectively. Overall, Pearson and Spearman correlations of covariates oscillate between -0.71 and 0.99 and -0.38 and 0.99, respec-

FIGURE

6.7 Median EC and NPC of INDCORR

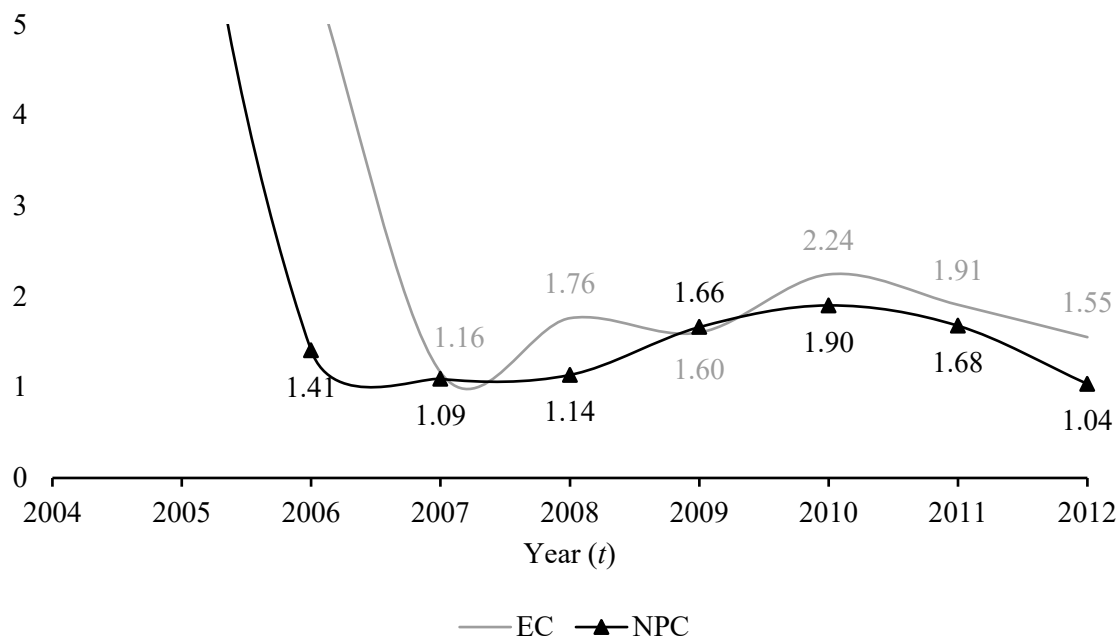


Note. For the sample period of 2004 to 2012, the FIGURE depicts the annual median employer contributions (*EC*) transferred to the Swiss pension plan (grey line) as well as the annual median net pension (income)/cost (*NPC*) recognized in line with the Corridor-Method of IAS 19 (2004; marked black line) as defined in TABLE 6.4 (see page 237). All values are denoted in CHFm. For INDCORR, annual medians are based on $n = 41$ (2004), 53 (2005), 55 (2006), 54 (2007), 50 (2008), 57 (2009), 49 (2010), 50 (2011) and 45 (2012) observations, respectively.

tively. Only 12 (i.e., 5.20%) and 14 (i.e., 6.06%) of all of these 231 estimated Pearson and Spearman correlations are not found to be significantly different from zero on a 10%-level or higher, respectively. Notably, all of the correlations not found to be significantly different from zero involve at least one of the three pension variables *NPL*, *RNPLNR* and *RPC*. More specifically, for *NPL*, five and six of the Pearson and Spearman correlations are not found to be significantly different from zero on 10%-level or higher, respectively. Moreover, all of these bivariate correlations involve another pension variable (i.e., *NPLNR*, *PLA*, *RNPLNR*, *NPC*, *EC*, *ER*, *AGL* and *RPC*). The same holds for *RNPLNR*, for which five and three of the Pearson and Spearman correlations are not found to be significantly different from zero on a 10%-level or higher, respectively. Apart from *DIV*, all of these correlations involve another pension variable (i.e., *NPL*, *NPLNR*, *FS*, *AGLNR* and *AGL*). Finally, four and seven of the Pearson and Spearman correlations involving *RPC* are not found to be significantly different from zero on a 10%-level or higher, respectively. However, in contrast to *NPL* and *RNPLNR*, most of these correlations involve non-pension variables (i.e., *NI*, *NibNPC*, *NibEC*, *DIV* and

FIGURE

6.8 Median EC and NPC of FSCORR



Note. For the sample period of 2004 to 2012, the FIGURE depicts the annual median employer contributions (*EC*) transferred to the Swiss pension plan (grey line) as well as the annual median net pension (income)/cost (*NPC*) recognized in line with the Corridor-Method of IAS 19 (2004; marked black line) as defined in TABLE 6.4 (see page 237). All values are denoted in CHFm. For FSCORR, annual medians are based on $n = 7$ (2004), 12 (2005), 15 (2006), 17 (2007), 16 (2008), 18 (2009), 19 (2010), 19 (2011) and 20 (2012) observations, respectively.

DIVbEC). The rest is attributable to *NPL* and *AGLNR*.

With respect to the response variable $MKTCAP_{t+0.25}$, the mean (median) Pearson and Spearman correlations are found to be 0.67 (0.87) and 0.62 (0.74), respectively. Overall, Pearson and Spearman correlations oscillate between -0.42 and 0.93 and -0.31 and 0.92, respectively. Notably, all of the bivariate correlations involving $MKTCAP_{t+0.25}$ are found to be significantly different from zero on a 1%-level or higher. Only nine of all 22 estimated Pearson correlations are below 0.84. Specifically, these are *DIV*, *DIVbNPC*, *DIVbEC*, *NPL*, *FS*, *RNPLNR*, *EC*, *AGL* and *RPC*. Further, only two of all Pearson correlations are found to be negative (i.e., < 0). Namely, the Pearson correlations for *NPL* and *RNPLNR* are estimated as -0.36 and -0.42, respectively. In terms of the Spearman correlations for $MKTCAP_{t+0.25}$, all but four (i.e., *EQ*, *EQbNPL*, *DIVbNPC* and *DIVbEC*) are found to be below 0.84. Moreover, only the correlation with *RNPLNR*

TABLE
6.15 Correlation-Matrix - INDCORR

	<i>MKTCAP_{t+0.25}</i>	<i>EQ</i>	<i>EQbNPL</i>	<i>NI</i>	<i>NIbNPC</i>	<i>NIbEC</i>	<i>DIV</i>	<i>DIVbNPC</i>	<i>DIVbEC</i>	<i>NPL</i>	<i>NPLNR</i>
<i>MKTCAP_{t+0.25}</i>											
<i>EQ</i>	0.91***		0.92***	0.81***	0.82***	0.82***	0.80***	0.84***	0.84***	0.25***	0.33***
<i>EQbNPL</i>	0.90***	0.99***		0.75***	0.77***	0.76***	0.77***	0.82***	0.82***	0.23***	0.41***
<i>NI</i>	0.88***	0.92***	0.92***		0.76***	0.76***	0.76***	0.82***	0.82***	0.25***	0.41***
<i>NIbNPC</i>	0.89***	0.93***	0.93***	0.99***	0.99***	0.99***	0.82***	0.81***	0.81***	0.17***	0.26***
<i>NIbEC</i>	0.89***	0.92***	0.92***	0.99***	0.99***	0.99***	0.82***	0.82***	0.82***	0.17***	0.27***
<i>DIV</i>	0.67***	0.62***	0.61***	0.67***	0.66***	0.67***	0.82***	0.82***	0.82***	0.16***	0.27***
<i>DIVbNPC</i>	0.70***	0.65***	0.64***	0.70***	0.69***	0.70***	0.99***	0.98***	0.98***	0.16***	0.32***
<i>DIVbEC</i>	0.70***	0.65***	0.64***	0.70***	0.70***	0.70***	0.99***	0.99***	0.99***	0.19***	0.36***
<i>NPL</i>	-0.36***	-0.16***	-0.12***	-0.14***	-0.14***	-0.14***	-0.35***	-0.34***	-0.34***	0.18***	0.36***
<i>NPLNR</i>	0.84***	0.82***	0.81***	0.82***	0.83***	0.83***	0.68***	0.71***	0.71***	-0.26***	0.03
<i>FS</i>	0.51***	0.63***	0.65***	0.65***	0.66***	0.66***	0.37***	0.40***	0.41***	0.48***	0.72***
<i>DBO</i>	0.92***	0.86***	0.86***	0.89***	0.90***	0.90***	0.73***	0.76***	0.76***	-0.22***	0.90***
<i>PLA</i>	0.93***	0.85***	0.84***	0.87***	0.88***	0.88***	0.74***	0.77***	0.77***	-0.32***	0.87***
<i>AGLNR</i>	0.90***	0.86***	0.86***	0.87***	0.87***	0.88***	0.66***	0.69***	0.70***	-0.25***	0.96***
<i>RNPLNR</i>	-0.42***	-0.35***	-0.35***	-0.34***	-0.35***	-0.35***	-0.06	-0.09*	-0.09**	0.02	-0.08
<i>NPC</i>	0.86***	0.85***	0.85***	0.87***	0.88***	0.89***	0.55***	0.59***	0.60***	-0.01	0.86***
<i>EC</i>	0.76***	0.72***	0.72***	0.77***	0.78***	0.79***	0.59***	0.63***	0.65***	-0.04	0.79***
<i>CSC</i>	0.91***	0.87***	0.87***	0.90***	0.91***	0.92***	0.68***	0.72***	0.72***	-0.13***	0.89***
<i>IC</i>	0.92***	0.88***	0.88***	0.91***	0.92***	0.92***	0.65***	0.69***	0.69***	-0.20***	0.89***
<i>ER</i>	0.93***	0.87***	0.87***	0.90***	0.90***	0.91***	0.62***	0.65***	0.66***	-0.23***	0.86***
<i>AGL</i>	0.24***	0.28***	0.28***	0.29***	0.29***	0.29***	0.15***	0.16***	0.16***	-0.03	0.32***
<i>RPC</i>	0.35***	0.27***	0.28***	0.27***	0.27***	0.28***	0.03	0.05	0.06	0.01	0.19***

(continued on next page)

TABLE (continued)

	<i>FS</i>	<i>DBO</i>	<i>PLA</i>	<i>AGLNR</i>	<i>RNPLNR</i>	<i>NPC</i>	<i>EC</i>	<i>CSC</i>	<i>IC</i>	<i>ER</i>	<i>AGL</i>	<i>RPC</i>
<i>MKTCAP_{t+0.25}</i>	0.42***	0.74***	0.72***	0.55***	-0.31***	0.72***	0.74***	0.77***	0.74***	0.71***	0.36***	0.12***
<i>EQ</i>	0.50***	0.83***	0.80***	0.64***	-0.26***	0.77***	0.80***	0.83***	0.81***	0.79***	0.41***	0.11**
<i>EQbNPL</i>	0.50***	0.82***	0.80***	0.64***	-0.26***	0.77***	0.80***	0.83***	0.81***	0.79***	0.40***	0.11**
<i>NI</i>	0.31***	0.62***	0.61***	0.44***	-0.29***	0.59***	0.63***	0.64***	0.63***	0.61***	0.36***	0.05
<i>NIbNPC</i>	0.33***	0.64***	0.63***	0.46***	-0.29***	0.62***	0.66***	0.67***	0.65***	0.64***	0.37***	0.06
<i>NIbEC</i>	0.33***	0.64***	0.63***	0.46***	-0.29***	0.62***	0.66***	0.67***	0.65***	0.64***	0.37***	0.05
<i>DIV</i>	0.36***	0.67***	0.66***	0.51***	-0.27***	0.65***	0.68***	0.70***	0.66***	0.65***	0.39***	0.05
<i>DIVbNPC</i>	0.41***	0.74***	0.72***	0.56***	-0.28***	0.74***	0.76***	0.78***	0.73***	0.71***	0.41***	0.09*
<i>DIVbEC</i>	0.41***	0.74***	0.73***	0.57***	-0.28***	0.73***	0.77***	0.78***	0.73***	0.72***	0.41***	0.07
<i>NPL</i>	0.32***	0.10**	0.07	0.08*	-0.06	0.23***	0.14***	0.15***	0.11**	0.07	0.05	-0.04
<i>NPLNR</i>	0.86***	0.40***	0.34***	0.82***	0.33***	0.43***	0.44***	0.42***	0.38***	0.33***	0.46***	-0.12***
<i>FS</i>		0.44***	0.37***	0.75***	0.23***	0.50***	0.47***	0.46***	0.42***	0.36***	0.41***	-0.12**
<i>DBO</i>	0.66***		0.99***	0.67***	-0.35***	0.82***	0.89***	0.94***	0.98***	0.97***	0.40***	0.13***
<i>PLA</i>	0.57***	0.99***		0.62***	-0.38***	0.79***	0.87***	0.92***	0.97***	0.98***	0.37***	0.15***
<i>AGLNR</i>	0.69***	0.95***	0.93***		-0.02	0.64***	0.67***	0.66***	0.64***	0.60***	0.49***	-0.04
<i>RNPLNR</i>	-0.05	-0.39***	-0.42***	-0.35***		-0.24***	-0.29***	-0.31***	-0.35***	-0.38***	-0.06	-0.17***
<i>NPC</i>	0.78***	0.92***	0.89***	0.91***	-0.38***		0.93***	0.91***	0.84***	0.79***	0.45***	0.18***
<i>EC</i>	0.69***	0.86***	0.83***	0.85***	-0.38***	0.88***		0.96***	0.91***	0.88***	0.44***	0.10**
<i>CSC</i>	0.71***	0.98***	0.96***	0.94***	-0.38***	0.96***	0.88***		0.95***	0.94***	0.41***	0.13***
<i>IC</i>	0.67***	0.98***	0.97***	0.95***	-0.41***	0.95***	0.85***	0.98***	0.99***	0.98***	0.41***	0.14***
<i>ER</i>	0.62***	0.98***	0.97***	0.94***	-0.46***	0.93***	0.84***	0.97***	0.99***	0.98***	0.39***	0.16***
<i>AGL</i>	0.27***	0.31***	0.30***	0.29***	0.05	0.29***	0.25***	0.29***	0.32***	0.33***		-0.30***
<i>RPC</i>	0.17***	0.29***	0.29***	0.30***	-0.46***	0.39***	0.34***	0.33***	0.32***	0.33***	-0.71***	

Note. The TABLE depicts bivariate correlations for the response variable $MKTCAP_{t+0.25}$ and all covariates defined for the sub-sample INDCORR ($n = 454$). Pearson and Spearman correlation coefficients are shown in the lower and upper diagonal, respectively. For notational reasons, figures are rounded to two decimals. *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

is found to be negative (i.e., -0.31).³³⁵

Analogous to TABLE 6.15 for INDCORR, TABLE 6.16 depicts the bivariate Pearson and Spearman correlation coefficients for FSCORR in the lower and upper diagonal, respectively. The mean (median) Pearson and Spearman correlations among covariates are found to be 0.51 (0.64) and 0.50 (0.60), respectively. Overall, Pearson and Spearman correlations of covariates oscillate between -0.92 and 0.99 and -0.33 and 0.99, respectively. Only 15 (i.e., 6.49%) and 23 (i.e., 10.00%) of all of the 231 estimated Pearson and Spearman correlations are not found to be significantly different from zero on a 10%-level or higher, respectively. Notably, more than half of all of these insignificant correlations (i.e., 3 Pearson and 19 Spearman coefficients) involve the pension variable *RPC*. Thus, for *RPC*, the Pearson correlations with *NPLNR*, *FS* and *EC* are not found to be significantly different from zero on a 10%-level or higher. Moreover, the same holds for the Spearman correlations between *RPC* and all other covariates except *NPL*, *NPC* and *AGL*. All of the other insignificant correlations involve either *NPL*, *RNPLNR* or both. Specifically, for *NPL*, the Pearson coefficients with *NI*, *NIbNPC*, *NIbEC*, *DIV*, *DIVbNPC*, *DIVbEC*, *RNPLNR*, *NPC* and *EC* are not found to be significantly different from zero on 10%-level or higher. The same holds for the Spearman correlation of *NPL* with *AGL*. For *RNPLNR*, Pearson correlations with *NPL*, *NPLNR*, *FS* and *AGL* are not found to be significantly different from zero on 10%-level or higher. Finally, also the Spearman correlations of *RNPLNR* with *FS*, *AGLNR* and *AGL* are insignificantly different from zero.

For the response variable $MKTCAP_{t+0.25}$, the mean (median) Pearson and Spearman correlations are found to be 0.67 (0.87) and 0.62 (0.76), respectively. Overall, Pearson and Spearman correlations oscillate between -0.79 and 0.93 and -0.22 and 0.88, respectively. Notably, all but two of the bivariate correlations involving $MKTCAP_{t+0.25}$ are found to be significantly different from zero on a 1%-level or higher. Specifically, the Pearson correlation with *NPL* (-0.19) is found to be significant on a 5%-level. In contrast, the Spearman correlation with *RPC* (0.08) is not significantly different from zero on a 10%-level or higher. Only seven of all 22 estimated Pearson correlations are below 0.78. Specifically, these are all pension variables *NPL*, *NPLNR*, *FS*, *RNPLNR*, *EC*, *AGL* and *RPC*. Further, only two of all Pearson correlations are found to be negative (i.e., < 0). As for INDCORR, the Pearson correlations for *NPL* and *RNPLNR* are estimated as -0.19 and -0.79, respectively. In terms of the Spearman correlations for $MKTCAP_{t+0.25}$,

³³⁵ Note, all results for $MKTCAP_{t+0.25}$ are qualitatively unaltered for $MKTCAP_t$ and $MKTCAP_{t+0.5}$. These are available from the author upon request.

TABLE
6.16 Correlation-Matrix - FSCORR

	<i>MKTCAP_{t+0.25}</i>	<i>EQ</i>	<i>EQbNPL</i>	<i>NI</i>	<i>NIbNPC</i>	<i>NIbEC</i>	<i>DIV</i>	<i>DIVbNPC</i>	<i>DIVbEC</i>	<i>NPL</i>	<i>NPLNR</i>
<i>MKTCAP_{t+0.25}</i>											
<i>EQ</i>	0.90**		0.88***	0.82***	0.83***	0.81***	0.68***	0.78***	0.78***	0.26***	0.39***
<i>EQbNPL</i>	0.90***	0.99***		0.81***	0.83***	0.80***	0.69***	0.78***	0.77***	0.32***	0.49***
<i>NI</i>	0.87***	0.78***	0.79***		0.99***	0.80***	0.69***	0.79***	0.78***	0.33***	0.49***
<i>NIbNPC</i>	0.88***	0.80***	0.81***	0.99***		0.98***	0.72***	0.74***	0.73***	0.34***	0.26***
<i>NIbEC</i>	0.88***	0.80***	0.81***	0.99***	0.99***		0.72***	0.75***	0.74***	0.36***	0.29***
<i>DIV</i>	0.87***	0.64***	0.65***	0.85***	0.86***	0.85***		0.96***	0.93***	0.42***	0.27***
<i>DIVbNPC</i>	0.89***	0.67***	0.68***	0.86***	0.86***	0.86***	0.99***		0.97***	0.39***	0.33***
<i>DIVbEC</i>	0.89***	0.68***	0.69***	0.86***	0.87***	0.87***	0.99***	0.99***		0.37***	0.33***
<i>NPL</i>	-0.19**	-0.25***	-0.19**	-0.06	-0.06	-0.05	0.09	0.09	0.09		0.14*
<i>NPLNR</i>	0.60***	0.85***	0.84***	0.48***	0.51***	0.53***	0.27***	0.30***	0.33***	-0.35***	
<i>FS</i>	0.39***	0.58***	0.61***	0.39***	0.42***	0.44***	0.32***	0.35***	0.37***	0.52***	0.63***
<i>DBO</i>	0.90***	0.99***	0.98***	0.77***	0.79***	0.80***	0.65***	0.68***	0.69***	-0.24***	0.87***
<i>PLA</i>	0.92***	0.98***	0.97***	0.77***	0.79***	0.80***	0.66***	0.68***	0.69***	-0.36***	0.84***
<i>AGLNR</i>	0.78***	0.94***	0.93***	0.66***	0.69***	0.70***	0.51***	0.54***	0.56***	-0.32***	0.96***
<i>RNPLNR</i>	-0.79***	-0.50***	-0.50***	-0.75***	-0.74***	-0.72***	-0.92***	-0.91***	-0.89***	0.00	-0.08
<i>NPC</i>	0.80***	0.88***	0.89***	0.62***	0.65***	0.67***	0.60***	0.63***	0.66***	-0.02	0.79***
<i>EC</i>	0.53***	0.62***	0.63***	0.46***	0.48***	0.54***	0.38***	0.41***	0.48***	0.02	0.63***
<i>CSC</i>	0.83***	0.94***	0.94***	0.65***	0.68***	0.69***	0.56***	0.60***	0.62***	-0.20**	0.87***
<i>IC</i>	0.87***	0.94***	0.94***	0.69***	0.72***	0.73***	0.62***	0.65***	0.67***	-0.20**	0.84***
<i>ER</i>	0.93***	0.95***	0.94***	0.73***	0.75***	0.75***	0.67***	0.70***	0.70***	-0.33***	0.79***
<i>AGL</i>	0.44***	0.59***	0.59***	0.21**	0.24***	0.27***	0.19**	0.23***	0.26***	-0.17**	0.65***
<i>RPC</i>	0.71***	0.45***	0.44***	0.61***	0.60***	0.59***	0.74***	0.73***	0.71***	-0.16*	0.08

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TABLE (continued)

	FS	DBO	PLA	AGLNR	RNPLNR	NPC	EC	CSC	IC	ER	AGL	RPC
<i>MKTCAP_{t+0.25}</i>	0.53***	0.81***	0.80***	0.48***	-0.22***	0.65***	0.70***	0.74***	0.78***	0.77***	0.39***	0.08
<i>EQ</i>	0.64***	0.90***	0.87***	0.60***	-0.25***	0.69***	0.76***	0.80***	0.89***	0.87***	0.46***	0.02
<i>EQbNPL</i>	0.65***	0.90***	0.88***	0.60***	-0.26***	0.69***	0.76***	0.80***	0.89***	0.87***	0.46***	0.02
<i>NI</i>	0.47***	0.72***	0.71***	0.38***	-0.32***	0.55***	0.62***	0.65***	0.73***	0.71***	0.25***	-0.01
<i>NIbNPC</i>	0.50***	0.75***	0.73***	0.41***	-0.32***	0.58***	0.65***	0.68***	0.75***	0.73***	0.27***	-0.01
<i>NIbEC</i>	0.47***	0.72***	0.70***	0.38***	-0.33***	0.56***	0.67***	0.66***	0.73***	0.71***	0.25***	0.01
<i>DIV</i>	0.46***	0.65***	0.62***	0.38***	-0.32***	0.43***	0.46***	0.52***	0.61***	0.58***	0.33***	-0.04
<i>DIVbNPC</i>	0.54***	0.75***	0.72***	0.46***	-0.31***	0.54***	0.57***	0.63***	0.72***	0.69***	0.41***	0.01
<i>DIVbEC</i>	0.52***	0.74***	0.71***	0.45***	-0.32***	0.53***	0.62***	0.63***	0.71***	0.68***	0.40***	0.03
<i>NPL</i>	0.54***	0.30***	0.19**	0.21**	-0.14*	0.28***	0.22***	0.25***	0.32***	0.18**	0.13	-0.16*
<i>NPLNR</i>	0.75***	0.56***	0.47***	0.88***	0.29***	0.53***	0.55***	0.57***	0.54***	0.46***	0.58***	-0.04
<i>FS</i>	0.70***	0.70***	0.60***	0.76***	0.04	0.67***	0.66***	0.69***	0.70***	0.60***	0.54***	-0.07
<i>DBO</i>	0.59***	0.99***	0.97***	0.69***	-0.25***	0.82***	0.89***	0.94***	0.98***	0.95***	0.49***	0.02
<i>PLA</i>	0.47***	0.96***	0.94***	0.63***	-0.31***	0.77***	0.87***	0.92***	0.95***	0.98***	0.44***	0.07
<i>AGLNR</i>	0.61***	0.96***	0.94***	0.94***	0.03	0.64***	0.66***	0.69***	0.67***	0.62***	0.57***	0.00
<i>RNPLNR</i>	-0.08	-0.51***	-0.54***	-0.36***	-0.39***	-0.15*	-0.20**	-0.18**	-0.26***	-0.31***	0.05	-0.10
<i>NPC</i>	0.71***	0.91***	0.87***	0.86***	-0.17**	0.77***	0.83***	0.87***	0.84***	0.78***	0.45***	0.16*
<i>EC</i>	0.59***	0.64***	0.60***	0.63***	-0.38***	0.97***	0.70***	0.94***	0.90***	0.88***	0.44***	0.03
<i>CSC</i>	0.63***	0.96***	0.94***	0.92***	-0.44***	0.96***	0.70***	0.99***	0.95***	0.92***	0.46***	0.01
<i>IC</i>	0.61***	0.97***	0.95***	0.91***	-0.55***	0.90***	0.70***	0.99***	0.97***	0.96***	0.46***	0.01
<i>ER</i>	0.44***	0.97***	0.98***	0.90***	0.01	0.75***	0.60***	0.96***	0.71***	0.65***	0.41***	0.07
<i>AGL</i>	0.45***	0.62***	0.59***	0.60***	0.01	0.75***	0.62***	0.74***	0.71***	0.65***	0.41***	-0.30***
<i>RPC</i>	-0.06	0.44***	0.49***	0.32***	-0.86***	0.33***	0.11	0.31***	0.37***	0.51***	-0.16*	

Note. The TABLE depicts bivariate correlations for the response variable $MKTCAP_{t+0.25}$ and all covariates defined for the sub-sample FSCORR ($n = 143$). Pearson and Spearman correlation coefficients are shown in the lower and upper diagonal, respectively. For notational reasons, figures are rounded to two decimals. *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

ten of the 22 are found to be equal or greater than 0.78. All but three (i.e., *DBO*, *PLA* and *IC*) of these are non-pension variables. Again, as is the case for INDCORR, the only negative Spearman correlation of $MKTCAP_{t+0.25}$ is found for *RNPLNR* (i.e., -0.22).³³⁶

6.3.2.7 Summary and Conclusion

For the industry firms included in the final sample that apply the Corridor-Method in line with IAS 19 (2004, i.e., INDCORR), the annual average funding ratios oscillate between 86.96% in 2004 and 105.32% in 2008. Specifically, across the sample period of 2004 to 2012, the mean (median) net pension (asset)/liability (*NPL*) recognized on the balance-sheet and the mean (median) funding status (*FS*) are found to be CHFm 12.20 (0.62) and 71.72 (5.97), respectively. Notably, for all but one sample year (i.e., 2007), the annual median funding status (*FS*) of the Swiss pension plans accounted for by these firms is found to be above the annual median recognized *NPL*. This finding is especially pronounced for the sample period after the out-break of the sub-prime crisis in 2008. Correspondingly, the mean (median) unrecognized net pension (asset)/liability (*NPLNR*) is found to be CHFm 59.51 (2.81). Furthermore, the mean (median) defined benefit obligation (*DBO*) as well as the mean (median) plan assets (*PLA*) of INDCORR are estimated to be CHFm 792.82 (146.65) and CHFm 721.11 (126.62), respectively. Lastly, the mean (median) values of the net pension (income)/cost (*NPC*) as well as the disclosed employer contributions (*EC*) are found to be CHFm 14.21 (3.22) and 18.22 (3.38), respectively.

Overall, the findings of the descriptive analysis summarized above correspond to the Swiss institutional setting as discussed in chapter 2. Accordingly, pension assets must be regularly transferred to and held by an entity which is legally separate from the employer. Notably, for all but the sample years of 2004 and 2012, the average annual funding ratios estimated for INDCORR are above the corresponding values found for the Swiss pension plans regularly surveyed by Swisscanto. Moreover, these values are also generally higher than the annual average funding ratios of large companies internationally. Nevertheless, in line with the Corridor-Method applicable under IAS 19 (2004), industry firms included in the final sample, on average, do not fully recognize the funding status (*FS*) of their Swiss pension plans but disclose mean (median) cumulative unrecognized net actuarial gains and losses (*AGLNR*) of CHFm 81.22 (6.82) as well as a mean (median) residual unrecognized net pension (asset)/liability (*RNPLNR*) of -21.71

³³⁶ Note, all results for $MKTCAP_{t+0.25}$ are qualitatively unaltered for $MKTCAP_t$ and $MKTCAP_{t+0.5}$. These are available from the author upon request.

(0.00), respectively. Also, the shares of observations with $NPL < 0$, $NPL = 0$ and $NPL > 0$ are 33.48%, 9.03% and 57.49%, respectively. Moreover, also for the recognized net pension (income)/cost (NPC), as well as the employer contributions paid (EC), annual median values are not fully aligned across the sample period. Specifically, in five out of nine sample years (i.e., 2005, 2007, 2008, 2009 and 2010), median NPC recognized in line with the Corridor-Method is found to be less than the corresponding value for EC . This finding is especially noteworthy since, in line with IAS 19 (2004), Swiss pension liabilities, on average, are valued at about 10-20% above respective valuations in accordance with ARR 26 (2004). Based on the results outlined above, at least with respect to the valuation in line with IAS 19 (2004), industry firms included in the final sample applying the Corridor-Method do not fully recognize their Swiss pension plans.

The Swiss institutional setting may also be illustrated by the fact that for NPL , FS , $NPLNR$, $AGLNR$ as well as $RNPLNR$ the mean values of these covariates as percentage of total book value of equity (EQ) oscillate between -2.45% ($RNPLNR$) and 3.87% ($AGLNR$). In contrast, for DBO and PLA , the corresponding values are found to be 68.37% and 65.73%, respectively. Furthermore, the mean values of NPC and EC as percentage of total book value of net income/(loss) (NI) as well as total book value of dividends proposed (DIV) oscillate between 12.65% ($NPC \% NI$) and 30.16% ($EC \% DIV$), respectively. For the median values, the findings are qualitatively unaltered although on a generally lower level compared to the mean values outlined above.

Appart from the descriptive analysis summarized thus far, all pension covariates of INDCORR are found to be significantly associated (Pearson and Spearman correlations) with the response variable of market capitalization three months after the fiscal-year end ($MKTCAP_{t+0.25}$), on a 1%-level or higher. Notably, in terms of Pearson correlations, coefficients for the unrecognized net pension (asset)/liability ($NPLNR$, +), plan assets (PLA , +), cumulative unrecognized net actuarial gains and losses ($AGLNR$, +) as well as the expected return (ER , +) are all found to have the expected positive sign.³³⁷ The same also holds for the respective Spearman correlations. Notably, also the Spearman correlation coefficient for the net pension (asset)/liability (NPL , -) is found to have the expected negative sign. For all other pension covariates, although significantly correlated with $MKTCAP_{t+0.25}$, signs are found to be opposite to expectations. As mentioned above,

³³⁷ The expected signs for all covariates are outlined in TABLE 6.5.

these results are qualitatively unaltered for the response variables of market capitalization at fiscal-year end ($MKTCAP_t$) as well as six month after the end of the financial year ($MKTCAP_{t+0.5}$).

Overall, the results of the bivariate correlation analysis for INDCORR confirm hypothesis $H(1)$ (*Value-Relevance of Swiss Pension Plans*), formulated in sub-section 5.2.3, whereas financial information about Swiss pension plans reported in line with IAS 19 (2004) is significantly associated with the market value of equity of the reporting firms. As outlined in sub-section 5.2.1, for the purposes of this study such pension information is defined as value-relevant and these findings thus contribute to answering research question $RQ(1)$, outlined in sub-section 5.1.3. Accordingly, financial information about Swiss pension plans reported in line with the Corridor-Method of IAS 19 (2004) is, at least partially, found to be decision-useful to the holders of equity securities of the reporting firms. Furthermore, results also confirm hypothesis $H(2a)$ (*Value-Relevance of NPL*), since the recognized net pension (asset)/liability (NPL , +/-) is found to be significantly associated with $MKTCAP_{t+0.25}$. Notably, for the Spearman correlation coefficient, the estimated sign is even in line with the expectation (i.e., negative). In terms of hypothesis $H(2b)$ (*Value-Relevance of NPC*), the Pearson and Spearman correlation coefficients of NPC (+/+) are significantly different from zero. Nevertheless, the estimated signs are opposite to expectations (i.e., negative). The same also holds for the employer contributions paid (EC , hypothesis $H(2c)$, *Value-Relevance of EC*). Lastly, also all pension covariates that are disclosed only (i.e., $NPLNR$ (+/+), $AGLNR$ (+/+) and $RNPLNR$ (-/-)) are found to be significantly correlated with $MKTCAP_{t+0.25}$, thus confirming hypothesis $H(2d)$ (*Value-Relevance of Disclosures*). Notably, for $NPLNR$ (+/+) as well as $AGLNR$ (+/+) , estimated signs are also in line with expectations (i.e., positive). Overall, these findings contribute to answering research question $RQ(2)$ on which elements of the financial information on Swiss pension plans reported in line with IAS 19 (2004) are decision-useful to holders of equity securities of the reporting firms. Notably, most significantly associated pension covariates for which signs are in line with expectations, are attributable to assets and liabilities (i.e., NPL (+/-), $NPLNR$ (+/+), $AGLNR$ (+/+) and PLA (+/+)). In contrast, although also significantly associated with $MKTCAP_{t+0.25}$, the estimated signs for the correlation coefficients of the employer contributions paid (EC , +/+) are opposite to expectations. Moreover, all of the pension (asset)/liability covariates attributable to pension information which is disclosed rather than recognized (i.e., $NPLNR$ (+/+), $AGLNR$ (+/+) and $RNPLNR$ (-/-)) are significantly associated with $MKTCAP_{t+0.25}$. Thence, taken together, these findings may suggest that investors prefer an Asset-Liability (ALA) over a Revenue-Expense Approach (REA) to

the accounting for Swiss pension plans where the funding status (*FS*) is recognized *in full* rather than the delayed and only partial recognition of actuarial gains and losses (*AGL*) as in line with the Corridor-Method.

For the financial firms included in the final sample that apply the Corridor-Method in line with IAS 19 (2004, i.e., FSCORR), the annual average funding ratios oscillate between 79.43% in 2005 and 91.78% in 2006. Specifically, across the sample period of 2004 to 2012, the mean (median) net pension (asset)/liability (*NPL*) recognized on the balance-sheet and the mean (median) funding status (*FS*) are found to be CHFm 112.94 (1.04) and 264.65 (5.88), respectively. Notably, for all but one sample year (i.e., 2007), the annual median funding status (*FS*) of the Swiss pension plans accounted for by these firms is found to be above the annual median recognized *NPL*. Apart from the sample years of 2004 and 2005 where results are highly influenced by the relatively small sample size, this finding is especially pronounced for the sample period after the out-break of the sub-prime crisis in 2008. Correspondingly, the mean (median) unrecognized net pension (asset)/liability (*NPLNR*) is found to be CHFm 151.72 (3.25). Furthermore, the mean (median) defined benefit obligation (*DBO*) as well as the mean (median) plan assets (*PLA*) of FSCORR are estimated to be CHFm 1,458.24 (69.30) and CHFm 1,193.59 (72.30), respectively. Lastly, the mean (median) values of the net pension (income)/cost (*NPC*) as well as the disclosed employer contributions (*EC*) are found to be CHFm 34.21 (1.60) and 52.03 (2.03), respectively.

Overall, the findings of the descriptive analysis for FSCORR outlined above are qualitatively unaltered compared to INDCORR. Nevertheless, for all of these pension covariates except plan assets (*PLA*), the mean values estimated for FSCORR are found to be significantly greater than for INDCORR, on a 10%-level or higher. In contrast, except for *PLA*, median values for these variables are not found to be significantly different on a 10%-level or higher between the two sub-samples. Moreover, median *PLA* for INDCORR is found to be significantly greater than for FSCORR on a 10%-level. Thus, the results suggest that the sub-sample of FSCORR is strongly influenced by upward outliers such as e.g., observations on *UBS AG* (ISIN: CH0024899483) and *Zurich Insurance Group AG* (ISIN: CH0011075394). Thence, financial firms included in the final sample that apply the Corridor-Method, on average, account for greater Swiss pension plans compared to the industry firms analyzed. Furthermore, findings for FSCORR also correspond to the Swiss institutional setting of highly funded pension plans. Notably, for all but the sample year of 2005, the average annual funding ratios estimated for FSCORR are closely aligned to the Swiss pension plans regularly surveyed by Swisscanto. Although the average annual funding ratios estimated for FSCORR are found to

be below the corresponding values for INDCORR, these are not significantly different on a 10%-level or higher with the exception of the sample year of 2005. Moreover, the values for FSCORR are also generally higher than the annual average funding ratios of large companies internationally. Nevertheless, as is the case for INDCORR, financial firms analyzed do not fully recognize the funding status (*FS*) of their Swiss pension plans but disclose mean (median) cumulative unrecognized net actuarial gains and losses (*AGLNR*) of CHFm 184.95 (4.34) as well as a mean (median) residual unrecognized net pension (asset)/liability (*RNPLNR*) of -33.23 (0.00), respectively. Again, the mean value of *AGLNR* for FSCORR is significantly greater on a 10%-level than the corresponding value for INDCORR. However, neither the median values for *AGLNR* and *RNPLNR* nor the mean values of *RNPLNR* are found to be significantly different between the two sub-samples. Also, the shares of observations with $NPL < 0$, $NPL = 0$ and $NPL > 0$ are 25.87%, 11.19% and 62.94%, respectively. Moreover, as is the case for the industry firms, also for FSCORR are the annual median values of the recognized net pension (income)/cost (*NPC*) and the employer contributions paid (*EC*) not fully aligned across the sample period. Specifically, in seven out of nine sample years (i.e., 2005, 2006, 2007, 2008, 2010, 2011 and 2012), median *NPC* recognized in line with the Corridor-Method is found to be less than the corresponding value for *EC*. The findings outlined above suggest that financial firms included in the final sample that apply the Corridor-Method, on average, account for greater Swiss pension plans than the industry firms analyzed. This corresponds to the higher mean values of market capitalization, book equity, total assets and also sales found for these firms compared to INDCORR. Moreover, based on the results outlined above and in line with the findings for INDCORR, also these financial firms do not fully recognize their Swiss pension plans.

