

NET INTEREST MARGIN AS AN INDICATOR OF BANK ASSET AND LIABILITY MANAGEMENT

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Abstract

This paper considers the role of the net interest margin in summarizing the effectiveness of bank asset and liability management. The objective of asset and liability management is to maximize profits, lower interest rate risk, ensure liquidity and capital adequacy as well as to increase shareholder value. Examining net interest margin dynamics contributes to this objective by succinctly summarizing the effectiveness of bank management of interest bearing assets and liabilities. This paper reviews the construction of net interest margin indicator, asset and liability management strategies (e.g. based on the business cycle, or interest rate gap) as well as dynamics of net interest margin in advanced economies – the United States, major euro area and Nordic countries. It finds evidence of considerable heterogeneity across countries and time. The analysis suggests that part of this heterogeneity may be explained by the slope of the yield curve; however, asset and liability management strategies must also play a significant role.

Key words: net interest margin, slope of the yield curve, asset and liability management

JEL Code: G11, G21

Introduction

Net interest margin is the difference between interest income received from bank's interest generating assets and interest expenditure paid out on bank's liabilities (e.g. on deposits or wholesale funding). It is typically expressed as a ratio to the bank's total interest bearing assets. Because maturity transformation is one of the key features of the financial system, banks and other financial institutions usually finance longer-term assets with shorter term liabilities, for example, by receiving income from long-term loans with higher interest rate, which are funded by shorter-term liabilities with lower interest rates.

Asset and liability management in this paper is defined by its objectives: maximizing profits, lowering interest rate risk, ensuring liquidity and capital adequacy as well as

increasing shareholder value. It is an internal management process for the bank, which is focused on the achievement of near and medium term financial objectives. Net interest margin can be considered as one of the more important indicators of asset and liability management.

The link between bank asset and liability management and net interest margin has been drawn out clearly in some of the earliest studies of net interest margin. In a seminal contribution Ho and Saunders (1981) showed that the existence of interest margin was the result of transactions uncertainty faced by the bank. It also depended on four factors: the degree of managerial risk aversion; the size of transactions undertaken by the bank; industry market structure; and the variance of interest rates. Their model was subsequently extended to take costs into account, as well as by improving the measure of competition (see e.g. Maudos and de Guevar (2004) focusing on the EU and Zhou and Wong (2008) focusing on China). In another multi-country extension Saunders and Schumacher (2000) suggested an important policy trade-off between assuring bank solvency—high capital-to-asset ratios—and lowering the cost of financial services to consumers—low net interest margins.

A wide variety of other factors have been shown to be important determinants of net interest margin in addition to the quality of asset and liability management. Hawtrey and Liang (2008), relate net interest margin to market power, operational cost, risk aversion, interest rate volatility, credit risk, and volume of loans. Demircuc-Kunt and Huizinga (1998) show that differences in interest margins and bank profitability reflect various determinants: bank characteristics, macroeconomic conditions, explicit and implicit bank taxes, regulation of deposit insurance, general financial structure, and several underlying legal and institutional indicators.

In Central and Eastern Europe interest margins have been investigated, for example, by Claeys and Vennet (2008), who studied to what extent the relatively high bank margins in CEEC can be attributed to low efficiency or non-competitive market conditions, controlling for the macroeconomic environment and the influence of foreign and state-owned banks. In contrast, focusing on the Czech Republic, Horváth (2009) found that more efficient banks exhibit lower margins and do not compensate themselves with higher fees. Larger banks also tended to charge lower margins, while higher capital adequacy was associated with lower margins contributing to the banking stability.

Particular attention has been paid to relating interest margins to risks faced by the bank. Delis and Kouretas (2011) show that that low interest rates indeed increase bank risk-taking substantially. Memmel (2011) focused on German banks' exposure to interest rate risk

finding that the systematic component of this exposure moves in sync with the shape of the term structure. On the other hand, at the bank level, the time variation of the exposure is largely determined by idiosyncratic effects. In macroeconomic context net interest rate margin has been proposed as a causal explanation for the forecasting power of the term spread for real economic activity. Adrian et.al. (2010) find empirical support for the hypothesis that monetary tightening is associated with a flattening of the term spread, which reduces net interest margin, which in turn makes lending less profitable, leading to a contraction in the supply of credit and a negative effect on growth.

