MODELING NON-MATURING SAVINGS VOLUMES

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WORKING PAPERS ON FINANCE NO. 2012/18

INSTITUTE OF OPERATIONS RESEARCH AND COMPUTATIONAL FINANCE (IOR/CF – HSG)

JULY 2012
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ABSTRACT

In Basel II the regulators stress the importance of finding realistic volumes models for non-maturing accounts (NMAs), given their cash-flow uncertainty due to optionality. Focusing on Swiss savings accounts, we identify their seasonal pattern and we derive their sensitivity to market rates and to relevant macroeconomic factors. We derive a realistic volumes model, that allows for cash-flow forecasting, which is essential for liquidity management in banks.

Keywords: non-maturing savings accounts, savings volumes, market rates macroeconomic factors regression analysis VAR

JEL classification: C13 – Estimation, E4 - Money and Interest Rates, G2 - Financial Institutions and Services

1. INTRODUCTION

Non-maturing accounts (NMAs) are characterized by two options: first, the bank is allowed to adjust the client rate at any time as a matter of policy and second, clients are allowed to withdraw their investments or to repay variable mortgages at any point in time without penalty. Therefore, the future cash flows from the client rate payments and the volume changes of these positions due to the demand for retail products are uncertain. In this context, Basel II stresses the importance of finding realistic client rate and volumes models for NMA, given the uncertainty of cash-flows due to optionality.

The evolution of product volumes on the level of individual banks has received less attention among researchers. This may also be attributed to the fact that data are not publicly available. In the context of NMA valuation and risk management, some authors model the product volume as a deterministic function of market and/or client rates, see [1], [3], [4], [5] or [6], which implies the simplistic assumption that the volume dynamics can be fully explained by interest rates. In contrast to this, [7] note that correlations between market rates and deposit volumes on the German market are not particularly high. Macroeconomic variables are often mentioned as important measures of systematic market effects, but rarely applied. It is far more common to include a deterministic time trend, as a proxy for macroeconomic influences, probably also due to the fact that forecasting such variables is far from trivial (see [2]).

The objective of this paper is to offer a comprehensive analysis of the Swiss NMA savings volumes dynamics, given their sensitivities to the client rate, to market rates and to relevant macroeconomic variables. We also identify seasonal patterns, which helps us to get important insights about the behavior of Swiss depositors.
2. MODEL

We use in our analysis NMA savings data at an aggregate level over all Swiss banks, as published by the Swiss National Bank (SNB). We derive a forecasting model for volumes based on the investigation of the goodness with respect to all single liquid swap rates (source: Datastream). Short-term as well as long-term maturities are considered in the analysis. We also investigate volumes sensitivities to relevant macroeconomic variables: monetary aggregate (M1), Consumer Prices Index (CPI), Swiss Performance Stock Index (SPI) as well as the Swiss Bonds Index (SBI) (source: SNB). We apply regression analysis to test for the constant impact in time of the explanatory variables on the volumes dynamics. The dynamic impact in time will be investigated in an VAR framework by impulse-response analysis (see [8]).

\[ \Delta V_t = \beta_0 + \beta_1 F_1 + \beta_2 F_2 + \alpha_t + \epsilon_t \]
\[ \epsilon_t = c + AR(1)\epsilon_{t-1} + AR(2)\epsilon_{t-2} + u_t \]  

(1)

where \( F_1 \) and \( F_2 \) are individual factors derived and \( \alpha_t \) represents dummy variables for each month of the year.