As in the case of INDCORR, also for FSCORR the Swiss institutional setting may be illustrated by the fact that for *NPL*, *FS*, *NPLNR*, *AGLNR* as well as *RNPLNR* the mean values of these covariates as percentage of total book value of equity (*EQ*) oscillate between -0.49% (*RNPLNR*) and 3.55% (*FS*). In contrast, for *DBO* and *PLA*, the corresponding values are found to be 18.80% and 15.25%, respectively. Furthermore, the mean values of *NPC* and *EC* as percentage of total book value of net income/(loss) (*NI*) as well as total book value of dividends proposed (*DIV*) oscillate between 4.70% ($NPC \% DIV$) and 29.44% ($EC \% NI$), respectively. For the median values, the findings are qualitatively unaltered although on a generally lower level compared to the mean values outlined above. Lastly, these results also depict the fact that the mean values of *EQ*, *NI* and *DIV* are found to be significantly greater for FSCORR compared to INDCORR.

Apart from the residual net pension (income)/cost (*RPC*), all pension covariates of FSCORR are found to be significantly associated (Pearson and Spearman correlations) with the response variable of market capitalization three months after the fiscal-year end ($MKTCAP_{t+0.25}$), on a 5%-level or higher. Thence, as for the descriptive analysis outlined above, also these results are qualitatively unaltered compared to INDCORR. Notably, in terms of Pearson correlations, coefficients for the unrecognized net pension (asset)/liability (*NPLNR*, +), plan assets (*PLA*, +), cumulative unrecognized net actuarial gains and losses (*AGLNR*, +) as well as the expected return (*ER*, +) are all found to have the expected positive sign.³³⁸ The same also holds for the respective Spearman correlations. Notably, as in the case of INDCORR, also the Spearman correlation coefficient for the net pension (asset)/liability (*NPL*, -) is found to have the expected negative sign. For all other pension covariates, although significantly correlated with $MKTCAP_{t+0.25}$, signs are found to be opposite to expectations. Again, these results are qualitatively unaltered for the response variables of market capitalization at fiscal-year end ($MKTCAP_t$) as well as six month after the end of the financial year ($MKTCAP_{t+0.5}$).

Overall, the interpretation of the results of the bivariate correlation analysis for FSCORR is analogous to INDCORR. Specifically, hypothesis *H(1)* (*Value-Relevance of Swiss Pension Plans*) is confirmed due to the high degree of correlation between pension covariates and $MKTCAP_{t+0.25}$. Thence, also for the financial firms analyzed is the pension information reported in line with the Corridor-Method of IAS 19 (2004) found to be, at least partially, decision-useful to investors (*RQ(1)*). Also, research hypotheses *H(2a)*-*H(2d)* (*Value-Relevance of NPL, NPC, EC and Disclosures*) are confirmed analogously to INDCORR. Concretely, the recognized net pension (asset)/liability (*NPL*, +/-), the recognized net pension (income)/cost (*NPC*, +/+), the employer contributions paid (*EC*, +/+) as well as all pension covariates disclosed only are significantly associated with $MKTCAP_{t+0.25}$. Moreover, for the Spearman correlation coefficient of *NPL* (-), as well as for the Pearson and Spearman correlation coefficients of *NPLNR* (+/+), *AGLNR* (+/+), *PLA* (+/+) and *ER* (+/+) are the estimated signs also in line with expectations. Thence, with respect to research question two (*RQ(2)*) as for INDCORR, also for FSCORR results suggest that investors prefer the full recognition of the funding status (*FS*) of Swiss pension plans in line with an Asset-Liability (ALA) rather than a Revenue-Expense Approach (REA).

³³⁸ The expected signs for all covariates are outlined in TABLE 6.5.

6.3.3 INDOCI and FSOCI

6.3.3.1 Data Structure

The sub-sample INDOCI consists of $n = 118$ firm-year observations and, as is the case with respect to INDCORR and FSCORR (see paragraph 6.3.2.1), has the structure of an unbalanced panel data set. Concretely, the sub-sample is based on pooled observations on $I = 24$ firms across $T = 8$ years (2005 to 2012). Thence, the average number of observations per firm i is five, oscillating between one and eight observations per firm. The coefficient of variation v of the number of observations per firm is estimated as 0.47. Furthermore, the lower half of firms accounts for about 31.36% of all 118 observations. Thus, the upper half of firms accounts for about 68.64% of all observations in the sub-sample. Correspondingly, the average number of observations per year t is 15, oscillating between a minimum of 5 (2005) and a maximum of 21 (2011). For the number of observations per year, v is estimated as 0.38. Thence, as is the case with respect to INDCORR and FSCORR, the sub-sample INDOCI is more balanced in terms of observations per year (i.e., along the time dimension) than in terms of observations per firm (i.e., along the firm dimension). In terms of the number of observations per firm, the lower half of firms of INDOCI accounts for slightly more observations (i.e., 31.36%) compared to INDCORR (28.63%) and for slightly less observations relative to FSCORR (32.87%).

The sub-sample FSOCI consists of $n = 14$ firm-year observations based on $I = 3$ firms across $T = 6$ years (2007 to 2012). Thence, the average number of observations per firm i is five, oscillating between two and six observations per firm. The coefficient of variation v of the number of observations per firm is estimated as 0.49. Overall, the lower half of firms accounts for about 14.29% of all 14 observations. Thus, the upper half of firms accounts for about 85.71% of all observations in the sub-sample. Correspondingly, the average number of observations per year t is 2, oscillating between a minimum of two (2007) and a maximum of three (2010). For the number of observations per year, v is estimated as 0.22. Thus, as in the case for all other sub-samples discussed thus far, also FSOCI is more balanced along the time than the firm dimension. However, FSOCI is clearly the least balanced sub-sample discussed thus far with regard to the number of observations per firm.

6.3.3.2 Supersectors

TABLE 6.17 depicts the distribution of firm-year observations of INDOCI across the different supersectors defined in line with ICB (2015). The TABLE is sorted in ascending order of each supersectors' share of total observations. Notably, the three supersectors *Industrial Goods & Services* (ICB: 2700), *Health Care* (ICB: 4500) and *Construction & Materials* (ICB: 2300) account for about 72.88% of all observations included in INDOCI. As for INDCORR (see TABLE 6.11 on page 282), also for INDOCI are the two supersectors *Industrial Goods & Services* (ICB: 2700) and *Health Care* (ICB: 4500) the two most dominant ones. For all observations attributable to the supersector *Industrial Goods & Services* about 80.00% are almost evenly distributed across the four subsectors *Electrical Components & Equipment* (ICB: 2733, 22.50%), *Business Support Services* (ICB: 2791, 20.00%), *Delivery Services* (ICB: 2771, 20.00%) and *Industrial Machinery* (ICB: 2757, 17.50%). For example, observations attributable to *Electrical Components & Equipment* include observations on *Von Roll Holding AG* (ISIN: CH0003245351). At the time, the firm's main operations included the manufacturing of electrical insulation and cable protection materials as well as energy transmission and water and wastewater treatment systems. Furthermore, the firm had also been active in the field of solar research and development projects (see e.g., Von Roll Holding AG, 2012, p. 53). Further, all observations on the *Business Support Services* subsector are attributable to *SGS AG* (ISIN: CH0002497458). At the time, the firm was "[...] the global leader and innovator in inspection, verification, testing and certification services [...]" (SGS AG, 2012, p. 52). Observations of the *Delivery Services* subsector all stem from *Panalpina Welttransport (Holding) AG* (ISIN: CH0002168083) which, at the time, was "[...] one of the world's leading providers of supply chain solutions [...]" (Panalpina Welttransport (Holding) AG, 2012, p. 76). Finally, all but one observation for the *Industrial Machinery* subsector are attributable to *OC Oerlikon Corporation AG* (ISIN: CH0000816824). At the time, the firm was a global leader in different fields such as production and transmission technology systems, textile machinery and information technology (see e.g., OC Oerlikon Corporation AG, 2012, p. 107). The rest of the observations from *Industrial Goods & Services* belong to the subsectors of *Marine Transportation* (ICB: 2773) and *Diversified Industrials* (ICB: 2727). With regard to the *Health Care* supersector, 100% of observations are attributable to firms classified as *Pharmaceuticals* (ICB: 4577). Apart from observations on *Novartis AG* (ISIN: CH0012005267), for which observations are also included in INDCORR (see paragraph 6.3.2.4), INDOCI also includes observations on the second major Swiss pharmaceutical company, namely *Roche Holding AG* (ISIN: CH0012032113). At the time, the firm was

TABLE
6.17 Supersectors of INDOCI

Supersector	ICB	Firm-Years	%-Total
<i>Basic Resources</i>	1700	1	0.85
<i>Personal & Household Goods</i>	3700	1	0.85
<i>Telecommunications</i>	6500	2	1.69
<i>Chemicals</i>	1300	3	2.54
<i>Retail</i>	5300	3	2.54
<i>Food & Beverage</i>	3500	6	5.08
<i>Technology</i>	9500	6	5.08
<i>Media</i>	5500	10	8.47
<i>Construction & Materials</i>	2300	19	16.10
<i>Health Care</i>	4500	27	22.88
<i>Industrial Goods & Services</i>	2700	40	33.90
<i>n = 118</i>			<i>100.00</i>

Note. The TABLE depicts the supersector composition of the sub-sample INDOCI. Classification is based on ICB (2015). Differences may be due to rounding.

the global leader in cancer pharmaceuticals and diagnostics (see e.g., Roche Holding AG, 2012, p. 27).³³⁹ Lastly, observations for the supersector *Construction & Materials* include, for example, observations on *Geberit AG* (ISIN: CH0030170408). At the time, the company was “[...] a leading supplier of sanitary plumbing systems for the residential and commercial new construction and renovation markets.” (Geberit AG, 2012, p. 59). Apart from *Industrial Goods & Services*, *Health Care* and *Construction & Materials*, the rest of the observations included in INDOCI is distributed across eight other different supersectors, none of which is exceeding 10% of total observations. As depicted in TABLE 6.17, these include supersectors from *Media* (ICB: 1700) to *Basic Resources* (ICB: 5500).

Analogous to INDOCI, TABLE 6.18 illustrates the distribution of observations included in FSOCI across different supersectors. As outlined in paragraph 6.3.2.1, all 14 observations included in FSOCI stem from only three different financial firms. Specifically, six observations (i.e., 42.86%) are attributable to *Zurich Insurance Group AG* (ISIN: CH0011075394), a major insurance company (ICB: 8500) that switched from the Corridor- to the OCI-Method in 2007 (see paragraph 6.3.2.2). Also, six observations

³³⁹ Notably, *Novartis AG* switched from the application of the Corridor- to the OCI-Method effective as of January 1, 2005 (see e.g., Novartis AG, 2005, p. 143). Analogously, for *Roche Holding AG* the switch was effective as of January 1, 2006 (see e.g., Roche Holding AG, 2006, p. 21).

TABLE

6.18 Supersectors of FSOCI

Supersector	ICB	Firm-Years	%-Total
<i>Financial Services</i>	8700	2	14.29
<i>Banks</i>	8300	6	42.86
<i>Insurance</i>	8500	6	42.86
		<i>n</i> = 14	100.00

Note. The TABLE depicts the supersector composition of the sub-sample FSOCI. Classification is based on ICB (2015). Differences may be due to rounding.

(i.e., 42.86%) are attributable to *Liechtensteinische Landesbank AG* (ISIN: LI0030195247) classified as bank (ICB: 8300). At the time, the financial institution was operating as universal bank in Liechtenstein as well as in the eastern part of Switzerland with a strong focus on private and institutional clients (see e.g., Liechtensteinische Landesbank AG, 2012, p. 20). Lastly, two observations (i.e., 14.29%) of FSOCI stem from *Spice Private Equity AG* (ISIN: CH0009153310) classified as *Financial Services* (ICB: 8700) firm. Due to the small number of total observations included in FSOCI, representing only three different financial firms, this sub-sample is excluded from any further discussions and analyses.

6.3.3.3 Response Variables and Non-Pension Covariates

In line with TABLE 6.13 for INDCORR and FSCORR, TABLE 6.19 depicts descriptive summary statistics of all response variables, non-pension related covariates as well as *TA*, *SALES* and *EMP* for INDOCI ($n = 118$). With the exception of the values for *EMP* as well as the values for skewness (Skew), all values depicted in TABLE 6.19 are denoted in CHFbn.

For the three different response variables $MKTCAP_t$, $MKTCAP_{t+0.25}$ and $MKTCAP_{t+0.5}$, the estimated mean (median) values in CHFbn are found to be 23.35 (1.48), 23.44 (1.52) and 23.22 (1.76), respectively. For all three response variables, the estimated distributions are right-skewed (Skew = 2.36, 2.49 and 2.42). In absolute terms, the variation (Range) in response variables oscillates between CHFbn 189.95 ($MKTCAP_t$) and CHFbn 218.85 ($MKTCAP_{t+0.25}$).

For *EQ*, mean (median) values are estimated to be CHF 8.92 (0.86) bn. The distribution of *EQ* is skewed to the right (Skew = 2.09). Moreover, absolute variation (Range) in *EQ* is estimated as CHF 63.20 bn.

The mean (median) value for *EQbNPL* is CHF 9.40 (0.89) bn. Notably, both mean and median values of *EQ* and *EQbNPL* are found to be significantly different on a 1%-level or higher (both p -values < 0.01). The distribution of *EQbNPL* is right-skewed (Skew = 2.08) and the absolute variation (Range) is CHF 67.99 bn. The estimated mean (median) for *NI* is CHF 2.10 (0.12) bn. The distribution of *NI* is skewed to the right (Skew = 3.57) and the absolute variation (Range) is CHF 34.66 bn.

For *NibNPC*, the mean (median) value is estimated to be CHF 2.14 (0.13) bn. Notably, the mean and median values of *NI* and *NibNPC* are found to be significantly different on a 1%-level or higher (both p -values < 0.01). The distribution is right-skewed (Skew = 3.51) and the absolute variation (Range) in *NibNPC* is CHF 34.79 bn.

All findings with regard to *NibEC* are in line with the findings for *NibNPC*. Notably, the mean and median values of CHFbn 2.17 and CHFbn 0.13 are found to significantly differ from the respective values of *NI* (both p -values < 0.01). This also holds with regard to the difference in mean and median values for *NibNPC* and *NibEC* (both p -values < 0.01). Furthermore, the distribution is skewed to the right (Skew = 3.53) and has an absolute variation (Range) of CHF 35.24 bn.

For *DIV*, the mean (median) value is found to be CHF 0.71 (0.04) bn. Notably, the mean and median values of *NI* are found to be significantly greater than the respective values of *DIV* on a 1%-level or higher (both p -values < 0.01). Hence, as discussed in paragraph 6.1.3.3, firms usually do not pay out all net income as dividends. The distribution is right-skewed (Skew = 2.61) and it has an absolute variation (Range) of CHF 6.54 bn.

The mean (median) value of *DIVbNPC* is estimated to be CHF 0.72 (0.04) bn. The mean and median values of *DIV* and *DIVbNPC* are found to be significantly different on a 1%-level (both p -values < 0.01). Also, the distribution is skewed to the right (Skew = 2.60) with an absolute variation (Range) of CHF 6.58 bn.

Findings for *DIVbEC* are by and large similar to the findings for *DIVbNPC*. Namely, the mean and median values of CHFbn 0.72 and CHFbn 0.04 are found to be significantly different from the respective values of *DIV* on a 1%-level or higher (both p -values < 0.01). This also holds for the mean and median value of *DIVbNPC* and *DIVbEC* (both p -values < 0.01). Also, the distribution of *DIVbEC* is right-skewed (Skew = 2.61). Last but not least, the absolute variation (Range) is found to be CHF 6.68 bn.

TABLE
6.19 Descriptive Statistics of Non-Pension Variables for INDOCI

Variable	Mean	STD	Skew	Q-1	Median	Q-3	Range
$MKTCAP_t$	23.3522	49.3505	2.3616	0.4538	1.4759	12.6357	189.9548
$MKTCAP_{t+0.25}$	23.4355	49.7744	2.4890	0.4389	1.5202	13.6473	218.8472
$MKTCAP_{t+0.5}$	23.2237	48.9553	2.4213	0.4583	1.7637	13.3101	199.3962
EQ	8.9235	18.5935	2.0858	0.2878	0.8601	2.2870	63.2015
$EQbNPL$	9.3892	19.2839	2.0767	0.3097	0.8890	2.3194	67.9897
NI	2.1037	4.7546	3.5683	0.0162	0.1218	0.5891	34.6590
$NIbNPC$	2.1429	4.8091	3.5109	0.0178	0.1283	0.5964	34.7866
$NIbEC$	2.1672	4.8601	3.5288	0.0178	0.1270	0.6065	35.2372
DIV	0.7053	1.5675	2.6126	0.0058	0.0386	0.4508	6.5365
$DIVbNPC$	0.7171	1.5821	2.5963	0.0068	0.0397	0.4622	6.5770
$DIVbEC$	0.7244	1.6004	2.6102	0.0071	0.0407	0.4646	6.6842
TA	18.4910	35.4186	1.8832	0.4893	1.9518	6.0429	126.1829
$SALES$	13.6574	25.1164	2.4279	0.4176	2.0539	11.3909	109.8935
EMP	37,317	67,919	2.9298	2,110	6,042	54,709	333,147

Note. The TABLE depicts the descriptive summary statistics arithmetic mean (Mean), standard deviation (STD), skewness (Skew), 25%-Quantile (Q-1), median (Median), 75%-Quantile (Q-3) and spread (i.e., difference) between the maximum and the minimum values (Range) of the response variables, non-pension related covariates as well as TA , $SALES$ and EMP for the sub-sample INDOCI ($n = 118$). Quantiles are estimated in line with the median-unbiased definition recommended by Hyndman and Fan (1996). Skew is estimated by G_1 as recommended by Joanes and Gill (1998). All values are denoted in CHFbn (except for EMP and Skew). Summary statistics for TA , $SALES$ and EMP are based on raw (i.e., unadjusted) data as sourced from annual reports and the Swiss Companies Guide database (EMP).

The estimated mean and median value of TA is CHF 18.49 (1.95) bn. The distribution is skewed to the right (Skew = 1.88). Also, the absolute variation (Range) is estimated as CHF 126.18 bn.

For $SALES$, the mean (median) value is CHF 13.66 (2.05) bn. The distribution is right-skewed (Skew = 2.43). The absolute range is CHF 109.89 bn.

Finally, for EMP , the mean and median values are 37,317 and 6,042, respectively. The distribution of EMP is skewed to the right (Skew = 2.93) and has an absolute variation (Range) of 333,147.

6.3.3.4 Pension Covariates

Analogous to TABLE 6.14 for INDCORR and FSCORR, TABLE 6.20 depicts descriptive summary statistics of all *pure* pension-related covariates for INDOCI ($n = 181$). With the exception of skewness (Skew), all values depicted in TABLE 6.20 are denoted in CHF bn.

TABLE
6.20 Descriptive Statistics of Pension Variables for INDOCI

Variable	Mean	STD	Skew	Q-1	Median	Q-3	Range
<i>NPL</i>	0.4657	1.0944	2.3824	0.0074	0.0361	0.1618	6.3223
<i>NPLNR</i>	-0.0288	0.1293	-8.3572	-0.0171	0.0000	0.0000	1.2898
<i>FS</i>	0.4369	1.0700	2.5039	0.0047	0.0342	0.1622	6.3603
<i>DBO</i>	3.5809	6.7347	1.9522	0.2040	0.4058	1.0036	24.4984
<i>PLA</i>	3.1440	6.0726	2.0695	0.1841	0.3560	1.0648	21.6361
<i>NPC</i>	0.0392	0.0754	2.1136	0.0019	0.0060	0.0194	0.3580
<i>EC</i>	0.0636	0.1283	2.7784	0.0038	0.0083	0.0303	0.6857
<i>CSC</i>	0.0634	0.1182	1.9443	0.0046	0.0080	0.0198	0.4517
<i>IC</i>	0.1093	0.2099	2.0500	0.0046	0.0098	0.0299	0.8061
<i>ER</i>	0.1272	0.2562	2.2680	0.0056	0.0122	0.0334	1.0604
<i>AGL</i>	0.1338	0.5025	2.9629	-0.0012	0.0067	0.0390	3.8991
<i>RPC</i>	0.0000	0.0000	-5.8344	0.0000	0.0000	0.0000	0.0000

Note. The TABLE depicts the descriptive summary statistics arithmetic mean (Mean), standard deviation (STD), skewness (Skew), 25%-Quantile (Q-1), median (Median), 75%-Quantile (Q-3) and spread (i.e., difference) between the maximum and the minimum values (Range) of the pension related covariates for the sub-sample INDOCI ($n = 118$). Quantiles are estimated in line with the median-unbiased definition recommended by Hyndman and Fan (1996). Skew is estimated by G_1 as recommended by Joanes and Gill (1998). All values are denoted in CHFbn (except for Skew).

The mean (median) value of *NPL* is estimated as CHF 0.47 (0.04) bn. More precisely, the values are CHFm 465.72 and CHFm 36.07 for the mean and median, respectively. Notably, both values are found to be significantly different from zero on a 1%-level or higher (both p -values < 0.01). Also, the shares of observations with $NPL < 0$, $NPL = 0$ and $NPL > 0$ are 10.17%, 0.00% and 89.83%, respectively. The distribution of *NPL* is right-skewed (Skew = 2.38). Overall, 12 (i.e., 10.17%) of all 118 observations included in INDOCI are attributable to firms accounting for a negative *NPL*, i.e., a net pension asset. The estimated absolute variation (Range) is CHF 6.32 bn. Lastly, the mean (median) value of *NPL* as percentage of *EQ* is estimated to be 8.49% (4.63%).

For *NPLNR*, the mean (median) value is found to be CHF -0.03 (0.00) bn. Specifically, the values are CHFm -28.79 and CHFm 0.00, respectively. Thus, on average, firms included in INDOCI disclosed a negative unrecognized net pension liability, i.e., an unrecognized net pension asset. Both, the mean and median value, are found to be statistically different from zero on a 1%-level or higher (both p -values < 0.01). Notably, the mean and median value of *NPLNR* are also found to be significantly smaller than the respective values of *NPL* (both p -values < 0.01). The distribution is skewed to the left (Skew = -8.36) and, apparently, is strongly influenced by negative outliers. For example, the minimum value of *NPLNR* of CHFbn -1.27 is attributable to the observation

of *Nestlé AG* (ISIN: CH0038863350) for 2006. At the time, the firm was a global leader in nutrition and health care employing 265,000 employees worldwide with $MKTCAP_{t+0.25}$, TA , EQ and $SALES$ of CHF 180.50 bn, CHF 101.81 bn, CHFbn 50.99 and CHFbn 98.46, respectively. The large negative $NPLNR$ was attributable to the excess of return of overfunded pension plans as well as contributions paid in excess of annual contributions that were not recognizable as plan assets at the time (see e.g., Nestlé AG, 2006). Overall, 55 (i.e., 46.61%) of all 118 observations included in INDOCI are attributable to firms accounting for a negative $NPLNR$, i.e., an unrecognized pension asset. The absolute variation (Range) is CHF 1.29 bn. Finally, the mean (median) value of $NPLNR$ as percentage of EQ is estimated to be -0.64% (0.00%).

The mean (median) value of FS is estimated as CHF 0.44 (0.03) bn. More precisely, the mean and median values correspond to CHFm 436.93 and CHFm 34.25, respectively. Notably, both values are found to be significantly different from zero on a 1%-level or higher (all p -values < 0.01). Further, the mean and median values of FS are found to be significantly smaller than the respective values of NPL (p -value = 0.02 and < 0.01). In contrast, the mean and median values of FS are significantly greater than the respective values of $NPLNR$ on a 1%-level or higher (both p -values < 0.01). The distribution of FS is right-skewed (Skew = 2.50) and shows an absolute variation (Range) of CHF 6.36 bn. Lastly, the mean (median) value of FS as percentage of EQ is estimated to be 7.85% (4.51%).

For the DBO , the mean (median) value is estimated to be CHF 3.58 (0.41) bn. Specifically, the values are CHFm 3,580.94 and CHFm 405.85, respectively. The distribution is skewed to the right (Skew = 1.95) with an absolute variation (Range) of CHF 24.50 bn. Finally, the mean (median) value of DBO as percentage of EQ is estimated to be 66.33% (48.29%).

The mean (median) value of PLA is CHF 3.14 (0.36) bn. More precisely, the mean and median values correspond to CHFm 3,144.01 and CHFm 356.00, respectively. Notably, the mean and median values of DBO are found to be significantly greater than the respective values of PLA on a 1%-level or higher (both p -values < 0.01). Also, the distribution of PLA is right-skewed (Skew = 2.07) with an absolute variation of CHF 21.64 bn. Lastly, the mean (median) value of PLA as percentage of EQ is estimated to be 58.48% (38.16%).

In terms of *flow measures* related to pensions, the estimated mean (median) value of NPC is CHF 0.04 (0.01) bn. Specifically, the values are CHFm 39.25 and CHFm 5.98 for the mean and median, respectively. Notably, both values are found to be significantly

different from zero on a 1%-level or higher (both p -values < 0.01). With an estimated skewness (Skew) of 2.11, the distribution of NPC is skewed to the right. The absolute variation (Range) in NPC is CHF 0.36 bn. Lastly, the mean (median) value of NPC as percentage of NI is estimated to be 48.63% (2.65%). Correspondingly, the mean (median) ratio of NPC and DIV is 8.09% (2.23%).

For EC , the mean (median) value is CHF 0.06 (0.01) bn. Specifically, the values are CHFm 63.55 and CHFm 8.26 for the mean and median, respectively. Notably, both values are found to be significantly different from zero on a 1%-level or higher (both p -values < 0.01). Also, the mean and median values of EC are found to be significantly different from the respective values of NPC (both p -values < 0.01). The distribution of EC is right-skewed (Skew = 2.78) with an absolute variation (Range) of CHF 0.69 bn. Finally, the mean (median) value of EC as percentage of NI is estimated to be 60.14% (4.39%). Correspondingly, the mean (median) ratio of EC and DIV is 11.55% (3.85%).

With respect to the components of NPC , the mean (median) value of CSC is found to be CHF 0.06 (0.01) bn. More precisely, the values are CHFm 63.39 and CHFm 7.99 for the mean and median, respectively. Notably, both values are found to be significantly different from zero on a 1%-level or higher (both p -values < 0.01). Furthermore, the distribution of CSC is skewed to the right (Skew = 1.94) with an absolute variation (Range) of CHF 0.45 bn. Lastly, the mean (median) value of CSC as percentage of NI is estimated to be 58.09% (3.99%). The corresponding mean (median) ratio of CSC and DIV is 11.31% (3.98%).

For IC , the mean (median) value is estimated as CHF 0.11 (0.01) bn. Specifically, the values are CHFm 109.34 and CHFm 9.75 for the mean and median, respectively. Notably, both values are found to be significantly different from zero on a 1%-level or higher (both p -values < 0.01). Moreover, the mean and median value of IC are found to be significantly greater than the respective values of CSC (both p -values < 0.01). Also, the distribution of IC is right-skewed (Skew = 2.05) with an absolute variation (Range) of CHF 0.81 bn. Finally, the mean (median) value of IC as percentage of NI is estimated to be 63.71% (5.54%). The corresponding mean (median) ratio of IC and DIV is 13.75% (4.97%).

The mean (median) value for ER is found to be CHF 0.13 (0.01) bn. More precisely, the values are CHFm 127.21 and CHFm 12.21 for the mean and median, respectively. Notably, both values are found to be significantly different from zero on a 1%-level or higher (both p -values < 0.01). Moreover, the mean and median value of ER are found to be significantly greater than the respective values of CSC and IC on a 1%-level or higher

(all p -values < 0.01). Also, the distribution of ER is skewed to the right (Skew = 2.27) with an absolute variation (Range) of CHF 1.06 bn. Lastly, the mean (median) value of ER as percentage of NI is estimated to be 70.44% (6.3%). The corresponding mean (median) ratio of ER and DIV is 15.15% (6.11%).

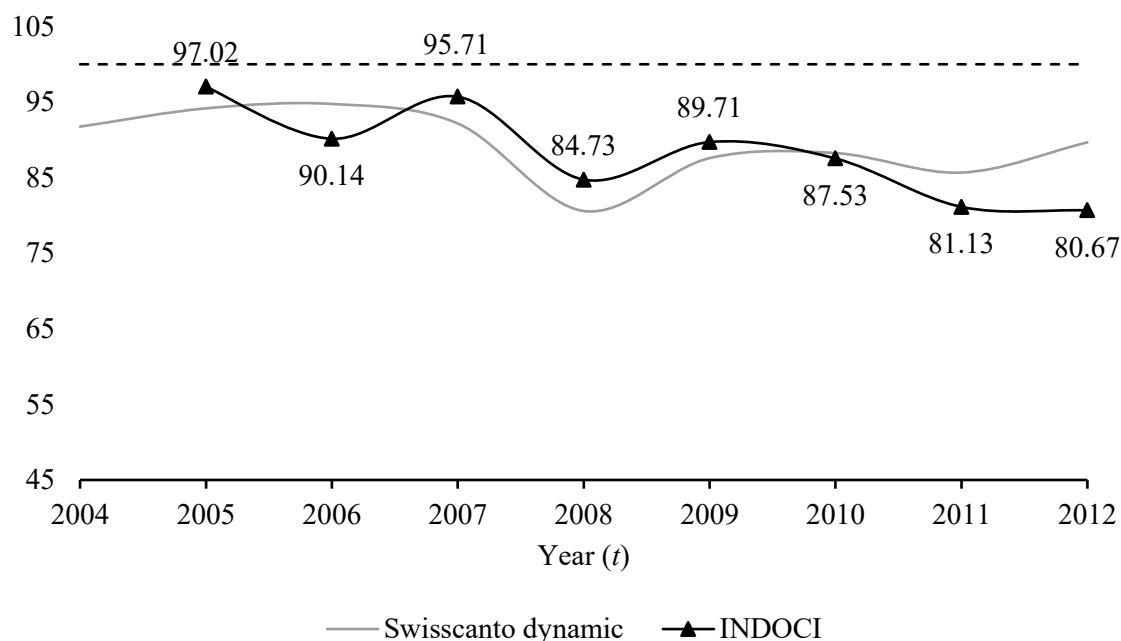
For AGL , the mean (median) value is CHF 0.13 (0.01) bn. Specifically, the values are CHFm 133.76 and CHFm 6.69 for the mean and median, respectively. Notably, both values of AGL are found to be significantly different from zero on a 1%-level or higher (both p -values < 0.01). Furthermore, the median value of AGL is found to be significantly smaller than the respective value of CSC on a 10%-level (p -value = 0.09). In contrast, this does not hold for the mean values of AGL and CSC (p -value = 0.1). Moreover, both mean and median value of AGL are not found to be significantly different from the respective values of IC and ER on a 10%-level or higher (all p -values between 0.54 and 87). The distribution of AGL is right-skewed (Skew = 2.96) with an absolute variation (Range) of CHF 3.90 bn. Finally, the mean (median) value of AGL as percentage of EQ is estimated to be 2.42% (0.74%).

Finally, the mean (median) value for RPC is CHF 0.00 (0.00) bn. More precisely, the values are CHFm -6.27 and CHFm 0.00 for the mean and median, respectively. Notably, on average, RPC is negative, thus a residual pension income. Both mean and median values are significantly different from zero on a 1%-level or higher (both p -values < 0.01). Moreover, the mean and median value of RPC are significantly smaller than the respective values of CSC , IC , ER and AGL on a 1%-level or higher (all p -values < 0.01). Furthermore, the distribution of RPC is skewed to the left (Skew = -5.83) with an absolute variation (Range) of CHF 0.00 bn. As a final note, the mean (median) value of RPC as percentage of NI is estimated to be -2.73% (0.00%). The corresponding mean (median) ratio of RPC and DIV is -1.81% (0.00%).

6.3.3.5 Time-Series Properties

Analogous to FIGURE 6.4 (see page 299) for $INDCORR$ and $FSCORR$, FIGURE 6.9 depicts the annual average funding ratios for $INDOCI$. In line with $INDCORR$ and $FSCORR$, between 2005 and 2012, the funding ratios of $INDOCI$ had been moving closely in line with the dynamized funding ratios of Swiss pension plans surveyed by Swisscanto. Furthermore, the annual average funding ratios of $INDOCI$, generally, had also been moving on higher levels than the respective ratios for the Fortune 1000 and

FIGURE

6.9 Mean Funding Ratios of INDOCI

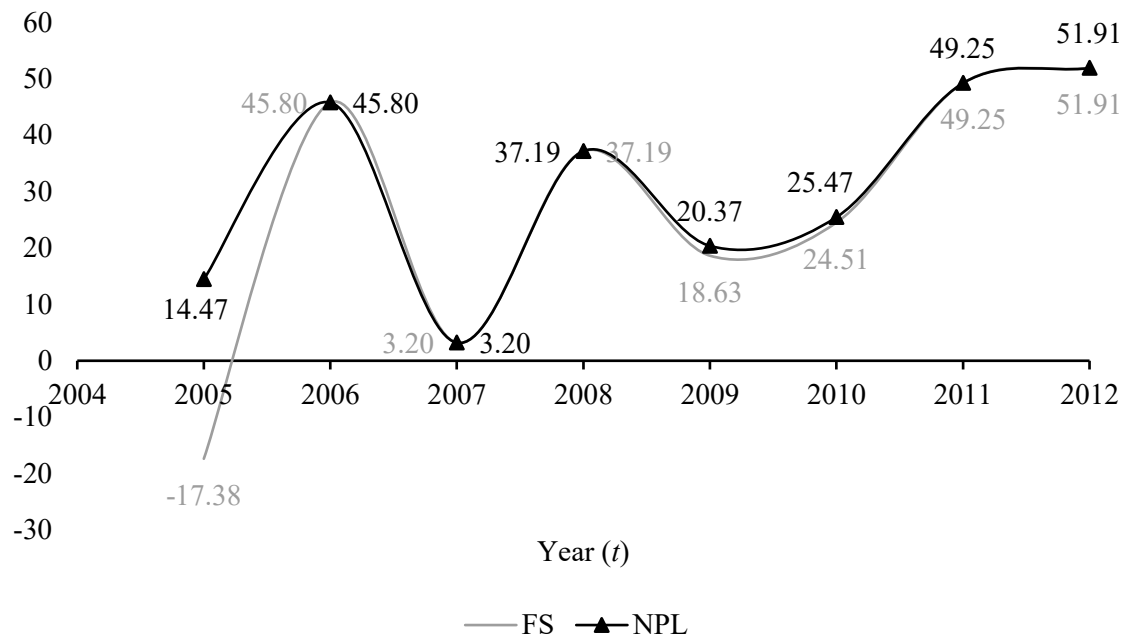
Note. For the sample period of 2004 to 2012, the FIGURE depicts annual average funding ratios (in %). Data of the Swisscanto survey is shown in grey and is identical to the data shown in FIGURE 2.7 (page 39). As described in sub-section 2.2.5, this data is *dynamized* by multiplication with the factor 0.83, which corresponds to a 20% increase in pension liabilities (*PL*). Data for INDOCI is shown as marked black line. Funding ratios are defined as *PLA* divided by the *DBO*. For INDOCI, annual averages are based on $n = 5$ (2005), 9 (2006), 11 (2007), 17 (2008), 18 (2009), 19 (2010), 21 (2011) and 18 (2012) observations, respectively. The dashed line indicates a funding ratio of 100%.

DAX indices (see FIGURE 2.7 on page 39).³⁴⁰ As for INDCORR and FSCORR, funding ratios of INDOCI had also been clearly affected by the turmoil on global financial markets due to the subprime and the euro-debt crisis in 2008 and 2011, respectively. Notably, the maximum annual average funding ratio for the period of 2009 to 2012 is estimated to be 89.71% in 2009. However, this value is still less than the minimum annual average funding ratio of 90.14% in 2006 estimated for the period of 2005 to 2007. Overall, the funding ratios of INDOCI oscillate between 80.67% (in 2012) and 97.02% (in 2005).

FIGURE 6.10 depicts the annual median recognized net pension (asset)/liability (*NPL*) as well as the annual median funding status (*FS*) disclosed by the firms included

³⁴⁰ As for INDCORR and FSCORR, this is taken as confirmatory evidence that the data adjustments outlined in paragraph 6.1.3.2, by and large, correctly account for the Swiss pension plans of the sample firms.

FIGURE

6.10 Median FS and NPL of INDOCI

Note. For the sample period of 2004 to 2012, the FIGURE depicts the annual median funding status (*FS*, grey line) as well as the annual median net pension (asset)/liability (*NPL*) recognized in line with the OCI-Method of IAS 19 (2004; marked black line) as defined in TABLE 6.4 (see page 237). All values are denoted in CHFm. For INDOCI, annual medians are based on $n = 5$ (2005), 9 (2006), 11 (2007), 17 (2008), 18 (2009), 19 (2010), 21 (2011) and 18 (2012) observations, respectively.

in INDOCI across the sample period of 2004 to 2012. Overall, the median *NPL* and the median *FS* oscillate between CHFm 3.20 in 2007 and CHFm 51.91 in 2012 as well as between CHFm -17.38 in 2005 and CHFm 51.91 in 2012, respectively. It must be noted that the relatively high variation of the median values observed in the period between 2005 and 2007 may also be driven by the relatively small number of observations ($n = 5, 9$ and 11) included for these three periods, respectively. Furthermore, with the exception of 2005, the median *NPL* and the median *FS* observed for INDOCI are constantly above the corresponding values observed for the sub-samples INDCORR and FSCORR, respectively. Most notably, with the exception of 2005, the annual median values for *NPL* and *FS* of the observations included in INDOCI are either very closely aligned or even identical throughout the sample period. This clearly illustrates the application of the OCI-Method in line with IAS 19 (2004), whereas all actuarial gains and losses (*AGL*) are recognized directly in other comprehensive income (OCI) and thus, the recognized net pension (asset)/liability (*NPL*), by and large, fully accounts for the funding status (*FS*) of respective pension plans. As outlined in paragraph 3.2.6.5, differences between

the recognized *NPL* and *FS* of firms applying the OCI-Method may be due to cumulative unrecognized net past service cost (*PSC*).