This paper offers several contributions to the literature on net interest margin and the link between net interest margin, term structure and asset and liability management. First, it summarizes the managerial perspective on asset and liability management, in context of asset and liability interest rate sensitivity. Second, it offers several stylized facts on the dynamics of net interest margins after the crisis comparing them between the US, major European economies and the Nordic countries. Third, it estimates a model linking net interest margin to the slope of the yield curve.

The remainder of the paper is structured as follows: Section 1 provides details on the theory of asset and liability management to maximize net interest margin, Section 2 documents some stylized facts on the dynamics of net interest margin, and Section 3 estimates a model relating net interest margin to the slope of the yield curve. Finally, some conclusions are proposed in the last section.

1 Net Interest Margin in Asset and Liability Management Theory

Net interest margin serves as a convenient summary of the effectiveness of asset and liability management. However, the underlying actions to maximize net interest margin consist mostly in choosing the appropriate mix of assets and funding it with the appropriate mix of liabilities.

The classification of assets depending on the sensitivity of the income generated from them to market interest rate changes is fairly intuitive (as seen in e.g. Gup (2011)). Such classifications generally focus on separating fixed and floating interest rate assets and liabilities. Changes in market interest rates would not affect net interest margin if all assets and liabilities were of fixed rate nature. Examples of such assets and liabilities include fixed rate loans and deposits, bonds, mortgages, preferred shares with fixed interest rate coupons, etc. Naturally, interest rate margin would be perfectly related to market interest rates if all

assets and liabilities had floating interest rates. Examples of such assets include floating interest rates loans and deposits, etc.

There are at least two caveats to this approach, which complicate asset and liability management. First, the *market value* of assets and liabilities can change if market interest rates change, even if the amount of interest income is not affected. For example, a secondary market value of the bond yielding three percent will decline if market interest rates rise from three to five percent, because newly issued bonds (at five percent) will be a more attractive investment opportunity. This in turn would change the market value of bank's assets, and potentially requirements for capital adequacy, etc. Second, there are trade-offs between maximizing net interest margin for a given set of market interest rates and maximizing profits in case of interest rate changes. For example, it is possible to only include fixed interest rate instruments in asset allocation and ensure a constant interest margin that maximizes profits at a given point in time. However, once interest rates change in the future, a bank may be forgoing some of the profits, which would be available had it been able to take advantage of the change in interest rates. These two trade-offs lie at the heart of formulating the appropriate asset and liability management strategy.

One example of the asset management strategy aligns bank's actions with interest rate dynamics governed by the monetary authority and the state of the business cycle. Gup (2011) defines four stages of the business cycle: recovery, prosperity, recession and depression. In the recovery phase (which is arguably the phase advanced economies are in now) short-term interest rates are low, but are expected to rise in the future if (or when) the recovery strengthens. In this environment the appropriate strategy would be to increase interest rate sensitivity of the asset portfolio, for example, by avoiding fixed rate loans and instead allocating more to variable interest rate investments. On the other hand, a bank could strive to lock in relatively cheaper sources of funding by issuing relatively low interest rate debt and trying to increase the maturity of low interest rate fixed term deposits.

As the business cycle enters "prosperity" phase and interest rates begin to rise relative to their historical averages, the emphasis of asset allocation could shift more towards fixed term instruments to lock in high levels of yield. Funding the assets cheaply may become increasingly difficult at this point. The subsequent phases of "recession" and "depression", which entail falling interest rates (as well as potentially falling asset prices and greater volatility in the markets), reverse these dynamics and make floating interest rate liabilities more attractive. In fact, if the bank has acquired assets which generate sufficiently high

interest payments, they can be sold in a low interest rate environment to generate additional revenue, which can supplement otherwise falling income.

Another possible asset and liability management strategy focuses on managing the so-called interest rate gap (see e.g. Mehta and Hung-Gay (2003)). The interest rate gap is determined by the relative shares of fixed and floating interest rate assets and liabilities. If the interest rate gap is positive then net interest margin increases following an increase in market interest rates (and decreases following a decrease). On the other hand, if the interest gap is negative changes in net interest margin and market interest rates are generally in opposite directions. This is at the heart of the regulatory approach to interest rate risk and many banks are regularly compelled to calculate the impact of yield curve shifts on their portfolios.

