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Bank's interest rate risk and profitability in a prolonged environment of low interest rates☆

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ABSTRACT

This paper investigates the size and development of banking book interest rate risk positions of Dutch banks during 2008 to 2015. Due to hedging, interest rate risk is small and the income from maturity transformation is only a small share of the net interest margin and the return on assets. However, interest rate risk positions do vary significantly between banks and over time. My results suggest that banks lower their interest rate risk significantly when the yield curve flattens. Interest rate risk is negatively related to on-balance sheet leverage and has a U-shaped relation with solvability for banks that do not use derivatives. Banks that received government assistance during the financial crisis have higher interest rate risk than banks that did not receive assistance.

1. Introduction

This paper investigates the interest rate risk position of Dutch banks in their banking books during the period from 2008 until the middle of 2015 using confidential data of the Dutch banking supervisor. The availability of this data presents an exceptional opportunity to analyse individual bank behaviour. The main question this paper addresses is whether Dutch banks are risk averse hedgers of interest rate risk or speculators. This question is answered in three steps: (1) What is the interest rates risk position of Dutch banks and how does it vary over time?; (2) how much of banks' return on assets and net interest margin can be accounted for by income from maturity transformation? and (3) which factors influence banks' interest rate risk position?

This paper adds to the literature in a number of ways. Firstly, the data on interest rate risk in the banking book of Dutch banks is unique since it is collected directly from banks and takes into account both on-balance positions as well as hedging. Secondly, the length of the time-series used (up to a maximum of 30 quarters) brings the advantage that the estimations can be performed by standard fixed effects panel methods as they are less affected by the Nickell bias in dynamic panel data (see Nickell, 1981 and Kievit, 1995). Thirdly and finally, I compare two measures of the profitability of maturity transformation. Most previous studies of interest rate risk – such as Purnanandam (2007) and Esposito et al., (2015) – employ a simple measure for the profitability of 'playing the yield curve', such as the spread between a long-term and a short-term interest rate. This measure does not yield any significant results in my estimations. I therefore repeat the estimations with excess holding yields, measuring the ex-post violation of the pure expectations theory of interest. This measure yields significant results, which suggests that simple term spreads are inappropriate for explaining the behaviour of banks' management of interest rate risk.

During the period studied, interest rates fell to historically low levels and yield curves flattened as the result of monetary policies in response to the world-wide financial crisis in 2008 and the European sovereign debt crisis in 2010. This has heightened the concern for an erosion of banks' profits. Low levels of interest rates and flat yield curves have been cited as reasons for the slow recovery of banks' profitability in Japan in the early 2000s (International Monetary Fund, 2003). Borio and Zhu (2012) have suggested a 'risk taking channel' for the transmission of monetary policy, where low interest rates lead to reduced risk perceptions and increased risk tolerance, a "search for yield". The effects of

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monetary policy on bank risk taking have received increased attention also in the theoretical literature (e.g. Dell' Ariccia et al., 2014). Rey (2015) suggests that cross-border risk cycles are to a large extent synchronised and depend on monetary policy conditions in the world's main currency areas. Chodorow-Reich (2014) presents an excellent overview of the effects of unconventional monetary policy on different financial sectors. Whether low interest rates have eroded banks' profits and caused them to take more risk has become a major issue for supervisors and policy makers (see for instance Chapter VI of the Bank for International Settlements, Annual Report (2015), Chapter 3 of the International Monetary Fund, Global Financial Stability Report (2013), and Deutsche Bundesbank, 2015). Since net interest income represents an important source of profits for banks, healthy net interest income is seen as a precondition for banks to build up higher capital buffers as required by the latest Basel framework. Managing interest rate risk is therefore of vital interest to banks and supervisors. It should therefore not come as a surprise that the Basel Committee has recently updated its recommendations on interest rate risk and proposes stricter limits than in its previous guidelines (Basel Committee, 2016).

The main takeaways of the paper are as follows. Net interest income is a very stable and important component of net operating income for Dutch banks. The interest rate risk positions of Dutch banks are, however, rather small primarily because they hedge most of the risk. As a result, income from maturity transformation is limited to about a tenth or less of the net interest margin. Although the interest rate risk levels are relatively modest, banks do seem to take advantage of persistent excess long-term yields by strategically enlarging their positions. My results also suggest that interest rate risk is negatively related to on-balance sheet leverage and has a U-shaped relation with solvability for banks that do not use derivatives. Banks that receive government assistance during the financial crisis have higher interest rate risk than banks that do not receive assistance.

