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Modelling and hedging savings and current accounts in a low rate environment

INTRODUCTION AND RELEVANCE

Similar to insurers, low interest rates and market dynamics have led to decreasing interest income ("margins") for Dutch retail banks. On the asset side, margins are pressured by strong competition in the mortgage and small business loan market. On the liability side, margins are declining as banks store their surplus at the central bank at a negative rate and are reluctant to charge negative rates to small savers. The reluctance is caused by political pressure and the threat of customers withdrawing their savings when faced with negative rates. As a result, banks are currently only charging negative rates above specified thresholds of the account balance, e.g. EUR 100k.

The reluctance to charge negative rates to small savers has made savings and current accounts an increasingly expensive funding source for banks. At the same time, COVID-19 caused a large inflow of volume on individual's accounts as holidays and other large expenses were cancelled. The COVID-19 surge reinforced an already ongoing trend of growing volumes on savings and current accounts, with total Dutch account balances currently reaching approximately EUR 512 billion[1]. To choose the right strategies to cope with the compressing margins and excess liquidity, an accurate measurement of the interest rate characteristics of the balance sheet is an important first step.

In this article, we explore the interest risk of savings and current account products and we introduce how replicating portfolios are typically used to mimic the risk profile of these products. In addition, the different techniques to model interest rate characteristics of savings and current accounts are discussed and a framework to accurately measure optionalities that come into play in low (negative) interest rate environments is explored.

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BACKGROUND NON-MATURING DEPOSITS

Savings and current accounts fall under the category of products referred to as non-maturing deposits ("NMDs") as they have no contractually defined maturity date. The cash flows on NMDs are influenced by bank behaviour as well as client behaviour. On the one hand, a bank sets a *client rate* (the interest rate you receive as saver), and determines how the deposited funds are invested. On the other hand, clients can deposit or withdraw money from their NMD account at any time. Figure 1 illustrates the feedback loop observed through the interplay between bank and client behaviour. The feedback loop is a continuous process that exposes the bank to different risks.

The main risks arising from NMDs for banks are the following[2]:
- **Liquidity risk**: consisting of two components: (i) future volumes in NMDs are uncertain, and funds can be withdrawn quicker than expected (liquidity availability risk); and (ii) uncertainties in the future levels of liquidity spread, affecting funding cost of NMDs, leading to liquidity typical repricing risk;
- **Interest rate risk**: arises from uncertainty in future level of interest rates, affecting funding cost of NMDs, leading to interest typical repricing risk.

Typically, banks develop *behavioural models* to estimate the characteristics of NMDs from both an interest typical and a liquidity typical point of view. These models aim to capture the drivers of bank and client behaviour. The remainder of this article focuses on modelling and replicating the interest typical characteristics.

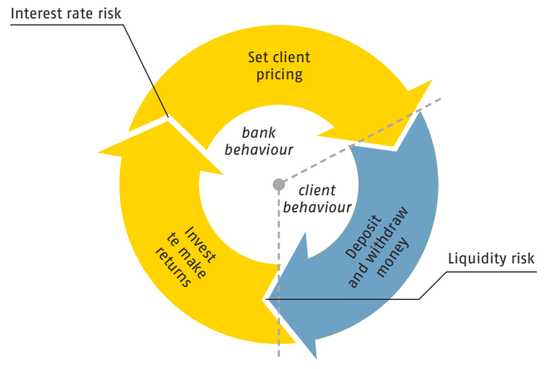

Figure 1: Interaction client and bank behaviour

CONSTRUCTION OF REPLICATING PORTFOLIOS: DIFFERENT TECHNIQUES OF CLIENT RATE MODELLING AND VOLUME MODELLING

Replicating portfolios are used to mimic the risk profile of NMDs, which has similarities to how replicating portfolios are used in the insurance sector. A bank can use different techniques to construct a replicating portfolio, ranging from pure client rate approaches to pure volume approaches. In pure client rate modelling, the aim is to find a linear combination of market rates (with different tenors) that replicate the rate sensitivity of the client rate; this approach is typically considered in cases where the bank is a market follower. Oppositely, in pure volume modelling, the aim is to find a portfolio that replicates the expected volume profile on the NMDs as closely as possible; this approach is typically considered in cases where the bank is a market leader. The interaction between bank and client's behaviour is visualised in Figure 1, it is important to prevent double counting of the effects driven by bank and client's behaviour when constructing the replicating portfolio. Although only two approaches are described above, most banks adopt a hybrid approach to replication, which combines the benefits of client rate and volume modelling to align with the bank's own view on the interest rate characteristics of its NMDs. Insurers use such a hybrid approach as they often replicate the value sensitivity of products, where both volume outflow - and interest rate cash flows are taken into account. This view matches with their Solvency II perspective of reporting balance sheet exposures at market value, while banks mainly report banking book positions at book value.

MODELLING IN A LOW INTEREST RATE ENVIRONMENT

From 2003 until 2015, client rates on NMDs typically moved at a similar pace as market rates as shown in Figure 2. But over recent years, where interest rates continued to drop into negative territory, the decline of the client rates slowed down or stopped as banks are reluctant to approach zero or negative client rates, especially for smaller retail clients. Figure 2 illustrates this concept of a reducing pass-through of market rate changes to the client rate, which results in a compressing (rate sensitive) margin for banks.