2 Stylized Facts on the Dynamics of Net Interest Margin after the Crisis

2.1 Data and Sample Selection

This paper focuses on several country groups, each of which can be claimed to have a distinct environment in which banks operates: the United States, major European economies (this includes Germany, Spain and Italy¹) and the Nordic economies (including Denmark, Finland, Norway and Sweden). The paper uses the SNL Financial database to obtain net interest margin for a total of 1180 banks, however, the sample is heavily dominated by the US banks (1105 banks). There are also 22 Norwegian banks, 19 Danish banks, 12 Italian, eight Spanish, seven German banks, four Swedish and three Finnish banks. In part, the relative scarcity of data on the banking systems of European countries necessitates consideration in groups.

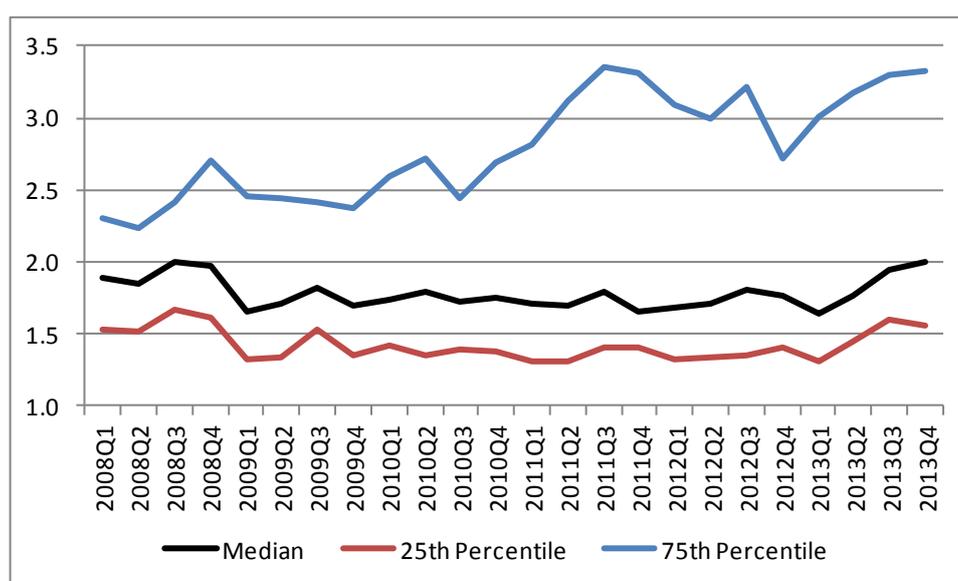
The majority of the data on net interest margin is available from 2008Q1. This paper therefore focuses on the period immediately before and in the aftermath of the financial crisis. Since part of the analysis is about the relationship between the slope of the yield curve and net interest margin, it is appropriate to focus on the latter period because there may have been a structural break in this relationship as central banks have implemented an unprecedented degree of monetary accommodation.

2.2 Net Interest Margin in the Nordic Countries

¹ France could obviously also be included in this category, but the data sources available to the author did not contain any data for French banks.

Figure 1 shows the median and interquartile range (the 25th and 75th percentiles) of net interest margin (NIM) of the banks in the Nordic countries.² Interestingly, the median and the 25th percentiles of net interest margin have barely changed in the period from 2008Q1 until 2013Q4. The median has increased slightly from 1.9 to 2 percent, and the 25th percentile has also increased from 1.5 to 1.6 percent. The impact of the financial crisis can be seen in lower median net interest margin from 2009 until the beginning of 2013. On the other hand, the 75th percentile, representing the better performing banks according to the net interest margin criterion has increased substantially from 2.3 to 3.3 percent. Furthermore the net interest margin has started to increase for this group as early as the middle of 2010. This suggests that some banks were able to actually increase the efficiency of their interest bearing assets, in spite of the general low interest rate environment and illustrates the role skilful asset and liability management can play.