FIGURE 6.11 illustrates the annual median values for the recognized net pension (income)/cost (*NPC*) as well as the regulatory employer contributions (*EC*) that are transferred to the respective Swiss pension plans of the firms included in INDOCI. Overall, the median *NPC* and the median *EC* oscillate between CHFm 3.88 in 2008 and CHFm 9.36 in 2006 as well as between CHFm 6.13 in 2009 and CHFm 20.67 in 2006, respectively. Notably, for six out of the eight sample years, the median value of *NPC* is found to be below the respective value of *EC*. Compared to the results found for INDCORR and FSCORR (see paragraph 6.3.2.5), apparently, this finding is even more pronounced for the sub-sample INDOCI. This is in line with the fact that firms applying the OCI-Method recognize all actuarial gains and losses (*AGL*) directly in equity rather than in *NPC*.

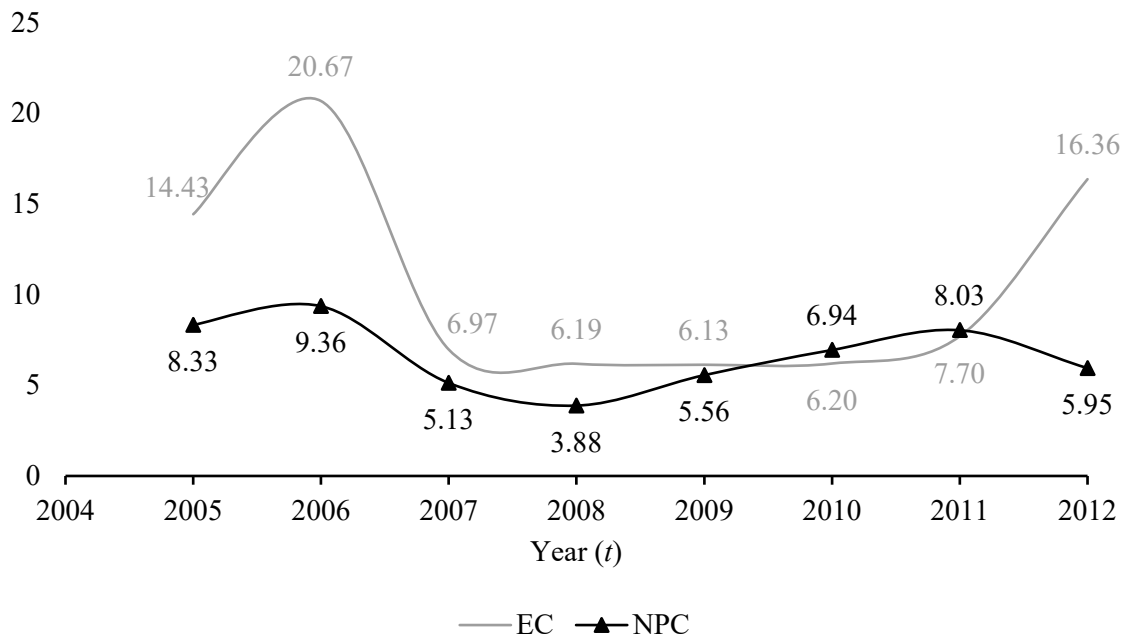
6.3.3.6 Bivariate Correlations

Analogous to TABLE 6.15 for INDCORR and TABLE 6.16 for FSCORR, TABLE 6.21 depicts the bivariate Pearson and Spearman correlation coefficients for INDOCI in the lower and upper diagonal, respectively. The mean (median) Pearson and Spearman correlations among covariates are found to be 0.58 (0.80) and 0.51 (0.71), respectively. Overall, Pearson and Spearman correlations of covariates oscillate between -0.47 and 0.99 and -0.49 and 0.99, respectively. Only six (i.e., 3.16%) and three (i.e., 1.58%) of all of these 190 estimated Pearson and Spearman correlations are not found to be significantly different from zero on a 10%-level or higher, respectively. Notably, all of the six insignificant Pearson correlations involve *NPLNR*. Specifically, the Pearson coefficients of *NPLNR* with *DIV*, *DIVbNPC*, *DIVbEC*, *FS*, *AGL* and *RPC* are not found to be significantly different from zero on a 10%-level or higher. In turn, all insignificant Spearman correlations involve *AGL*. Concretely, Spearman coefficients of *AGL* with *NPLNR*, *NPC* as well as with *RPC* are insignificantly different from zero.

For the response variable $MKTCAP_{t+0.25}$, the mean (median) Pearson and Spearman correlations are found to be 0.72 (0.92) and 0.66 (0.76), respectively. Overall, Pearson and Spearman correlations oscillate between -0.40 and 0.96 and -0.43 and 0.96. Notably, all bivariate correlations involving $MKTCAP_{t+0.25}$ are found to be significantly different from zero on a 1%-level or higher. Only nine of all 20 estimated Pearson correlations are below 0.91. Specifically, apart from *NI*, *NIbNPC* and *NIbEC*, all of these are pension variables (i.e., *NPL*, *NPLNR*, *FS*, *NPC*, *AGL* and *RPC*). Further, only two of all Pearson

FIGURE

6.11 Median EC and NPC of INDOCI



Note. For the sample period of 2004 to 2012, the FIGURE depicts the annual median employer contributions (EC) transferred to the Swiss pension plan (grey line) as well as the annual median net pension (income)/cost (NPC) recognized in line with the OCI-Method of IAS 19 (2004; marked black line) as defined in TABLE 6.4 (see page 237). All values are denoted in CHFm. For INDOCI, annual medians are based on $n = 5$ (2005), 9 (2006), 11 (2007), 17 (2008), 18 (2009), 19 (2010), 21 (2011) and 18 (2012) observations, respectively.

correlations are found to be negative (i.e., < 0). In contrast to INDCORR and FSCORR, these do not include *NPL*. In contrast, for INDOCI, the Pearson correlations of $MKTCAP_{t+0.25}$ with *NPLNR* and *RPC* are estimated to be -0.32 and -0.40, respectively. In terms of Spearman correlations, seven of 20 coefficients, none of which is a pension variable, are equal or greater to 0.90. As for Pearson correlations, the only two negative Spearman correlations with $MKTCAP_{t+0.25}$ are found for *NPLNR* (i.e., -0.43) and *RPC* (-0.30).³⁴¹

6.3.3.7 Summary and Conclusion

For the industry firms included in the final sample that apply the OCI-Method in line with IAS 19 (2004, i.e., INDCORR), the annual average funding ratios oscillate between

³⁴¹ Note, all results for $MKTCAP_{t+0.25}$ are qualitatively unaltered for $MKTCAP_t$ and $MKTCAP_{t+0.5}$. These are available from the author upon request.

TABLE
6.21 Correlation-Matrix - INDOCI

	<i>MKTCAP_{t+0.25}</i>	<i>EQ</i>	<i>EQbNPL</i>	<i>NI</i>	<i>NIbNPC</i>	<i>NIbEC</i>	<i>DIV</i>	<i>DIVbNPC</i>	<i>DIVbEC</i>	<i>NPL</i>	<i>NPLNR</i>
<i>MKTCAP_{t+0.25}</i>											
<i>EQ</i>	0.93***		0.96***	0.90***	0.90***	0.90***	0.88***	0.90***	0.90***	0.61***	-0.43***
<i>EQbNPL</i>	0.93***	0.99***		0.89***	0.90***	0.90***	0.86***	0.89***	0.89***	0.65***	-0.45***
<i>NI</i>	0.79***	0.84***	0.85***		0.90***	0.89***	0.86***	0.89***	0.89***	0.67***	-0.45***
<i>NIbNPC</i>	0.80***	0.85***	0.85***	0.99***		0.99***	0.92***	0.93***	0.93***	0.56***	-0.43***
<i>NIbEC</i>	0.80***	0.85***	0.85***	0.99***	0.99***		0.92***	0.93***	0.93***	0.57***	-0.44***
<i>DIV</i>	0.92***	0.91***	0.91***	0.80***	0.80***	0.81***		0.99***	0.99***	0.53***	-0.34***
<i>DIVbNPC</i>	0.92***	0.91***	0.91***	0.80***	0.80***	0.81***	0.99***		0.99***	0.56***	-0.38***
<i>DIVbEC</i>	0.92***	0.91***	0.91***	0.80***	0.80***	0.81***	0.99***	0.99***		0.56***	-0.37***
<i>NPL</i>	0.59***	0.61***	0.65***	0.61***	0.61***	0.62***	0.64***	0.65***	0.65***		-0.39***
<i>NPLNR</i>	-0.32***	-0.33***	-0.33***	-0.25***	-0.25***	-0.25***	-0.05	-0.06	-0.06	-0.25***	
<i>FS</i>	0.57***	0.59***	0.62***	0.60***	0.60***	0.60***	0.65***	0.66***	0.66***	0.99***	-0.13
<i>DBO</i>	0.96***	0.95***	0.96***	0.84***	0.84***	0.84***	0.91***	0.91***	0.91***	0.69***	-0.34***
<i>PLA</i>	0.96***	0.95***	0.95***	0.82***	0.83***	0.83***	0.89***	0.90***	0.90***	0.59***	-0.36***
<i>NPC</i>	0.72***	0.75***	0.76***	0.72***	0.73***	0.72***	0.64***	0.65***	0.64***	0.62***	-0.38***
<i>EC</i>	0.91***	0.83***	0.84***	0.82***	0.82***	0.83***	0.85***	0.85***	0.86***	0.70***	-0.35***
<i>CSC</i>	0.94***	0.94***	0.94***	0.86***	0.87***	0.87***	0.88***	0.88***	0.88***	0.66***	-0.36***
<i>IC</i>	0.94***	0.94***	0.94***	0.90***	0.90***	0.90***	0.90***	0.90***	0.90***	0.68***	-0.36***
<i>ER</i>	0.96***	0.94***	0.95***	0.88***	0.89***	0.89***	0.91***	0.91***	0.91***	0.65***	-0.34***
<i>AGL</i>	0.47***	0.48***	0.50***	0.41***	0.41***	0.41***	0.61***	0.61***	0.61***	0.67***	0.14
<i>RPC</i>	-0.40***	-0.43***	-0.43***	-0.42***	-0.42***	-0.42***	-0.47***	-0.46***	-0.47***	-0.37***	0.08

(continued on next page)

TABLE (continued)

	FS	DBO	PLA	NPC	EC	CSC	IC	ER	AGL	RPC
<i>MKTCAP_{t+0.25}</i>	0.56***	0.76***	0.76***	0.71***	0.79***	0.75***	0.76***	0.76***	0.26***	-0.30***
<i>EQ</i>	0.61***	0.80***	0.79***	0.74***	0.80***	0.78***	0.80***	0.79***	0.29***	-0.33***
<i>EQbNPL</i>	0.63***	0.81***	0.80***	0.75***	0.81***	0.79***	0.81***	0.80***	0.30***	-0.34***
<i>NI</i>	0.52***	0.72***	0.73***	0.65***	0.78***	0.73***	0.73***	0.74***	0.27***	-0.29***
<i>NIbNPC</i>	0.53***	0.74***	0.74***	0.68***	0.79***	0.74***	0.74***	0.75***	0.27***	-0.28***
<i>NIbEC</i>	0.53***	0.74***	0.75***	0.67***	0.80***	0.75***	0.75***	0.76***	0.28***	-0.29***
<i>DIV</i>	0.48***	0.67***	0.68***	0.58***	0.72***	0.67***	0.67***	0.70***	0.36***	-0.27***
<i>DIVbNPC</i>	0.51***	0.72***	0.72***	0.64***	0.76***	0.72***	0.72***	0.74***	0.35***	-0.28***
<i>DIVbEC</i>	0.52***	0.72***	0.73***	0.63***	0.77***	0.73***	0.72***	0.75***	0.36***	-0.29***
<i>NPL</i>	0.98***	0.63***	0.56***	0.60***	0.64***	0.59***	0.62***	0.59***	0.45***	-0.38***
<i>NPLNR</i>	-0.31***	-0.48***	-0.48***	-0.44***	-0.47***	-0.49***	-0.47***	-0.45***	-0.07	0.37***
<i>FS</i>	0.67***	0.60***	0.53***	0.57***	0.60***	0.55***	0.58***	0.55***	0.46***	-0.36***
<i>DBO</i>	0.56***	0.99***	0.99***	0.82***	0.92***	0.95***	0.98***	0.97***	0.30***	-0.38***
<i>PLA</i>	0.59***	0.83***	0.82***	0.81***	0.93***	0.95***	0.98***	0.98***	0.24***	-0.37***
<i>NPC</i>	0.67***	0.90***	0.88***	0.74***	0.88***	0.85***	0.82***	0.80***	0.14	-0.17*
<i>EC</i>	0.64***	0.99***	0.98***	0.85***	0.92***	0.94***	0.93***	0.93***	0.30***	-0.37***
<i>CSC</i>	0.65***	0.97***	0.96***	0.83***	0.92***	0.98***	0.95***	0.96***	0.26***	-0.39***
<i>IC</i>	0.62***	0.97***	0.97***	0.77***	0.91***	0.98***	0.99***	0.99***	0.31***	-0.38***
<i>ER</i>	0.70***	0.52***	0.45***	0.30***	0.48***	0.49***	0.52***	0.55***	0.32***	-0.36***
<i>AGL</i>	-0.37***	-0.45***	-0.44***	-0.15*	-0.40***	-0.44***	-0.44***	-0.43***	-0.20**	-0.09

Note. The TABLE depicts bivariate correlations for the response variable $MKTCAP_{t+0.25}$ and all covariates defined for the sub-sample INDOCI ($n = 118$). Pearson and Spearman correlation coefficients are shown in the lower and upper diagonal, respectively. For notational reasons, figures are rounded to two decimals. *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

80.67% in 2012 and 97.02% in 2005. Specifically, across the sample period of 2004 to 2012, the mean (median) net pension (asset)/liability (*NPL*) recognized on the balance-sheet and the mean (median) funding status (*FS*) are found to be CHFm 465.72 (36.07) and 436.93 (34.25), respectively. Notably, in only three out of the eight sample years analyzed for INDOCI is the annual median funding status (*FS*) of the Swiss pension plans accounted for by these firms found to be different from the annual median recognized *NPL*. Furthermore, the mean (median) unrecognized net pension (asset)/liability (*NPLNR*) is found to be CHFm -28.79 (0.00). Furthermore, the mean (median) defined benefit obligation (*DBO*) as well as the mean (median) plan assets (*PLA*) of INDOCI are estimated to be CHFm 3,580.94 (405.85) and CHFm 3,144.01 (356.00), respectively. Lastly, the mean (median) values of the net pension (income)/cost (*NPC*) as well as the disclosed employer contributions (*EC*) are found to be CHFm 39.25 (5.98) and 63.55 (8.26), respectively.

Overall, as in the case of the sub-samples INDCORR and FSCORR discussed in sub-section 6.3.2, the results of the descriptive analysis for INDOCI are also in line with the Swiss institutional setting of highly funded pension plans. Notably, annual average funding ratios of INDOCI are closely aligned with the Swiss pension plans regularly surveyed by Swisscanto. Moreover, these funding ratios are generally also higher than the ones estimated for large companies internationally during the same period. Most notably and as expected, in contrast to firms applying the Corridor-Method, for the industry firms analyzed that apply the OCI-method the difference between the annual median recognized *NPL* and the funding status disclosed (*FS*) is almost negligible. Accordingly, since those firms must recognize actuarial gains and losses (*AGL*) immediately and directly in equity, these firms disclose a mean (median) unrecognized net pension (asset)/liability (*NPLNR*) that is relatively small compared to the mean (median) values of the recognized *NPL* as well as the funding status (*FS*). Also, the shares of observations with $NPL < 0$, $NPL = 0$ and $NPL > 0$ are 10.17%, 0.00% and 89.83%, respectively. Furthermore, the recognized net pension (income)/cost (*NPC*) as well as the employer contributions paid (*EC*) by these firms are not very closely aligned across the sample period of 2005 to 2012. Specifically, in six out of eight sample years (i.e., 2005, 2006, 2007, 2008, 2009 and 2012) are the annual median values for *NPC* found to be below the respective values for *EC*. Thus, the descriptive results summarized above reveal that the analyzed industry firms applying the OCI-Method, at least with respect to the valuations in line with IAS 19 (2004), more or less fully recognize the funding status (*FS*)

of their Swiss pension plans. In contrast, the net pension (income)/cost (*NPC*) recognized in profit or loss generally underestimates the employer contributions paid (*EC*) to the respective Swiss pension plans.

Analogous to INDCORR and FSCORR, the Swiss institutional setting may also be illustrated by the fact that for INDOCI the mean values of *NPL*, *FS* and *NPLNR* as percentage of total book value of equity (*EQ*) oscillate between -0.64% (*NPLNR*) and 8.49% (*NPL*). In contrast, for *DBO* and *PLA*, the corresponding values are found to be 66.33% and 58.48%, respectively. Furthermore, the mean values of *NPC* and *EC* as percentage of total book value of net income/(loss) (*NI*) as well as total book value of dividends proposed (*DIV*) oscillate between 8.09% (*NPC % DIV*) and 60.14% (*EC % NI*), respectively. For the median values, the findings are qualitatively unaltered although on a generally lower level compared to the mean values outlined above.

In line with the findings for INDCORR and FSCORR, all pension covariates analyzed for INDOCI are found to be significantly associated (Pearson and Spearman correlations) with the response variable of market capitalization three months after the fiscal-year end ($MKTCAP_{t+0.25}$) on a 1%-level or higher. Notably, in terms of Pearson correlations, coefficients for the plan assets (*PLA*, +) and the expected return (*ER*, +) as well as the residual net pension (income)/cost (*RPC*, -) are found to have the expected signs.³⁴² The same also holds for the respective Spearman correlations. Notably, in contrast to the sub-samples INDCORR and FSCORR, for INDOCI the correlation coefficients estimated for the net pension (asset)/liability (*NPL*, +/+) are not found to have the expected negative signs. For all other pension covariates, although significantly correlated with $MKTCAP_{t+0.25}$, signs are neither found to be in line with expectations. As mentioned above, these results are qualitatively unaltered for the response variables of market capitalization at fiscal-year end ($MKTCAP_t$) as well as six month after the end of the financial year ($MKTCAP_{t+0.5}$).

By and large, the interpretation of the results of the bivariate correlation analysis for INDOCI is analogous to INDCORR and FSCORR. Specifically, hypothesis *H(1)* (*Value-Relevance of Swiss Pension Plans*) is confirmed due to the high degree of correlation between pension covariates and $MKTCAP_{t+0.25}$. Thence, also for the industry firms analyzed that account for their Swiss pension plans in line with the OCI-Method of IAS 19 (2004), the pension information reported is, at least partially, found to be decision-useful to investors (*RQ(1)*). Also, research hypotheses *H(2a)*-*H(2d)* (*Value-*

³⁴² The expected signs for all covariates are outlined in TABLE 6.5.

Relevance of NPL, NPC, EC and Disclosures) are confirmed analogously to the sub-samples of firms applying the Corridor-Method. Concretely, the recognized net pension (asset)/liability (*NPL*, +/+), the recognized net pension (income)/cost (*NPC*, +/+), the employer contributions paid (*EC*, +/+) as well as the unrecognized net pension (asset)/liability (*NPLNR* (-/-)) disclosed only are significantly associated with $MKTCAP_{t+0.25}$. However, neither of these correlation coefficients is found to have the expected sign. Notably, this is in contrast to INDCORR and FSCORR, where for the recognized *NPL* (+/-) as well as for the disclosed *NPLNR* (+/+) coefficients are partly found to have the expected signs. Nevertheless, for the Pearson and Spearman correlations of *PLA* (+/+), *ER* (+/+) and *RPC* (-/-) the estimated signs are in line with expectations. Thence, in contrast to the findings for INDCORR and FSCORR, results for INDOCI may be somewhat more equivocal with regard to research question two (*RQ(2)*) of whether investors adopt an Asset-Liability (ALA) or a Revenue-Expense (REA) view to the accounting of Swiss pension plans.

6.3.4 INDFER and FSFER

6.3.4.1 Data Structure

The sub-sample INDFER consists of $n = 106$ firm-year observations and, as is the case with respect to the IFRS sub-samples discussed in the sub-sections 6.3.2 and 6.3.3, has the structure of an unbalanced panel data set. Concretely, the sub-sample is based on pooled observations on $I = 29$ firms across $T = 8$ years (2005 to 2012). Thence, the average number of observations per firm i is four, oscillating between one and nine observations per firm. The coefficient of variation v of the number of observations per firm is estimated as 0.57. Furthermore, the lower half of firms accounts for about 28.30% of all 106 observations. Thus, the upper half of firms accounts for about 71.70% of all observations in the sub-sample. Correspondingly, the average number of observations per year t is 13, oscillating between a minimum of 4 (2005) and a maximum of 24 (2012). For the number of observations per year, v is estimated as 0.56. Hence, in contrast to the IFRS sub-samples discussed thus far, the sub-sample INDFER is almost equally balanced in terms of observations per firm (i.e., along the firm dimension) and in terms of observations per year (i.e., along the time dimension).

The sub-sample FSFER consists of $n = 75$ firm-year observations based on $I = 15$ firms across $T = 8$ years (2005 to 2012). Thence, the average number of observations

per firm i is five, oscillating between one and seven observations per firm. The coefficient of variation v of the number of observations per firm is estimated as 0.44. Overall, the lower half of firms accounts for about 29.33% of all 75 observations. Thus, the upper half of firms accounts for about 70.67% of all observations in the sub-sample. Correspondingly, the average number of observations per year t is nine, oscillating between a minimum of one (2005) and a maximum of 13 (2012). For the number of observations per year, v is estimated as 0.40. Thus, as is the case for INDFER, also FSFER is almost equally balanced along the firm and time dimension. Furthermore, FSFER is also almost equally balanced compared to INDFER with regard to the number of observations per firm. Whereas the lower half of firms accounts for 28.30% of total observations of INDFER, this share is almost identical in the case of FSFER (i.e., 29.33%).

6.3.4.2 Supersectors

TABLE 6.22 depicts the distribution of firm-year observations of INDFER across the different supersectors defined in line with ICB (2015). The TABLE is sorted in ascending order of each supersectors' share of total observations. Notably, the two supersectors *Industrial Goods & Services* (ICB: 2700) and *Food & Beverage* (ICB: 3500) account for about 59.43% of all observations included in INDFER. About 79.54% of the observations attributable to firms classified as *Industrial Goods & Services* are distributed across the subsectors *Industrial Machinery* (ICB: 2757, 50.00%), *Containers & Packaging* (ICB: 2723, 18.18%) and *Business Support Services* (ICB: 2791, 11.36%). For example, observations for *Industrial Machinery* include observations on *Conzzeta AG* (ISIN: CH0244017502), at the time, a widely diversified group operative in fields such as machinery and systems engineering, foam materials, sporting goods and real estate (see e.g., Conzzeta AG, 2012, p. 2). Further, all observations classified as *Containers & Packaging* stem from *Vetropack Holding AG* (ISIN: CH0006227612). At the time, the company was “[...] one of Europe’s leading manufacturers of glass packaging for the food and beverage industry [...]” (Vetropack Holding AG, 2012, p. 26). Lastly, the observations for *Business Support Services* are attributable to *MCH Group AG* (ISIN: CH0039542854), at the time, “[...] a leading international group of live-marketing companies with a comprehensive services network spanning the entire exhibition and event market.” (MCH Group AG, 2012, p. 5). With respect to observations attributable to firms classified as *Food & Beverage* firms, 100.00% of all observations stem from the *Food Products* (ICB: 3577) subsector. For example, this includes observations on *Emmi AG* (ISIN: CH0012829898). At the time, the firm was “[...] the largest Swiss milk pro-

TABLE
6.22 Supersectors of INDFER

Supersector	ICB	Firm-Years	%-Total
<i>Chemicals</i>	1300	2	1.89
<i>Media</i>	5500	2	1.89
<i>Retail</i>	5300	4	3.77
<i>Personal & Household Goods</i>	3700	6	5.66
<i>Health Care</i>	4500	6	5.66
<i>Basic Resources</i>	1700	7	6.60
<i>Travel & Leisure</i>	5700	7	6.60
<i>Construction & Materials</i>	2300	9	8.49
<i>Food & Beverage</i>	3500	19	17.92
<i>Industrials Goods & Services</i>	2700	44	41.51
		<i>n</i> = 106	<i>100.00</i>

Note. The TABLE depicts the supersector composition of the sub-sample INDFER. Classification is based on ICB (2015). Differences may be due to rounding.

cessor and one of the most innovative premium dairies in Europe.” (Emmi AG, 2012, p. 2). Apart from *Industrial Goods & Services* as well as *Food & Beverage*, all other supersectors remain below 10% of total observations of INDFER. As illustrated in TABLE 6.22, this includes eight other supersectors ranging from *Construction & Materials* (ICB: 2300) to *Chemicals* (ICB: 1300).

In line with TABLE 6.22, TABLE 6.23 illustrates the distribution of the 75 observations included in FSFER across three different supersectors. Notably, 61.33% of all observations are attributable to *Banks* (ICB: 8300). It is important to note, 37 (i.e., 80.44%) of these observations stem from banks that are partly state-owned by Swiss Cantons (so called *Cantonal Banks*). Thence, for these banks, part of their liabilities are state-guaranteed (see e.g., St.Galler Kantonalbank AG, 2012, p. 5). Moreover, all banks included in FSFER are obliged to report financial information in accordance with the Swiss *Ordinance on Banks and Savings Banks*, as well as the financial reporting guidelines stipulated by the *Swiss Financial Market Supervisory Authority* (FINMA). In parts, these rules are based on Swiss GAAP FER (FINMA, 2008). Importantly, all the banks included in the sub-sample account for their Swiss pension plans in accordance with ARR 16 (2005), as discussed in section 3.3. Nevertheless, for these banks, material parts of the financial reporting may not be in line with Swiss GAAP FER. Overall, it must be noted, the regulatory peculiarities of the banks included in FSFER, such as e.g., the state-guarantees of the Cantonal Banks, as well as the different accounting rules applied

TABLE
6.23 Supersectors of FSFER

Supersector	ICB	Firm-Years	%-Total
<i>Insurance</i>	8500	7	9.33
<i>Financial Services</i>	8700	22	29.33
<i>Banks</i>	8300	46	61.33
<i>n</i> = 75			100.00

Note. The TABLE depicts the supersector composition of the sub-sample FSFER. Classification is based on ICB (2015). Differences may be due to rounding.

potentially impair any comparability of results between FSFER and FSCORR and even more so between FSFER and the industry sub-samples.

Apart from banks, 22 (i.e., 29.33%) of the observations included in FSFER are attributable to firms classified as *Financial Services* (ICB: 8700) firms. 36.36% of these observations stem from the *Real Estate Holding & Development* (ICB: 8733) subsector. Specifically, all but one observation attributable to this subsector is based on *Warteck Invest AG* (ISIN: CH0002619481). At the time, the firm developed and managed a real estate portfolio comprising of 40 different estates in eight different cantons of Switzerland (see e.g., Warteck Invest AG, 2012, p. 6). The rest of the observations included in *Financial Services* is almost evenly distributed across the three subsectors *Specialty Finance* (ICB: 8775, 22.73%), *Asset Managers* (ICB: 8771, 22.73%) and *Investment Services* (ICB: 8777, 18.18%). Finally, 7 (i.e., 9.33%) of all observations in FSFER are attributable to *Insurance* (ICB: 8500) firms. Concretely, all of these observations belong to *Vaudoise Assurances Holding SA* (ISIN: CH0021545667). As a mid-sized *Full Line Insurance* (ICB: 8532) firm, at the time, the company offered all sorts of private and pension insurance solutions to more than 350,000 clients throughout Switzerland (see e.g., Vaudoise Assurances Holding SA, 2012, p. 10).

6.3.4.3 Response Variables and Non-Pension Covariates

In line with TABLE 6.13 for INDCORR and FSCORR as well as TABLE 6.19 for INDOCI, TABLE 6.24 depicts descriptive summary statistics of all response variables, non-pension related covariates as well as *TA*, *SALES* and *EMP* for INDFER (Panel A, *n* = 106) and FSFER (Panel B, *n* = 75), respectively. With the exception of the values for *EMP* as well as the values for skewness (Skew), all values depicted in TABLE 6.24 are

TABLE

6.24 Descriptive Statistics of Non-Pension Variables for INDFER and FSFER

Variable	Mean	STD	Skew	Q-1	Median	Q-3	Range
Panel A: INDFER ($n = 106$)							
$MKTCAP_t$	0.3285***	0.2981	1.3040	0.1005	0.2165***	0.4916	1.2298
$MKTCAP_{t+0.25}$	0.3544***	0.3175	1.1992	0.1116	0.2415***	0.4778	1.4273
$MKTCAP_{t+0.5}$	0.3576***	0.3155	1.1852	0.1093	0.2469***	0.5473	1.4719
EQ	0.2682***	0.2604	1.3148	0.0698	0.1567***	0.3528	0.9741
$EQbNPL$	0.2684***	0.2606	1.3124	0.0698	0.1567***	0.3553	0.9741
$EQbFS$	0.2653***	0.2607	1.3300	0.0696	0.1523***	0.3546	0.9742
NI	0.0225***	0.0306	0.5671	0.0036	0.0169***	0.0398	0.2345
$NIbNPC$	0.0260***	0.0332	0.6749	0.0052	0.0183***	0.0416	0.2411
$NIbEC$	0.0261***	0.0333	0.6795	0.0052	0.0183***	0.0416	0.2416
DIV	0.0060***	0.0077	2.1242	0.0003	0.0032***	0.0087	0.0401
$DIVbNPC$	0.0070***	0.0082	1.8442	0.0009	0.0039***	0.0095	0.0406
$DIVbEC$	0.0071***	0.0082	1.8459	0.0009	0.0040***	0.0095	0.0406
TA	0.5418***	0.4966	1.3271	0.2104	0.3379***	0.7744	2.2894
$SALES$	0.5744	0.6746	2.1053	0.1267	0.3280	0.6542	2.9801
EMP	1,649***	1,419	0.8319	481	972***	3,001	6,668
Panel B: FSFER ($n = 75$)							
$MKTCAP_t$	1.4187***	1.2882	0.7365	0.2496	1.2455***	2.2641	5.0025
$MKTCAP_{t+0.25}$	1.4687***	1.3473	0.7293	0.2529	1.2434***	2.3380	4.9166
$MKTCAP_{t+0.5}$	1.4343***	1.3138	0.7907	0.2545	1.1488***	2.2800	5.3819
EQ	1.0947***	0.9498	0.7461	0.2102	0.8515***	1.8021	3.2856
$EQbNPL$	1.0947***	0.9498	0.7461	0.2102	0.8515***	1.8021	3.2856
$EQbFS$	1.0950***	0.9567	0.7682	0.2081	0.8515***	1.8017	3.3558
NI	0.0962***	0.1000	1.4292	0.0216	0.0613***	0.1454	0.4879
$NIbNPC$	0.1032***	0.1062	1.4267	0.0233	0.0649***	0.1538	0.5119
$NIbEC$	0.1032***	0.1063	1.4263	0.0233	0.0649***	0.1538	0.5119
DIV	0.0599***	0.0797	2.2656	0.0072	0.0436***	0.0818	0.3993
$DIVbNPC$	0.0620***	0.0816	2.2515	0.0084	0.0474***	0.0846	0.4067
$DIVbEC$	0.0620***	0.0816	2.2512	0.0082	0.0474***	0.0846	0.4067
TA	14.7127***	11.3028	0.3640	4.0612	12.571***	24.1176	39.6045
$SALES$	0.5075	0.5508	2.0512	0.0669	0.4059	0.6293	2.9546
EMP	850***	623	0.2854	207	972***	1,185	2,361

Note. The TABLE depicts the descriptive summary statistics arithmetic mean (Mean), standard deviation (STD), skewness (Skew), 25%-Quantile (Q-1), median (Median), 75%-Quantile (Q-3) and spread (i.e., difference) between the maximum and the minimum values (Range) of the response variables, non-pension related covariates as well as TA , $SALES$ and EMP for the two sub-samples INDFER (Panel A, $n = 106$) and FSFER (Panel B, $n = 75$), respectively. Quantiles are estimated in line with the median-unbiased definition recommended by Hyndman and Fan (1996). Skew is estimated by G_1 as recommended by Joanes and Gill (1998). All values are denoted in CHFbn (except for EMP and Skew). Summary statistics for TA , $SALES$ and EMP are based on raw (i.e., unadjusted) data as sourced from annual reports and the Swiss Companies Guide database (EMP). Differences in means are tested via a parametric t -test applying a *Welch degrees of freedom approximation*. Differences in medians are tested via a non-parametric *Wilcoxon rank sum test* equivalent to a *Mann-Whitney test* (see e.g., Wollschläger, 2012). *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

denoted in CHFbn.

For the three different response variables $MKTCAP_t$, $MKTCAP_{t+0.25}$ and $MKTCAP_{t+0.5}$, the estimated mean (median) values in CHFbn are found to be 0.33 (0.22), 0.35 (0.24) and 0.36 (0.25) for INDFER and 1.42 (1.25), 1.47 (1.24) and 1.43 (1.15) for FSFER, respectively. For all three response variables, differences in mean and median values are significantly different from zero on a 1%-level or higher (all p -values < 0.01). For INDFER, the three estimated distributions are right-skewed (Skew = 1.30, 1.20 and 1.19) whereas for FSFER, the distributions are almost symmetrical (Skew = 0.74, 0.73 and 0.79). In absolute terms, the variation (Range) of the response variables oscillates between CHFbn 1.23 ($MKTCAP_t$) and CHFbn 1.47 ($MKTCAP_{t+0.5}$) for the industry firms and between CHFbn 4.92 ($MKTCAP_{t+0.25}$) and CHFbn 5.38 ($MKTCAP_{t+0.5}$) for the financial firms, respectively.

For EQ , mean (median) values are estimated to be CHFbn 0.27 (0.16) and CHFbn 1.10 (0.85) for INDFER and FSFER, respectively. Both differences in mean and median values are found to be significantly different from zero on a 1%-level or higher (both p -values < 0.01). The estimated distribution of EQ is skewed to the right for INDFER (Skew = 1.31) and almost symmetrical for FSFER (Skew = 0.75). Also, the absolute variation (Range) in EQ is estimated as CHFbn 3.29 and CHFbn 0.97 for the two sub-samples, respectively.

The mean (median) values of $EQbNPL$ are CHFbn 0.27 (0.16) and CHFbn 1.10 (0.85) for INDFER and FSFER, respectively. Notably, for INDFER, both mean and median values are found to be significantly different between EQ and $EQbNPL$ (both p -values < 0.01). In contrast, for FSFER, only the mean but not the median values of EQ and $EQbNPL$ are found to be significantly different on a 10%-level or higher (p -value = 0.06 and 0.1). Nonetheless, in line with EQ , both differences in mean and median values between the two sub-samples are significantly different from zero on 1%-level or higher (both p -values < 0.01). The distribution of $EQbNPL$ for INDFER is right-skewed (Skew = 1.31) whereas the one for FSFER is almost symmetrical (Skew = 0.75). Finally, the absolute variation (Range) is found to be CHFbn 3.29 and CHFbn 0.97, respectively.

For the total book value of equity net of (i.e., *before*) the funding status (FS), $EQbFS$, the mean (median) value is found to be CHFbn 0.27 (0.15) and CHFbn 1.10 (0.85) for INDFER and FSFER, respectively. Notably, for INDFER, mean and median values of $EQbFS$ are found to be significantly different from the respective values of EQ and $EQbNPL$ on a 1%-level or higher (all p -values < 0.01). In contrast, for FSFER,

only the median values of *EQbFS* are found to be significantly different from the respective values of *EQ* and *EQbNPL* on a 5%-level (both p -values = 0.02). However, mean values of *EQbFS* are not significantly different from the respective values of *EQ* and *EQbNPL* on a 10%-level or higher (both p -values = 0.84). Nevertheless, findings regarding the differences in means and medians of *EQbFS* between the two sub-samples as well as skewness and variation of *EQbFS* strongly resemble the respective findings for *EQ* and *EQbNPL*. Namely, both differences in mean and median values between the two sub-samples are significantly different from zero on a 1%-level or higher (all p -values < 0.01). Furthermore, the distribution of *EQbFS* is skewed to the right for INDFER (Skew = 1.33) whereas it is almost symmetrical for FSFER (Skew = 0.77). Finally, the absolute variation (Range) in *EQbFS* is estimated as CHFbn 3.36 and CHFbn 0.97 for the two sub-samples, respectively.

For INDFER and FSFER, estimated means (medians) of *NI* are CHFbn 0.02 (0.02) and CHFbn 0.10 (0.06), respectively. Mean and median values are found to be significantly different on a 1%-level or higher (all p -values < 0.01). The distribution of *NI* is almost symmetrical for INDFER (Skew = 0.57) and right-skewed for FSFER (Skew = 1.43). The absolute variations (Range) of *NI* are CHFbn 0.23 and CHFbn 0.49, respectively.

For *NibNPC*, mean (median) values are estimated to be CHFbn 0.03 (0.02) and CHFbn 0.10 (0.07) for INDFER and FSFER, respectively. Notably, for both sub-samples, the mean and median values of *NI* and *NibNPC* are found to be significantly different on a 1%-level or higher (all p -values < 0.01). Furthermore, as is the case for *NI*, the mean and median values of *NibNPC* for INDFER and FSFER are significantly different on a 1%-level (all p -values < 0.01). The distribution of *NibNPC* is almost symmetrical for INDFER (Skew = 0.67) and skewed to the right for FSFER (Skew = 1.43). The absolute variation (Range) in *NibNPC* is CHFbn 0.24 and CHFbn 0.51, respectively.