Classical linear NMD models (as explained in the previous section) are not taking into account such rate sensitivity in the margin component, and therefore are not including the impact of a rate sensitive margin on portfolio duration and key interest rate risk metrics. For example, when the client rate on NMD accounts is floored (say at 0% which seems to be the effective barrier currently), the duration of the portfolio increases as the bank effectively writes in-the-money floors to savers. This will have implications for important interest rate steering metrics such as the sensitivity of economic value of equity[3] or net interest income[4].

A way that banks can address this challenge is by adding the non-linearity (coming from the margin sensitivity) to the replicating portfolio through options. In doing that, interest rate floors can be calibrated with specified underlying and strike levels, based on the (different regimes in) pass-through rates of market rates to the client rate and the bank's expected pricing strategy. Taking the situation in Figure 2 as an example, one floor could be calibrated with a strike price of "X" and a second floor could be calibrated with a strike price of "Y". Where "X" and "Y" reflect the different levels of the interest rates at which the pass-through of market rates to the client rate significantly changes. The aim of calibrating these floors is to arrive again in a situation where all rate sensitivity is captured in the replicating portfolio, leaving a theoretically stable margin as is visualized in Figure 3.

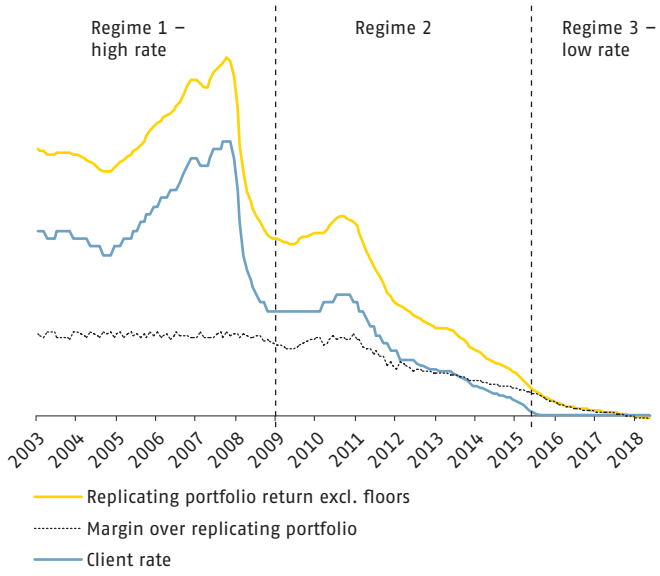

Figure 2: Client floor in non-maturing deposits, where the yellow line is a weighted average of moving average market rates with different tenors which corresponds to the classical replicating portfolio without floors.

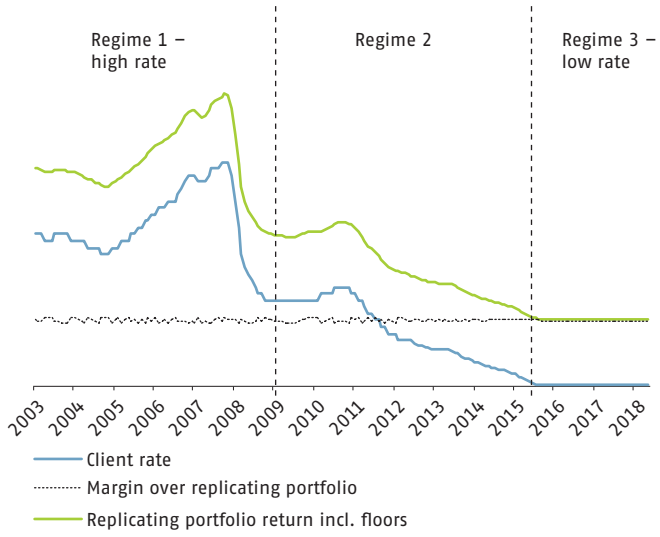

Figure 3: Client floor in non-maturing deposits, where the green line corresponds to a replicating portfolio including floors.

WHAT DOES THIS MEAN IN PRACTICE

Due to the low rate environment and (implicit) floors in client rates, banks are challenged to revise their classical NMD models with the goal to (i) accurately measure interest rate risk e.g. through key metrics such as duration or interest income sensitivity; (ii) set up an effective interest rate hedging strategy to maintain and stabilise interest income under different rate environments; and (iii) determine appropriate balance sheet steering measures such as defining the competitive pricing strategy or deciding on changes in balance sheet composition. Accurately measuring the interest rate risk enables banks to make the right strategic decisions. However, measuring the risk accurately is only the first step. Subsequent challenges include adequately allocating the non-linear risk within the organisation to optimise incentives and designing effective and feasible hedging strategies given limited liquidity in the market for options compared to the size of NMD portfolios. ■

1 – This is the sum of the current accounts, savings accounts and term deposits at April 2021 held by Dutch households. Data is retrieved from DNB database at https://www.dnb.nl/en/statistics/.

2 – Bardenhewer, M. (2007). Modeling Non-maturing Products. In L. a. Matz, *Liquidity Risk Measurement and Management: A Practitioner's Guide to Global Best Practices* (p. Chapter 10).

3 – The economic value of equity reflects the difference between the present value of all asset cash flows and the present value of all liability cash flows.

4 – The net interest income reflects the difference between the revenue generated by the bank's interest-bearing assets and the expenses associated with paying on its interest-bearing liabilities.