Fig. 1: Median, Select Percentiles of NIM in the Nordic Countries, 2008-2013, percent



Source: SNL Financial, Author's Calculations. Based on 48 banks

2.3 Net Interest Margin in the European Countries

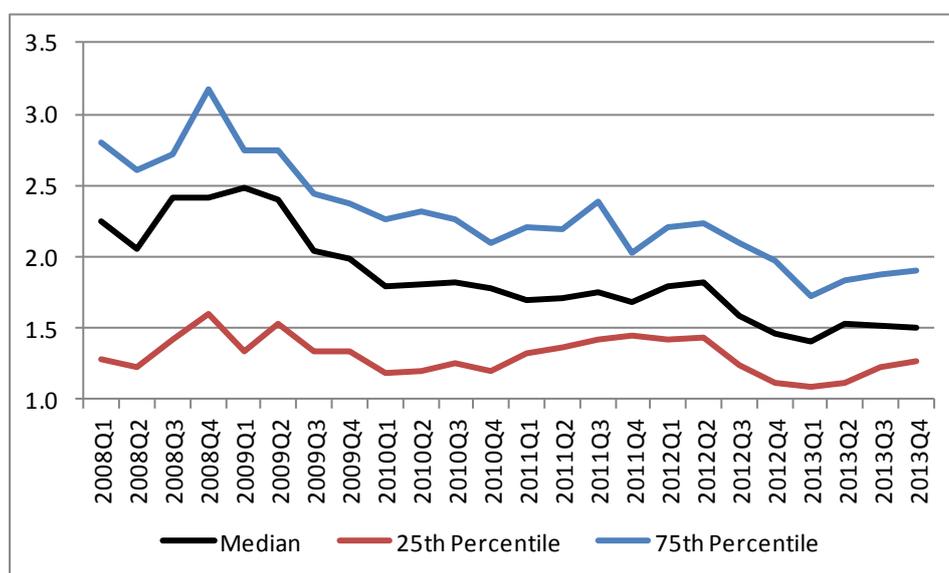
Figure 2 shows the median and interquartile range of net interest margins in select European economies. It reveals the opposite dynamic to the one in the Nordic countries, the interquartile range of net interest margins was actually smaller in 2013Q4 than it was in 2008Q1. The median net interest margin also declined from 2.3 to 1.5 percentage points. This suggests that

² Note that the median is taken at every observation point, therefore the lines on the chart do not correspond to any particular

the overall circumstances for the industry were so unfavorable that even the most efficiently managed banks before the crisis had to contend with a decline in the net interest margin.

Taking into account the countries included in the European group this conclusion is not surprising. Banks in Italy and Spain, in particular, have suffered heavily both as a result of stronger sovereign bank links and contagion following the debt crisis of 2010, lower demand due to prolonged recession (especially in Spain) and difficulties in accessing wholesale funding because of the generalized decline in investor confidence. On the positive side, Figure 2 suggests that European banks have considerable upside potential as European economies recover and, possibly, as the development of the banking union in Europe strengthens the resilience of country financial systems.

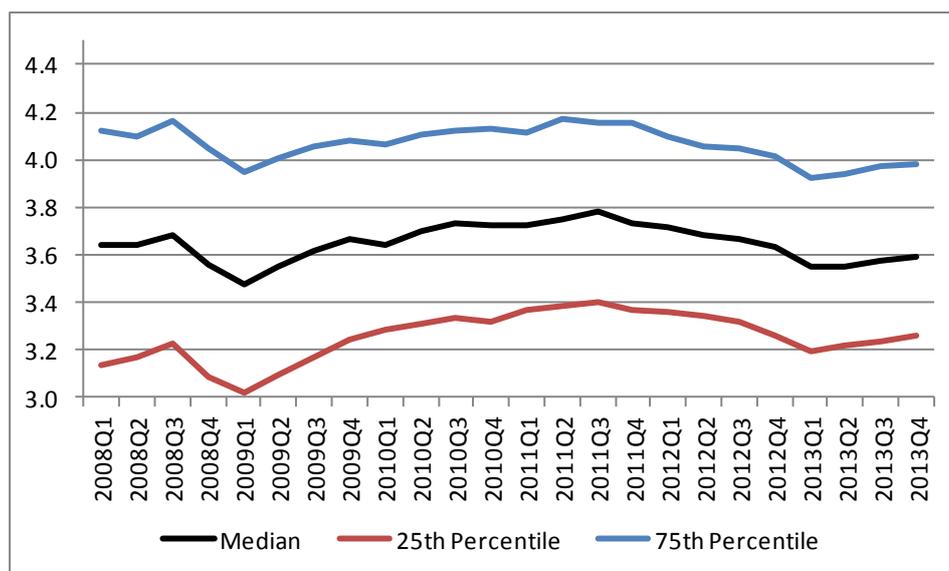
Fig. 2: Median, Select Percentiles of NIM in European Countries, 2008-2013, percent