The paper is structured as follows. Section 2 presents the return on assets, net interest margins and interest rate risk positions of Dutch banks during the period from 2008 to the middle of 2015. Section 3 uses this information to decompose net interest income into income from maturity transformation, income from equity and from commercial margins. Section 4.1 details the econometric model and the variables used in dynamic panel estimations of banks' interest rate risk. Section 4.2 presents the results. Section 5 offers conclusions.

2. Return on assets, net interest margins and interest rate risk positions

2.1. Data sources

Unlike other studies on interest rate risk, this paper uses confidential quarterly data on interest rate risk in the banking book collected by De Nederlandsche Bank (DNB, the Dutch central bank) directly from banks for supervisory purposes since 2008.[1] Studies, such as Flannery and James (1984); Hirtle (1997); Fraser et al., (2002); Bharati et al., (2006); Pinheiro and Ferreira (2008); Czaja et al., (2009) and English et al., (2012) employ an approach pioneered by Fama and McBeth (1973) to derive the interest rate risk position indirectly from the sensitivity of banks' share prices to changes in interest rates. This approach severely limits the potential sample of banks for analysis, since (especially in Europe) many banks are not listed. Also, these studies are primarily concerned with the estimation of the sensitivity of (portfolios of) bank stock returns to interest rate movements, not with the interest rate risk positions of banks or their hedging behaviour.

Other studies, such as Sierra and Yeager (2004) and Purnanandam (2007), are based on interest rate risk measures derived from accounting information. Entrop et al., (2008) use a similar approach on data from German banks. As noted by Pagano (2001, p. 304), accounting data is usually not granular enough, there is usually no information on prepayment behaviour and the influence of derivatives cannot be incorporated. Data on interest rate risk from the banks themselves that account for these issues provide a more reliable measure on the actual interest rate risk of banks. A dataset that is similar to the one used here is Esposito et al., (2015), who use supervisory data collected on a semi-annual basis from Italian banks. Their data on duration gaps is divided by on-balance and off-balance sheet gaps, a distinction which is lacking in the data collected in the Netherlands. My data, however, is of higher (quarterly) frequency, which allows for analysing short-term changes in banks' risk position. A drawback of this data, however, is that banks employ different methods to calculate prepayment behaviour and make different assumptions for the duration of non-maturity deposits. The interest rate risk measures used here may therefore have been calculated differently by different banks. The sample consists of 42 banks representing roughly 90% of the balance sheet total of the Dutch banking sector during this period.

The money market interest rates and constant maturity zero yields used in this paper were obtained from the Deutsche Bundesbank. The constant maturity zero yields are constructed from the yields on German government bonds (see Schich, 1997) and are used as an approximation of risk-free euro interest rates.

2.2. Operating income and net interest margins

Fig. 1, based on the quarterly consolidated supervisory data on profits and losses, presents the return on assets for the period from 2008 to 2015 for the 42 banks in my sample. The return on assets is divided into three components: the net interest margin on the banking book, net fees and commissions and the results on financial transactions, including other income. On aggregate, the net interest margin on the banking book was remarkably stable over the whole period, despite continuously falling interest rates. The full period average of the net interest margin amounts to 1.20% and its standard deviation is 0.14%, giving a coefficient of variation of 0.115. Net fees and commissions average at 0.31%, with a coefficient of variation of 0.142, slightly higher than that of net interest income. The statistics on the results on financial transactions are of course heavily influenced by the credit crisis in the fourth quarter of 2008. But even after dropping this 'outlier', it averages just 0.17% with a coefficient of variation of 0.843. Making up over three quarters of operating income, net interest margins clearly form the bedrock of banks' profits in the Netherlands. Fig. 2 presents the net interest margin of the banks along with the yield on 10 year German government zerobonds and the difference between 10 and one year zero yields. The volatility of net interest income is much lower than that of either the long-term interest rate or the yield spread. In fact, while net interest income has a coefficient of variation of 0.115, the 10 year zero yield and the yield spread have coefficients of variation of 0.488 and 0.436, respectively.[2]

Fig. 3 is a box-and-whisker plot of net interest income divided by total assets for individual banks per quarter. The figure shows

[1] Most supervisors in Europe only collect information on interest rate risk from banks through their annual supervisory reviews or when banks breach the outlier criterion, as defined in the Basel guidelines (e.g. Basel Committee, 2016).

[2] This observation does not depend on the period analysed. Over both longer and shorter time frames, net interest margins are less volatile than either long-term interest rates or yield spreads.