The mean (median) values of *NibEC* are CHFbn 0.03 (0.02) and CHFbn 0.10 (0.07) for INDFER and FSFER, respectively. All findings with regard to *NibEC* are in line with the findings for *NibNPC*. Specifically, the mean and median values of *NI* and *NibEC* are found to be significantly different on a 1%-level or higher (all p -values < 0.01). Also, the mean and median values of *NibEC* for INDFER and FSFER are significantly different on a 1%-level (both p -values < 0.01). Notably, for INDFER, the mean and median value of *NibEC* are found to be significantly greater than for *NibNPC* on a 5% level or higher (p -value = 0.03 and 0.01). In contrast, this does not hold for FSFER where mean and median values of *NibEC* and *NibNPC* are not found to be significantly

different on a 10%-level or higher (p -value = 0.23 and 0.15). Furthermore, both distributions are right-skewed (Skew = 6.97 and 4.86) and have absolute variations (Range) of CHFbn 10.11 and CHFbn 14.79 for INDFER and FSFER, respectively.

For *DIV*, mean (median) values of INDFER and FSFER are found to be CHFbn 0.01 (0.00) and CHFbn 0.06 (0.04), respectively. Notably, for both sub-samples, the mean and median values of *NI* are found to be significantly greater than the respective values of *NI* on a 1%-level or higher (all p -values < 0.01). Hence, as discussed in paragraph 6.1.3.3, firms usually do not pay out all net income as dividends. The mean and median values of *DIV* for INDFER and FSFER are significantly different on a 1%-level or higher (both p -values < 0.01). Both distributions are skewed to the right (Skew = 2.12 and 2.27) and have absolute variations (Range) of CHFbn 0.04 and CHFbn 0.40, respectively.

The mean (median) values of *DIVbNPC* are estimated to be CHFbn 0.01 (0.00) and CHFbn 0.06 (0.05) for INDFER and FSFER, respectively. The mean and median values of *DIV* and *DIVbNPC* are found to be significantly different on a 1%-level for both sub-samples (all p -values < 0.01). Moreover, the mean and median values of *DIVbNPC* for INDFER and FSFER are significantly different on a 1%-level or higher (all p -values < 0.01). Also, both distributions are right-skewed (Skew = 1.84 and 2.25) with absolute variations (Range) estimated as CHFbn 0.04 and CHFbn 0.41 for INDFER and FSFER, respectively.

For *DIVbEC*, mean (median) values of INDFER and FSFER are found to be CHFbn 0.01 (0.00) and CHF 0.06 (0.05) bn, respectively. Findings for *DIVbEC* are by and large similar to the findings for *DIVbNPC*. Namely, for INDFER and FSFER are the mean and median values of *DIV* and *DIVbEC* significantly different on a 1%-level or higher (all p -values < 0.01). Furthermore, differences in mean values of *DIVbEC* between INDFER and FSFER are significantly different on a 1%-level (all p -values < 0.01). Notably, for INDFER, the mean and median value of *DIVbEC* are found to be significantly greater than for *DIVbNPC* on a 5% level (p -value = 0.03 and 0.01). In contrast, for FSFER, neither mean nor median value of *DIVbNPC* and *DIVbEC* are significantly different on a 10%-level or higher (p -value = 0.23 and 0.15). Also, both distributions of *DIVbEC* are skewed to the right (Skew = 1.85 and 2.25). Last but not least, the absolute variations (Range) is CHFbn 0.04 for INDFER and CHFbn 0.41 for FSFER, respectively.

Mean (median) values for *TA* are found to be CHFbn 0.54 (0.34) and CHFbn 14.71 (12.57) for INDFER and FSFER, respectively. Differences for both mean and median

values are significantly different from zero on a 1%-level or higher (all p -values < 0.01). The distribution for INDFER is right-skewed (Skew = 1.33) whereas the one for FSFER is almost symmetrical (Skew = 0.36). Also, the absolute variations (Range) are estimated as CHFbn 2.29 and CHFbn 39.60, respectively.

For *SALES*, the mean and median values are estimated as CHFbn 0.57 (0.33) for INDFER and as CHFbn 0.51 (0.41) for FSFER. Notably, *SALES* is the only variable depicted in TABLE 6.24 for which there is no significant difference found between INDFER and FSFER, neither with regard to mean (p -value = 0.46) nor median values (p -value = 0.70). Both distributions are skewed to the right (Skew = 2.11 and 2.05) with absolute variations (Range) of CHFbn 2.98 and CHFbn 2.95, respectively.

Finally, *EMP* is the only variable depicted in TABLE 6.13, for which the mean and median values of INDFER are found to be significantly greater than the respective values for FSFER. Specifically, the mean values of 1,649 and 850 are significantly different on a 1%-level or higher (p -value < 0.01). By chance, both sub-samples have an estimated median value of 972. Nonetheless, according to the applied *Wilcoxon rank sum test* (equivalent to a *Mann-Whitney test*), the distribution of *EMP* for INDFER is found to be significantly different from the respective distribution for FSFER on a 1%-level or higher (p -value < 0.01).³⁴³ Both distributions of *EMP* are almost symmetrical (Skew = 0.83 and 0.29). The absolute variations (Range) of *EMP* are found to be 6,668 and 2,361, respectively.

6.3.4.4 Pension Covariates

Analogous to TABLE 6.14 for INDCORR and FSCORR as well as TABLE 6.20 for INDOCI, TABLE 6.25 depicts descriptive summary statistics of all *pure* pension-related covariates for INDFER (Panel A, $n = 106$) and FSFER (Panel B, $n = 75$), respectively. With the exception of skewness (Skew), all values depicted in TABLE 6.25 are denoted in CHF bn.

The mean (median) values of *NPL* are estimated as CHFbn 0.00 (0.00) and CHFbn 0.00 (0.00) for INDFER and FSFER, respectively. More precisely, for INDFER, the values are CHFm 0.25 and CHFm 0.00 for the mean and median, respectively. Correspondingly, for FSFER, the respective values are CHFm -0.01 and CHFm 0.00. Thus,

³⁴³ Note, the test statistic of the *Mann-Whitney test* for independent samples is not the difference in medians but rather related to the median of the differences between the ranked values of the two samples (see e.g., Toutenburg, Heumann, Schomaker, & Wissmann, 2008b, pp. 174-176).

TABLE

6.25 Descriptive Statistics of Pension Variables for INDFER and FSFER

Variable	Mean	STD	Skew	Q-1	Median	Q-3	Range
Panel A: INDFER ($n = 106$)							
<i>NPL</i>	0.0002***	0.0009	4.0760	0.0000	0.0000***	0.0000	0.0059
<i>NPLNR</i>	-0.0021	0.0073	-2.7934	-0.0009	0.0000	0.0000	0.0510
<i>FS</i>	-0.0029*	0.0085	-3.0785	-0.0022	0.0000	0.0000	0.0557
<i>ECR</i>	0.0010***	0.0023	2.8824	0.0000	0.0000	0.0013	0.0109
<i>NPC</i>	0.0034***	0.0044	2.6191	0.0009	0.0020***	0.0034	0.0305
<i>EC</i>	0.0000***	0.0000	2.6770	0.0000	0.0000***	0.0000	0.0000
Panel B: FSFER ($n = 75$)							
<i>NPL</i>	0.0000***	0.0001	-4.9287	0.0000	0.0000***	0.0000	0.0004
<i>NPLNR</i>	0.0007	0.0146	4.9329	-0.0002	0.0000	0.0000	0.1263
<i>FS</i>	0.0003*	0.0147	4.8392	-0.0007	-0.0002	0.0000	0.1263
<i>ECR</i>	0.0003***	0.0004	1.0006	0.0000	0.0000	0.0007	0.0013
<i>NPC</i>	0.0070***	0.0069	1.5362	0.0015	0.0040***	0.0096	0.0277
<i>EC</i>	0.0000***	0.0000	1.5392	0.0000	0.0000***	0.0000	0.0000

Note. The TABLE depicts the descriptive summary statistics arithmetic mean (Mean), standard deviation (STD), skewness (Skew), 25%-Quantile (Q-1), median (Median), 75%-Quantile (Q-3) and spread (i.e., difference) between the maximum and the minimum values (Range) of all pension related covariates for the two sub-samples INDFER (Panel A, $n = 106$) and FSFER (Panel B, $n = 75$), respectively. Quantiles are estimated in line with the median-unbiased definition recommended by Hyndman and Fan (1996). Skew is estimated by G_1 as recommended by Joanes and Gill (1998). All values are denoted in CHFbn (except for Skew). Differences in means are tested via a parametric *t*-test applying a *Welch degrees of freedom approximation*. Differences in medians are tested via a non-parametric *Wilcoxon rank sum test* equivalent to a *Mann-Whitney test* (see e.g., Wollschläger, 2012). *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

on average, observations included in FSFER show a negative *NPL*, i.e., a net pension asset. Notably, for INDFER, the mean and median value of *NPL* are both found to be significantly different from zero on a 1%-level or higher (both p -values < 0.01). In contrast, for FSFER, the mean value is significantly different from zero on a 10%-level only (p -value = 0.06). Moreover, the median value is not found to be significantly different from zero on a 10%-level or higher (p -value = 0.1). It is important to note here, for INDFER, the shares of observations with $NPL < 0$, $NPL = 0$ and $NPL > 0$ are 2.83%, 84.91% and 12.26%, respectively. Thence, an overwhelming majority of observations is attributable to firms that did not recognize a net pension (asset)/liability at the respective fiscal year-end. Correspondingly, for FSFER, the respective ratios are found to be 5.33%, 94.67% and 0.00%, respectively. Again, almost all observations are attributable to firm-years where there is no net pension (asset)/liability recognized. Nonetheless, the

mean and median values of the two sub-samples are found to be significantly different on a 1%-level or higher (both p -values < 0.01). Notably, for INDFER the distribution of NPL is skewed to the right (Skew = 4.08) whereas for FSFER the distribution is skewed to the left (Skew = -4.93). The absolute variations (Range) of NPL are estimated to be CHFbn 0.01 and CHFbn 0.00 for INDFER and FSFER, respectively. Lastly, the mean (median) value of NPL as percentage of EQ is estimated to be 0.07% (0.00%) for INDFER and 0.00% (0.00%) for FSFER.

For $NPLNR$, mean (median) values are CHFbn 0.00 (0.00) and CHFbn 0.00 (0.00) for INDFER and FSFER, respectively. Specifically, for INDFER, the values are CHFm -2.10 and CHFm 0.00 for the mean and median, respectively. Correspondingly, for FSFER, the respective values are CHFm 0.69 and CHFm 0.00. Thus, on average, observations included in INDFER show a negative $NPLNR$, i.e., an unrecognized net pension asset. Notably, for INDFER, the mean and median values of $NPLNR$ are found to be significantly different from zero on a 1%-level or higher (p -value < 0.01) as well as on a 5%-level (p -value = 0.01), respectively. In contrast, this does not hold for FSFER (p -value = 0.68 and 0.18). Moreover, neither the mean nor the median values of the two sub-samples are found to be different on a 10%-level or higher (p -value = 0.13 and 0.86). Notably, for INDFER, the mean and median values of $NPLNR$ are found to be significantly different from the respective values of NPL (both p -values < 0.01). In contrast, the same does not hold for FSFER (p -value = 0.68 and 0.18). Also, the distribution of $NPLNR$ is left-skewed for INDFER (Skew = -2.79) and right-skewed for FSFER (Skew = 4.93). The absolute variations (Range) of the two sub-samples are CHFbn 0.05 and CHF 0.13 bn, respectively. Finally, the mean (median) value of $NPLNR$ as percentage of EQ is estimated to be -0.96% (0.00%) for INDFER and -0.48% (0.00%) for FSFER, respectively.

The mean (median) values of FS are estimated as CHFbn 0.00 (0.00) and CHFbn 0.00 (0.00) for INDFER and FSFER, respectively. More precisely, for INDFER, the mean and median values correspond to CHFm -2.90 and CHFm 0.00, respectively. For FSFER, the respective values are CHFm 0.34 and CHFm -0.20. Thus, on average, observations included in INDFER show a negative funding status, i.e., pension assets exceed pension liabilities. Notably, for INDFER, the mean and median values of FS are found to be significantly different from zero on a 1%-level or higher (both p -values < 0.01). In contrast, for FSFER, the mean value of FS is not found to be significantly different from zero on a 10%-level or higher (p -value = 0.84) and the median value is significantly different from zero on a 5%-level (p -value = 0.02). Further, for INDFER, mean and median values of FS and NPL as well as of FS and $NPLNR$ are all significantly

different on a 1%-level or higher (all p -values < 0.01). This also holds for FSFER with regard to the difference of mean and median values of FS and $NPLNR$ (both p -values < 0.01). However, the mean values of FS and NPL are not found to be significantly different on a 10%-level or higher (p -value = 0.84). Nevertheless, the median values of FS and NPL for FSFER are significantly different on a 5%-level (p -value = 0.02). Furthermore, the difference in mean values of FS between the two sub-samples is found to be significantly different from zero on a 10%-level (p -value = 0.09). In contrast, this does not hold for the difference in median values (p -value = 0.58). The distribution of FS is skewed to the left for INDFER (Skew = -3.08) and skewed to the right for FSFER (Skew = 4.84). The absolute variations (Range) of the two sub-samples are CHFbn 0.06 and CHFbn 0.13, respectively. Lastly, the mean (median) value of FS as percentage of EQ is estimated to be -1.62% (0.00%) for INDFER and -0.56% (-0.02%) for FSFER.

For the total book value of the employer contribution reserves, ECR , mean (median) values are CHFbn 0.00 (0.00) and CHFbn 0.00 (0.00) for INDFER and FSFER, respectively. Specifically, for INDFER, the values are CHFm 1.05 and CHFm 0.00 for the mean and median, respectively. Correspondingly, for FSFER, the respective values are CHFm 0.34 and CHFm 0.00. Notably, for both sub-samples, the mean and median values of ECR are found to be significantly different from zero on a 1%-level or higher (all p -values < 0.01). Moreover, the mean values of the two sub-samples are found to be different on a 1%-level or higher (p -value < 0.01). In contrast, this does not hold for the median values (p -value = 0.79). For INDFER, the mean and median values of ECR are found to be significantly different from the respective values of NPL , $NPLNR$ and FS (all p -values < 0.01). The same holds for FSFER with regard to the differences in mean and median values of ECR and NPL (both p -values < 0.01), the difference between the median values of ECR and $NPLNR$ (p -value = 0.02) as well as with respect to the difference between the median values of ECR and FS (p -value = 0.01). However, the differences between the mean values of ECR and $NPLNR$ as well as between the mean values of ECR and FS are not found to be significantly different from zero on a 10%-level or higher (p -value = 0.84 and 0.99). Both distributions of ECR are right-skewed (Skew = 2.88 and 1.00) and the absolute variations (Range) are CHFbn 0.01 and CHFbn 0.00 for INDFER and FSFER, respectively. Finally, the mean (median) value of ECR as percentage of EQ is estimated to be 0.73% (0.00%) for INDFER and 0.08% (0.00%) for FSFER, respectively.

In terms of *flow measures* related to pensions, estimated mean (median) values of NPC are CHFbn 0.00 (0.00) and CHFbn 0.01 (0.00) for INDFER and FSFER, respectively. Specifically, for INDFER, the values are CHFm 3.42 and CHFm 1.96 for the

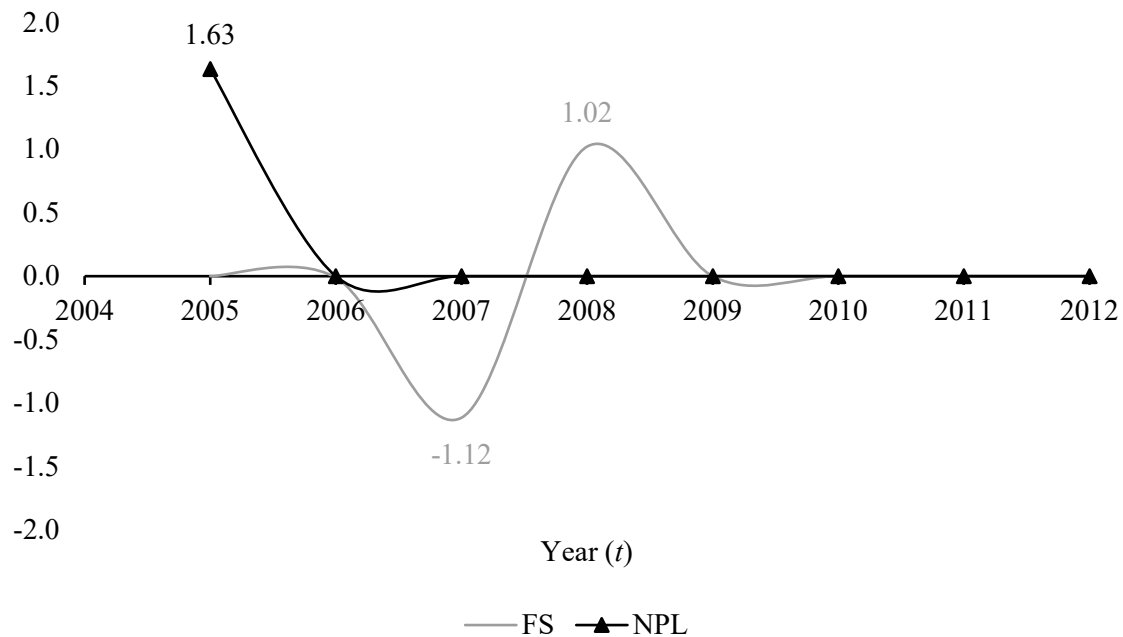
mean and median, respectively. Correspondingly, for FSFER, the respective values are CHFm 7.02 and CHFm 4.01. Notably, for both sub-samples, mean and median values of *NPC* are found to be significantly different from zero on a 1%-level or higher (all p -values < 0.01). Moreover, the differences in mean and median values of INDFER and FSFER are found to be different from zero on a 1%-level or higher (both p -values < 0.01). Also, both distributions are skewed to the right (Skew = 2.62 and 1.54) with equal absolute variations (Range) of CHF 0.03 bn. Lastly, the mean (median) value of *NPC* as percentage of *NI* is estimated to be 17.05% (10.88%) for INDFER and 10.93% (6.34%) for FSFER. Correspondingly, the mean (median) ratio of *NPC* and *DIV* is 63.74% (17.45%) for INDFER and 6.34% (3.34%) for FSFER.

Finally, for *EC*, mean (median) values are CHFbn 0.00 (0.00) and CHFbn 0.00 (0.00) for INDFER and FSFER, respectively. Specifically, for INDFER, the values are CHFm 3.60 and CHFm 2.08 for the mean and median, respectively. Correspondingly, for FSFER, the respective values are CHFm 6.99 and CHF 3.93 m. Notably, for both sub-samples, mean and median values of *EC* are found to be significantly different from zero on a 1%-level or higher (all p -values < 0.01). Also, for INDFER, the mean and median value of *EC* are found to be significantly different from the respective values of *NPC* on a 5%-level (p -value = 0.03 and 0.01). In contrast, this does not hold for FSFER (p -value = 0.23 and 0.15). Moreover, for both sub-samples, mean and median values of *EC* are found to be significantly different from zero on a 1%-level or higher (all p -values < 0.01). Both distributions are right-skewed (Skew = 2.68 and 1.54). Also, there is an equal absolute range for both sub-samples of CHF 0.00 bn. Finally, the mean (median) value of *EC* as percentage of *NI* is estimated to be 18.30% (10.92%) for INDFER and 10.86% (6.34%) for FSFER. Correspondingly, the mean (median) ratio of *EC* and *DIV* is 66.05% (17.45%) for INDFER and 6.21% (3.34%) for FSFER.

6.3.4.5 Time-Series Properties

FIGURE 6.12 illustrates the annual median values of the recognized net pension (asset)/liability (*NPL*) as well as the funding status (*FS*) of the industry firms applying ARR 16 (2005, i.e., INDFER) across the sample period of 2004 to 2012. The constellation of a positive median value for *NPL* as well as a median value of zero for *FS* in 2005 is due to the small number of observations ($n = 4$) included for this sample year, as well as the fact that one firm discloses a relatively large negative funding status (*FS*), i.e., an unrecognized net pension asset, while actually not recognizing any amount as *NPL*. Further, in 2007, a majority of firms included in the sub-sample INDFER also disclosed either a negative value or zero for *FS* whereas the opposite is true for the observations included

FIGURE

6.12 Median *FS* and *NPL* of *INDFER*

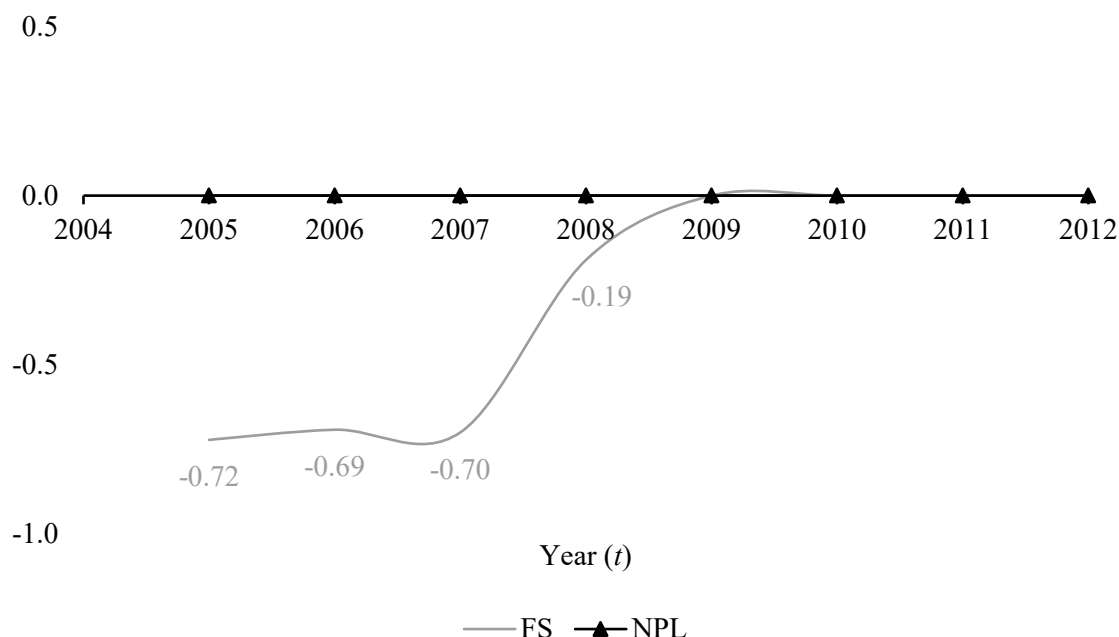
Note. For the sample period of 2004 to 2012, the FIGURE depicts the annual median funding status (*FS*, grey line) as well as the annual median net pension (asset)/liability (*NPL*) recognized in line with ARR 16 (2005; marked black line) as defined in TABLE 6.4 (see page 237). All values are denoted in CHFm. For *INDFER*, annual medians are based on $n = 4$ (2005), 8 (2006), 6 (2007), 10 (2008), 15 (2009), 17 (2010), 22 (2011) and 24 (2012) observations, respectively. Labels are shown for values that are different from 0.00 only.

for 2008. This also corresponds to the out-break of the sub-prime crisis in September 2008. Nevertheless, in five out of the eight years where observations for *INDFER* are included in the final sample, the median values of both *NPL* and *FS* are found to be zero. This is in line with the smoothing approach applied in line with ARR 16 (2005) as outlined in section 3.3.

In accordance with FIGURE 6.12, FIGURE 6.13 depicts the annual median values for *NPL* and *FS* for the financial firms included in the final sample that apply ARR 16 (2005, i.e., *FSFER*). While the median value for the funding status (*FS*) is found to be constantly negative (i.e., this indicates a median pension plan surplus found for the sub-sample of *FSFER*) between 2005 and 2007, median *FS* is decreasing to zero between 2007 and 2009 and remains at that level until the end of the sample period in 2012. This, again, is in line with the evolution of the sub-prime crisis starting in 2008. Most notably, for *FSFER* the median value for the recognized *NPL* is found to be zero across the entire sample period. As in the case of *INDFER*, this illustrates how the recognition of a net pension (asset)/liability (*NPL*) is smoothed along the statutory funding ratio in line with

FIGURE

6.13 Median FS and NPL of FSFER



Note. For the sample period of 2004 to 2012, the FIGURE depicts the annual median funding status (*FS*, grey line) as well as the annual median net pension (asset)/liability (*NPL*) recognized in line with ARR 16 (2005; marked black line) as defined in TABLE 6.4 (see page 237). All values are denoted in CHFm. For FSFER, annual medians are based on $n = 1$ (2005), 8 (2006), 9 (2007), 10 (2008), 11 (2009), 12 (2010), 11 (2011) and 13 (2012) observations, respectively. Labels are shown for values that are different from 0.00 only.

ARR 16 (2005).

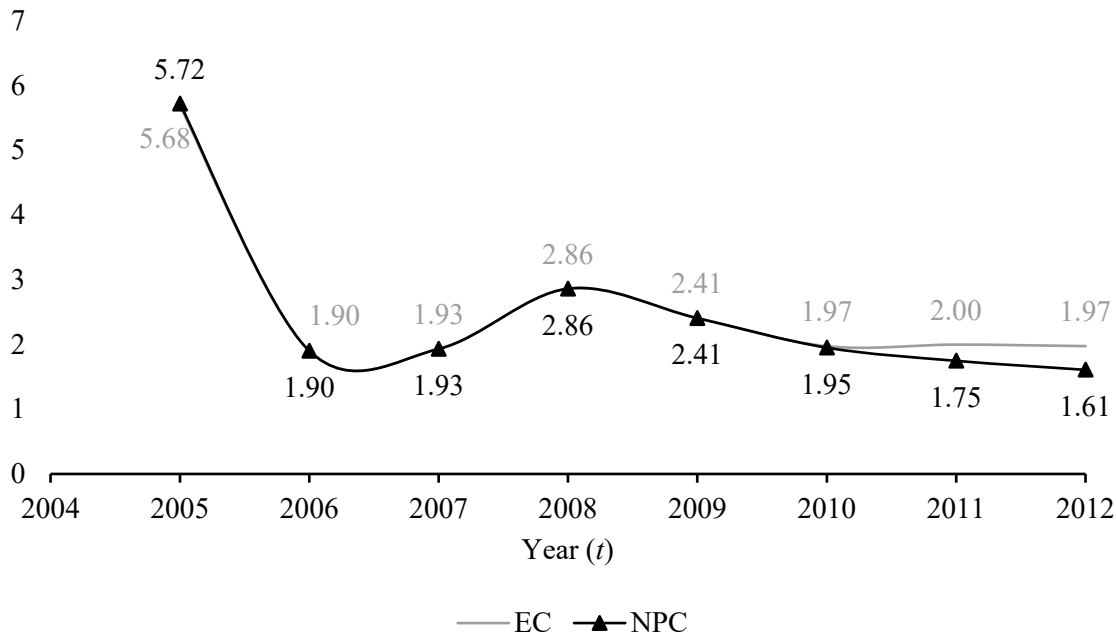
FIGURE 6.14 and 6.15 depict the annual median values for the recognized net pension (income)/cost (*NPC*) as well as the regulatory employer contributions (*EC*) transferred to the respective Swiss pension plans for the sub-samples INDFER and FSFER, respectively. Obviously, the annual medians for *NPC* and for *EC* are closely aligned for both sub-samples across the entire sample period. This is in line with the smoothing approach stipulated by ARR 16 (2005), whereas recognized *NPC* is mainly based on *EC* and differences may only arise from the change in the recognized *NPL*. However, as described above, for the most part of the sample period, annual median values of *NPL* are found to be zero for both sub-samples INDFER and FSFER.

6.3.4.6 Bivariate Correlations

In line with the IFRS sub-samples TABLE 6.26 depicts the bivariate Pearson and Spearman correlation coefficients for INDFER in the lower and upper diagonal, respectively.

FIGURE

6.14 Median EC and NPC of INDFER

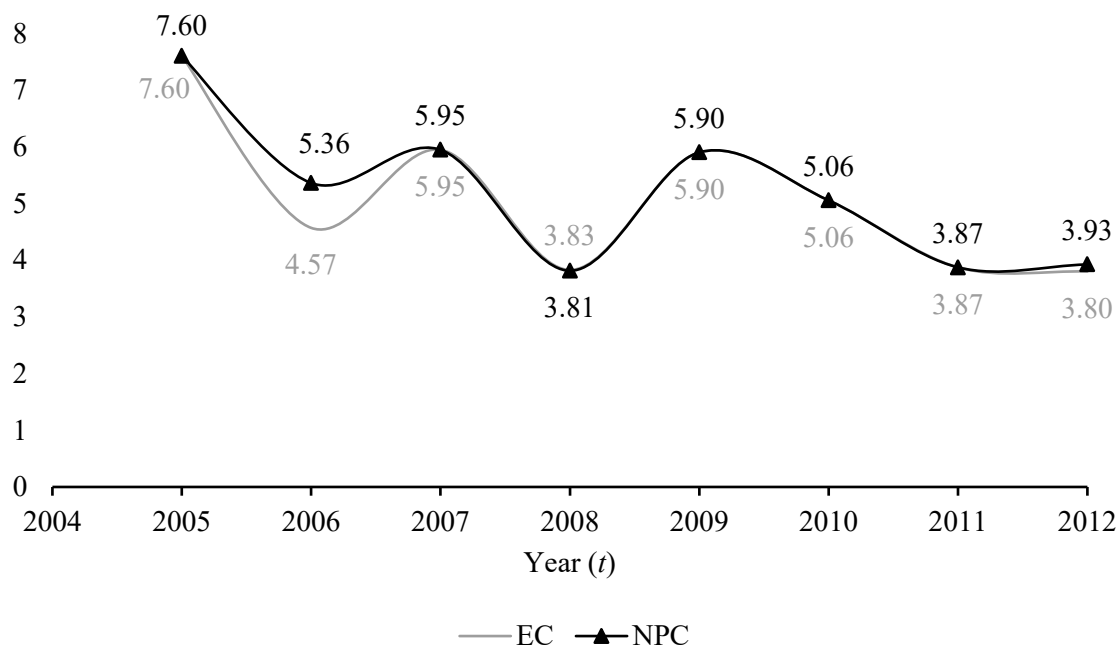


Note. For the sample period of 2004 to 2012, the FIGURE depicts the annual median employer contributions (*EC*) transferred to the Swiss pension plan (grey line) as well as the annual median net pension (income)/cost (*NPC*) recognized in line with ARR 16 (2005; marked black line) as defined in TABLE 6.4 (see page 237). All values are denoted in CHFm. For INDFER, annual medians are based on $n = 4$ (2005), 8 (2006), 6 (2007), 10 (2008), 15 (2009), 17 (2010), 22 (2011) and 24 (2012) observations, respectively.

The mean (median) Pearson and Spearman correlations among covariates are found to be 0.37 (0.46) and 0.44 (0.55), respectively. Overall, Pearson and Spearman correlations of covariates oscillate between -0.61 and 0.99 and -0.46 and 0.99, respectively. In total, 40 (i.e., 38.10%) and 36 (i.e., 34.29%) of all of these 105 estimated Pearson and Spearman correlations are not found to be significantly different from zero on a 10%-level or higher, respectively. Notably, all of the insignificant correlations are attributable to at least one pension variable. Specifically, for *NPLNR*, *FS* and *ECR*, all estimated Pearson correlations except the three mutual ones are not found to be significantly different from zero on 10%-level or higher. The remaining four insignificant Pearson coefficients all involve *NPL*. For the Spearman correlations, the picture is the same. The only insignificant correlation not related to either *NPLNR*, *FS* or *ECR* is the one of *NI* and *NPL*. Moreover, for *NPLNR*, the only Spearman correlation significantly different from zero is found with *FS*. For *FS*, all but the correlations with *NPL*, *NPLNR* and *ECR* are insignificant. Finally, for *ECR*, only the correlations with *FS* and *EC* are found to be significantly different from zero on a 10%-level or higher. For the response variable

FIGURE

6.15 Median EC and NPC of FSFER



Note. For the sample period of 2004 to 2012, the FIGURE depicts the annual median employer contributions (*EC*) transferred to the Swiss pension plan (grey line) as well as the annual median net pension (income)/cost (*NPC*) recognized in line with ARR 16 (2005; marked black line) as defined in TABLE 6.4 (see page 237). All values are denoted in CHFm. For FSFER, annual medians are based on $n = 1$ (2005), 8 (2006), 9 (2007), 10 (2008), 11 (2009), 12 (2010), 11 (2011) and 13 (2012) observations, respectively.

$MKTCAP_{t+0.25}$, the mean (median) Pearson and Spearman correlations are found to be 0.56 (0.69) and 0.58 (0.73), respectively. Overall, Pearson and Spearman correlations oscillate between -0.15 and 0.84 and -0.01 and 0.87, respectively. Notably, for $MKTCAP_{t+0.25}$, all but the Pearson correlations with *NPL*, *NPLNR*, *FS* and *ECR* are found to be significantly different from zero on a 1%-level or higher. Moreover, the correlations with *NPL*, *NPLNR*, *FS* and *ECR* are not found to be significant on a 10%-level or higher. In terms of Spearman correlations, again, all but the correlations with *NPL*, *NPLNR*, *FS* and *ECR* are found to be significantly different from zero on a 1%-level or higher. However, in contrast to the Pearson coefficients, the Spearman correlation between $MKTCAP_{t+0.25}$ and *NPL* (i.e., 0.21) is significantly different from zero on 5%-level. Nonetheless, the correlations with *NPLNR*, *FS* and *ECR* are all insignificant. Nine out of all 15 estimated Pearson correlations are below 0.82. Specifically, apart from *DIV*, *DIVbNPC* and *DIVbEC*, all of these are pension variables (i.e., *NPL*, *NPLNR*, *FS*, *ECR*, *NPC* and *EC*). Further, only the insignificant Pearson correlation with *ECR* is found to be negative (i.e., -0.15). In terms of Spearman correlations, the same six coef-

TABLE
6.26 Correlation-Matrix - INDFER

	$MKTCAP_{t+0.25}$	EQ	$EQbNPL$	$EQbFS$	NI	$NIbNPC$	$NIbEC$	DIV	$DIVbNPC$
$MKTCAP_{t+0.25}$									
EQ	0.83***	0.84***	0.84***	0.84***	0.86***	0.87***	0.87***	0.70***	0.73***
$EQbNPL$	0.83***	0.99***	0.99***	0.99***	0.79***	0.82***	0.82***	0.76***	0.80***
$EQbFS$	0.84***	0.99***	0.99***	0.99***	0.79***	0.82***	0.82***	0.76***	0.80***
NI	0.82***	0.74***	0.99***	0.74***	0.79***	0.82***	0.82***	0.76***	0.81***
$NIbNPC$	0.84***	0.78***	0.78***	0.79***	0.99***	0.99***	0.99***	0.77***	0.79***
$NIbEC$	0.84***	0.78***	0.78***	0.78***	0.99***	0.99***	0.99***	0.78***	0.80***
DIV	0.62***	0.49***	0.49***	0.49***	0.59***	0.59***	0.59***	0.77***	0.80***
$DIVbNPC$	0.69***	0.58***	0.58***	0.58***	0.64***	0.65***	0.65***	0.99***	0.99***
$DIVbEC$	0.69***	0.58***	0.58***	0.58***	0.64***	0.65***	0.66***	0.99***	0.99***
NPL	0.15	0.20**	0.20**	0.20**	0.15	0.17*	0.17*	0.04	0.07
$NPLNR$	0.03	-0.03	-0.03	0.01	0.04	0.03	0.04	0.01	0.01
FS	0.08	0.02	0.02	0.05	0.08	0.08	0.08	0.06	0.06
ECR	-0.15	-0.06	-0.06	-0.08	-0.11	-0.11	-0.11	-0.14	-0.14
NPC	0.66***	0.78***	0.78***	0.78***	0.55***	0.63***	0.64***	0.32***	0.46***
EC	0.65***	0.76***	0.76***	0.76***	0.54***	0.63***	0.64***	0.32***	0.46***

(continued on next page)

TABLE (continued)

	<i>DIVbEC</i>	<i>NPL</i>	<i>NPLNR</i>	<i>FS</i>	<i>ECR</i>	<i>NPC</i>	<i>EC</i>
<i>MKTCAP_{t+0.25}</i>	0.73***	0.21**	0.00	0.02	-0.01	0.61***	0.58***
<i>EQ</i>	0.80***	0.31***	-0.03	0.02	0.07	0.69***	0.67***
<i>EQbNPL</i>	0.80***	0.31***	-0.03	0.02	0.07	0.69***	0.67***
<i>EQbFS</i>	0.81***	0.30***	0.01	0.05	0.05	0.69***	0.67***
<i>NI</i>	0.79***	0.16	0.00	0.07	-0.04	0.55***	0.54***
<i>NIbNPC</i>	0.80***	0.18*	0.01	0.09	-0.04	0.61***	0.60***
<i>NIbEC</i>	0.80***	0.18*	0.02	0.10	-0.03	0.61***	0.60***
<i>DIV</i>	0.98***	0.18*	0.00	0.05	-0.05	0.43***	0.43***
<i>DIVbNPC</i>	0.99***	0.20**	0.01	0.05	-0.04	0.56***	0.55***
<i>DIVbEC</i>		0.20**	0.01	0.07	-0.04	0.56***	0.56***
<i>NPL</i>	0.07		0.02	0.29***	-0.06	0.22**	0.19**
<i>NPLNR</i>	0.02	-0.10		0.80***	-0.14	0.05	0.05
<i>FS</i>	0.06	0.05	0.96***		-0.46***	0.03	0.02
<i>ECR</i>	-0.14	-0.12	-0.37***	-0.61***		0.15	0.19**
<i>NPC</i>	0.46***	0.22**	-0.02	0.02	-0.05		0.98***
<i>EC</i>	0.46***	0.23**	0.01	0.04	-0.04	0.98***	

Note. The TABLE depicts bivariate correlations for the response variable $MKTCAP_{t+0.25}$ and all covariates defined for the sub-sample INDFER ($n = 106$). Pearson and Spearman correlation coefficients are shown in the lower and upper diagonal, respectively. For notational reasons, figures are rounded to two decimals. *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

ficients as above (i.e., EQ , $EQbNPL$, $EQbFS$, NI , $NIbNPC$ and $NIbEC$) are found to be the highest (i.e., equal or greater than 0.84). As for Pearson correlations, the only negative Spearman correlation with $MKTCAP_{t+0.25}$ is found for ECR (i.e., -0.01). However, as noted above, this correlation is not significant on a 10%- level or higher.³⁴⁴

Analogous to TABLE 6.26 for INDFER, TABLE 6.27 depicts the bivariate Pearson and Spearman correlation coefficients for FSFER in the lower and upper diagonal, respectively. The mean (median) Pearson and Spearman correlations among covariates are found to be 0.60 (0.87) and 0.54 (0.78), respectively. Overall, Pearson and Spearman correlations of covariates oscillate between -0.32 and 0.99 and -0.60 and 0.99, respectively. In total, 25 (i.e., 23.81%) and 31 (i.e., 29.52%) of all of these 105 estimated Pearson and Spearman correlations are not found to be significantly different from zero on a 10%-level or higher, respectively. Notably, as in the case of INDFER, all of the insignificant correlations are attributable to at least one pension variable. Specifically, for NPL , all estimated Pearson correlations are not found to be significantly different from zero on 10%-level or higher. The same holds for ECR with the exception of the correlations with $NPLNR$ and FS . For the Spearman correlations, by and large, the picture is the same. For NPL , all but the correlations with DIV and FS , are insignificant. For ECR , the exceptions from insignificant Spearman correlations are the ones with $NPLNR$ and FS . Also for FS are nine (i.e., 64.29%) of 14 Spearman correlations not found to be significantly different from zero on a 10%-level or higher. All of the insignificant Spearman correlations involve either one or two of the pension variables NPL , FS or ECR .