Source: SNL Financial, Author's Calculations. Based on 27 banks

2.4 Net Interest Margin in the United States

Fig. 3: Median, Select Percentiles of NIM in the United States, 2008-2013, percent



Source: SNL Financial, Author's Calculations. Based on 1105 banks

Figure 3 shows the median and interquartile range of net interest margin in the United States. Two stylized facts emerge: (i) net interest margin is larger and less volatile in the United States than either in the Nordics or in Europe and (ii) there is relatively little change in the interquartile range suggesting that distribution of asset and liability management efficiency has not changed much in the aftermath of the financial crisis.³ Several explanations are possible for the higher net interest margin in the US, for example, the prevalence of fixed, as opposed to floating, interest rate mortgages, or lower market concentration – in a much larger country, some parts of it may only be served by relatively fewer banks, which can extract greater rents because of greater monopoly power.

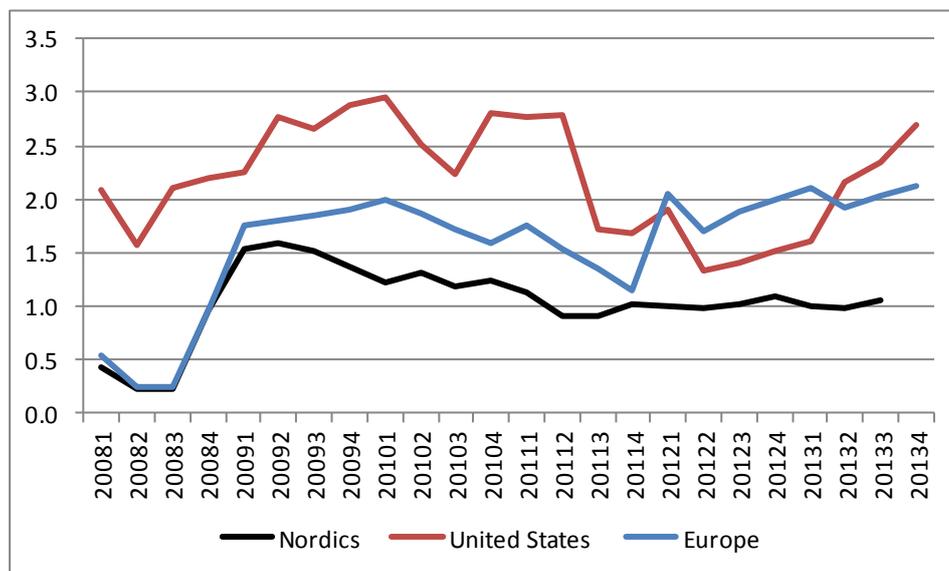
3 Net Interest Margin and the Slope of the Yield Curve

The author has now outlined several stylized facts on the net interest margins in the Nordic and European countries as well as the US. This section considers to what extent net interest margin dynamics can be explained by the slope of the yield curve. The slope of the yield curve is defined as the difference between yields on the ten and two year government bond.⁴

³ This interpretation is subject to the caveat that the sample of US banks is much larger than the sample of either Nordic or European banks, which by itself should lower the volatility of the distribution of net interest margins. Nonetheless the finding that the median net interest margin is substantially higher in the US is not affected by the size of the sample.

⁴ Occasionally due to data limitations nearest equivalents of these instruments have to be used, e.g. a 3 or a 5 year bond for some countries.