3. RESULTS

The OLS estimation results of equation 1 are presented in Table 1. Our results show that for the aggregate Swiss savings accounts the Swap 5 year rate is the market rate which offers the best explanatory power. For each 100 bp increase in the Swap 5 year rate, a decrease of \(-869.042\) mil. CHF occurs. Thus, our model reflects the negative correlation between the savings accounts and market rates. Including more than one market rate in our volumes model we deal with the problem of multicollinearity, since the market rates are strongly correlated. Performing a test for omitted variables (see [9], pp. 137), we found that the Monetary Aggregate (M1) is the only macroeconomic variable which, added to our list of explanatory variables, would bring a significant additional explanatory power to the volumes. Concerning the seasonality pattern, we observe that the winter as well as the summer months are significant. Furthermore, we observe that significant withdrawals occur in June and July. This can be explained by the fact that in many cantons in Switzerland taxes are paid in June or July. On the other hand, the drop can be due to vacation costs. We also observe that in December a significant increase in the savings volumes occurs. This can be explain by the fact that in December the 13th salary is paid (Christmas payments).
In the context of linear regression analysis we found that the SBI, SPI and CPI do not have a significant constant impact in time on the savings dynamics. We employ the impulse-response analysis in a VAR framework to see if there is a dynamic impact of shocks in one of these variables on the savings volumes (see [8]). The vector of variables includes the discussed macroeconomic factors, as well as one short-term and one long-term market rate. Results are available in figure 1.

The Swiss savings volumes respond to changes in the market rates. Thus, an increase in the Libor 3 month rate and in Swap 5 year rate will have as effect a decrease of the savings volumes after 2-3 months.

We observe that any shock in the SPI Index will affect the savings volumes after 3 months. Swiss investors shift from their savings deposits to stock investments, if they expect increasing stock markets. From the analysis we cannot conclude a response of the volumes dynamics to shocks in the bond index.

The third graph from the second row of figure 1 shows that the Swiss deposits respond to shocks in the Monetary Aggregate (M1) after 2 months. Because of inflation, the nominal volume is expected to increase.

Overall, our results show no response of the volumes to shocks in the CPI. Therefore, we conclude that the Monetary Aggregate (M1) is a better proxy for the inflation in our investigation.
Figure 1: Response in $\Delta V_{all}$

Response to Cholesky One S.D. Innovations ± 2 S.E.

Response of SNB_VOLS to SNB_VOLS
Response of SNB_VOLS to DELTA_LSM_LAG1(3)
Response of SNB_VOLS to DELTA_BSY_LAG1(3)
Response of SNB_VOLS to DELTA_EOLA_LAG1(3)
Response of SNB_VOLS to CP1
4. MODEL ASSESSMENT – out-of-sample test

In order to test for stability in our estimated coefficients, we test our model out-of-sample. Thus, we re-estimate equation (1) using a shorter data sample (up to December 2005). We use the re-estimated parameters to calculate the model fit out-of-sample and to test, in this way, the forecasting power of the model. The results of the out-of-sample test are presented in Table 2. We observe that also out-of-sample we have a summer/winter seasonality pattern. Significant withdrawals occur in June/July, while in December the volumes of the aggregate Swiss savings accounts increase significantly. The identified model coefficients are stable over time. Figure 2 concludes a good forecasting power of the volumes model. However, during the financial crisis period, in 2008, we observe that the model underestimates the increase in deposit volumes.

Table 2: SNB aggregate savings - out-of-sample test split in 2005

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>t-stat</th>
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<tbody>
<tr>
<td>Constant</td>
<td>0</td>
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<tr>
<td>ΔSwap 5 yearlag1</td>
<td>-886.507*</td>
</tr>
<tr>
<td>M1</td>
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</tr>
<tr>
<td>JAN</td>
<td>660.342</td>
</tr>
<tr>
<td>FEB</td>
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<tr>
<td>MAR</td>
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<tr>
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<tr>
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<tr>
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<tr>
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<tr>
<td>AR(1)</td>
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<tr>
<td>AR(2)</td>
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<td>0.73</td>
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<tr>
<td>DW</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Figure 2: Volumes model - out-of-sample test split in 2005
5. CONCLUSION
As a general conclusion of our volumes modeling efforts, we found that the market rates are important explanatory factors and have a good forecasting power for savings volumes dynamics. The monthly seasonality factor is important to be considered in modeling volumes of non-maturing savings accounts. Because of inflation, the nominal savings volumes is expected to increase. Swiss investors shift from their savings deposits to stocks in investments with increasing stock markets. All these findings help banks to understand depositors’ behavior. This is essential for cash-flow forecasting, which helps banks to plan a sufficient cushion of liquid assets, as hedge against a range of liquidity stress events.

REFERENCES
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