For the response variable $MKTCAP_{t+0.25}$, the mean (median) Pearson and Spearman correlations are found to be 0.71 (0.84) and 0.71 (0.92), respectively. Overall, Pearson and Spearman correlations oscillate between -0.05 and 0.94 and 0.03 and 0.95, respectively. Notably, for $MKTCAP_{t+0.25}$, all but the Pearson correlations with NPL and ECR are found to be significantly different from zero on a 1%-level or higher. Specifically, the correlation with NPL (i.e., 0.19) is significant on a 10%-level whereas the one with ECR (i.e., -0.05) is insignificant. In terms of Spearman correlations with $MKTCAP_{t+0.25}$, all but the ones with NPL , $NPLNR$, FS and ECR are significant on a 1%-level. The correlation with $NPLNR$ (i.e., 0.29) is found to be significant on a 5%-level. In contrast, the ones with NPL (i.e., 0.12), FS (i.e., 0.12) and ECR (i.e., 0.03) are not found to be significantly different from zero on a 10%-level or higher. Finally, the only bivariate correla-

³⁴⁴ Note, all results for $MKTCAP_{t+0.25}$ are qualitatively unaltered for $MKTCAP_t$ and $MKTCAP_{t+0.5}$. These are available from the author upon request.

TABLE
6.27 Correlation-Matrix - FSFER

	<i>MKTCAP_{t+0.25}</i>	<i>EQ</i>	<i>EQbNPL</i>	<i>EQbFS</i>	<i>NI</i>	<i>NIbNPC</i>	<i>NIbEC</i>	<i>DIV</i>	<i>DIVbNPC</i>
<i>MKTCAP_{t+0.25}</i>									
<i>EQ</i>	0.94***		0.94***	0.94***	0.95***	0.95***	0.95***	0.92***	0.92***
<i>EQbNPL</i>	0.94***	0.99***		0.99***	0.94***	0.94***	0.94***	0.89***	0.90***
<i>EQbFS</i>	0.94***	0.99***	0.99***		0.94***	0.94***	0.94***	0.89***	0.90***
<i>NI</i>	0.92***	0.93***	0.93***	0.93***		0.99***	0.94***	0.89***	0.90***
<i>NIbNPC</i>	0.92***	0.93***	0.93***	0.93***	0.99***		0.99***	0.92***	0.92***
<i>NIbEC</i>	0.92***	0.93***	0.93***	0.93***	0.99***	0.99***		0.92***	0.93***
<i>DIV</i>	0.81***	0.87***	0.87***	0.87***	0.93***	0.94***	0.94***		0.99***
<i>DIVbNPC</i>	0.81***	0.87***	0.87***	0.87***	0.93***	0.94***	0.94***	0.99***	
<i>DIVbEC</i>	0.81***	0.87***	0.87***	0.87***	0.93***	0.94***	0.94***	0.99***	0.99***
<i>NPL</i>	0.19*	0.17	0.17	0.17	0.16	0.15	0.15	0.15	0.15
<i>NPLNR</i>	0.39***	0.47***	0.47***	0.48***	0.41***	0.42***	0.42***	0.51***	0.51***
<i>FS</i>	0.39***	0.47***	0.47***	0.48***	0.40***	0.41***	0.41***	0.51***	0.51***
<i>ECR</i>	-0.05	-0.05	-0.05	-0.06	-0.02	-0.02	-0.02	-0.14	-0.14
<i>NPC</i>	0.84***	0.89***	0.89***	0.89***	0.90***	0.91***	0.91***	0.89***	0.90***
<i>EC</i>	0.84***	0.89***	0.89***	0.89***	0.90***	0.92***	0.92***	0.89***	0.90***

(continued on next page)

TABLE (continued)

	<i>DIVbEC</i>	<i>NPL</i>	<i>NPLNR</i>	<i>FS</i>	<i>ECR</i>	<i>NPC</i>	<i>EC</i>
<i>MKTCAP_{t+0.25}</i>							
<i>EQ</i>	0.92***	0.12	0.29**	0.12	0.03	0.81***	0.81***
<i>EQbNPL</i>	0.90***	0.12	0.38***	0.21*	0.01	0.84***	0.84***
<i>EQbFS</i>	0.90***	0.12	0.38***	0.21*	0.01	0.84***	0.84***
<i>NI</i>	0.90***	0.11	0.39***	0.23**	0.00	0.84***	0.84***
<i>NIbNPC</i>	0.92***	0.15	0.25**	0.04	0.16	0.88***	0.88***
<i>NIbEC</i>	0.93***	0.15	0.26**	0.04	0.15	0.89***	0.89***
<i>DIV</i>	0.93***	0.15	0.26**	0.04	0.15	0.89***	0.89***
<i>DIVbNPC</i>	0.99***	0.20*	0.27**	0.06	0.07	0.76***	0.77***
<i>DIVbEC</i>	0.99***	0.18	0.27**	0.06	0.08	0.78***	0.79***
<i>NPL</i>	0.15	0.18	0.27**	0.06	0.08	0.78***	0.79***
<i>NPLNR</i>	0.51***	0.06	0.13	0.20*	0.13	0.07	0.08
<i>FS</i>	0.51***	0.06	0.99***	0.87***	-0.37***	0.25**	0.25**
<i>ECR</i>	-0.14	0.13	-0.29**	-0.32***	-0.60***	0.07	0.06
<i>NPC</i>	0.90***	0.09	0.53***	0.53***	-0.15	0.00	0.03
<i>EC</i>	0.90***	0.10	0.53***	0.53***	-0.15	0.99***	0.99***

Note. The TABLE depicts bivariate correlations for the response variable *MKTCAP_{t+0.25}* and all covariates defined for the sub-sample FSFER ($n = 75$). Pearson and Spearman correlation coefficients are shown in the lower and upper diagonal, respectively. For notational reasons, figures are rounded to two decimals. *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

tion involving $MKTCAP_{t+0.25}$ that is found to be negative is the Pearson correlation with ECR (i.e., -0.05). However, as noted above, this correlation is not significant on a 10%-level or higher.³⁴⁵

6.3.4.7 Summary and Conclusion

For the industry firms included in the final sample that apply ARR 16 (2005; i.e., INDFER), the mean (median) net pension (asset)/liability (NPL) recognized on the balance-sheet and the mean (median) funding status (FS) are found to be CHFm 0.25 (0.00) and CHFm -2.90 (0.00), respectively. Furthermore, the mean (median) unrecognized net pension (asset)/liability ($NPLNR$) is estimated to be CHFm -2.10 (0.00). Also, the mean (median) value of the recognized employer contribution reserves (ECR) is found to be CHFm 1.05 (0.00). Lastly, the mean (median) values for the net pension cost (NPC) as well as the employer contributions paid (EC) are found to be CHFm 3.42 (1.96) and CHFm 3.60 (2.08), respectively.

Overall, the results of the descriptive analysis outlined above are in line with the Swiss institutional setting of highly funded pension plans as well as the smoothing approach stipulated by ARR 16 (2005). Notably, in five out of the eight years where observations for INDFER are included in the final sample, the median values of both NPL and FS are found to be zero. Moreover, for 84.91% of all observations included in INDFER NPL is found to be zero. Also, the mean values of NPL , FS , $NPLNR$ and ECR in percentage of the total book value of equity (EQ) oscillate between -1.62% (FS) and 0.73% (ECR) whereas all median values of these pension covariates in percentage of EQ are found to be 0.00%. In contrast, the mean (median) values of NPC and EC as percentage of total book value of net income/(loss) (NI) are estimated to be 17.05% (10.88%) and 18.30% (10.92%), respectively. With regard to the the total book value of dividends proposed (DIV), these ratios are estimated to be 63.74% (17.45%) as well as 66.05% (17.45%), accordingly. Furthermore, the median values of NPC and EC are closely aligned across the sample period of 2005 to 2012.

The findings of the bivariate correlation analysis of INDFER corroborate the results of the descriptive analysis discussed above. Specifically, the Pearson coefficient for NPL (+) is the only bivariate correlation of any of the covariates NPL (+/+), FS (+/+), $NPLNR$ (+/+) and ECR (-/-) with the market capitalization three months after the fiscal-

³⁴⁵ Note, all results for $MKTCAP_{t+0.25}$ are qualitatively unaltered for $MKTCAP_t$ and $MKTCAP_{t+0.5}$. These are available from the author upon request.

year end ($MKTCAP_{t+0.25}$) that is found to be significantly different from zero on a 10%-level or higher. In contrast, for NPC (+/+) and EC (+/+), all respective Pearson and Spearman correlation coefficients are estimated to be significantly different from zero on 1%-level or higher. Nevertheless, with the exception of $NPLNR$, for none of the bivariate correlation coefficients between the pension covariates and $MKTCAP_{t+0.25}$ are the estimated signs found to be in line with expectations.³⁴⁶ These results are qualitatively unaltered for the response variables of market capitalization at fiscal-year end ($MKTCAP_t$) as well as six month after the end of the financial year ($MKTCAP_{t+0.5}$).³⁴⁷

Overall, the results of the bivariate correlation analysis for INDFER partly confirm hypothesis $H(1)$ (*Value-Relevance of Swiss Pension Plans*), formulated in sub-section 5.2.3, whereas financial information about Swiss pension plans reported in line with ARR 16 (2005) is significantly associated with the market value of equity of the reporting firms. Thus, as in the case of the IFRS sub-samples, also for industry firms applying ARR 16 (2005), financial information reported on Swiss pension plans is, at least partially, found to be decision-useful to the holders of equity securities of the reporting firms ($RQ(1)$). Notably, in contrast to the sub-samples INDCORR, FSCORR and INDOCI, findings of the bivariate correlation analysis for INDFER only partly confirm research hypotheses $H(2a)$ (*Value-Relevance of NPL*) since the Spearman correlation coefficient for NPL (+/+) is not found to be significantly associated with $MKTCAP_{t+0.25}$. Also, estimated signs for NPL (+/+) are opposite to expectations (i.e., negative). The same also holds for the estimated signs of NPC (+/+) and EC (+/+). Nevertheless, these two covariates are found to be significantly associated with $MKTCAP_{t+0.25}$. Thence, as for the firms applying IAS 19 (2004), these findings confirm research hypotheses $H(2b)$ (*Value-Relevance of NPC*) and $H(2c)$ (*Value-Relevance of EC*), respectively. Notably, hypothesis $H(2d)$ cannot be confirmed for INDFER since $NPLNR$ (+/+) is not found to be significantly associated with $MKTCAP_{t+0.25}$. Accordingly, with regard to research question two ($RQ(2)$), results for INDFER may suggest that pension information recognized in profit or loss is decision-useful whereas the same does not necessarily hold for information that is recognized on the balance-sheet or disclosed in the notes. Thus, in contrast to firms applying IAS 19 (2004), results for INDFER hint towards the fact that investors adopt a view corresponding more to the Revenue-Expense (REA) rather than the Asset-Liability Approach (ALA) of pension accounting.

³⁴⁶ The expected signs for all covariates are outlined in TABLE 6.5.

³⁴⁷ The only exception is the Spearman correlation coefficient of NPL and $MKTCAP_{t+0.5}$, which is found to be significantly different from zero on a 10%-level or higher.

For the financial firms included in the final sample that apply ARR 16 (2005; i.e., FSFER), the mean (median) net pension (asset)/liability (*NPL*) recognized on the balance-sheet and the mean (median) funding status (*FS*) are found to be CHFm -0.01 (0.00) and CHFm 0.34 (-0.20), respectively. Furthermore, the mean (median) unrecognized net pension (asset)/liability (*NPLNR*) is estimated to be CHFm 0.69 (0.00). Also, the mean (median) value of the recognized employer contribution reserves (*ECR*) is found to be CHFm 0.34 (0.00). Lastly, the mean (median) values for the net pension cost (*NPC*) as well as the employer contributions paid (*EC*) are found to be CHFm 7.02 (4.01) and CHFm 6.99 (3.93), respectively.

As in the case of INDFER, also the results of the descriptive analysis for FSFER are in line with the Swiss institutional setting of highly funded pension plans as well as the smoothing approach stipulated by ARR 16 (2005). Notably, the median values of *NPL* are found to be zero for all sample years from 2005 to 2012. For *FS*, the corresponding values between 2009 and 2012 are also found to be zero. Moreover, for 94.67% of all observations included in FSFER *NPL* is found to be zero. Also, the mean values of *NPL*, *FS*, *NPLNR* and *ECR* in percentage of the total book value of equity (*EQ*) oscillate between -0.56% (*FS*) and 0.08% (*ECR*) whereas all median values of these pension covariates in percentage of *EQ* are found to be between -0.02% (*FS*) and 0.00% (*NPL*, *NPLNR* and *ECR*). In contrast, the mean (median) values of *NPC* and *EC* as percentage of total book value of net income/(loss) (*NI*) are estimated to be 10.93% (6.34%) and 10.86% (6.34%), respectively. With regard to the the total book value of dividends proposed (*DIV*), these ratios are estimated to be 6.34% (3.34%) as well as 6.21% (3.34%), accordingly. Furthermore, the median values of *NPC* and *EC* are closely aligned across the sample period of 2005 to 2012. Notably, for *NPL* and *ECR*, estimated mean values for INDFER are found to be significantly greater than the corresponding values estimated for FSFER on a 1%-level or higher. In contrast, for all other pension covariates except *NPLNR*, are the mean values of INDFER found to be significantly smaller than for FSFER. Thence, on average, industry firms included in the final sample that apply ARR 16 (2005) recognize a higher net pension (asset)/liability (*NPL*) as well as lower net pension (income)/cost (*NPC*) compared to the financial counterparts. In terms of median values, estimations for *NPL*, *NPC* and *EC* are significantly different between INDFER and FSFER on a 1%-level or higher.

The findings of the bivariate correlation analysis of FSFER do not necessarily corroborate the results of the analysis conducted for INDFER. Specifically, although for *NPL* (+/+) only the Spearman correlation coefficient with $MKTCAP_{t+0.25}$ is found to be

significantly different from zero on a 10%-level or higher, the Pearson correlation coefficient for $NPLNR$ (+) as well as the Spearman correlation coefficients for $NPLNR$ (+) and FS (+) are estimated to be significantly different from zero on a 5%-level or higher. Furthermore, in line with the results for INDFER, the Pearson and Spearman correlations of NPC (++) and EC (++) with $MKTCAP_{t+0.25}$ are all found to be significantly different from zero on a 1%-level or higher. Nevertheless, for all of these pension covariates except $NPLNR$ (++), the estimated signs are not in line with expectations.³⁴⁸ The results are qualitatively unaltered for the response variables of market capitalization at fiscal-year end ($MKTCAP_t$) as well as six month after the end of the financial year ($MKTCAP_{t+0.5}$).³⁴⁹

Overall, in line with the IFRS sub-samples as well as INDFER, the results of the bivariate correlation analysis for FSFER also partly confirm hypothesis $H(1)$ (*Value-Relevance of Swiss Pension Plans*) and thus, financial information reported on Swiss pension plans, at least partially, is found to be decision-useful to the holders of equity securities of the firms included in FSFER ($RQ(1)$). Notably, in line with INDFER and in contrast to the sub-samples INDCORR, FSCORR and INDOCI, findings of the bivariate correlation analysis for FSFER only partly confirm research hypotheses $H(2a)$ (*Value-Relevance of NPL*). Specifically, the Pearson correlation coefficient for NPL (++) is not found to be significantly different from zero. Moreover, estimated signs are also opposite to expectations (i.e., negative). In contrast, all correlation coefficients estimated for NPC (++) and EC (++) are found to be significantly different from zero. Although the estimated signs are opposite to expectations (i.e., negative), in line with INDFER as well as the firms applying IAS 19 (2004), these findings confirm research hypotheses $H(2b)$ (*Value-Relevance of NPC*) and $H(2c)$ (*Value-Relevance of EC*). Notably, in contrast to INDFER but in line with the firms applying IAS 19 (2004), $NPLNR$ (++) is found to be significantly associated with $MKTCAP_{t+0.25}$, thus confirming hypothesis $H(2d)$ (*Value-Relevance of Disclosures*). Also, estimated signs for $NPLNR$ (++) are in line with expectations. Hence, results for FSFER may suggest that investors rather adopt an Asset-Liability (ALA) than a Revenue-Expense (REA) view of accounting for Swiss pension plans.

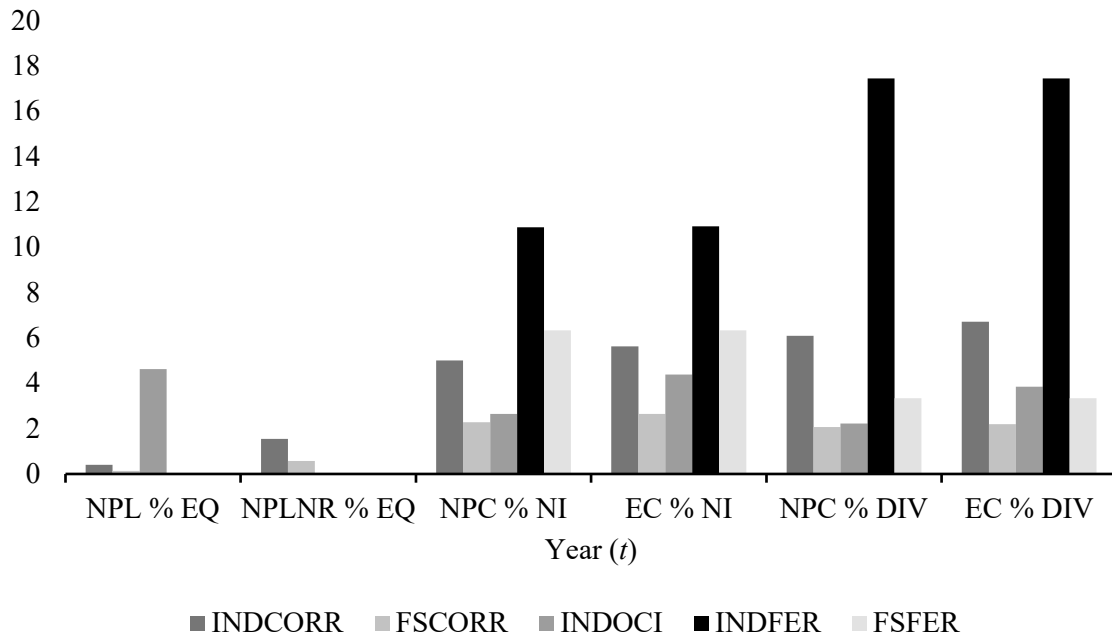
³⁴⁸ The expected signs for all covariates are outlined in TABLE 6.5.

³⁴⁹ The only exception is the Spearman correlation coefficient of NPL and $MKTCAP_{t+0.5}$ which is not found to be significantly different from zero on a 10%-level or higher.

6.3.5 Materiality

FIGURE 6.16 depicts the median values of the net pension (asset)/liability (*NPL*) as percentage of (%) total book value of equity (*EQ*), the unrecognized net pension (asset)/liability (*NPLNR*) % *EQ*, the net pension (income)/cost (*NPC*) % total book value of net income (*NI*), the employer contributions (*EC*) % *NI*, *NPC* % total book value of dividends proposed (*DIV*) as well as *EC* % *DIV* for the sub-samples INDCORR, FSCORR, INDOCI, INDFER and FSFER, respectively. The first four of these ratios may be interpreted as measures of *materiality* based on total book value of equity (*EQ*) and total book value of net income (*NI*). As described in paragraph 5.2.1.3, these are the two primary summary measures provided by financial statements related to firm value. In addition, *NPC* % *DIV* and *EC* % *DIV* provide measures of materiality for *NPC* and *EC* in relation to the total book value of dividends proposed (*DIV*), adjusted for the median dividend pay-out ratio of 0.3005 estimated for the full final sample (see paragraph 6.1.3.3). For the purposes of this study, *DIV* serves as an alternative proxy variable for the earnings power, as well as the cash-flows to the holders of equity securities, of the reporting firms (also see sub-section 6.4.1 for more details). As discussed in paragraph 5.2.1.2, the two standard-setters IASB and the Commission of Swiss GAAP FER define materiality as one of the qualitative characteristics of financial information in order to be decision-useful.

Notably, with respect to *NPL* % *EQ*, the highest median value of 4.63% is found for INDOCI. For the other sub-samples, the respective values oscillate between 0.00% (INDFER and FSFER) and 0.40% (INDCORR). Furthermore, for *NPLNR* % *EQ*, the median ratios of INDCORR and FSCORR are estimated to be 1.55% and 0.58%, respectively. In contrast, for the other sub-samples this ratio is found to be 0.00%. These findings are in line with the results of the descriptive analysis, and illustrate the different accounting methods of IAS 19 (2004) and ARR 16 (2005) outlined in chapter 3. Accordingly, firms applying the OCI-Method (i.e., INDOCI) recognize the highest net pension (assets)/liabilities (*NPL*) relative to the total book value of equity (*EQ*) since these firms must recognize actuarial gains and losses (*AGL*) immediately and directly in equity. In contrast, for firms applying the Corridor-Method, the recognition of *AGL* is delayed and often only partial. Even more pronounced is the smoothed recognition of the *NPL* for firms applying ARR 16 (2005). Specifically, for only 15.09% of observations included in INDFER is *NPL* found to be different from zero. For FSFER, this ratio is even estimated to be as low as 5.33%. In contrast to *NPL* and *NPLNR*, materiality of *NPC* and *EC* relative to *NI* and *DIV* oscillate between 2.07% (*NPC* % *DIV*, FSCORR) and 17.45% (*NPC* and *EC* % *DIV*, INDFER). Thence, with the exception of INDOCI,

FIGURE**6.16 Materiality**

Note. The FIGURE depicts the median values of the net pension (asset)/liability (*NPL*) as percentage of (%) total book value of equity (*EQ*), the unrecognized net pension (asset)/liability (*NPLNR*) % *EQ*, the net pension (income)/cost (*NPC*) % total book value of net income (*NI*), the employer contributions (*EC*) % *NI*, *NPC* % total book value of dividends proposed (*DIV*) as well as *EC* % *DIV* for the sub-samples INDCORR, FSCORR, INDOCI, INDFER and FSFER, respectively. For the different sub-samples, the median values are based on $n = 454, 143, 118, 106$ and 75 observations, respectively.

FIGURE 6.16 illustrates that *NPC* and *EC* are generally more material than *NPL* and *NPLNR*. This finding corroborates the results of the bivariate correlation analysis since *NPC* and *EC* are found to be constantly and significantly associated with the market capitalization of the reporting firms across all sub-samples. In contrast, for INDFER and FSFER not all correlation coefficients of *NPL* and *NPLNR* are significantly different from zero.

6.3.6 Summary and Conclusion

Overall, the main findings of the descriptive as well as the bivariate correlation analysis of the firms included in the final sub-samples are summarized below. Notably, all Pearson and Spearman correlation coefficients referred to are attributable to respective pension covariates and the market capitalization three months after the fiscal-year end ($MKTCAP_{t+0.25}$). Thence, the findings are summarized as follows:

1. There is strong evidence found that the financial pension information recognized and disclosed is in line with the Swiss institutional setting of highly funded pension plans. Specifically, the funding ratios of Swiss pension plans attributable to the firms applying IAS 19 (2004) are generally found to be in line and even above the funding ratios of the Swiss pension plans regularly surveyed by Swisscanto. Moreover, these funding ratios are also higher than for some of the largest companies internationally. Also, most firms applying ARR 16 (2005) do not recognize any net pension (assets)/liabilities (*NPL*). This hints at the fact that the respective Swiss pension plans are sufficiently funded.
2. There is strong evidence found that the financial pension information recognized and disclosed is in line with the respective pension accounting standards applied. Specifically, firms applying the Corridor-Method do not fully account for the funding status (*FS*) of their Swiss pension plans but instead disclose material cumulative unrecognized net actuarial gains and losses (*AGLNR*). In contrast, for firms applying the OCI-Method, the recognized net pension (asset)/liability (*NPL*) as well as the funding status (*FS*) are closely aligned. However, since these firms recognize actuarial gains and losses (*AGL*) immediately and directly in equity, net pension (income)/cost (*NPC*) and employer contributions paid (*EC*) are relatively less aligned compared to firms applying the Corridor-Method. Lastly, most firms applying ARR 16 (2005) do not recognize any amount for the *NPL*. Also, *NPC* and *EC* are found to be very closely aligned for these firms.
3. There is strong evidence found in support of hypothesis *H(1)* (*Value-Relevance of Swiss Pension Plans*). This holds irrespective of the industry classification (i.e., industry and financial) as well as the pension accounting method applied (i.e., Corridor, OCI and ARR 16 (2005)) of the firms analyzed.
4. There is strong evidence found in support of hypothesis *H(2a)* (*Value-Relevance of NPL*) for firms applying IAS 19 (2004). Notably, for firms applying the Corridor-Method the Spearman correlation coefficients of *NPL* are also found to have the expected negative signs.
5. There is some evidence found in support of hypothesis *H(2a)* (*Value-Relevance of NPL*) for firms applying ARR 16 (2005). Nevertheless, the respective Pearson correlation coefficient for industry firms as well as the respective Spearman correlation coefficient for financial firms are only found to be significantly different from zero on a 5%- and 10%-level, respectively. Moreover, none of the estimated signs is in line with expectations (i.e., negative).

6. There is strong evidence found in support of hypothesis $H(2b)$ (*Value-Relevance of NPC*) for firms applying IAS 19 (2004). However, for none of the Pearson and Spearman correlation coefficients is the estimated sign in line with expectations (i.e., negative).
7. There is strong evidence found in support of hypothesis $H(2b)$ (*Value-Relevance of NPC*) for firms applying ARR 16 (2005). Nonetheless, in line with the findings for the firms applying IFRS, the estimated signs are all positive.
8. There is strong evidence found in support of hypothesis $H(2c)$ (*Value-Relevance of EC*) for firms applying IAS 19 (2004). However, analogous to the findings for NPC, the estimated signs are all positive.
9. There is strong evidence found in support of hypothesis $H(2c)$ (*Value-Relevance of EC*) for firms applying ARR 16 (2005). Nevertheless, analogous to the findings for the firms applying IFRS, the estimated signs are all positive.
10. There is strong evidence found in support of hypothesis $H(2d)$ (*Value-Relevance of Disclosures*) for firms applying IAS 19 (2004). Notably, all estimated Pearson and Spearman correlation coefficients for pension covariates that are disclosed only (i.e., *NPLNR*, *AGLNR* and *RNPLNR*) are found to be significantly different from zero on a 1%-level or higher. Furthermore, for the unrecognized net pension (asset)/liability (*NPLNR*) and the cumulative unrecognized net actuarial gains and losses (*AGLNR*) estimated Pearson and Spearman correlation coefficients for the firms applying the Corridor-Method are all found to have the expected positive signs. Correspondingly, for industry firms applying the OCI-Method the Pearson and Spearman correlation coefficients for *NPLNR* are also found to be significantly different from zero on a 1%-level or higher. Nonetheless, estimated signs are negative and thus opposite to expectations.
11. There is some evidence found in support of hypothesis $H(2d)$ (*Value-Relevance of Disclosures*) for firms applying ARR 16 (2005). Specifically, for industry firms the Pearson and Spearman correlation coefficients of the unrecognized net pension (asset)/liability (*NPLNR*) are not found to be significantly different from zero on a 10%-level or higher. In contrast, for financial firms the Pearson and Spearman correlation coefficients of *NPLNR* are estimated to be significantly different from zero on a 5%- and 1%-level, respectively. Moreover, these coefficients also show the expected positive signs.

12. Lastly, with the exception of INDOCI, *NPC* and *EC* are generally found to be more material than *NPL* and *NPLNR*, thus illustrating the application of the different pension accounting methods as well as corroborating the results of the descriptive and bivariate correlation analyses.

Overall, the results of the descriptive as well as the bivariate correlation analysis provide insights on research question *RQ(1)* insofar that financial information on Swiss pension plans reported in line with IAS 19 (2004) and ARR 16 (2005) is generally found to be decision-useful to holders of equity securities of the reporting firms. Moreover, with respect to research question *RQ(2)*, the findings suggest that investors of firms applying the Corridor-Method (i.e., INDCORR and FSCORR) as well as of financial firms applying ARR 16 (2005; i.e., FSFER) prefer an Asset-Liability Approach (ALA) to the accounting of Swiss pension plans, where the full funding status (*FS*) is recognized on the balance-sheet. In contrast, for industry firms applying ARR 16 (2005; i.e., INDFER), results suggest that investors rather adopt a Revenue-Expense view to pension accounting. Lastly, for firms applying the OCI-Method (i.e., INDOCI) results are somewhat equivocal regarding *RQ(2)*.

Finally, contrasting the results of the descriptive as well as the bivariate correlation analysis may also provide further insights regarding research question *RQ(3)* of whether accounting for Swiss pension plans in line with IAS 19 (2004) or ARR 16 (2005) is more decision-useful to investors. Specifically, the findings of the descriptive analysis show that most firms applying ARR 16 (2005) do not recognize any amount as net pension (asset)/liability (*NPL*) for the funding status (*FS*) of their Swiss pension plans. Correspondingly, the net pension (income)/cost (*NPC*) recognized in profit or loss as well as the employer contributions paid (*EC*) are closely aligned across the sample period of 2004 to 2012. In contrast, for most observations where firms apply IAS 19 (2004), the recognized *NPL* is different from zero. Also, *NPC* and *EC* are generally found to be less aligned for these observations. Thence, results confirm the expectation that pension accounting in accordance with ARR 16 (2005) is more in line with the idiosyncracies of the Swiss institutional setting of highly funded pension plans, where employer contributions must be regularly transferred to entities that are legally separate from the reporting firms. Nevertheless, hypothesis *H(3)* (*Value-Relevance of Standards*), that the financial information on Swiss pension plans reported in line with ARR 16 (2005) is more value-relevant, i.e., more strongly and significantly associated with the market value of equity of the reporting firms, than the financial information reported in line with IAS 19 (2004), cannot be confirmed. Specifically, in contrast to the IFRS-observations, for the sub-samples of INDFER and FSFER, evidence regarding the correlation between the

net pension (asset)/liability (*NPL*) and the market capitalization ($MKTCAP_{t+0.25}$) is equivocal. Moreover, for INDFER, the unrecognized net pension (asset)/liability (*NPLNR*) is not found to be significantly correlated with $MKTCAP_{t+0.25}$.

6.4 Multiple Linear Regression Analysis

6.4.1 Benchmark Model

In line with prior research, the value-relevance of Swiss pension plans is further analyzed by estimating empirical variants of the benchmark model defined as follows,

$$MKTCAP_{it+0.25} = \hat{\beta}_0 + \hat{\beta}_1 EQ_{it} + \hat{\beta}_2 NI_{it} + \varepsilon_{it} \quad (6.53)$$

Notably, (6.53) is defined as the empirical version of the benchmark model defined in equation (5.4) on page 183. $MKTCAP_{it+0.25}$, EQ_{it} as well as NI_{it} stand for the market capitalization three months after fiscal year-end, the total book value of equity as well as the total book value of net income/(loss) of firm i in year t , as defined in TABLE 6.3 and 6.4, respectively. As outlined in paragraph 5.2.1.3, this model conveys the intuition that net income/(loss) (*NI*) is a proxy variable for the unrecognized net assets (*UNA*) not included in the book value of equity (*EQ*), since revenues and expenses related to *UNA* are potentially reflected within *NI*.

Although model (6.53) has been widely used as benchmark model in empirical pension value-relevance research, for firms listed in Switzerland it might not be as accurate as for firms listed in other institutional settings. Notably, prior research conducted by e.g., Cormier et al. (2000) find dividends rather than earnings to be the “[...] key determinant of stock market prices [...]” for firms listed in Switzerland (Cormier et al., 2000, p. 410). Specifically, for a sample of Swiss non-financial firms listed on the SPI Global Index between 1990 and 1995, the authors regress stock market prices on lagged, current and future earnings per share (*EPS*) as well as dividends per share (*DPS*). The estimated coefficient for *DPS* is 21.85, whereas earnings coefficient estimates are 1.69, 1.27 and 2.81, respectively. All coefficients are estimated to be positive and statistically significant at the 5%-level or higher (one-tailed). However, the t -statistic for *DPS* is found to be at least 1.76 times higher compared to the t -statistics for the earnings coefficients. $Adj. R^2$ is estimated to be 61.70% and annual OLS regressions corroborate these pooled results. Moreover, current *EPS* is also found to be significantly more value-relevant for

firms that announce an increase in current dividend per share. The authors suggest that their results are mainly due to the relative illiquidity of the Swiss stock market. Accordingly, investors value Swiss stocks as “[...] quasi-bond investments not to be traded for short-term profits [...]” (Cormier et al., 2000, p. 410), where reported earnings are mainly relevant for the determination of dividends (Cormier et al., 2000). In light of the results found by Cormier et al. (2000), model (6.54) outlined below is estimated for the sub-samples INDCORR, FSCORR, INDOCI, INDFER and FSFER, respectively.

$$MKT CAP_{it+0.25} = \hat{\beta}_0 + \hat{\beta}_1 EQ_{it} + \hat{\beta}_2 NI_{it} + \hat{\beta}_3 DIV_{it} + \varepsilon_{it} \quad (6.54)$$

Model (6.54) is equivalent to the benchmark model (6.53) defined above, but incorporates total book value of dividends proposed (*DIV*) for firm *i* in year *t* as additional covariate.

6.4.1.1 INDCORR, INDOCI and FSCORR

TABLE 6.28 below depicts the results of estimating model (6.54) for the sub-samples of firms applying IAS 19 (2004; i.e., INDCORR, INDOCI and FSCORR). All models are estimated by OLS, as outlined in paragraph 6.2.3.1, pooling observations across firms and years. Notably, for all sub-samples, the test for *heteroskedasticity of unknown form*, as proposed by White (1980) and conducted as outlined in paragraph 6.2.3.2, is found to reject the null hypothesis of homoscedastic errors (*u*). Moreover, results of the autocorrelation analysis conducted in paragraph 6.2.3.3 indicate the presence of a strong *firm-effect* in the final sample data. Thence, *t*-statistics and *p*-values are estimated based on heteroskedasticity and autocorrelation consistent (HAC) standard errors that are clustered by firm (i.e., account for a potential firm-effect), as described in paragraphs 6.2.3.3 and 6.2.3.6. Moreover, as outlined in paragraph 6.2.3.6, year-fixed effects are also included in each model in order to account for potential time-effects. However, respective estimation results are not reported separately.³⁵⁰ The bivariate correlation analyses conducted in section 6.3 show high degrees of *correlation* between the covariates *EQ*, *NI* and *DIV* for all of the sub-samples investigated. Nevertheless, for all of the estimated models reported in TABLE 6.28, the maximum variance inflation factor (VIF) is found

³⁵⁰ Estimation results for the year-dummy variables are available from the author upon request. Note, henceforth, all results referred to but not reported separately are available from the author upon request.

TABLE
6.28 Value-Relevance of EQ, NI and DIV – IFRS Data

	Exp. Sign	Sub-Samples		
		INDCORR (a)	INDOCI (b)	FSCORR (c)
<i>n</i>		454	118	143
<i>I</i>		88	24	23
<i>T</i>		9	8	9
<i>Adj. R</i> ²		.55	.67	.95
<i>F</i> -stat.		51.71***	24.79***	256.34***
<i>Intercept</i>	?	3.13e+05*** (8.93e+04)	3.05e+05* (1.71e+05)	-1.36e+09*** (4.95e+08)
<i>EQ</i>	+	0.95*** (0.14)	1.75*** (0.45)	1.10*** (0.12)
<i>NI</i>	+	-0.69 (0.42)	-0.30 (1.28)	-0.47 (0.50)
<i>DIV</i>	+	8.89** (4.16)	11.30*** (4.05)	19.79*** (1.56)
<i>White</i>		***	***	***
<i>max VIF</i>		1.44 (<i>DIV</i>)	1.71 (<i>NI</i>)	5.76 (<i>NI</i>)

Note. The TABLE depicts the results of pooled OLS regressions for INDCORR, INDOCI and FSCORR, respectively. The response variable $MKTCAP_{t+0.25}$ is regressed on the covariates *EQ*, *NI* and *DIV*. All variables are defined as in section 6.1. For the industry data sub-samples (columns a and b), all variables are deflated by the number of employees (*EMP*). Expected signs are as defined in paragraph 6.1.3.4. As outlined in paragraph 6.2.3.6, all models include unreported year-fixed effects to account for time effects. In order to account for heteroskedasticity as well as firm-effects, all standard errors reported in parentheses are clustered by firm as described in paragraph 6.2.3.3. *n*, *I* and *T* indicate the number of firm-year observations, the number of firms and the number of years included in the sub-sample, respectively. *White* indicates the significance of the test for unknown heteroskedasticity as described in paragraph 6.2.3.2. *max VIF* indicates the maximum variance inflation factor, estimated as described in paragraph 6.2.3.4. *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

to be below 10, which is generally applied as threshold indicating severe adverse effects of multicollinearity (see paragraph 6.2.3.4). It must be noted, the estimated VIFs are highly dependent on whether the respective models are deflated by the number of employees of firm *i* in year *t* (EMP_{it}). As discussed in paragraph 6.2.3.5, deflation by *EMP* is suggested to account for the *service cost anomaly* (i.e., omitted variables bias) confirmed by many prior pension value-relevance studies. Thus, it is generally believed that

pension covariates also proxy for the *value of human capital* of the reporting firm. However, deflation by *EMP* increases the maximum VIFs estimated for FSCORR to 641.93 (*DIV*). Apparently, deflation by *EMP* leads to a severe increase of multicollinearity for the sub-sample of financial firms applying the Corridor-Method. In contrast, for the sub-samples of INDCORR and INDOCI maximum variance inflation factors (VIFs) are found to be considerably higher for estimations of *undeflated* models.³⁵¹ These differences in the results found for industry and financial firms might be due to the different institutional settings prevalent for the two groups of firms. Hence, the findings confirm the approach discussed in sub-section 6.3.1, whereas to analyze the defined sub-samples separately. Accordingly, for INDCORR and INDOCI results reported in TABLE 6.28 are based on models deflated by *EMP*. Conversely, for FSCORR estimations are based on the undeflated model.