Fig. 4: Slope of the Yield Curve in the US, European and Nordic Countries, 2008-2013, percentage points



Source: HAVER Analytics, Author’s estimates. Average slopes are used for different country groupings.

The rationale for considering the slope of the yield curve as a potential driver of net interest margin is intuitive: a steeper slope means that long-term rates are relatively higher than short-term rates, which should improve net interest margins for the majority of banks, which engage in maturity transformation. Similarly, a smaller difference between long-term and short-term rates should lower net interest margins. Figure 4 shows the slopes of the yield curves in countries considered previously. In Europe and the Nordic countries there has been a marked steepening of the yield curve in the aftermath of the financial crisis. In the US, the slope has been more volatile (note, in particular, the declines in 2011, following operation “Twist” by the Federal Reserve) and has lately been increasing.

The relationship between net interest margin, the slope of the yield curve and asset and liability management can be summarized with the following model:

$$y_{i,t} = \alpha + \mu_i + \beta_1 \bar{x}_i + \beta_2 (x_{i,t} - \bar{x}_i) + \varepsilon_{i,t} \quad (1)$$

In equation (1), α is the common intercept for all banks, μ is the fixed effect specific to a particular bank (indexed by i), \bar{x}_i is the average value of the slope of the yield curve facing bank i (this will, of course, be the same for banks from the same country) and $x_{i,t}$ is the slope of the yield curve facing bank i at time t . Finally, $\varepsilon_{i,t}$ is the error term following standard assumptions. Equation (1) allows changes in the average value of the net interest margin to

have different effects from temporary deviations from that average. A bank that operates in a country with higher slope of the yield curve can be expected to have higher net interest margin, hence we expect β_1 to be positive. On the other hand, the impact of a particular deviation of the slope of the yield curve from the average measured by β_2 presumably may depend on the efficiency of asset and liability management. If banks are on average managed efficiently, one might expect β_2 to be close to zero because banks adjust their assets and liabilities to minimize the fluctuation of net interest margin due to shocks to the yield curve.

Table 1 shows that this theoretical expectation is correct. An increase in the average slope of the yield curve indeed has a strongly positive impact on the net interest margin. However, a positive deviation from the average slope, actually turns out to have a very small negative effect on the net interest margin. On balance, however, the effect is not economically significant as even a 10 percentage *point* increase in the slope of the yield curve results in only 0.2 percentage points decline in net interest margin. To summarize, Table 1 seems to offer preliminary supporting evidence of our hypothesis that a higher slope of the yield curve tends to increase net interest margins, however, efficient bank asset and liability management strategy can minimize the impact of the temporary changes in the slope of the yield curve.

Tab. 1: Econometric Estimates of Equation (1)

Parameter	Estimate (standard error in brackets)
α	-2.925*** (0.143)
β_1	3.009*** (0.087)
β_2	-0.024*** (0.005)
R-squared	0.76

Source: Author's calculations. *** denotes significance at 1 percent. Heteroskedasticity and autocorrelation robust standard errors are provided.

Note that equation (1) also suggests an additional way in which the efficiency of bank asset and liability management strategy can be measured – by examining the fixed effect parameter μ^5 . Banks with a higher value of μ presumably can manage their assets and liabilities more efficiently ensuring a higher net interest margin on average.

⁵ To conserve space these results are not reported here, nonetheless summarizing their descriptive statistics would be a suitable starting point for new investigations of asset and liability management efficiency in banks.

Conclusion

This paper examined theoretical role of the net interest margin in bank asset and liability management strategies, and offered some stylized facts on the dynamics of net interest margin in the Nordic and European countries as well as the United States.

The author finds considerable heterogeneity in net interest margin dynamics across the world. For the Nordic banks the median net interest margin has stayed approximately constant, while the interquartile range has increased suggesting that some banks have implemented better asset and liability management strategies. In Europe, the median and the interquartile range for net interest margin have both narrowed suggesting that adverse circumstances for the banking industry have affected everyone. Finally, in the US the distribution of net interest margin has stayed approximately the same and the median net interest margin is higher than in the Nordics or European countries. The author's analysis suggests that in part this may be due to a higher slope of the yield curve.

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