Analyzing the systematic risk of logistics service providers: The influence of market, industry and company effects

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1. Paper background

2. Methodology

3. Results

4. Implications, conclusion and outlook
Current research relevance

Paper Background

Cost of capital of Deutsche Bahn’s infrastructure operation

The president of the German network regulation agency (Bundesnetzagentur), Matthias Kurth, today hosted the annual German rail regulation forum. Discussion focussed on the current consultation by Bundesnetzagentur in relation to the allowable return for regulated rail infrastructure activities in Germany.

Christoph Riechmann, a Director at Frontier (Europe), presented the highlights of a Frontier report for the regulator. The report describes approaches to identifying and analysing international benchmark companies that exhibit a similar risk profile to the infrastructure operation of Deutsche Bahn and other operators. This analysis helps to understand the cost of capital of rail infrastructure.

Frontier regularly advises regulators and infrastructure operators across Europe on the financing conditions and cost of capital in industries such as rail, telecoms, water and energy.

Source: http://www.frontier-economics.com/europe/es/practices/1/n/1027/

Despite increased operational efficiencies, the company’s management believes the current yield of its assets is not yet commensurate with its cost of capital and risk considerations, as such, management will be working diligently to improve such yields.

Source: Agility logistics annual report

Creditor Relations

The Group’s goal is to minimise financial risk and the cost of capital, whilst preserving the Group’s lasting financial stability and flexibility. In order to maintain its unrestricted access to the capital markets, the Group continues to aim for a credit rating appropriate to the sector.

By including the cost of capital in our business decisions, we encourage all divisions to use resources efficiently and to organise our operating business to increase value sustainably whilst generating cash flow. In the reporting year, EAC served as a key performance indicator in


- The cost of capital plays an important role in the management of logistics service providers (LSPs), especially regarding their strategic directions and decisions.
- The systematic risk (β) is an important factor when calculating a company’s cost of capital.
To make financial evaluations and determine financial controls, LSPs have to know their cost of capital.
Cost of capital and systematic risk

Paper background

- Beta is a measure of stock price volatility – that is, the sensitivity of each stock’s price to changes in the market.
- Beta represents the percentage performance of the stock which has historically accompanied a one per cent move in the market.

Weighted average cost of capital (WACC)

within the context of the capital asset pricing model (CAPM)

\[
WACC = \left( \frac{E}{E+D} \right) \times r_E + \left( \frac{D}{E+D} \right) \times r_D \times (1-T_C)
\]

\[
r_E = r_f + \beta \times (r_m - r_f)
\]

Beta (\(\beta\)) is a key component of the WACC

\[
\beta = \frac{cov(R_i,R_m)}{\sigma^2(R_m)}
\]
Research question

To what extend is the systematic risk (beta) of logistics service providers dependent on market, industry and company effects?

The analyses shall allow conclusions on the leverage of market, industry and company effects on LSPs’ beta and build the basis for further analyses on the composition and determinants of LSPs’ cost of capital.
Clustering LSPs by their headquarters’ location does not reveal significant differences in stock price development,…
...while clustering LSPs by their industry classification (primary SIC code)…
…or the level of asset turnover does show significant differences in stock price development.

This analyses allow first conclusions on expected results.
Agenda

1. Paper background

2. Methodology

3. Results

4. Implications, conclusion and outlook
Correlation and multiple regression analyses are conducted in order to answer the research question.

\( \beta \) is calculated for each LSP, using stock price and market index data for the time period of five years.
**Sample selection – descriptive statistics I/II**

### Methodology

- **LSPs** with the appropriate SIC code and being active since at least 2006 have been chosen for the analysis of microeconomic variables...

<table>
<thead>
<tr>
<th>Cluster (SIC)</th>
<th>ALL LSPs</th>
<th>SIC 40</th>
<th>SIC 42</th>
<th>SIC 44</th>
<th>SIC 45</th>
<th>SIC 46</th>
<th>SIC 47</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster description</td>
<td>Railroad Transportation</td>
<td>Motor Freight Transportation</td>
<td>Water Transportation</td>
<td>Transportation by Air</td>
<td>Pipeline, Except Natural Gas</td>
<td>Transportation Services</td>
<td></td>
</tr>
<tr>
<td>Number of LSPs</td>
<td>760</td>
<td>48</td>
<td>187</td>
<td>337</td>
<td>140</td>
<td>23</td>
<td>25</td>
</tr>
<tr>
<td>Beta</td>
<td>0.32</td>
<td>0.38</td>
<td>0.18</td>
<td>0.33</td>
<td>0.41</td>
<td>0.38</td>
<td>0.52</td>
</tr>
<tr>
<td>(0.63)</td>
<td>(0.50)</td>
<td>(0.45)</td>
<td>(0.73)</td>
<td>(0.61)</td>
<td>(0.28)</td>
<td>(0.48)</td>
<td></td>
</tr>
</tbody>
</table>