Notably, no additional covariates are included in order to control for potential *scale effects*. However, as described in paragraph 6.2.3.5, total book value of equity (*EQ*) is found to be sufficiently correlated with other potential scale factors such as total book value of assets (*TA*) and total book value of net sales (*SALES*). Nonetheless, as a test of robustness in terms of outlying observations, all estimations are also run by first winsorizing the sub-samples at the 1%-level. Specifically, for all covariates included (i.e., *EQ*, *NI* and *DIV*) observations higher than the 0.99-Quantile as well as lower than the 0.01-Quantile are set to the respective values of these two quantiles.³⁵² Notably, for all model estimations depicted in TABLE 6.28, results based on winsorized data are qualitatively unaltered (i.e., same covariates are found to be significant and to have equal signs) compared to the unadjusted data.

Lastly, as discussed in sub-section 6.1.2, as a further test of robustness regarding potential *measurement error* in the response variable $MKTCAP_{it+0.25}$, all models are additionally estimated including the two alternative response variables of market capitalization at fiscal year-end ($MKTCAP_{it}$) as well as six months after fiscal year-end ($MKTCAP_{it+0.5}$), respectively. Notably, as in the case of the winsorized data, all results are qualitatively unaltered compared to the estimations based on $MKTCAP_{it+0.25}$.

³⁵¹ Compared to the maximum VIFs reported in TABLE 6.28, the respective values are estimated to be 7.89 (*NI*) and 8.43(*EQ*) for INDCORR and INDOCI, respectively.

³⁵² Quantiles are estimated based on the median-unbiased definition recommended by Hyndman and Fan (1996). Other pension value-relevance studies where authors winsorize data samples are e.g., Chen et al. (2015); Kiosse et al. (2007) and Wiedman and Wier (2004).

Overall, for all three sub-samples, estimated $adj. R^2$ oscillate between 0.55 (INDCORR, F -statistic = 51.71) and 0.95 (FSCORR, F -statistic = 256.34) and, thus, explain between 55% and 95% of the variation in market capitalization three months after fiscal year-end ($MKTCAP_{it+0.25}$). As expected, all estimated coefficients for EQ and DIV are found to be positive and significantly different from zero on a 5%-level or higher.³⁵³ Specifically, coefficient estimates of EQ oscillate between 0.95 (INDCORR) and 1.75 (INDOCI). Furthermore, estimated coefficients for DIV oscillate between 8.89 (INDCORR) and 19.79 (FSCORR). In contrast, for all three sub-samples, estimated coefficients of NI are found to be negative and not significantly different from zero on a 10%-level or higher. Thence, results suggest that there is no value-relevance of total book value of net income/(loss) (NI) incremental to the total book value of equity (EQ) and the total book value of dividends proposed (DIV), for firms included in the analysis that apply IAS 19 (2004). Generally, these findings are in line with the evidence provided by Cormier et al. (2000). Moreover, coefficient estimates for EQ appear to be relatively close to the expected theoretical value of one. In contrast, the same does not hold for DIV , which is used here as proxy variable for the actual but unobservable value of the unrecognized net assets (UNA , also see paragraph 5.2.1.3). Nevertheless, results are in line with prior (pension) value-relevance studies such as e.g., Barth, Beaver, et al. (1998); Fasshauer and Glaum (2008) and Hann, Hefflin, et al. (2007), where authors use NI instead of DIV as covariate. Lastly, it is worth noting that there exists quite a considerable discrepancy between results estimated for industry firms on the one hand (i.e., INDCORR and INDOCI) as well as financial firms (i.e., FSCORR) on the other. Apparently, for financial firms, a considerably larger multiple (i.e., valuation weight) is attached to the book value of dividends proposed ($\hat{\beta}_{DIV} = 19.79$), and the estimated model explains almost all variation in $MKTCAP_{it+0.25}$ (i.e., $adj. R^2 = 0.95$). However, results must be interpreted with caution, since, for FSCORR there is also a higher level of multicollinearity found compared to the industry sub-samples, potentially leading to inflated estimates of coefficients and $adj. R^2$ (see paragraph 6.2.3.4).

³⁵³ Note, for all multiple linear regression results, reported significance levels are always based on two-tailed t -tests. For example, for INDCORR, INDOCI and FSCORR, t -statistics for EQ (DIV) are estimated as 6.75 (2.14), 3.92 (2.79) and 9.01 (12.67), respectively. Note, henceforth, t -statistics as well as p -values are not reported separately. However, they may be derived from estimated and reported coefficients and clustered standard errors, i.e., $t = \frac{\hat{\beta}_k}{\widehat{sd}(\hat{\beta}_k)}$. Any differences are due to rounding.

6.4.1.2 INDFER and FSFER

Analogously to the IFRS sub-samples, TABLE 6.29 below depicts the results of estimating model (6.54) for the sub-samples of firms applying ARR 16 (2005; i.e., INDFER and FSFER). If not stated otherwise, all methodological comments outlined in paragraph 6.4.1.1 also hold for the analysis conducted here. Notably, deflation by *EMP* results in maximum estimated variance inflation factors (VIFs) of 10.45 (*NI*) and 68.87 (*DIV*) for INDFER and FSFER, respectively. Thence, in line with FSCORR, results reported in TABLE 6.29 are based on undeflated models. Nevertheless, for FSFER, the maximum variance inflation factor (VIF) for the undeflated estimation is still found to be above 10 (i.e., 18.10 for *NI*), indicating a rather severe level of multicollinearity. Moreover, for the benchmark model estimated for INDFER, the null hypothesis of homoscedastic errors (*u*) cannot be rejected. However, statistical inference based on OLS standard errors is qualitatively unaltered compared to the application of standard errors clustered by firm. Also, results estimated for winsorized data are qualitatively unaltered compared to the base cases. Lastly, this also holds for the estimations including the alternative response variables $MKTCAP_{it}$ and $MKTCAP_{it+0.5}$ in the case of FSFER. However, for INDFER, estimated coefficients for *DIV* are either found to be not significant ($MKTCAP_{it}$) or significantly different from zero on a 10%-level only ($MKTCAP_{it+0.5}$).

Overall, estimated $adj. R^2$ are found to be 0.81 (INDFER, F -statistic = 46.33) and 0.91 (FSFER, F -statistic = 80.12) and, thus, explain between 81% and 91% of the variation in $MKTCAP_{it+0.25}$. As expected, estimated coefficients for *EQ* are found to be positive and significantly different from zero on a 1%-level or higher. Specifically, coefficient estimates of *EQ* are found to be 0.61 (INDFER) and 0.87 (FSFER). However, in contrast to the IFRS sub-samples, the estimated coefficient of *DIV* for FSFER is found to be negative and significantly different from zero on a 1%-level or higher. Moreover, in the case of INDFER, estimated coefficients of *DIV* are either not found to be significant or significant on a 10%-level only, if the alternative response variables are applied. Moreover, for both sub-samples, estimated coefficients of *NI* (3.32 and 8.89) are found to be positive and significantly different from zero on a 5%-level or higher. Thence, in contrast to the IFRS sub-samples, results for INDFER and FSFER suggest that there is value-relevance of *NI incremental* to *EQ* and *DIV*. Also, results for *DIV* are rather equivocal and partially unexpected. Thus, findings are not in line with Cormier et al. (2000), but even more so with (prior) pension value-relevance studies as outlined above. Also, coefficient estimates for *EQ* are generally closer to the expected theoretical value of one than is the case for *NI*. Lastly, there also exists some discrepancy between results estimated for industry firms and financial firms. As for the IFRS sub-sample, there is a

TABLE

6.29 Value-Relevance of *EQ*, *NI* and *DIV* – *FER* Data

	Exp. Sign	Sub-Samples	
		INDFER (a)	FSFER (b)
<i>n</i>		106	75
<i>I</i>		29	15
<i>T</i>		8	8
<i>Adj. R</i> ²		.81	.91
<i>F</i> -stat.		46.33***	80.12***
<i>Intercept</i>	?	8.18e+07* (4.30e+07)	1.76e+08 (1.13e+08)
<i>EQ</i>	+	0.61*** (0.10)	0.87*** (0.19)
<i>NI</i>	+	3.32** (1.35)	8.89*** (1.39)
<i>DIV</i>	+	7.84** (3.73)	-5.71*** (1.97)
<i>White</i>			***
<i>max VIF</i>		2.90 (<i>NI</i>)	18.10 (<i>NI</i>)

Note. The TABLE depicts the results of pooled OLS regressions for INDFER and FSFER, respectively. The response variable $MKTCAP_{t+0.25}$ is regressed on the covariates *EQ*, *NI* and *DIV*. All variables are defined as in section 6.1 and undeinflated. Expected signs are as defined in paragraph 6.1.3.4. As outlined in paragraph 6.2.3.6, all models include unreported year-fixed effects to account for time effects. In order to account for heteroskedasticity as well as firm-effects, all standard errors reported in parentheses are clustered by firm as described in paragraph 6.2.3.3. *n*, *I* and *T* indicate the number of firm-year observations, the number of firms and the number of years included in the sub-sample, respectively. *White* indicates the significance of the test for unknown heteroskedasticity as described in paragraph 6.2.3.2. *max VIF* indicates the maximum variance inflation factor, estimated as described in paragraph 6.2.3.4. *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

considerably larger *NI*-multiple found for financial firms and the estimated model explains almost all variation in $MKTCAP_{it+0.25}$. However, as for FSCORR, also the results for FSFER must be interpreted somewhat more cautiously, due to a heightened level of multicollinearity.

6.4.1.3 Summary and Conclusion

Estimations of the extended benchmark model (6.54) show that results found for the observations included in the final sample are generally in line with prior (pension) value-relevance research. Specifically, for all sub-samples, total book value of equity (EQ) is found to be value-relevant and relatively close to its theoretical value of one. However, the same does not hold for total book value of net income/(loss) (NI). In contrast, for all IFRS sub-samples, NI is not found to be incrementally value-relevant to EQ and the total book value of dividends proposed (DIV). However, DIV is found to be value-relevant and generally in line with results found for NI in prior research. Thence, these findings also confirm evidence provided by e.g., Cormier et al. (2000), whereas the key price determinant of shares listed in Switzerland are dividends rather than earnings. Notably, these findings do not hold for the sub-samples of firms applying ARR 16 (2005). Here, results for DIV are equivocal and instead, NI is found to be value-relevant and generally in line with estimations found in prior (pension) value-relevance studies. Furthermore, irrespective of the accounting standards applied, estimated coefficients for DIV or NI as well as the shares of explained variation in the market capitalization three months after fiscal year-end ($MKTCAP_{it+0.25}$) are found to be considerably higher for financial firms compared to industry firms. Thus, combined with the different results for firms applying IAS 19 (2004) and ARR 16 (2005), these findings also confirm the approach of analyzing different sub-samples of industry classification and pension accounting standards separately. Last but not least, deflation of the estimation models by the number of employees (EMP) is found to increase multicollinearity for the sub-samples FSCORR, INDFER and FSFER to relatively severe levels.

Overall, with regard to the following multiple regression analyses conducted on pension covariates, results outlined above invoke the following procedure:

- For all models to be estimated for INDCORR, INDOCI and FSCORR, the proxy variable included for the unrecognized net assets (UNA) is total book value of dividends proposed (DIV).
- For all models to be estimated for INDFER and FSFER, the proxy variable included for the unrecognized net assets (UNA) is total book value of net income (NI).
- All models to be estimated for INDCORR and INDOCI are deflated by the number of employees of firm i in year t (EMP_{it}).
- All models to be estimated for FSCORR, INDFER and FSFER are undeflated.

6.4.2 Pension Models

6.4.2.1 INDCORR, INDOCI and FSCORR

NPL and *NPC*

In order to analyze the value-relevance of Swiss pension plans for firms applying IAS 19 (2004), the following model is estimated first,

$$\begin{aligned} MKTCAP_{it+0.25} &= \hat{\beta}_0 + \hat{\beta}_1 EQbNPL_{it} + \hat{\beta}_2 DIVbNPC_{it} + \hat{\beta}_3 NPL_{it} + \hat{\beta}_4 NPC_{it} \quad (6.55) \\ &+ \varepsilon_{it} \end{aligned}$$

(6.55) is an extension of the benchmark model (6.54), estimated in sub-section 6.4.1, and defines an empirical version of the pension value-relevance model (5.5), outlined in paragraph 5.2.1.3. Specifically, the response variable of the market capitalization three months after the fiscal year-end ($MKTCAP_{it+0.25}$) is regressed on the total book value of equity net of (i.e., *before*) the net pension (asset)/liability ($EQbNPL_{it}$), the total book value of dividends proposed before the net pension (income)/cost ($DIVbNPC_{it}$), the net pension (asset)/liability (NPL_{it}) as well as the net pension (income)/cost (NPC_{it}) for firm i in year t , respectively. As discussed in paragraph 5.2.1.3, variants of model (6.55) have been widely used in prior studies in order to estimate whether *NPL* and *NPC* are value-relevant *incremental* to non-pension book equity ($EQbNPL$) and non-pension dividends proposed ($DIVbNPC$) (Glaum, 2009).³⁵⁴ As described in paragraph 6.1.3.4, $\hat{\beta}_3$ and $\hat{\beta}_4$ are both expected to have a negative sign, indicating a negative association between the market capitalization ($MKTCAP$) and the net pension (asset)/liability (NPL) as well as the net pension (income)/cost (NPC).

TABLE 6.30 depicts the estimation results of model (6.55) for the sub-samples INDCORR, INDOCI and FSCORR, respectively. Notably, for all three estimations, the null hypothesis of homoscedastic errors (u) is rejected. However, estimated p -values are based on heteroskedasticity consistent (HAC) standard errors clustered by firm. Moreover, these standard errors are also robust against potential autocorrelation (i.e., firm effects) present in the sample data. Furthermore, in order to control for potential time-

³⁵⁴ Note, based on the analysis conducted in sub-section 6.4.1, for the IFRS sub-samples, model (6.55) incorporates dividends proposed (*DIV*) rather than net income/(loss) (*NI*), generally used in prior research.

TABLE
6.30 Value-Relevance of NPL and NPC – IFRS Data

	Exp. Sign	Sub-Samples		
		INDCORR (a)	INDOCI (b)	FSCORR (c)
<i>n</i>		454	118	143
<i>I</i>		88	24	23
<i>T</i>		9	8	9
<i>Adj. R</i> ²		.55	.67	.97
<i>F</i> -stat.		46.53***	22.48***	346.78***
<i>Intercept</i>	?	2.83e+05*** (9.08e+04)	3.06e+05* (1.68e+05)	-7.22e+08 (4.56e+08)
<i>EQbNPL</i>	+	0.96*** (0.15)	1.77*** (0.43)	0.77*** (0.16)
<i>DIVbNPC</i>	+	7.70** (3.91)	10.77** (4.51)	20.81*** (1.19)
<i>NPL</i>	-	4.11 (5.05)	-2.07 (1.80)	-5.45*** (1.31)
<i>NPC</i>	-	-2.32 (5.72)	-9.44*** (3.36)	12.16 (21.54)
<i>White</i>		***	***	***
<i>max VIF</i>		1.34 (<i>DIVbNPC</i>)	1.33 (<i>NPL</i>)	6.86 (<i>EQbNPL</i>)

Note. The TABLE depicts the results of pooled OLS regressions for INDCORR, INDOCI and FSCORR, respectively. The response variable $MKTCAP_{t+0.25}$ is regressed on the covariates *EQbNPL*, *DIVbNPC*, *NPL* and *NPC*. All variables are defined as in section 6.1. For the industry data sub-samples (columns a and b), all variables are deflated by the number of employees (*EMP*). Expected signs are as defined in paragraph 6.1.3.4. As outlined in paragraph 6.2.3.6, all models include unreported year-fixed effects to account for time effects. In order to account for heteroskedasticity as well as firm-effects, all standard errors reported in parentheses are clustered by firm as described in paragraph 6.2.3.3. *n*, *I* and *T* indicate the number of firm-year observations, the number of firms and the number of years included in the sub-sample, respectively. *White* indicates the significance of the test for unknown heteroskedasticity as described in paragraph 6.2.3.2. *max VIF* indicates the maximum variance inflation factor, estimated as described in paragraph 6.2.3.4. *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

effects, year-fixed effects are included in the models, but respective results are not reported separately. As discussed in sub-section 6.4.1, in order to mitigate potentially adverse effects of multicollinearity, estimations for INDCORR and INDOCI are based on model versions deflated by the number of employees of firm *i* in year *t* (EMP_{it}). Con-

versely, estimations for FSCORR are based on the undeflated model. Accordingly, maximum variance inflation factors (VIFs) are found to be below the critical threshold value of 10 for all three sub-samples. Nonetheless, as for the benchmark model estimated in paragraph 6.4.1.1, the level of multicollinearity amongst covariates is found to be considerably higher for the observations on financial firms (i.e., FSCORR) compared to the observations on industry firms (i.e., INDCORR and INDOCI). Lastly, deflation by *EMP* for INDCORR and INDOCI may simultaneously control for the service cost anomaly (i.e., omitted variables bias) discussed in paragraph 6.2.3.5.

For all three sub-samples, estimated $adj. R^2$ oscillate between 0.55 (INDCORR, F -statistic = 46.53) and 0.97 (FSCORR, F -statistic = 346.78) and, thus, explain between 55% and 97% of the variation in market capitalization three months after fiscal year-end ($MKTCAP_{it+0.25}$). As expected, all estimated coefficients for *EQbNPL* and *DIVbNPC* are found to be positive and significantly different from zero on a 5%-level or higher. Overall, these findings are in line with the benchmark model estimated in paragraph 6.4.1.1. Notably, the net pension (asset)/liability (*NPL*) is found to have the expected negative sign and to be significantly different from zero (i.e., on a 1%-level or higher) for FSCORR only. For INDOCI, *NPL* shows a negative sign, but is not found to be significantly different from zero on a 10%-level or higher. Moreover, for INDCORR, *NPL* is not only not significant, but also has a positive sign. In contrast, the net pension (income)/cost (*NPC*) is only found to have the expected negative sign and to be significantly different from zero (i.e., on a 1%-level or higher) for INDOCI. Thus, for FSCORR and INDOCI, *NPL* and *NPC* are found to be incrementally value-relevant, respectively. The coefficient magnitudes of -5.45 (*NPL*) and -9.44 (*NPC*) are both not in line with a theoretical value of minus one. Moreover, results indicate that investors of firms included in FSCORR, apparently, attach a considerably greater valuation weight to the net pension (assets)/liabilities (*NPL*) than to the non-pension equity components (i.e., *EQbNPL*). Conversely, investors of firms included in INDOCI seem to attach a slightly lower valuation weight to the net pension (income)/cost (*NPC*) compared to the non-pension dividends proposed (i.e., *DIVbNPC*). Finally, it is also worth noting that the deflation by *EMP* for INDCORR and INDOCI seems to effectively control for the service cost anomaly, since coefficients of *NPC* are estimated to have negative signs for these two sub-samples accordingly. On the contrary, the same does not hold for FSCORR, where the model is estimated in undeflated form.

Note, results depicted in TABLE 6.30 are qualitatively unaltered for unreported estimation results based on the data winsorized at the 1%-level, as well as for the alternative response variables of market capitalization at fiscal year-end ($MKTCAP_{it}$) and six

months after fiscal year-end ($MKTCAP_{it+0.5}$), respectively. Moreover, the same also holds for estimated but unreported model versions where only one of the two pension covariates, either NPL or NPC , is included.

NPL, CSC, IC, ER, AGL and RPC

In order to enhance the granularity of the analysis, model (6.55) is extended as follows,

$$\begin{aligned}
 MKTCAP_{it+0.25} &= \hat{\beta}_0 + \hat{\beta}_1 EQbNPL_{it} + \hat{\beta}_2 DIVbNPC_{it} + \hat{\beta}_3 NPL_{it} + \hat{\beta}_4 CSC_{it} \\
 &+ \hat{\beta}_5 IC_{it} + \hat{\beta}_6 ER_{it} + \hat{\beta}_7 AGL_{it} + \hat{\beta}_8 RPC_{it} + \varepsilon_{it}
 \end{aligned} \quad (6.56)$$

Model (6.56) is equivalent to model (6.55), however, instead of the net pension (income)/cost (NPC), the different components of NPC , disclosed separately in the notes of the firms, are included as pension covariates in addition to the net pension (asset)/liability (NPL). Specifically, the total book value of current service cost (CSC), the total book value of interest cost (IC), the total book value of the expected return (ER), the total book value of net actuarial (gains)/losses (AGL) as well as the total book value of the residual net pension (income)/cost (RPC), as defined in sub-section 6.1.3, are included separately in model (6.56). Note, as described in paragraph 3.2.6.4, for firms applying the OCI-Method of IAS 19 (2004), net actuarial (gains)/losses (AGL) must be recognized immediately and directly in equity rather than in profit or loss. Overall, $\hat{\beta}_3$, $\hat{\beta}_4$, $\hat{\beta}_5$, $\hat{\beta}_7$ and $\hat{\beta}_8$ are expected to have negative signs, whereas $\hat{\beta}_6$ is expected to have a positive sign. Thence, this indicates a negative association between $MKTCAP$ and all pension covariates except for ER .

TABLE 6.31 illustrates the estimation results of model (6.56) for INDCORR, INDOCI and FSCORR, respectively. Notably, for all three estimations, the null hypothesis of homoscedastic errors (u) is rejected. However, estimated p -values are based on heteroskedasticity and autocorrelation consistent (HAC) standard errors clustered by firm. Furthermore, in order to control for potential time-effects, unreported year-fixed effects are included in the models. Again, in order to mitigate adverse effects of multicollinearity, estimations for INDCORR and INDOCI are based on model versions deflated by EMP , whereas for FSCORR estimations are based on the undeflated model. Nevertheless, maximum variance inflation factors (VIFs) are found to oscillate between 21.07 (INDCORR) and 232.08 (FSCORR). Thence, results for all three sub-samples must be

TABLE

6.31 Value-Relevance of NPL, CSC, IC, ER, AGL and RPC – IFRS Data

	Exp. Sign	Sub-Samples		
		INDCORR (a)	INDOCI (b)	FSCORR (c)
<i>n</i>		454	118	143
<i>I</i>		88	24	23
<i>T</i>		9	8	9
<i>Adj. R²</i>		.56	.68	.99
<i>F-stat.</i>		37.00***	17.68***	664.90***
<i>Intercept</i>	?	3.62e+05*** (1.16e+05)	3.73e+05** (1.84e+05)	-1.18e+08 (4.89e+08)
<i>EQbNPL</i>	+	0.99*** (0.14)	1.78*** (0.31)	0.44*** (0.10)
<i>DIVbNPC</i>	+	8.98** (3.51)	11.41*** (3.98)	12.49*** (0.78)
<i>NPL</i>	-	1.17 (6.19)	-2.66 (3.09)	0.63 (1.00)
<i>CSC</i>	-	42.83 (26.00)	33.25 (61.21)	-47.33 (79.00)
<i>IC</i>	-	-60.83* (31.79)	-14.96 (45.30)	-31.29 (61.26)
<i>ER</i>	+	12.88 (27.53)	-31.71 (52.18)	101.58*** (32.21)
<i>AGL</i>	-	-1.38 (15.15)	4.52 (6.02)	0.50 (29.61)
<i>RPC</i>	-	-8.69 (13.86)	-2.40 (7.89)	32.06 (24.51)
<i>White</i>		***	***	***
<i>max VIF</i>		21.07 (IC)	36.42 (ER)	232.08 (IC)

(continued on next page)

TABLE (continued)

Note. The TABLE depicts the results of pooled OLS regressions for INDCORR, INDOCI and FSCORR, respectively. The response variable $MKTCAP_{it+0.25}$ is regressed on the covariates $EQbNPL$, $DIVbNPC$, NPL , CSC , IC , ER , AGL and RPC . All variables are defined as in section 6.1. For the industry data sub-samples (columns a and b), all variables are deflated by the number of employees (EMP). Expected signs are as defined in paragraph 6.1.3.4. As outlined in paragraph 6.2.3.6, all models include unreported year-fixed effects to account for time effects. In order to account for heteroskedasticity as well as firm-effects, all standard errors reported in parentheses are clustered by firm as described in paragraph 6.2.3.3. n , I and T indicate the number of firm-year observations, the number of firms and the number of years included in the sub-sample, respectively. *White* indicates the significance of the test for unknown heteroskedasticity as described in paragraph 6.2.3.2. *max VIF* indicates the maximum variance inflation factor, estimated as described in paragraph 6.2.3.4. *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

interpreted with caution due to the potential of unstable coefficient estimates and inflated values of estimated $adj.R^2$. Lastly, deflation by EMP for INDCORR and INDOCI may also simultaneously control for the service cost anomaly.

For all three sub-samples, estimated $adj.R^2$ oscillate between 0.56 (INDCORR, F -statistic = 37.00) and 0.99 (FSCORR, F -statistic = 664.90) and, thus, explain between 55% and 99% of the variation in $MKTCAP_{it+0.25}$. As expected, all estimated coefficients for $EQbNPL$ and $DIVbNPC$ are found to be positive and significantly different from zero on a 5%-level or higher. Overall, these findings are in line with model (6.55) estimated above. Notably, in contrast to model (6.55), NPL is not found to be significantly different from zero on a 10%-level or higher, for any of the three sub-samples. Moreover, only for INDOCI, NPL is found to have the expected negative sign. In terms of NPC components, only two are found to be significantly different from zero on a 10%-level or higher, across all three sub-samples. Specifically, for INDCORR, IC is found to have the expected negative sign and to be significantly different from zero on a 10%-level or higher. Moreover, for FSCORR, ER is found to have the expected positive sign and to be significantly different from zero on a 1%-level or higher. Thence, for industry and financial firms applying the Corridor-Method, IC and ER are found to be incrementally value-relevant, respectively. However, both coefficient estimates of -60.83 (IC) and 101.58 (ER) are not in line with a theoretical value of minus and one, respectively. Correspondingly, investors seem to attach considerably higher valuation weights to IC and ER compared to the non-pension dividend components. Lastly, deflation by EMP seems not to effectively control for the service cost anomaly, since only for the undeflated estimations of FSCORR is CSC found to have the expected negative sign. Overall, results depicted in TABLE 6.31 must be interpreted within context of the severe levels

of multicollinearity estimated for these three models. Thence, this also confirms the approach of mainly including pension covariates (i.e., *NPC* in this case) on a net rather than a gross basis (see paragraph 6.2.3.4).

Note, results depicted in TABLE 6.31 are qualitatively unaltered if estimation is based on data winsorized at the 1%-level for INDOCI. In contrast, for INDCORR, *IC* is no longer found to be significantly different from zero on a 10%-level or higher. Furthermore, for FSCORR, *IC* is additionally found to have the expected negative sign and to be significantly different from zero on a 10%-level or higher. Also, for INDOCI and FSCORR, results estimated for the alternative response variables of market capitalization at fiscal year-end ($MKTCAP_{it}$) and six months after fiscal year-end ($MKTCAP_{it+0.5}$) are qualitatively unaltered compared to the base cases. However, for INDCORR, *CSC* is found to have an unexpected positive sign and to be significantly different from zero on a 10%-level or higher for the estimation including $MKTCAP_{it}$. Finally, for INDOCI, results are qualitatively unaltered if *NPL* is excluded. On the contrary, for INDCORR, *CSC* is found to be positive (opposite to expectations) and significantly different from zero on a 10%-level or higher. Moreover, the same holds for FSCORR with respect to *RPC*, which is found to be positive (opposite to expectations) and significantly different from zero on a 5%-level or higher.

NPL* and *EC

As another variant of the extended benchmark model (6.54), the following model is estimated next for the three IFRS sub-samples.

$$\begin{aligned} MKTCAP_{it+0.25} &= \hat{\beta}_0 + \hat{\beta}_1 EQbNPL_{it} + \hat{\beta}_2 DIVbEC_{it} + \hat{\beta}_3 NPL_{it} + \hat{\beta}_4 EC_{it} \\ &+ \varepsilon_{it} \end{aligned} \quad (6.57)$$

Model (6.57) is equivalent to model (6.55), however, instead of the net pension (income)/cost (*NPC*), the employer contributions paid (*EC*) are included as pension covariate in addition to the net pension (asset)/liability (*NPL*). Accordingly, the total book value of dividends proposed before the employer contributions paid ($DIVbEC_{it}$) are included as non-pension components of dividends proposed. Analogous to model (6.55), $\hat{\beta}_3$ and $\hat{\beta}_4$ are both expected to have a negative sign, indicating a negative association between *MKTCAP* and *NPL* as well as *EC*.

TABLE 6.32 illustrates the estimation results of model (6.57) for INDCORR, INDOCI and FSCORR, respectively. Notably, for all three estimations, the null hypothesis of homoscedastic errors (u) is rejected. However, estimated p -values are based on heteroskedasticity and autocorrelation consistent (HAC) standard errors clustered by firm. Furthermore, in order to control for potential time-effects, unreported year-fixed effects are included in the models. Again, estimations for INDCORR and INDOCI are based on model versions deflated by *EMP*, whereas for FSCORR estimations are based on the undeflated model. Accordingly, maximum variance inflation factors (VIFs) are found to be below the critical threshold value of 10 for all three sub-samples. Nonetheless, in contrast to model (6.55), the level of multicollinearity for financial firms is not found to be considerably higher. Lastly, deflation by *EMP* for INDCORR and INDOCI may also simultaneously control for the service cost anomaly.

For all three sub-samples, estimated $adj. R^2$ oscillate between 0.55 (INDCORR, F -statistic = 46.57) and 0.97 (FSCORR, F -statistic = 328.04) and, thus, explain between 55% and 97% of the variation in $MKTCAP_{it+0.25}$. As expected, all estimated coefficients for *EQbNPL* and *DIVbEC* are found to be positive and significantly different from zero on a 10%-level or higher. Overall, these findings are in line with model (6.55) estimated further above. Notably, in contrast to model (6.55), neither of the two pension covariates included is found to be significantly different from zero on a 10%-level or higher for the industry sub-samples. Moreover, for INDCORR, neither *NPL* nor *EC* is found to have the expected negative sign. However, both *NPL* and *EC* are estimated to have the expected negative signs and to be significantly different from zero on a 1%-level or higher for FSCORR. Thence, for financial firms applying the Corridor-Method, *NPL* and *EC* are found to be incrementally value-relevant. Analogous to model (6.55), both coefficient estimates of -4.99 (*NPL*) and -6.36 (*EC*) are not in line with a theoretical value of minus one. Correspondingly, investors seem to attach a higher (lower) valuation weight to *NPL* (*EC*) compared to the non-pension equity (dividend) components. Lastly, deflation by *EMP* seems not to effectively control for the service cost anomaly in the case of INDCORR, since the coefficient of *EC* is estimated to be positive.

Note, results depicted in TABLE 6.32 are qualitatively unaltered for unreported estimation results based on data winsorized at the 1%-level, as well as for the alternative response variables of market capitalization at fiscal year-end ($MKTCAP_{it}$) and six months after fiscal year-end ($MKTCAP_{it+0.5}$), respectively. Moreover, the same also holds for estimated but unreported model versions where only one of the two pension covariates, either *NPL* or *EC*, is included.

TABLE
6.32 Value-Relevance of NPL and EC – IFRS Data

	Exp. Sign	Sub-Samples		
		INDCORR (a)	INDOCI (b)	FSCORR (c)
<i>n</i>		454	118	143
<i>I</i>		88	24	23
<i>T</i>		9	8	9
<i>Adj. R</i> ²		.55	.67	.97
<i>F</i> -stat.		46.57***	22.31***	328.04***
<i>Intercept</i>	?	2.72e+05*** (9.68e+04)	3.04e+05* (1.69e+05)	-4.32e+08 (6.39e+08)
<i>EQbNPL</i>	+	0.95*** (0.15)	1.74*** (0.43)	0.95*** (0.05)
<i>DIVbEC</i>	+	7.46* (3.97)	11.01** (4.47)	20.70*** (0.96)
<i>NPL</i>	-	3.96 (5.15)	-1.67 (2.24)	-4.99*** (0.87)
<i>EC</i>	-	3.64 (10.44)	-6.13 (15.14)	-6.36*** (1.94)
<i>White</i>		***	***	***
<i>max VIF</i>		1.39 (<i>DIVbEC</i>)	1.51 (<i>NPL</i>)	2.93 (<i>EQbNPL</i>)

Note. The TABLE depicts the results of pooled OLS regressions for INDCORR, INDOCI and FSCORR, respectively. The response variable $MKTCAP_{t+0.25}$ is regressed on the covariates *EQbNPL*, *DIVbEC*, *NPL* and *EC*. All variables are defined as in section 6.1. For the industry data sub-samples (columns a and b), all variables are deflated by the number of employees (*EMP*). Expected signs are as defined in paragraph 6.1.3.4. As outlined in paragraph 6.2.3.6, all models include unreported year-fixed effects to account for time effects. In order to account for heteroskedasticity as well as firm-effects, all standard errors reported in parentheses are clustered by firm as described in paragraph 6.2.3.3. *n*, *I* and *T* indicate the number of firm-year observations, the number of firms and the number of years included in the sub-sample, respectively. *White* indicates the significance of the test for unknown heteroskedasticity as described in paragraph 6.2.3.2. *max VIF* indicates the maximum variance inflation factor, estimated as described in paragraph 6.2.3.4. *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

FS, NPLNR, AGLNR, RNPLNR and NPC

In order to extend the analysis to the pension information that is disclosed only (i.e., not recognized) by firms applying IAS 19 (2004), model (6.55) is extended as follows,

$$\begin{aligned}
MKT CAP_{it+0.25} &= \hat{\beta}_0 + \hat{\beta}_1 EQbNPL_{it} + \hat{\beta}_2 DIVbNPC_{it} + \hat{\beta}_3 FS_{it} \\
&+ \hat{\beta}_4 NPLNR_{it} + \hat{\beta}_5 NPC_{it} + \varepsilon_{it}
\end{aligned} \tag{6.58}$$

In model (6.58), the recognized net pension (asset)/liability (*NPL*) is split into the funding status (*FS*), defined as the difference between the fair values of the defined benefit obligation (*DBO*) and the plan assets (*PLA*) disclosed in the notes of the reporting firm, as well as the unrecognized net pension (asset)/liability (*NPLNR*) that is disclosed only. Otherwise, model (6.58) is equivalent to model (6.55) estimated further above. Notably, as described in sub-section 3.2.6, for firms applying the Corridor-Method (i.e., INDCORR and FSCORR), *NPLNR* is comprised of cumulative unrecognized net actuarial gains and losses (*AGLNR*) as well as the residual unrecognized net pension (asset)/liability (*RNPLNR*), which in turn consists of the cumulative unrecognized net past service cost (*PSC*). In contrast, for firms applying the OCI-Method (i.e., INDOCI), *NPLNR* comprises cumulative unrecognized net *PSC* only. Overall, $\hat{\beta}_3$ and $\hat{\beta}_5$, are expected to have negative signs, whereas $\hat{\beta}_4$ is expected to have a positive sign. Thence, this indicates a negative association between *MKT CAP* and *FS* as well as *NPC*. Conversely, a positive association between *MKT CAP* and *NPLNR* is expected, since every unit of the funding status (*FS*) of the respective Swiss pension plan that is not recognized by the reporting firm is expected to be positively associated with *MKT CAP*.

To further enhance the granularity of model (6.58) for firms applying the Corridor-Method, the following model is additionally estimated for INDCORR and FSCORR,

$$\begin{aligned}
MKT CAP_{it+0.25} &= \hat{\beta}_0 + \hat{\beta}_1 EQbNPL_{it} + \hat{\beta}_2 DIVbNPC_{it} + \hat{\beta}_3 FS_{it} + \hat{\beta}_4 AGLNR_{it} \\
&+ \hat{\beta}_5 RNPLNR_{it} + \hat{\beta}_6 NPC_{it} + \varepsilon_{it}
\end{aligned} \tag{6.59}$$

Notably, compared to model (6.58) outlined above, in model (6.59) *NPLNR* is split into its components *AGLNR* and *RNPLNR*. Correspondingly, $\hat{\beta}_4$ and $\hat{\beta}_5$ are expected to have positive signs, indicating a positive association to *MKT CAP*.

TABLE 6.33 depicts the estimation results of model (6.58) for INDCORR, INDOCI and FSCORR (columns a to c), as well as of model (6.59) for INDCORR and FSCORR (columns d and e), respectively. Notably, for all five estimations, the null hypothesis of

TABLE

6.33 Value-Relevance of FS, NPLNR, AGLNR, RNPLNR and NPC – IFRS Data

	Exp. Sign	Sub-Samples				
		INDCORR (a)	INDOCI (b)	FSCORR (c)	INDCORR (d)	FSCORR (e)
<i>n</i>		454	118	143	454	143
<i>I</i>		88	24	23	88	23
<i>T</i>		9	8	9	9	9
<i>Adj. R²</i>		.55	.68	.98	.55	.98
<i>F-stat.</i>		42.93***	21.96***	467.09***	39.77***	502.50***
<i>Intercept</i>	?	2.88e+05*** (8.89e+04)	3.29e+05* (1.74e+05)	6.71e+08 (1.82e+09)	2.90e+05*** (9.18e+04)	3.86e+08 (1.49e+09)
<i>EQbNPL</i>	+	0.97*** (0.15)	1.76*** (0.39)	1.26*** (0.15)	0.97*** (0.15)	1.14*** (0.11)
<i>DIVbNPC</i>	+	7.77* (3.99)	11.07** (4.51)	15.52*** (1.13)	7.79* (4.03)	9.58** (3.87)
<i>FS</i>	-	3.94 (4.90)	-1.41 (2.10)	-6.71*** (1.26)	3.89 (4.88)	-5.83*** (1.16)
<i>NPLNR</i>	+	-4.87 (5.74)	31.23** (13.99)	-2.31 (1.74)		
<i>AGLNR</i>	+				-4.98 (5.98)	-1.10 (1.40)
<i>RNPLNR</i>	+				-4.50 (5.90)	-18.24* (9.57)
<i>NPC</i>	-	-2.44 (5.99)	-4.51 (4.52)	33.56*** (10.49)	-2.46 (6.02)	40.35*** (9.75)
<i>White</i>		***	***	***	***	***
<i>max VIF</i>		5.86 (NPLNR)	1.37 (FS)	13.65 (EQbNPL)	5.52 (FS)	15.02 (EQbNPL)

Note. The TABLE depicts the results of pooled OLS regressions for INDCORR, INDOCI and FSCORR, respectively. The response variable $MKTCAP_{t+0.25}$ is regressed on the covariates *EQbNPL*, *DIVbNPC*, *FS*, *NPLNR*, *AGLNR*, *RNPLNR* and *NPC*. All variables are defined as in section 6.1. For the industry data sub-samples (columns a, b and d), all variables are deflated by the number of employees (*EMP*). Expected signs are as defined in paragraph 6.1.3.4. As outlined in paragraph 6.2.3.6, all models include unreported year-fixed effects to account for time effects. In order to account for heteroskedasticity as well as firm-effects, all standard errors reported in parentheses are clustered by firm as described in paragraph 6.2.3.3. *n*, *I* and *T* indicate the number of firm-year observations, the number of firms and the number of years included in the sub-sample, respectively. *White* indicates the significance of the test for unknown heteroskedasticity as described in paragraph 6.2.3.2. *max VIF* indicates the maximum variance inflation factor, estimated as described in paragraph 6.2.3.4. *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

homoscedastic errors (u) is rejected. However, estimated p -values are based on heteroskedasticity and autocorrelation consistent (HAC) standard errors clustered by firm. Furthermore, in order to control for potential time-effects, unreported year-fixed effects are included in the models but not reported separately. Again, estimations for INDCORR and INDOCI are based on model versions deflated by EMP , whereas for FSCORR estimations are based on the undeflated model. Nevertheless, the maximum variance inflation factors (VIFs) of 13.65 ($EQbNPL$) and 15.02 ($EQbNPL$) estimated for FSCORR are found to be above the critical threshold value of 10. Accordingly, the respective results must be interpreted with caution. Lastly, deflation by EMP for INDCORR and INDOCI may also simultaneously control for the service cost anomaly.

For all three sub-samples and both models, estimated $adj. R^2$ oscillate between 0.55 (INDCORR, F -statistic = 42.93 and 39.77) and 0.98 (FSCORR, F -statistic = 467.09 and 502.50) and, thus, explain between 55% and 98% of the variation in $MKTCAP_{it+0.25}$. As expected, all estimated coefficients for $EQbNPL$ and $DIVbNPC$ are found to be positive and significantly different from zero on a 10%-level or higher. Overall, these findings are in line with model (6.55) estimated further above. Notably, in line with the findings for NPL estimating model (6.55), the funding status (FS) is found to have the expected negative sign and to be significantly different from zero (i.e., on a 1%-level or higher) for both model estimations for FSCORR only. For INDOCI, FS shows a negative sign, but is not found to be significantly different from zero on a 10%-level or higher. Moreover, for INDCORR, FS is not only not significant, but also has a positive sign in both model estimations. Furthermore, the net pension (income)/cost (NPC) is found to have the expected negative signs for the model estimations for INDCORR and INDOCI. However, neither of these coefficients is found to be significantly different from zero on a 10%-level or higher. In contrast, for FSCORR, NPC is found to be significantly different from zero on a 1%-level or higher in both model estimations. Nevertheless, estimated signs are positive opposite to expectations. Thus, for FSCORR, FS and NPC are found to be incrementally value-relevant, respectively. The coefficient magnitudes of -6.71 and -5.83 (FS) as well as 33.56 and 40.35 (NPC) are all not in line with a theoretical value of minus one. Moreover, for $NPLNR$, only the estimated coefficient for INDOCI is found to be positive, as expected, and significantly different from zero (i.e., on a 5%-level or higher). In contrast, for INDCORR and FSCORR, estimated coefficients have negative signs and are not significantly different from zero on a 10%-level or higher. Thence, for INDOCI, $NPLNR$ is found to be incrementally different from zero. However, the estimated coefficient value of 31.23 is not in line with the theoretical value of one. Also, with regard to $AGLNR$ and $RNPLNR$, the only estimated

coefficient found to be significantly different from zero (i.e., on a 10%-level or higher) is *RNPLNR* for FSCORR. However, opposite to expectations, all coefficients are found to have negative signs. Therefore, only *RNPLNR* for FSCORR is found to be incrementally value-relevant. Nonetheless, all results for FSCORR presented in TABLE 6.33 must be interpreted cautiously due to the heightened level of multicollinearity. Lastly, deflation by *EMP* seems to effectively control for the service cost anomaly since the coefficients of *NPC* are estimated to be negative for INDCORR and INDOCI.

Note, results depicted in TABLE 6.33 are qualitatively unaltered for unreported estimation results based on data winsorized at the 1%-level. This also holds for both model estimations for INDCORR, with regard to the alternative response variables of market capitalization at fiscal year-end ($MKTCAP_{it}$) and six months after fiscal year-end ($MKTCAP_{it+0.5}$), respectively. In contrast, for INDOCI, applying $MKTCAP_{it+0.5}$ as response variable leads to a coefficient estimate for *NPC* that is negative (as expected) and significantly different from zero on a 10%-level or higher. Also, for FSCORR, estimation of model (6.58) with $MKTCAP_{it}$ leads to a negative estimate for *NPLNR* (opposite to expectations) significantly different from zero on a 5%-level or higher. Furthermore, the same holds for the coefficient of *AGLNR* estimating model (6.59) with $MKTCAP_{it}$ for FSCORR. Moreover, for INDCORR, all results are qualitatively unaltered if the funding status (*FS*) is split into its two components defined benefit obligation (*DBO*) and plan assets (*PLA*). On the contrary, for INDOCI, *NPLNR* is not found to be significantly different from zero on a 10%-level or higher if *FS* is split into *DBO* and *PLA*. Moreover, the same also holds for FSCORR regarding *RNPLNR*. Overall, it is important to note that splitting *FS* into *DBO* and *PLA* leads to severely increased multicollinearity across all estimations and sub-samples. Thus, once again, this confirms the approach of mainly including pension covariates on a net rather than a gross basis. Last but not least, all results depicted in TABLE 6.33 are also qualitatively unaltered if *NPC* is excluded.

6.4.2.2 INDFER and FSFER

NPL, *NPC* and *EC*

Analogous to the IFRS sub-samples, the following two models are estimated for the firms applying ARR 16 (2005).

$$\begin{aligned}
& MKTCAP_{it+0.25} \\
& = \hat{\beta}_0 + \hat{\beta}_1 EQbNPL_{it} + \hat{\beta}_2 NibNPC_{it} + \hat{\beta}_3 NPL_{it} + \hat{\beta}_4 NPC_{it} \\
& + \varepsilon_{it}
\end{aligned} \quad (6.60)$$

$$\begin{aligned}
& MKTCAP_{it+0.25} \\
& = \hat{\beta}_0 + \hat{\beta}_1 EQbNPL_{it} + \hat{\beta}_2 NibEC_{it} + \hat{\beta}_3 NPL_{it} + \hat{\beta}_4 EC_{it} + \varepsilon_{it}
\end{aligned} \quad (6.61)$$

As outlined in paragraph 6.4.1.3, instead of dividends proposed (*DIV*), for the FER sub-samples, all estimated models incorporate net income/(loss) (*NI*) as a proxy for unrecognized net assets (*UNA*). Further, for both models, $\hat{\beta}_3$ and $\hat{\beta}_4$ are expected to have negative signs, indicating a negative association between the market capitalization (*MKTCAP*) and the net pension (asset)/liability (*NPL*) as well as the net pension (income)/cost (*NPC*) and the employer contributions paid (*EC*), respectively.

TABLE 6.34 illustrates the results of both model estimations (6.60) and (6.61), for the sub-samples INDFER and FSFER, respectively. Notably, for the two estimations regarding INDFER (columns a and c), the null hypothesis of homoscedastic errors (*u*) is not rejected. In contrast, this does not hold for FSFER (columns b and d). However, estimated *p*-values are based on heteroskedasticity and autocorrelation consistent (HAC) standard errors clustered by firm.³⁵⁵ Furthermore, in order to control for potential time-effects, year-fixed effects are included in the models, but respective results are not reported separately. As discussed in sub-section 6.4.1, in order to mitigate potentially adverse effects of multicollinearity, estimations for INDFER and FSFER are based on model versions that are not deflated by the number of employees (*EMP*). Nevertheless, maximum variance inflation factors (VIFs) of 15.31 (*NibNPC*) and 15.43 (*NibEC*) estimated for FSFER are found to be above the critical threshold value of 10. Thence, as for the benchmark model estimated in paragraph 6.4.1.2, the level of multicollinearity amongst covariates is found to be considerably higher for the observations on financial firms compared to the observations on industry firms.

For both models, estimated *adj. R*² are found to be 0.79 (INDFER, *F*-statistic = 36.89 and 36.88) and 0.90 (FSFER, *F*-statistic = 60.79 and 60.71) and, thus, explain 79% and 90% of the variation in market capitalization three months after fiscal year-end (*MKTCAP*_{*it+0.25*}), respectively. As expected, all estimated coefficients for *EQbNPL*,

³⁵⁵ Results for INDFER are qualitatively unaltered if based on OLS standard errors.

TABLE

6.34 Value-Relevance of NPL, NPC and EC – FER Data

	Exp. Sign	Sub-Samples			
		INDFER (a)	FSFER (b)	INDFER (c)	FSFER (d)
<i>n</i>		106	75	106	75
<i>I</i>		29	15	29	15
<i>T</i>		8	8	8	8
<i>Adj. R</i> ²		.79	.90	.79	.90
<i>F</i> -stat.		36.89***	60.79***	36.88***	60.71***
<i>Intercept</i>	?	5.25e+07 (8.18e+07)	2.86e+08*** (1.00e+08)	5.46e+07 (8.06e+07)	2.87e+08*** (1.01e+08)
<i>EQbNPL</i>	+	0.56*** (0.16)	0.92*** (0.14)	0.57*** (0.15)	0.92*** (0.14)
<i>NibNPC</i>	+	4.49*** (1.51)	4.89*** (1.61)		
<i>NibEC</i>	+			4.46*** (1.48)	4.84*** (1.65)
<i>NPL</i>	-	-4.41 (22.02)	682.29* (359.00)	-4.89 (22.13)	701.05** (346.03)
<i>NPC</i>	-	1.29 (5.62)	-17.41 (22.87)		
<i>EC</i>	-			0.70 (5.10)	-16.35 (23.42)
<i>White</i>			***		***
<i>max VIF</i>		4.40 (EQbNPL)	15.31 (NibNPC)	3.92 (EQbNPL)	15.43 (NibEC)

Note. The TABLE depicts the results of pooled OLS regressions for INDFER and FSFER, respectively. The response variable $MKTCAP_{t+0.25}$ is regressed on the covariates *EQbNPL*, *NibNPC*, *NibEC*, *NPL*, *NPC* and *EC*. All variables are defined as in section 6.1 and undeflated. Expected signs are as defined in paragraph 6.1.3.4. As outlined in paragraph 6.2.3.6, all models include unreported year-fixed effects to account for time effects. In order to account for heteroskedasticity as well as firm-effects, all standard errors reported in parentheses are clustered by firm as described in paragraph 6.2.3.3. *n*, *I* and *T* indicate the number of firm-year observations, the number of firms and the number of years included in the sub-sample, respectively. *White* indicates the significance of the test for unknown heteroskedasticity as described in paragraph 6.2.3.2. *max VIF* indicates the maximum variance inflation factor, estimated as described in paragraph 6.2.3.4. *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

NibNPC and *NibEC* are found to be positive and significantly different from zero on a 1%-level or higher. Overall, these findings are in line with the benchmark model estimated in paragraph 6.4.1.2. Notably, for INDFER, neither the estimated coefficients of *NPL*, *NPC* or *EC* are found to be significantly different from zero on a 10%-level or higher. Nevertheless, for *NPL*, estimated coefficients show negative signs in line with expectations for both models. In contrast, this does not hold for *NPC* nor *EC*. For FSFER, estimated coefficients for *NPC* and *EC* are found to be negative (as expected) but not significantly different from zero on a 10%-level or higher. On the contrary, *NPL* is estimated to be significantly different from zero on a 10%-level or higher as well as on a 5%-level or higher for models (6.60) and (6.61), respectively. However, opposite to expectations, coefficients are estimated to be positive. Furthermore, the estimated magnitudes of 682.29 and 701.05 are not in line with a theoretical value of one. Thence, investors of financial firms applying ARR 16 (2005) appear to attach a considerably greater valuation weight to *NPL* than to the non-pension components of equity (i.e., *EQbNPL*).

Note, results depicted in TABLE 6.34 are qualitatively unaltered (i.e., same covariates are found to be significant and to have equal signs) for unreported estimation results based on data winsorized at the 1%-level, as well as for the alternative response variables of market capitalization at fiscal year-end ($MKTCAP_{it}$) and six months after fiscal year-end ($MKTCAP_{it+0.5}$), respectively. Moreover, the same also holds for estimated but unreported model versions where only one of the two pension covariates, either *NPL* or *NPC* and *EC* is included. The only exception is the estimation of model (6.60) for FSFER including $MKTCAP_{it}$, where *NPL* is no longer found to be significantly different from zero on a 10%-level or higher.

FS, NPLNR, ECR and NPC

In order to enhance the granularity of the analysis as well as to extend the analysis to the pension information that is disclosed only (i.e., not recognized) by firms applying ARR 16 (2005), the following model is also estimated for INDFER and FSFER, respectively.

$$\begin{aligned}
 MKTCAP_{it+0.25} &= \hat{\beta}_0 + \hat{\beta}_1 EQbNPL_{it} + \hat{\beta}_2 NibNPC_{it} + \hat{\beta}_3 FS_{it} + \hat{\beta}_4 NPLNR_{it} \\
 &+ \hat{\beta}_5 ECR_{it} + \hat{\beta}_6 NPC_{it} + \varepsilon_{it}
 \end{aligned} \quad (6.62)$$

Model (6.62) is equivalent to model (6.60) but incorporates the components of NPL , i.e., the funding status (FS), the unrecognized net pension (asset)/liability ($NPLNR$) and the recognized employer contribution reserve (ECR), as stand-alone covariates. This follows from the definition (6.13) of FS for firms applying ARR 16 (2005) outlined in paragraph 6.1.3.3. Accordingly, NPL may be defined as follows,

$$NPL_t = FS_t - NPLNR_t + ECR_t \quad (6.63)$$

As discussed in paragraph 6.1.3.4, the estimated signs for $\hat{\beta}_3$, $\hat{\beta}_4$ and $\hat{\beta}_5$ are expected to be negative, positive and negative, respectively. Within the framework of model (6.62), this indicates an expected negative association between $MKTCAP$ and FS as well as ECR . In contrast, for $NPLNR$, the association with $MKTCAP$ is expected to be positive.

TABLE 6.35 depicts the estimation results for model (6.62) for INDFER and FSFER, respectively. Notably, only for FSFER is the null hypothesis of homoscedastic errors (u) rejected. However, results for INDFER are qualitatively unaltered if based on OLS standard errors. Thence, estimated p -values are based on heteroskedasticity and autocorrelation consistent (HAC) standard errors clustered by firm. Furthermore, in order to control for potential time-effects, unreported year-fixed effects are included in the models. Furthermore, as discussed in sub-section 6.4.1, in order to mitigate potentially adverse effects of multicollinearity, estimations for INDFER and FSFER are based on model versions that are not deflated by the number of employees (EMP). Nevertheless, maximum variance inflation factors (VIFs) of 139.71 (FS) for INDFER and 61,798.25 (FS) for FSFER are indicating extremely severe levels of multicollinearity. Thence, this confirms the approach of including pension covariates on a net rather than a gross basis, if possible, in order to mitigate these effects. Accordingly, results presented in TABLE 6.35 must be interpreted with caution due to the potential of unstable coefficient estimates and inflated values of estimated $adj.R^2$. This is especially true with regard to FSFER.

For both models, estimated $adj.R^2$ are found to be 0.79 (INDFER, F -statistic = 31.36) and 0.90 (FSFER, F -statistic = 51.66) and, thus, explain 79% and 90% of the Variation in $MKTCAP_{it+0.25}$, respectively. As expected, all estimated coefficients for $EQbNPL$ and $NlbNPC$ are found to be positive and significantly different from zero on a 5%-level or higher. Overall, these findings are in line with model (6.60) estimated above. Notably, for INDFER, neither the estimated coefficients of FS , $NPLNR$, ECR or

TABLE
6.35 Value-Relevance of FS, NPLNR, ECR and NPC – FER Data

	Exp. Sign	Sub-Samples	
		INDFER (a)	FSFER (b)
<i>n</i>		106	75
<i>I</i>		29	15
<i>T</i>		8	8
<i>Adj. R</i> ²		.79	.90
<i>F</i> -stat.		31.36***	51.66***
<i>Intercept</i>	?	6.61e+07 (8.54e+07)	3.63e+08*** (9.80e+07)
<i>EQbNPL</i>	+	0.57*** (0.15)	0.93*** (0.14)
<i>NlbNPC</i>	+	4.37*** (1.47)	5.04** (2.14)
<i>FS</i>	-	-6.99 (21.62)	850.75*** (292.94)
<i>NPLNR</i>	+	7.76 (22.22)	-855.06*** (292.88)
<i>ECR</i>	-	-14.50 (21.32)	695.41** (302.16)
<i>NPC</i>	-	1.39 (5.81)	-18.14 (23.47)
<i>White</i>			***
<i>max VIF</i>		139.71 (FS)	61,798.25 (FS)

Note. The TABLE depicts the results of pooled OLS regressions for INDFER and FSFER, respectively. The response variable $MKTCAP_{t+0.25}$ is regressed on the covariates *EQbNPL*, *NlbNPC*, *FS*, *NPLNR*, *ECR* and *NPC*. All variables are defined as in section 6.1 and undeflated. Expected signs are as defined in paragraph 6.1.3.4. As outlined in paragraph 6.2.3.6, all models include unreported year-fixed effects to account for time effects. In order to account for heteroskedasticity as well as firm-effects, all standard errors reported in parentheses are clustered by firm as described in paragraph 6.2.3.3. *n*, *I* and *T* indicate the number of firm-year observations, the number of firms and the number of years included in the sub-sample, respectively. *White* indicates the significance of the test for unknown heteroskedasticity as described in paragraph 6.2.3.2. *max VIF* indicates the maximum variance inflation factor, estimated as described in paragraph 6.2.3.4. *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

NPC are found to be significantly different from zero on a 10%-level or higher. Nevertheless, for *FS*, *NPLNR* and *ECR* estimated coefficients show signs in line with expectations. In contrast, this does not hold for *NPC*. For FSFER, estimated coefficients for *FS*, *NPLNR* and *ECR* are found to be significantly different from zero on a 5%-level or higher. However, all estimated signs are opposite to expectations. On the contrary, *NPC* is not estimated to be significantly different from zero on a 10%-level but shows a negative sign as expected. Thus, for FSFER, *FS*, *NPLNR* and *ECR* are found to be incrementally value-relevant. The estimated magnitudes of 850.75 (*FS*), -855.06 (*NPLNR*) and 695.41 (*ECR*) are not in line with the theoretical values of minus one (*FS* and *ECR*) and one (*NPLNR*), respectively. Thence, investors of financial firms applying ARR 16 (2005) appear to attach considerably greater valuation weights to these pension covariates compared to the non-pension components of equity (i.e., *EQbNPL*). Nonetheless, as above-mentioned, these findings must be interpreted in light of the extremely high level of multicollinearity detected for FSFER.

Note, results depicted in TABLE 6.34 are qualitatively unaltered for unreported estimation results based on data winsorized at the 1%-level, as well as for the alternative response variables of $MKTCAP_{it}$ and $MKTCAP_{it+0.5}$, respectively. Moreover, the same also holds for estimated but unreported model versions where *NPC* is excluded.

6.4.2.3 Summary and Conclusion

Overall, the main findings of the multiple linear regression analysis of the firms included in the final sub-samples are summarized as follows:

1. There is strong evidence found in support of hypothesis *H(1)* (*Value-Relevance of Swiss Pension Plans*) for industry firms applying the OCI-Method as well as for financial firms applying the Corridor-Method in line with IAS 19 (2004; i.e., INDOCI and FSCORR). In contrast, there is only weak evidence found for *H(1)* with respect to industry firms applying the Corridor-Method (i.e., INDCORR).
2. There is only weak evidence found in support of hypothesis *H(1)* (*Value-Relevance of Swiss Pension Plans*) for financial firms applying ARR 16 (2005; i.e., FSFER). In contrast, there is no evidence found for *H(1)* for industry firms (i.e., INDFER).
3. There is strong evidence found in support of hypothesis *H(2a)* (*Value-Relevance of NPL*) for financial firms applying the Corridor-Method in line with IAS 19

- (2004; i.e., FSCORR). In contrast, there is no evidence found for $H(2a)$ with respect to industry firms applying the Corridor-Method (i.e., INDCORR) as well as for industry firms applying the OCI-Method (i.e., INDOCI).
4. There is only weak evidence found in support of hypothesis $H(2a)$ (*Value-Relevance of NPL*) for financial firms applying ARR 16 (2005; i.e., FSFER). In contrast, there is no evidence found for $H(2a)$ with regard to industry firms (i.e., INDFER).
 5. There is strong evidence found in support of hypothesis $H(2b)$ (*Value-Relevance of NPC*) for industry firms applying the OCI-Method as well as for financial firms applying the Corridor-Method in line with IAS 19 (2004; i.e., INDOCI and FSCORR). In contrast, there is only weak evidence found for $H(2b)$ with respect to industry firms applying the Corridor-Method (i.e., INDCORR).
 6. There is no evidence found in support of hypothesis $H(2b)$ (*Value-Relevance of NPC*) for industry as well as financial firms applying ARR 16 (2005; i.e., INDFER and FSFER).
 7. There is strong evidence found in support of hypothesis $H(2c)$ (*Value-Relevance of EC*) for financial firms applying the Corridor-Method in line with IAS 19 (2004; i.e., FSCORR). In contrast, there is no evidence found for $H(2c)$ with respect to industry firms applying the Corridor-Method (i.e., INDCORR) as well as for industry firms applying the OCI-Method (i.e., INDOCI).
 8. There is no evidence found in support of hypothesis $H(2c)$ (*Value-Relevance of EC*) for industry as well as financial firms applying ARR 16 (2005; i.e., INDFER and FSFER).
 9. There is weak evidence found in support of hypothesis $H(2d)$ (*Value-Relevance of Disclosures*) for industry firms applying the OCI-Method as well as for financial firms applying the Corridor-Method in line with IAS 19 (2004; i.e., INDOCI and FSCORR). In contrast, there is no evidence found for $H(2d)$ regarding industry firms applying the Corridor-Method (i.e., INDCORR).
 10. There is only weak evidence found in support of hypothesis $H(2d)$ (*Value-Relevance of Disclosures*) for financial firms applying ARR 16 (2005; i.e., FSFER). In contrast, there is no evidence found for $H(2d)$ for industry firms (i.e., INDFER).

The conclusions outlined above are also summarized in TABLE 6.36 below.

TABLE

6.36 Main Findings of Multiple Linear Regression Analysis

	Sub-Samples				
	INDCORR	INDOCI	FSCORR	INDFER	FSFER
<i>H(1)</i>	weak	strong	strong	no	weak
<i>H(2a)</i>	no	no	strong	no	weak
<i>H(2b)</i>	weak	strong	strong	no	no
<i>H(2c)</i>	no	no	strong	no	no
<i>H(2d)</i>	no	weak	weak	no	weak

Note. The TABLE summarizes the strength of evidence found through multiple linear regression analysis for hypotheses *H(1)* – *H(2d)* formulated in sub-section 5.2.3, and across all sub-samples analyzed. INDCORR and FSCORR are the sub-samples of industry and financial firms applying the Corridor-Method in line with IAS 19 (2004), respectively. INDOCI is the sub-sample of industry firms applying the OCI-Method in line with IAS 19 (2004). INDFER and FSFER are the sub-samples of industry and financial firms applying ARR 16 (2005), respectively. The hypotheses are defined as follows:

- *H(1)* - Value-Relevance of Swiss Pension Plans
- *H(2a)* - Value-Relevance of NPL
- *H(2b)* - Value-Relevance of NPC
- *H(2c)* - Value-Relevance of EC
- *H(2d)* - Value-Relevance of Disclosures

Overall, answers to research question *RQ(1)* provided by the multiple linear regression analysis suggest that financial information on Swiss pension plans is especially useful for investors of industry firms applying the OCI-Method as well as of financial firms applying the Corridor-Method in line with IAS 19 (2004), respectively. On the contrary, evidence for the decision-usefulness of Swiss pension plans is only weak for industry firms applying the Corridor-method in line with IAS 19 (2004) as well as for financial firms applying ARR 16 (2005). Moreover, for the industry firms analyzed that apply ARR 16 (2005), financial information on Swiss pension plans appears not to be decision-useful to equity holders.

With regard to research question *RQ(2)*, evidence provided by the multiple linear regression analysis is rather equivocal. Specifically, for financial firms applying the

Corridor-Method (i.e., FSCORR), hypotheses $H(2a)$, $H(2b)$ and $H(2c)$ are strongly confirmed, whereas the same does not hold for hypothesis $H(2d)$. Thence, such findings indicate that investors of these firms adopt a Revenue-Expense (REA) view in terms of Swiss pension plans, supporting the delayed and often only partial recognition of actuarial gains and losses (*AGL*) in line with the Corridor-Method. Although there is only weak evidence found confirming hypothesis $H(2b)$, the same interpretation may also hold for industry firms (i.e., INDCORR). Moreover, for industry firms applying the OCI-Method (i.e., INDOCI), there is also strong evidence found confirming hypotheses $H(2b)$. In contrast, there is no evidence confirming hypotheses $H(2a)$ and $H(2c)$ as well as only weak evidence supporting $H(2d)$. Thence, these findings also suggest that investors prefer the Revenue-Expense Approach (REA) to pension accounting. However, with regard to ARR 16 (2005), there is only weak evidence found in favor of hypotheses $H(2a)$ and $H(2d)$ for financial firms (i.e., FSFER). On the contrary, none of the hypotheses $H(2a)$ to $H(2d)$ can be confirmed for the industry firms analyzed (i.e., INDFER). Hence, if at all, evidence with respect to ARR 16 (2005) suggests that investors rather adopt an Asset-Liability (ALA) than a Revenue-Expense view (REA).

Lastly, evidence provided by the multiple linear regression analysis is rather unequivocal in terms of research question $RQ(3)$. Notably, as above-mentioned, there is no evidence found confirming any of the hypotheses $H(1)$ to $H(2d)$ for industry firms applying ARR 16 (2005; i.e., INDFER). Moreover, there is only weak evidence found for hypotheses $H(1)$, $H(2a)$ and $H(2d)$ with regard to the financial firms applying ARR 16 (2005; i.e., FSFER). In contrast, there is strong evidence found for hypotheses $H(1)$ and $H(2b)$ for industry firms applying the OCI-Method as well as for financial firms applying the Corridor-Method in line with IAS 19 (2004; i.e., INDOCI and FSCORR). Furthermore, there is strong evidence found for hypotheses $H(2a)$ and $H(2c)$ for FSCORR. Also, weak evidence is found for hypotheses $H(1)$ and $H(2b)$ for industry firms applying the Corridor-Method (i.e., INDCORR) as well as for hypothesis $H(2d)$ with respect to INDOCI and FSCORR. Thence, overall, hypothesis $H(3)$ (*Value-Relevance of Standards*), whereas financial information reported in line with ARR 16 (2005) is more value-relevant i.e., more strongly and significantly associated with the market value of equity of the reporting firms than financial information reported in line with IAS 19 (2004), cannot be confirmed. Accordingly, in terms of research question $RQ(3)$, results of the multiple linear regression analysis suggest that financial information in line with IAS 19 (2004) is more decision-useful to equity holders of the reporting firms than corresponding information in line with ARR 16 (2005).

6.5 Conclusion and Limitations

6.5.1 Main Findings

The descriptive analysis conducted in section 6.3 provides evidence that the financial pension information recognized and disclosed by the final sample firms is in line with the Swiss institutional setting of highly funded pension plans. Specifically, the funding ratios of Swiss pension plans attributable to the firms applying IAS 19 (2004) are generally found to be in line and even above the funding ratios of the Swiss pension plans regularly surveyed by Swisscanto. Moreover, these funding ratios are also higher than for some of the largest companies internationally. Also, most firms applying ARR 16 (2005) do not recognize any net pension (assets)/liabilities (*NPL*). This hints at the fact that the respective Swiss pension plans are sufficiently funded. Furthermore, findings of the descriptive analysis also confirm that the financial pension information recognized and disclosed is in line with the respective pension accounting standards applied. Specifically, firms applying the Corridor-Method do not fully account for the funding status (*FS*) of their Swiss pension plans but instead disclose material cumulative unrecognized net actuarial gains and losses (*AGLNR*). In contrast, for firms applying the OCI-Method, *NPL* as well as *FS* are closely aligned. However, since these firms recognize actuarial gains and losses (*AGL*) immediately and directly in equity, net pension (income)/cost (*NPC*) and employer contributions paid (*EC*) are relatively less aligned compared to firms applying the Corridor-Method. Lastly, most firms applying ARR 16 (2005) do not recognize any amount for the *NPL*. Also, *NPC* and *EC* are found to be very closely aligned for these firms.

Overall, results of the bivariate correlation analysis conducted in section 6.3, generally, confirm *H(1)* (*Value-Relevance of Swiss Pension Plans*), irrespective of industry classification (i.e., industry and financial) as well as the pension accounting standard applied (i.e., IAS 19 (2004) and ARR 16 (2005)). In contrast, results of the multiple linear regression analysis conducted in section 6.4 are somewhat less clear. Specifically, strong evidence is found confirming hypothesis *H(1)* for industry firms applying the OCI-Method as well as for financial firms applying the Corridor-Method in line with IAS 19 (2004; i.e., INDOCI and FSCORR), respectively. On the contrary, evidence for the value-relevance of Swiss pension plans is only weak for industry firms applying the Corridor-Method in line with IAS 19 (2004; i.e., INDCORR) as well as for financial firms applying ARR 16 (2005; i.e., FSFER). Moreover, for the industry firms analyzed that apply ARR 16 (2005; i.e., INDFER), there is no evidence provided in support of hypothesis *H(1)*. Taken together, based on this evidence, research question *RQ(1)*, i.e.,

whether reported financial information on Swiss pension plans is decision-useful to holders of equity securities of the reporting firms, can be affirmed for firms applying IAS 19 (2004). On the contrary, the same does not hold for firms applying ARR 16 (2005). Thence, results for the IFRS sub-samples are overall in line with the body of prior literature based on US data discussed in sub-section 5.2.2. Moreover, the same also holds for prior studies on the value-relevance of IAS 19 (2004) such as e.g., Fasshauer and Glaum (2008, 2009, 2012) as well as Kirkpatrick (2012). Conversely, the same does not hold for the evidence on the FER sub-samples. Notably, these results are also not in line with e.g., Wiedman and Wier (2004), who find pension information reported in line with the Canadian domestic pension accounting standard to be value-relevant.

Furthermore, the bivariate correlation analysis provides evidence strongly confirming hypothesis $H(2a)$ (*Value-Relevance of NPL*) for the firms applying IAS 19 (2004). In contrast, for firms applying ARR 16 (2005), the evidence is rather equivocal. With respect to financial firms, these results are basically confirmed by the multiple linear regression analysis. Concretely, strong evidence confirming hypothesis $H(2a)$ is found for FSCORR, whereas for financial firms applying (ARR 16, 2005; i.e., FSFER) evidence in favor of hypothesis $H(2a)$ is only weak. However, for all industry firms, irrespective of the pension accounting standard applied, evidence provided by the multiple linear regression analysis does not confirm hypothesis $H(2a)$. Further, the bivariate correlation analysis provides evidence in support of hypothesis $H(2b)$ (*Value-Relevance of NPC*) as well as $H(2c)$ (*Value-Relevance of EC*) for all sub-samples. Nonetheless, results of the multiple linear regression analysis strongly support hypotheses $H(2b)$ and $H(2c)$ for some of the IFRS-observations only. Specifically, for FSCORR, both hypotheses are strongly confirmed. In contrast, for industry firms applying the OCI-Method in line with IAS 19 (2004; i.e., INDOCI) only hypothesis $H(2b)$ is strongly confirmed. In contrast, hypothesis $H(2c)$ is not confirmed. The same also holds for the industry firms applying the Corridor-Method in line with IAS 19 (2004; i.e., INDCORR). However, for INDCORR, evidence in support of hypothesis $H(2b)$ is only weak. As above-mentioned, neither of the hypotheses $H(2b)$ and $H(2c)$ is supported for the firms applying ARR 16 (2005). Lastly, for hypothesis $H(2d)$ (*Value-Relevance of Disclosures*), the bivariate correlation analysis provides evidence that strongly supports hypothesis $H(2d)$ with regard to the IFRS sub-samples. In contrast, only weak evidence is provided by the multiple linear regression analysis for INDOCI and FSCORR. Moreover, there is no evidence in support of hypothesis $H(2d)$ for INDCORR. Furthermore, for industry firms applying (ARR 16, 2005) i.e., INDFER, neither the bivariate correlation analysis, nor the multiple linear regression analysis provides evidence supporting hypothesis $H(2d)$.

For FSFER, the bivariate correlation as well as the multiple linear regression analysis provide strong and weak evidence in support of hypothesis $H(2d)$, respectively.

Overall, with regard to research question $RQ(2)$, i.e., which elements of reported financial information on Swiss pension plans is decision-useful to holders of equity securities of the reporting firms, the findings outlined above suggest that pension income and cost components are more decision-useful to investors than pension assets and liabilities for financial firms applying the Corridor-Method (i.e., FSCORR). Specifically, results are in support of the delayed and often only partial recognition of actuarial gains and losses (AGL) in line with the Corridor-Method. Although there is only weak evidence found confirming hypothesis $H(2b)$, the same interpretation may also hold for industry firms (i.e., INDCORR). Moreover, for industry firms applying the OCI-Method, results also suggest that pension income and cost components are more decision-useful than pension assets and liabilities. Thus, these results indicate that investors rather adopt a Revenue-Expense (REA) than an Asset-Liability view (ALA) with regard to the accounting for Swiss pension plans. Accordingly, this conclusion is in line with prior pension value-relevance studies such as e.g., Coronado and Sharpe (2003) and Coronado et al. (2008) that find pension assets and liabilities to be value-relevant only if pension income and cost components are not accounted for in their empirical models. In contrast, evidence provided here does not necessarily confirm prior pension value-relevance studies such as e.g., Barth et al. (1993) where authors find pension income and cost components to be value-relevant only if pension assets and liabilities are not controlled for in their model specifications. Also, results do not necessarily confirm e.g., Werner (2011) who finds the unrecognized net pension (asset)/liability ($NPLNR$), disclosed only, to be value-relevant. In contrast, they are more in line with e.g., Yu (2013) who finds $NPLNR$ not to be incrementally value-relevant to NPL . Notably, with respect to prior research on IAS 19 (2004), results of this study are more in line with e.g., Kirkpatrick (2012), that finds evidence for the value-relevance of both NPL and NPC , and opposite to studies such as e.g., Fasshauer and Glaum (2008, 2009, 2012) that mainly corroborate the results of Barth et al. (1993). Lastly, if at all, evidence with respect to ARR 16 (2005) suggests that pension assets and liabilities are more decision-useful than pension income and cost components. Thus, investors would then rather adopt an Asset-Liability (ALA) than a Revenue-Expense view (REA). However, evidence found here for the decision-usefulness of financial information on Swiss pension plans in line with ARR 16 (2005) is generally weak. Hence, it is rather questionable whether such results could actually be in line with prior evidence such as provided by Barth et al. (1993) or Fasshauer and Glaum (2008, 2009, 2012).

Although the findings of the descriptive analysis show that most firms applying ARR 16 (2005) are generally more in line with the idiosyncracies of the Swiss institutional setting of highly funded pension plans, where employer contributions must be regularly transferred to entities that are legally separate from the reporting firms, hypothesis *H(3) (Value-Relevance of Standards)*, that financial information on Swiss pension plans reported in line with ARR 16 (2005) is more value-relevant, i.e., more strongly and significantly associated with the market value of equity of the reporting firms, than the financial information reported in line with IAS 19 (2004), cannot be confirmed. On the contrary, as outlined above, evidence provided by the bivariate correlation as well as the multiple linear regression analysis suggests that financial information on Swiss pension plans in line with IAS 19 (2004) is more value-relevant than in line with ARR 16 (2005). Therefore, research question *RQ(3)*, i.e., whether financial information on Swiss pension plans reported in line with IAS 19 (2004) or ARR 16 (2005) is *more* decision-useful to holders of equity securities of the reporting firms, can clearly be answered with “IAS 19 (2004)”.