### Absolute (1000 US$)

- **Mean value (standard deviation in parentheses)**

| Cash flow per share | 9.21 | 6.54 | 1.46 | 12.11 | 8.24 | 48.33 | 0.75 |
| (107.45) | (18.71) | (57.74) | (138.86) | (67.11) | (199.66) | (1.18) |
| Total current assets | 611'463 | 833'810 | 214'594 | 427'359 | 1'457'307 | 1'046'246 | 586'284 |
| (1'673'788) | (1'221'419) | (529'906) | (1'247'787) | (2'826'401) | (2'890'201) | (1'150'455) |
| Total current liabilities | 561'216 | 1'123'661 | 179'729 | 308'133 | 1'524'440 | 568'284 | 294'013 |
| (1'642'365) | (1'219'440) | (947'317) | (2'967'761) | (1'150'455) | (1'046'246) | (294'013) |
| EBIT | 158'989 | 620'750 | 35'612 | 106'245 | 265'244 | 379'730 | 76'518 |
| (663'820) | (1'189'785) | (75'501) | (675'348) | (1'221'440) | (1'046'246) | (76'518) |
| EBIT & depreciation | 269'234 | 949'368 | 64'433 | 178'426 | 503'247 | 538'949 | 99'178 |
| (978'624) | (1'807'999) | (121'863) | (924'607) | (1'082'513) | (1'150'455) | (99'178) |
| Long term debt | 816'868 | 2'901'161 | 159'940 | 586'662 | 1'502'034 | 1'730'225 | 42'301 |
| (2'557'209) | (6'860'048) | (1'537'707) | (765'348) | (1'221'440) | (1'046'246) | (42'301) |
| Net income | 84'968 | 309'690 | 18'608 | 55'049 | 149'305 | 228'952 | 43'835 |
| (386'495) | (1'807'999) | (121'863) | (924'607) | (1'082'513) | (1'150'455) | (43'835) |
| Net sales/revenue | 1'789'260 | 3'000'226 | 717'058 | 1'018'166 | 2'699'078 | 4'438'789 | 2'950'100 |
| (5'430'791) | (5'448'226) | (3'942'464) | (1'247'787) | (2'967'761) | (6'064'315) | (1'645'841) |
| Operating income | 144'827 | 621'057 | 33'306 | 94'772 | 220'337 | 367'708 | 79'751 |
| (652'096) | (1'219'440) | (295'080) | (951'467) | (1'150'455) | (806'471) | (79'751) |
| Property, plant & equipment | 1'569'333 | 6'646'942 | 367'438 | 1'018'166 | 2'699'078 | 4'438'789 | 2'950'100 |
| (4'911'056) | (13'332'655) | (1'046'246) | (1'046'246) | (1'046'246) | (1'046'246) | (13'332'655) |
| Total assets | 2'579'179 | 8'168'849 | 710'062 | 1'739'855 | 5'085'045 | 8'699'999 | 802'815 |
| (7'092'887) | (15'160'763) | (1'488'464) | (3'942'464) | (9'367'922) | (11'247'478) | (802'815) |
| Total capital | 1'734'691 | 5'786'458 | 466'030 | 1'355'365 | 2'788'102 | 4'669'999 | 474'392 |
| (4'769'033) | (11'049'612) | (3'668'587) | (6'064'315) | (9'332'690) | (11'247'478) | (474'392) |
| Total debt | 973'137 | 3'241'108 | 215'592 | 705'274 | 1'848'680 | 1'830'115 | 87'670 |
| (2'883'166) | (7'462'934) | (1'765'481) | (3'352'426) | (4'062'999) | (1'650'16) | (87'670) |
| Total shareholder's equity | 872'530 | 2'840'442 | 298'170 | 706'458 | 1'238'929 | 1'984'269 | 413'981 |
| (2'466'281) | (4'861'755) | (659'711) | (2'123'467) | (2'542'922) | (5'183'103) | (413'981) |

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...the active period from 2006-2010 is required in order to calculate beta. In total, 760 LSPs from 70 countries have been analyzed.
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Example of quantitative results
Results of regression analysis of beta coefficient and absolute microeconomic variables