Concluding, it is also worth to note that the evidence provided in this study, whereas estimated regression coefficients are generally found to be different from their theoretical values of one or minus one, is in line with most prior pension value-relevance studies outlined in sub-section 5.2.2. The same also holds with respect to the well-documented *service cost anomaly*. Moreover, findings of this study are also in line with e.g., Barth et al. (1992) who find estimated coefficients on pension income and cost components to be significantly higher compared to non-pension income and cost. The authors suggest that investors perceive pension income and cost to be more persistent and thus attach lower risks to these components compared to non-pension income and cost figures. In contrast, e.g., Daley (1984) finds no differences between the estimated coefficients of non-pension and pension income and cost components. Furthermore, the overall interpretation of the main findings, whereas investors of firms applying IAS 19 (2004) appear to prefer a Revenue-Expense (REA) over an Asset-Liability Approach (ALA), is not dependent on the specific accounting method (i.e., Corridor or OCI) used by the sample firms. Moreover, evidence provided by this study, in general, is more strong for financial firms (i.e., FSCORR and FSFER) than for industry firms confirming the approach of analyzing separate sub-samples for these two groups of firms. Lastly, it might also be worth to note that e.g., Wiedman and Wier (2004) find pension plan deficits to be more value-relevant than pension plan surpluses. Hence, within the Swiss context of highly funded pension plans, these prior findings could also be part of the explanation why, in

this study, there mostly is either no or only weak evidence found for the value-relevance of *NPL* and *NPLNR*, respectively.

6.5.2 Limitations and Remedies

It is important to note, apart from the more fundamental limitations of the concept of value-relevance and its implications for standard-setting as discussed in paragraph 5.2.1.1, the study conducted here is also subject to different data-specific as well as methodological limitations as outlined in sections 6.1 and 6.2.

First and foremost, sample firms, generally, do not report financial information on Swiss pension plans separately. Instead, in order to approximate the information attributable to the Swiss pension plans, each pension covariate had to be adjusted prior to analysis based on the share of funded pension plans as reported by the firms (see paragraph 6.1.3.2). Nonetheless, for most sample firms, the *true* (i.e., actual) information on Swiss pension plans cannot be observed directly and, thus, remains unknown. Also, as outlined in paragraph 6.1.3.2, further data adjustments were applied in order to mitigate potential *measurement error* in the response variable of market capitalization three months after fiscal year-end ($MKTCAP_{it+0.25}$) and in the different covariates. Also, economically, $MKTCAP_{it+0.25}$ is expected to be better aligned with the covariates due to these data adjustments. Further, all estimated bivariate correlations as well as multiple linear regression models were additionally estimated using the alternative response variables of market capitalization at fiscal year-end ($MKTCAP_{it}$) and six months after fiscal year-end ($MKTCAP_{it+0.5}$), respectively. However, at best, the adjusted data can only be an approximation of the actual but unobservable information used by investors to value the sample firms. Thence, results presented here must be seen as indirect evidence regarding the value-relevance of Swiss pension plans (also see paragraph 5.2.1.1).

Second, to mitigate *heterogeneity* in the analyzed data, the final sample was split into sub-samples along the dimensions of industry classification (i.e., industry and financial) as well as pension accounting standards applied (i.e., IFRS and FER). All analyses conducted were strictly based on these sub-samples rather than the pooled final sample. Nevertheless, as described in section 6.3, the general level of qualitative (i.e., different supersectors, sectors and sub-sectors) as well as quantitative heterogeneity (i.e., range and variation in response variables and different covariates) prevalent within each sub-sample is still quite considerable. Thence, apart from Pearson correlation coefficients, also Spearman correlation coefficients have been estimated since these are generally more robust to outlying observations (see section 6.3). Moreover, all models

have additionally been estimated by first winsorizing the data at the 1%-level (see section 6.4). Nonetheless, methodological limitations such as e.g., omitted variables bias and scale effects (see below) may have also been caused by heterogeneity.

Third, due to the idiosyncracies of the firms listed in Switzerland, total book value of *dividends proposed* (*DIV*) rather than *net income/(loss)* (*NI*) was applied as proxy variable for unrecognized net assets (*UNA*) for all IFRS sub-samples. In contrast, for the FER sub-samples, the analysis of the benchmark model revealed *NI* to be the adequate proxy variable (see sub-section 6.4.1). Moreover, due to the specific institutional setting, Swiss pension plans of the firms included in the final sample are found to be highly funded. Notably, most of the firms applying ARR 16 (2005) do not recognize any net pension (assets)/liabilities (*NPL*, see section 6.3). Therefore, comparability of the results found in this study with evidence provided by prior literature as well as between the sub-samples of firms applying IAS 19 (2004) and ARR 16 (2005) might be impaired accordingly.

Fourth, as indicated in paragraphs 6.4.2.1 and 6.4.2.2, almost all estimated multiple linear regression models suffer from *heteroskedasticity of unknown form*. Moreover, as discussed in paragraph 6.2.3.3, generally, there is a high degree of autocorrelation present in the final sample. Thence, the analyzed data potentially suffers from firm- and time-effects. Accordingly, statistical inference is based on heteroskedasticity and autocorrelation consistent (HAC) standard errors clustered by firm. Furthermore, year-fixed effects are also included in the models to control for potential time-effects parametrically. Nevertheless, the true form of heteroskedasticity and autocorrelation present in the data cannot be observed directly and, thus, the applied remedies might not be the most optimal for the specific data analyzed in this study.

Fifth, as described in section 6.3, all analyzed sub-samples show high degrees of correlation between different covariates. Thence, estimated multiple linear regression models suffer from *multicollinearity*, potentially leading to unstable and inflated estimates for coefficients and *adj. R²*. Therefore, if possible, regression models were estimated using pension covariates on a net rather than a gross basis. However, in order to enhance the granularity of the analysis, certain model versions include highly correlated pension covariates such as e.g., different components of the net pension (asset)/liability (*NPL*) or the net pension (income)/cost (*NPC*). Accordingly, for some of the models, severe or extremely severe levels of multicollinearity are detected, which potentially impairs the reliability of the estimated results.

Sixth, as outlined in paragraph 6.2.3.5, the multiple linear regression analysis potentially suffers from *omitted variables bias*. In particular, the so called *service cost anomaly* is well documented by prior pension value-relevance studies. Accordingly, the pension (service) cost is also believed to proxy for the value of human capital of the reporting firm. Thus, respective coefficients are often estimated as positive values, although, within the concept of value-relevance, pension cost is expected to be negatively associated with firm value. A remedy commonly applied in prior studies is the inclusion of the number of employees (*EMP*) as well as a proxy for the productivity of the workforce such as e.g., *R&D* expenses or growth in sales, as separate covariates. However, for the final sample analyzed in this study, *R&D* expenses had not been reported separately by firms. Moreover, using sales growth would have reduced the final sample size considerably. Also, as described in 6.2.3.5, *EMP* is highly correlated with the total book value of equity (*EQ*), which in one form or the other is part of all of the regression models estimated in this study. Thence, in order to control for the service cost anomaly while at the same time mitigating multicollinearity, if possible, estimated models were deflated by the number of employees (*EMP*). However, for some of the sub-samples, deflation by *EMP* lead to a severe increase in multicollinearity (see sub-section 6.4.1). Accordingly, estimated models could only be deflated for INDCORR and INDOCI, respectively. Thus, the service cost anomaly outlined above could not be adequately controlled for in the case of the other sub-samples analyzed.

As seventh and last limitation addressed for the purposes of this study, bias in estimated regression coefficients might also be caused through cross-sectional *scale effects*. Hence, separate scale factors are commonly introduced to estimated models in order to mitigate such effects. Nevertheless, as outlined in paragraph 6.2.3.5, total book value of equity (*EQ*), which in one form or the other is part of all of the regression models estimated in this study, is highly correlated with other potential scale factors such as e.g., total book value of assets (*TA*), total book value of net sales (*SALES*) or the number of employees (*EMP*). Thus, in order to account for potential scale effects while simultaneously mitigating multicollinearity, no other scale factor apart from *EQ* was introduced to the estimated models. However, this procedure might not be the most optimal to adequately control for potential scale effects.

Overall, results summarized in sub-section 6.5.1 must be interpreted against the backdrop of the limitations outlined above. Notably, where possible, respective remedies were applied in line with prior (pension) value-relevance literature. However, the remedies applied might not be the most adequate possible for each and every limitation.

Furthermore, there potentially exist other limitations that have not been taken into account for the purposes of this study.

7 Conclusion

As already noted at the very beginning of this study, accounting for Swiss pension plans is complex. Also, how to best account for these pension plans has been highly controversial. Specifically, by law, Swiss pension plans are legally separate from the employer (i.e., the sponsoring firm), and they must be sufficiently funded. Moreover, employer and employee contributions must be regularly transferred to the pension plan, and any refund to the sponsoring firm is prohibited. Nevertheless, in line with the International Accounting Standard No. 19 (IAS 19), *Employee Benefits*, issued by the International Accounting Standards Board (IASB), Swiss pension plans must be classified as *defined benefit plans* and, thus, based on the funding status (*FS*) of each plan, a potentially material net pension (asset)/liability (*NPL*) must be recognized on the balance-sheet of the sponsoring (i.e., reporting) firm. Furthermore, net pension (income)/cost (*NPC*), to be recognized in profit or loss, has to be derived based on regular re-valuations of the defined benefit obligation (*DBO*), as well as the plan assets (*PLA*), attributable to the respective pension plan. In contrast, in line with Accounting and Reporting Recommendation No. 16 (ARR 16), *Pension benefit obligations*, issued by the Swiss standard-setter, the Commission of Swiss GAAP FER, the recognition of a *NPL* arising from a Swiss pension plan is smoothed along the statutory funding ratio of the plan, and *NPC* is mainly based on the employer contributions (*EC*) paid for the respective reporting period. Also, accounting for Swiss pension plans in line with ARR 16, in general, is less costly compared to IAS 19, since valuations are based on the financial statements of the pension plans, and disclosures are less exhaustive.

Notably, both standard-setters, the IASB as well as the Commission of Swiss GAAP FER, define the provision of *decision-useful* information to the holders of equity securities (i.e., investors) of the reporting firms as main objective of financial reporting. Thence, it is the aim of the study presented here to contribute to the pension accounting standard-setting process by investigating the decision-usefulness of the financial information on Swiss pension plans reported in line with IAS 19 and ARR 16. Specifically, in line with a vast body of existent literature, the so called *value-relevance* of Swiss pension plans is determined by analyzing the association of pension information recognized on the balance-sheet and on the income-statement, as well as disclosed in the notes, with the market value of equity (i.e., market capitalization, *MKTCAP*) of the reporting firms. The analysis is based on hand-collected data from the annual reports of

an unbalanced panel data set of 227 industry as well as financial firms listed in Switzerland, totaling 910 firm-year observations across the sample period of 2004 to 2012.

From a conceptual point of view, international pension accounting standards, such as the Statement of Financial Accounting Standards No. 87 (SFAS 87), *Employers' Accounting for Pensions*, issued by the US standard-setter, the Financial Accounting Standards Board (FASB), as well as IAS 19, have evolved from a purely cost-based towards a more liability-based approach. Notably, this evolution is in line with a greater shift in paradigm, whereby the Asset-Liability Approach (ALA) has evolved to become “[...] the dominant worldwide accounting doctrine.” (Dichev, 2008, p. 456). The approach is often attributed to the seminal work of Sprouse and Moonitz (1962). According to the ALA, main goal of financial reporting is the estimation of the change in net assets (i.e., book equity), as result of the change in the valuation of the difference between recognized assets and liabilities, from the beginning to the end of an accounting period (Zülch et al., 2006). Thus, according to the ALA, the recognition of revenues, expenses, gains and losses is based on the recognition and measurement of assets and liabilities (Dichev, 2008). In contrast, the Revenue-Expense Approach (REA), mainly attributed to Paton and Littleton (1940), had “[...] dominated theory, practice, standard-setting, and pedagogy until the mid-1970s.” (Dichev, 2008, p. 455). Correspondingly, the main purpose of financial reporting in line with the REA, is the determination of periodic income as the result of the realization of revenue and the respective matching of expenses. Thence, according to the REA, the recognition and measurement of assets and liabilities is mainly derivative on the recognition and measurement of revenues and expenses (Dichev, 2008).

Based on US data, a considerable number of prior studies provides evidence for the value-relevance of financial information on pension plans that is reported in the financial statements of the sponsoring firms in line with SFAS 87. For example, Barth et al. (1993) provide indirect evidence for the Asset-Liability Approach (ALA) of pension accounting, since the authors find pension income and cost components to be value-relevant only, if pension assets and liabilities are not controlled for. In contrast, results provided by e.g., Coronado and Sharpe (2003) are rather in support of the Revenue-Expense Approach (REA), since pension assets and liabilities are found to be value-relevant only, if pension income and cost components are not accounted for in applied empirical models. Moreover, e.g., Werner (2011) finds the unrecognized net pension (asset)/liability (*NPLNR*), disclosed in the notes, to be value-relevant, whereas e.g., Yu (2013) does not find *NPLNR* to be incrementally value-relevant to *NPL*. Although less numerous, there also exist prior studies on European data. For example, Fasshauer and

Glaum (2008) provide evidence for the ALA based on a sample of German firms that mainly apply IAS 19. Specifically, the authors find pension assets and liabilities to be consistently value-relevant across all estimated model specifications, whereas the same does not hold for the net pension (income)/cost (*NPC*). On the contrary, e.g., Kirkpatrick (2012) finds both the net pension (asset)/liability (*NPL*) as well as *NPC* to be value-relevant for his sample of UK firms applying IAS 19. Lastly, almost no prior studies are publicly available with regard to domestic pension accounting standards, such as e.g., ARR 16. One exception is e.g., Wiedman and Wier (2004), who provide evidence for the value-relevance of pension information reported in line with the Canadian pension accounting standard, i.e., Handbook Section 3461 *Employee Future Benefits*.

Overall, evidence found by prior research is rather equivocal with regard to the question of whether the Asset-Liability (ALA) or the Revenue-Expense Approach (REA) to pension accounting provides more value-relevant, i.e., more decision-useful information to investors. Moreover, existent evidence is scarce with respect to the value-relevance of pension accounting in line with IAS 19, or any domestic pension accounting standard. The same also holds for institutional settings where pension plans are highly funded, as in the case of Swiss pension plans. Last but not least, none of the prior studies reviewed explicitly investigates the value-relevance of pension accounting for financial services firms. Accordingly, for a sample of industry as well as financial firms, the study conducted here, first, sheds light on whether financial information on Swiss pension plans reported in line with IAS 19 (2004) and ARR 16 (2005) is decision-useful to investors of the reporting firms (research question *RQ(1)*). Second, evidence is provided regarding which elements of the financial information reported on Swiss pension plans are decision-useful to investors (research question *RQ(2)*). Lastly, results found in this study also hint at whether financial information on Swiss pension plans reported in line with IAS 19 (2004) or ARR 16 (2005) is more decision-useful to investors of the respective firms (research question *RQ(3)*).

Across all analyzed sub-samples, statistical inference on the association of market capitalization (*MKTCAP*) and different pension accounting items suggests that Swiss pension plans are value-relevant for investors (research hypothesis *H(1)*). Specifically, the net pension (income)/cost (*NPC*), recognized in profit or loss, is found to be more value-relevant than the net pension (asset)/liability (*NPL*), recognized on the balance-sheet of the reporting firms (research hypotheses *H(2a)* and *H(2b)*). Furthermore, strong evidence for the value-relevance of employer contributions paid (*EC*) is found for only one of the analyzed sub-samples (research hypotheses *H(2c)*). For all other sub-samples, there is no evidence found in support of *H(2c)*. Also, there is only weak evidence found

for the value-relevance of the unrecognized net pension (asset)/liability (*NPLNR*) disclosed in the notes (research hypothesis *H(2d)*). Overall, results hint at the fact that financial information on Swiss pension plans reported in line with IAS 19 (2004) is more value-relevant for investors than respective information reported in line with ARR 16 (2005). Thence, research hypothesis *H(3)*, whereas financial information reported in line with ARR 16 (2005) is more value-relevant than financial information reported in line with IAS 19 (2004), cannot be confirmed. Lastly, financial information reported on Swiss pension plans is also found to be more value-relevant for financial firms than for industry firms. This holds irrespective of the accounting standard applied.

The findings outlined above may contribute to pension accounting standard-setting as they reveal a general decision-usefulness of financial information reported on pension plans, even in an institutional setting of high funding levels. Notably, evidence suggests that net pension (income)/cost (*NPC*) recognized in profit or loss is generally more decision-useful to investors than the net pension (asset)/liability (*NPL*) recognized on the balance-sheet as well as the unrecognized net pension (asset)/liability (*NPLNR*) disclosed in the notes. Furthermore, *NPC* is also found to be more decision-useful than the employer contributions (*EC*) paid to the pension plans. Accordingly, these findings are generally in support of a Revenue-Expense Approach (REA) to pension accounting. Moreover, results are even in support of smoothing mechanisms for actuarial gains and losses (*AGL*) and past service cost (*PSC*), such as e.g., the Corridor- or the OCI-Method in line with IAS 19 (2004). Further, the evidence presented here suggests that the decision-usefulness of pension accounting may also be dependent on industry classification (i.e., industry vs. financial firms). Lastly, the study may also contribute to the long-standing and ongoing controversy about how to best account for Swiss pension plans. Notably, financial information on Swiss pension plans reported in line with IAS 19 (2004) is found to be more adequately reflected in the market value of equity than respective information in line with ARR 16 (2005). This somewhat confirms the chairman of the IASB, who once noted: “[...] the comfort provided by Swiss GAAP to the preparer comes at a price to the investor.” (Hoogervorst, 2015b, p. 3).

As outlined in section 5.3, apart from potential contributions to pension accounting standard-setting, the study conducted here may also provide new insights to stakeholders, such as e.g., investors and analysts, interested in the valuation of firms sponsoring Swiss pension plans. First, the detailed description outlined in chapter 2 may contribute to these stakeholders’ general understanding of the Swiss occupational pension system. Furthermore, chapter 3 may also contribute to their understanding of how Swiss pension plans are accounted for in line with IAS 19 (2004) and ARR 16 (2005), and thence, may

increase their awareness of the financial impact such pension plans have on the sponsoring firms. Also, chapter 4 may enhance those stakeholders' comprehension of the theoretical underpinnings of pension accounting, how it evolved over time, and where pension accounting standard-setting is heading to in the foreseeable future. Moreover, sub-section 5.1.1 informs those stakeholders about the long-standing and ongoing controversy about how to best account for Swiss pension plans, potentially sensitizing them more for the particularities of the Swiss occupational pension system. Lastly, the results of the empirical analysis of the value-relevance of Swiss pension plans may show to these stakeholders if, and how, Swiss pension plans are reflected within the market value of equity of sponsoring firms, and whether this is also dependent on industry classification (i.e., industry vs. financial) or the specific accounting standard applied, i.e., IAS 19 (2004) or ARR 16 (2005)

Last but not least, it is important to note that all results presented in this study are subject to data-specific as well as methodological limitations that are discussed at length in chapter 6. Thus, although all limitations identified are adequately addressed in line with prior literature, it cannot be ruled out that all or some of the findings as well as their corresponding interpretations are biased due to any limitation(s), identified or not. Accordingly, in terms of future research, it is recommended here to further increase the robustness of the value-relevance study of Swiss pension plans methodologically. Moreover, conducting survey studies among investors and analysts could provide direct evidence on the decision-usefulness of pension accounting in terms of Swiss pension plans. Finally, apart from the financial statements of sponsoring firms, it would also be especially interesting to get access to non-public financial statement data of the respective Swiss pension plans. In this way, it would be possible to directly compare the financial situation of each pension plan with the financial information reported by the employer. Overall, such research approaches might shed more light on the difference in decision-usefulness of financial information reported on Swiss pension plans found here for industry and financial firms on the one hand, as well as between IAS 19 and ARR 16 on the other.

Appendices

A.1 Sample Firms

TABLE
A.1 Sample Firms

Firm	ISIN	ICB	<i>n</i>
<i>Accu Holding AG</i>	CH0001366332	3000	3
<i>Addex Therapeutics Ltd</i>	CH0029850754	4000	2
<i>Adval Tech Holding AG</i>	CH0008967926	2000	7
<i>AEVIS Holding SA</i>	CH0012488190	4000	4
<i>AFG Arbonia-Forster-Holding AG</i>	CH0110240600	2000	5
<i>Allreal Holding AG</i>	CH0008837566	8000	5
<i>Alpiq Holding AG</i>	CH0034389707	7000	6
<i>ALSO Holding AG</i>	CH0024590272	9000	7
<i>APG SGA SA</i>	CH0019107025	5000	8
<i>Ascom Holding AG</i>	CH0011339204	9000	9
<i>Autoneum Holding AG</i>	CH0127480363	3000	2
<i>Bachem Holding AG</i>	CH0012530207	4000	9
<i>Bâloise Holding AG</i>	CH0012410517	8000	9
<i>Banque Cantonale de Genève</i>	CH0001642682	8000	5
<i>Banque Cantonale du Jura SA</i>	CH0032991348	8000	1
<i>Banque Cantonale Vaudoise</i>	CH0015251710	8000	7
<i>Banque Profil de Gestion S.A.</i>	CH0002492293	8000	4
<i>BELIMO Holding AG</i>	CH0001503199	2000	8
<i>Bellevue Group AG</i>	CH0028422100	8000	7
<i>Berner Kantonalbank AG</i>	CH0009691608	8000	4
<i>BKW AG</i>	CH0130293662	7000	2
<i>Bobst Group SA</i>	CH0012684657	2000	8
<i>Bossard Holding AG</i>	CH0238627142	2000	8
<i>Bucher Industries AG</i>	CH0002432174	2000	8
<i>Burkhalter Holding AG</i>	CH0212255803	2000	4
<i>BVZ Holding AG</i>	CH0008207356	2000	3
<i>Calida Holding AG</i>	CH0126639464	3000	3
<i>Cham Paper Group Holding AG</i>	CH0001931853	1000	8
<i>Charles Vögele Holding AG</i>	CH0006937772	5000	6
<i>Chocoladefabriken Lindt & Sprüngli AG</i>	CH0010570759	3000	8
<i>Cicor Technologies Ltd.</i>	CH0008702190	2000	5
<i>Clariant AG</i>	CH0012142631	1000	7
<i>COLTENE Holding AG</i>	CH0025343259	4000	7
<i>Comet Holding AG</i>	CH0003825756	2000	7
<i>Compagnie financière Tradition S.A.</i>	CH0014345117	8000	8

(continued on next page)

TABLE (continued)

Firm	ISIN	ICB	n
<i>Conzzeta AG</i>	CH0244017502	2000	8
<i>Cytos Biotechnology AG</i>	CH0011025217	4000	6
<i>Dätwyler Holding AG</i>	CH0030486770	2000	8
<i>DKSH Holding AG</i>	CH0126673539	2000	1
<i>Dufry AG</i>	CH0023405456	5000	6
<i>Edisun Power Europe AG</i>	CH0024736404	7000	4
<i>Edmond de Rothschild (Suisse) S.A.</i>	CH0001347498	8000	5
<i>EFG International AG</i>	CH0022268228	8000	8
<i>Elma Electronic AG</i>	CH0005319162	2000	7
<i>Emmi AG</i>	CH0012829898	3000	8
<i>Ems-Chemie Holding AG</i>	CH0016440353	1000	9
<i>Energiedienst Holding AG</i>	CH0039651184	7000	7
<i>Evolva Holding SA</i>	CH0021218067	4000	2
<i>Feintool International Holding AG</i>	CH0009320091	2000	1
<i>Forbo Holding AG</i>	CH0003541510	2000	9
<i>Galenica AG</i>	CH0015536466	5000	8
<i>GAM Holding AG</i>	CH0102659627	8000	7
<i>Geberit AG</i>	CH0030170408	2000	8
<i>Georg Fischer AG</i>	CH0001752309	2000	8
<i>Givaudan SA</i>	CH0010645932	1000	8
<i>Goldbach Group AG</i>	CH0004870942	9000	6
<i>Groupe Baumgartner Holding SA</i>	CH0002175773	1000	1
<i>Groupe Minoteries SA</i>	CH0012949464	3000	4
<i>Gurit Holding AG</i>	CH0008012236	1000	6
<i>Helvetia Holding AG</i>	CH0012271687	8000	8
<i>Highlight Event and Entertainment AG</i>	CH0003583256	5000	7
<i>HOCHDORF Holding AG</i>	CH0024666528	3000	3
<i>Huber+Suhner AG</i>	CH0030380734	9000	4
<i>Hügli Holding AG</i>	CH0004647951	3000	9
<i>Hypothekbank Lenzburg AG</i>	CH0001341608	8000	2
<i>Implenla AG</i>	CH0023868554	2000	7
<i>INFICON Holding AG</i>	CH0011029946	2000	1
<i>Interroll Holding AG</i>	CH0006372897	2000	3
<i>Intershop Holding AG</i>	CH0273774791	8000	7
<i>IVF HARTMANN Holding AG</i>	CH0187624256	4000	5
<i>Julius Bär Gruppe AG</i>	CH0102484968	8000	4
<i>Jungfraubahn Holding AG</i>	CH0017875789	5000	7
<i>Kardex AG</i>	CH0100837282	2000	7
<i>Komax Holding AG</i>	CH0010702154	2000	9
<i>Kudelski S.A.</i>	CH0012268360	9000	8
<i>Kühne + Nagel International AG</i>	CH0025238863	2000	8
<i>Kuoni Reisen Holding AG</i>	CH0003504856	5000	6
<i>LafargeHolcim Ltd</i>	CH0012214059	2000	8

(continued on next page)

TABLE (continued)

Firm	ISIN	ICB	<i>n</i>
<i>Leclanché S.A.</i>	CH0110303119	3000	1
<i>Liechtensteinische Landesbank AG</i>	LI0030195247	8000	6
<i>Lonza Group AG</i>	CH0013841017	4000	9
<i>Looser Holding AG</i>	CH0026205861	2000	6
<i>Luzerner Kantonalbank AG</i>	CH0011693600	8000	6
<i>MCH Group AG</i>	CH0039542854	2000	5
<i>METALL ZUG AG</i>	CH0039821084	3000	3
<i>Meyer Burger Technology AG</i>	CH0108503795	2000	5
<i>Mikron Holding AG</i>	CH0003390066	2000	8
<i>mobilezone holding ag</i>	CH0276837694	5000	5
<i>Mobimo Holding AG</i>	CH0011108872	8000	4
<i>Myriad Group AG</i>	CH0019624805	9000	1
<i>Nestlé AG</i>	CH0038863350	3000	8
<i>NORINVEST HOLDING SA</i>	CH0013592248	8000	5
<i>Novartis AG</i>	CH0012005267	4000	9
<i>OC Oerlikon Corporation AG</i>	CH0000816824	2000	8
<i>Orascom Development Holding AG</i>	CH0038285679	8000	2
<i>Orell Füssli Holding AG</i>	CH0003420806	5000	8
<i>Orior AG</i>	CH0111677362	3000	3
<i>Panalpina Weltransport (Holding) AG</i>	CH0002168083	2000	8
<i>Pargesa Holding SA</i>	CH0021783391	8000	2
<i>Partners Group Holding AG</i>	CH0024608827	8000	7
<i>Peach Property Group AG</i>	CH0118530366	8000	3
<i>Perfect Holding SA</i>	CH0009115129	2000	4
<i>Phoenix Mecano AG</i>	CH0002187810	2000	8
<i>PSP Swiss Property AG</i>	CH0018294154	8000	9
<i>Repower AG</i>	CH0016405836	7000	6
<i>Rieter Holding AG</i>	CH0003671440	2000	6
<i>Roche Holding AG</i>	CH0012032113	4000	9
<i>Romande Energie Holding SA</i>	CH0025607331	7000	8
<i>Santhera Pharmaceuticals Holding AG</i>	CH0027148649	4000	6
<i>Schindler Holding AG</i>	CH0024638212	2000	7
<i>Schlatter Industries AG</i>	CH0002277314	2000	7
<i>SCHMOLZ+BICKENBACH AG</i>	CH0005795668	1000	1
<i>Schweiter Technologies AG</i>	CH0010754924	2000	7
<i>SGS AG</i>	CH0002497458	2000	9
<i>Siegfried Holding AG</i>	CH0014284498	4000	8
<i>Sika AG</i>	CH0000587979	2000	9
<i>Spice Private Equity AG</i>	CH0009153310	8000	2
<i>St.Galler Kantonalbank AG</i>	CH0011484067	8000	7
<i>Starrag Group Holding AG</i>	CH0002361068	2000	5
<i>Straumann Holding AG</i>	CH0012280076	4000	9
<i>Sulzer AG</i>	CH0038388911	2000	8

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TABLE (continued)

Firm	ISIN	ICB	<i>n</i>
<i>Swiss Life Holding AG</i>	CH0014852781	8000	9
<i>Swiss Prime Site AG</i>	CH0008038389	8000	6
<i>Swisscom AG</i>	CH0008742519	6000	9
<i>Swissquote Group Holding Ltd</i>	CH0010675863	8000	8
<i>Syngenta AG</i>	CH0011037469	1000	9
<i>Tamedia AG</i>	CH0011178255	5000	9
<i>Tecan Group AG</i>	CH0012100191	4000	9
<i>Temenos Group AG</i>	CH0012453913	9000	8
<i>The Swatch Group AG</i>	CH0012255151	3000	9
<i>Tornos Holding AG</i>	CH0011607683	2000	1
<i>u-blox Holding AG</i>	CH0033361673	9000	6
<i>UBS AG</i>	CH0024899483	8000	5
<i>Valartis Group AG</i>	CH0001840450	8000	7
<i>Valiant Holding AG</i>	CH0014786500	8000	7
<i>Valora Holding AG</i>	CH0002088976	5000	7
<i>Vaudoise Assurances Holding SA</i>	CH0021545667	8000	7
<i>Vetropack Holding AG</i>	CH0006227612	2000	8
<i>Villars Holding S.A.</i>	CH0002609656	5000	4
<i>Von Roll Holding AG</i>	CH0003245351	2000	7
<i>Vontobel Holding AG</i>	CH0012335540	8000	9
<i>VZ Holding AG</i>	CH0028200837	8000	6
<i>Walter Meier AG</i>	CH0208062627	2000	6
<i>Wartec Invest AG</i>	CH0002619481	8000	7
<i>Zehnder Group AG</i>	CH0276534614	2000	6
<i>Zug Estates Holding AG</i>	CH0148052126	8000	1
<i>Zuger Kantonalbank AG</i>	CH0001308904	8000	7
<i>Zurich Insurance Group AG</i>	CH0011075394	8000	9
<i>Zwahlen & Mayr SA</i>	CH0002661731	1000	5

***N* = 910**

Note. The TABLE lists all firms that are included in the final sample as described in sub-section 6.1.1. ICB = Industry Classification Benchmark (see ICB, 2015, for more details); ISIN = International Securities Identification Number; *n* = number of firm-year observations included in the final sample.

A.2 Data Collection

Data files provided by Verlag Finanz und Wirtschaft (i.e., the Swiss Companies Guide database) were obtained directly from Mr. Erich Knecht, whose competent support in compiling the necessary data files must be acknowledged here.

A.3 Autocorrelation Analysis

TABLE
A.2 Within-Firm Autocorrelation of Covariates (Final Sample)

Variables	Lag (<i>l</i>)							
	1 (<i>n</i> = 696)	2 (<i>n</i> = 582)	3 (<i>n</i> = 474)	4 (<i>n</i> = 374)	5 (<i>n</i> = 287)	6 (<i>n</i> = 191)	7 (<i>n</i> = 109)	8 (<i>n</i> = 40)
<i>EQ</i>	0.9946***	0.9821***	0.9663***	0.9509***	0.9400***	0.9412***	0.9429***	0.9430***
<i>EQbNPL</i>	0.9946***	0.9825***	0.9675***	0.9525***	0.9414***	0.9420***	0.9457***	0.9501***
<i>NI</i>	0.8111***	0.7210***	0.7009***	0.7239***	0.7284***	0.7745***	0.7419***	0.7724***
<i>NIbNPC</i>	0.8297***	0.7480***	0.7326***	0.7488***	0.7546***	0.7864***	0.7573***	0.7906***
<i>NIbEC</i>	0.8260***	0.7409***	0.7273***	0.7471***	0.7467***	0.7718***	0.7598***	0.7914***
<i>DIV</i>	0.9232***	0.8494***	0.8003***	0.7833***	0.7453***	0.7424***	0.7717***	0.8079***
<i>DIVbNPC</i>	0.9443***	0.8949***	0.8597***	0.8345***	0.8036***	0.7978***	0.8180***	0.8488***

(continued on next page)

TABLE (continued)

Variables	Lag (<i>l</i>)							
	1 (<i>n</i> = 696)	2 (<i>n</i> = 582)	3 (<i>n</i> = 474)	4 (<i>n</i> = 374)	5 (<i>n</i> = 287)	6 (<i>n</i> = 191)	7 (<i>n</i> = 109)	8 (<i>n</i> = 40)
<i>DIVbEC</i>	0.9431***	0.8898***	0.8585***	0.8385***	0.7952***	0.7875***	0.8223***	0.8306***
<i>NPL</i>	0.8488***	0.7421***	0.6227***	0.5350***	0.4226***	0.4398***	0.4577***	0.5980***
<i>NPLNR</i>	0.6744***	0.4299***	0.3086***	0.2364***	0.1093*	0.0695	0.0116	-0.1994
<i>NPC</i>	0.8687***	0.8445***	0.8402***	0.8134***	0.8110***	0.7719***	0.7782***	0.7345***
<i>EC</i>	0.9323***	0.9143***	0.9070***	0.9062***	0.8845***	0.8734***	0.9087***	0.9051***

Note. The TABLE depicts the within-firm autocorrelation of all covariates, as defined in TABLE 6.4, for the full final sample ($N = 910$). In line with Petersen (2009), within-firm autocorrelation is measured through bivariate correlation. Specifically, data is first sorted alphabetically by firm name and then, within each firm-cluster, sorted chronologically by year. Subsequently, for each covariate, Spearman correlation coefficients (r_s) are estimated for all possible combinations (n) of within-firm observations based on lag $l = \{1, \dots, 8\}$, respectively. Due to the unbalanced form of the sample data including gaps, the number of matched pairs (n) is not decreasing in lag l steadily. *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

TABLE
A.3 Within-Year Autocorrelation of Covariates (Final Sample)

Variables	Lag (<i>l</i>)							
	1 (<i>n</i> = 901)	2 (<i>n</i> = 892)	3 (<i>n</i> = 883)	4 (<i>n</i> = 874)	5 (<i>n</i> = 865)	6 (<i>n</i> = 856)	7 (<i>n</i> = 847)	8 (<i>n</i> = 838)
<i>EQ</i>	0.1996***	0.1345***	0.1665***	0.1735***	0.0856**	0.0727**	0.0832**	0.1124***
<i>EQbNPL</i>	0.1932***	0.1341***	0.1588***	0.1691***	0.0843**	0.0727**	0.0839**	0.1098***
<i>NI</i>	0.1121***	0.0942***	0.1512***	0.1565***	0.0693**	0.0808**	0.0765**	0.1121***
<i>NIbNPC</i>	0.1164***	0.0969***	0.1566***	0.1554***	0.0670**	0.0755**	0.0710**	0.1096***
<i>NIbEC</i>	0.1081***	0.0906***	0.1516***	0.1544***	0.0652*	0.0702**	0.0722**	0.1098***
<i>DIV</i>	0.1309***	0.1211***	0.1466***	0.1155***	0.0697**	0.0669*	0.0689**	0.0791**
<i>DIVbNPC</i>	0.1325***	0.1186***	0.1414***	0.1234***	0.0703**	0.0530	0.0719**	0.0849**

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TABLE (continued)

Variables	Lag (<i>l</i>)							
	1 (<i>n</i> = 901)	2 (<i>n</i> = 892)	3 (<i>n</i> = 883)	4 (<i>n</i> = 874)	5 (<i>n</i> = 865)	6 (<i>n</i> = 856)	7 (<i>n</i> = 847)	8 (<i>n</i> = 838)
<i>DIVbEC</i>	0.1299***	0.1172***	0.1356***	0.1198***	0.0641*	0.0441	0.0773**	0.0897***
<i>NPL</i>	0.0860***	0.0006	0.0073	-0.0401	-0.0780**	0.0305	0.0349	-0.0194
<i>NPLNR</i>	0.1143***	0.1098***	0.1283***	0.1329***	0.0761**	0.0845**	0.0624*	0.1118***
<i>NPC</i>	0.1813***	0.1303***	0.0981***	0.0747**	-0.0068	-0.0207	0.0427	0.0645*
<i>EC</i>	0.1479***	0.1005***	0.0951***	0.0822**	0.0089	-0.0456	0.0430	0.0983***

Note. The TABLE depicts the within-year autocorrelation of all covariates, as defined in TABLE 6.4, for the full final sample (*N* = 910). In line with Petersen (2009), within-year autocorrelation is measured through bivariate correlation. Specifically, data is first sorted chronologically by year and then, sequentially, sorted by industry, supersector, sector and subsector as classified according to ICB (2015), respectively. Subsequently, for each covariate, Spearman correlation coefficients (r_s) are estimated for all possible combinations (*n*) of within-year observations based on lag $l = \{1, \dots, 8\}$, respectively. The number of matched pairs (*n*) is decreasing steadily in lag *l* by nine observations per lag due to the eight crossovers between the different years. *, **, *** indicate significant levels at 10, 5 and 1 percent (two-tailed), respectively.

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Curriculum Vitae

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Education

2013 – 2018	University of St. Gallen (HSG) , St. Gallen, Switzerland Ph.D. Programme in Management
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Professional Experience

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2013 – 2015	Institute of Accounting, Control and Auditing (ACA) University of St. Gallen (HSG), St. Gallen, Switzerland Research Associate and Teaching Assistant
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