<table>
<thead>
<tr>
<th>Absolute (US$)</th>
<th>Standardized slope of regression (t-value in parentheses)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(13.656)</td>
</tr>
<tr>
<td>Cash flow per share</td>
<td>(-1.369)</td>
</tr>
<tr>
<td>Total current assets</td>
<td>0.080</td>
</tr>
<tr>
<td>Total current liabilities</td>
<td>-0.281</td>
</tr>
<tr>
<td>EBIT</td>
<td></td>
</tr>
<tr>
<td>EBIT &amp; depreciation</td>
<td>-0.294</td>
</tr>
<tr>
<td>Long term debt</td>
<td></td>
</tr>
<tr>
<td>Net income</td>
<td></td>
</tr>
<tr>
<td>Net sales or revenues</td>
<td>0.135</td>
</tr>
<tr>
<td>Operating income</td>
<td></td>
</tr>
<tr>
<td>Property, plant &amp; equipment</td>
<td>-0.025</td>
</tr>
<tr>
<td>Total assets</td>
<td></td>
</tr>
<tr>
<td>Total capital</td>
<td></td>
</tr>
<tr>
<td>Total debt</td>
<td></td>
</tr>
<tr>
<td>Total shareholder's equity</td>
<td>-0.488</td>
</tr>
</tbody>
</table>

R²

In total 10 result tables (only for regression analysis) exist, in addition to results of correlation analysis.

High explanatory power
Significant at 1% level
(p-value is not shown separately here)

***significant at 1% level, **significant at 5% level, *significant at 10% level.
Summarized results
Based on the theoretical model

The beta of LSPs is influenced by company effects (microeconomic variables).

- There is no uniform “structure” of microeconomic variables influencing LSPs’ beta.
- All LSPs: Continuous intensity and asset turnover are highly significant (but overall explanatory power rather low).
- Industry clusters: Obvious differences regarding absolute values as well as ratios.
- Ratios more significant than absolute values.
- Country clusters are not appropriate to explain the correlation between microeconomic variables and beta of LSPs.

Microeconomic characteristics of LSPs affect the explanatory power of macroeconomic variables.

- Overall significant variables from microeconomic analysis: total current assets, total shareholders’ equity, net sales or revenue, continuous intensity, and asset turnover ► for alternative cluster formation
- High explanatory power and significance.

H1

The beta of LSPs is influenced by market effects (macroeconomic variables).

- Except the mean oil price, all variables significantly correlate with all LSPs beta.
- Mean oil price significantly correlates with SIC 46’s (pipeline) beta.
- Explanatory power of regression models nearly 1 in all models referring to SIC code clusters.
- Country clusters are not appropriate to explain the correlation between macroeconomic variables and beta of LSPs.

H2a

H2b

All hypotheses could be confirmed, but the influence of macroeconomic variables on LSPs’ beta is more significant than of microeconomic variables.
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1. Paper background
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**Practical implications**

**Hypothetical case**

**Logistics service provider**

- Offering transportation services
- Owning a transport fleet
- Operating in country A

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**Strategic decision**

- Option 1
- Option 2

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**Option 1:** Buy / enlarge the transportation fleet and offer transportation service on its own behalf.

**Option 2:** Establish cooperation with an LSP that is already offering transportation services in country B.

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**Choosing option 1 leads to (related to results):**

- Higher total assets
- lead to a higher beta
- which implies higher cost of capital.
- Lower continuous intensity (current/total assets)
- Leads to a higher beta as well.
- Share price develops more closely to the stock market that means higher returns for stakeholders in case of a positive market development (v.v.).

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**Choosing option 2 leads to (related to results):**

- No direct influence on the total asset structure and hence beta.

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If the LSP is intended to reduce its cost of capital and the volatility of its share price to market development, the economic climate of the country the LSP wants to expand in is no less important. Economies tending to be rather less developed could enable a lower beta (in future, after having made a decision).

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- Since not only microeconomic variables do influence beta, the LSP would also have to look at macroeconomic variable when making its decision.
Conclusion, limitations and future research

Outlook

CONCLUSION

To what extent is the systematic risk (beta) of logistics service providers dependent on market, industry and company effects?

- The influence of market effects is much more significant than of company effects.
- Clear differences can be observed regarding the industry sector (SIC code) LSPs are operating in.

LIMITATIONS

- Only quoted LSPs were analyzed whose primary SIC code refers to logistics services. Hence not all potential LSPs might have been identified.
- Beta has been calculated using daily stock data for five years. The time periods used for calculating beta vary in general between 2 to 10 years.
- S&P 500 was used as market index to calculate beta. Another one could have been used.
- Results of analyzing beta’s determinants are also dependent on time period under consideration and industry sector.

FUTURE RESEARCH

- Can be derived from limitations.
- Integration of WACC or cost of capital into quantitative analyses to investigate further determinants of cost of capital.
- Integration of “classic” time series of logistics parameters (e.g. ton-kilometers or number of picks etc.) in order to gain new suggestion for strategic decision of LSPs – focusing on financial and non-financial information as well.
Thank you for your attention.
Questions? Comments?

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