Net Interest Margin and Asset Liability Management of Banks in India: An Empirical Investigation

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Abstract

Purpose – The past two years have been tough for banks around the world. The instability of the markets has forced the regulators around the world to fundamentally strengthen the resilience of the global financial system. With competition rising in the banking sector, it is interesting to explore the key determinants of net interest margin (NIM) as an indicator of both performance and efficiency in the banking system.

Methodology / Approach – The present paper investigates the impact of bank specific factors on the determinants of Net Interest Margin (NIM) for the public sector, private sector and foreign banks operating in India for the year 2010.

Findings – We examine the impact of the recent changes on the NIM by dividing the data into two subparts: Model 1 for public sector, private sector and foreign banks and Model 2 for only public sector banks in India. The results suggest that for Model 1 Asset Quality, Operating Expenses, Capital Adequacy and Return on Assets have a significant impact while for Model 2 Operating Expenses, Capital Adequacy, Return on Assets and Gap are significant determinants of the net interest margin of banks.

Practical Implications — The calculation of NIM is crucial since it includes important information about the efficiency of the banking system and identifying the determinants of net interest margin would help to provide policy implications for the banking environment. The need for risk management in the banking sector is inherent in the nature of the banking business. Poor asset quality and low levels of liquidity have emerged as two major causes of bank failures in the recent times.

Key words – Net Interest Margin, Asset Liability Management, GAP, Capital Adequacy, Asset Quality

Paper Type – Research paper

1. Introduction

The banking industry has undergone a rapid transformation in the last decade and the recent trends of shrinking margins and increasing competitive pressures have changed the face of banking industry beyond recognition. Recent changes in the banking business due to rapid technological development, increased competition and diversity in banking operations have made the process of Asset Liability Management (ALM) complex. With increasing pressure on the banks bottom lines, ALM continues to be a much - debated topic for both regulators and policy makers.
Though the Asset Liability Management (ALM) process is too complex to practice, it is perhaps the only solution for banks to survive in this rapidly changing environment where the composition, duration and risk profile of their assets and liabilities have an important bearing on their growth and profitability. An efficient ALM technique aims to manage the volume, mix, maturity, rate sensitivity, quality and liquidity of the assets and liabilities as a whole so as to earn a predetermined acceptable risk/reward ratio. The technique views the financial institution as a set of interrelationships that must be identified, coordinated and managed as an integrated system (Moynihan,G.P., Purushothaman,P, Mcleod,R.W. and Nichols,G,2002). In fact a sound ALM process helps the banks to evaluate balance sheet risk and take prudent decisions that enable them to remain financially viable as economic conditions change.

With competition rising in the banking sector more and more focus is on effective asset liability management of banks so as manage the risk and consequently achieve desirable returns. To appreciate ALM in its existing state in the interest volatility scenario, it is useful to study the relationship between Interest rate risk and maturity gaps as they exist in Indian banks and also the key determinants of NIM. That the banks are not in the best of health can also be seen from the fall in their net interest margins NIM. A Business Standard report says that NIM of 32 public and private sector banks have fallen by 26 basis points (100 basis points make a per-cent) from their peak level in December 2010 of 3.42%, while they are down by 13 basis points over the previous year ( Financial Express, June 10, 2012).

NIM is an indicator of both performance and efficiency in the banking system. According to Rudra Sensarma and Saurabh Ghosh (2004), a competitive banking system is expected to foster efficiency which should get reflected in lower NIM. Too high NIM is reflective of lack of competition in the industry. However, too low NIM can also put a stress on the profitability of banks. As NIM is an indicator of both performance and efficiency in the banking system, it is interesting to explore its determinants.

In the context of the international financial crisis, results from the study will allow us to shed light on some of the possible effects on determinants of bank performance and the resulting banking net interest margins. The Indian banking system is an important sector of the economy which is robust and has not suffered much in spite of the successive international and domestic crises that the countries have gone through over the years. Analysts feel that margins of banks peaked in 2010 and protecting the current level will be a challenge especially for the public sector banks. This means that banks need to cut their operating cost and increase efficiency by generating more fee based income in the coming years. This will help them to increase their profitability in spite of a decrease in NIM. According to a recent report, the Indian banking sector has performed well in the recent past and was fortunate to have emerged unscathed from the global financial crisis in 2008 because they had limited exposure to riskier assets. Moreover, India’s strong domestic economy was driving growth at much higher levels compared to its global counterparts (PWC Report and 4th ICC banking summit, May 2012).

The rest of this paper proceeds as follows. Section 2 reviews the relevant literature. Section 3 describes the data and methodology used for the study. Section 4 presents the results while Section 5 presents the conclusions and policy implications.

2. Review of Literature

The measurement of interest rate and liquidity risks on the banking book of a bank has had a prominent place in ALM. Some of the early studies include Platt (1986), Farin (1989), and Fabozzi and Konishi (1991). Most of the existing literature in this area suggests that banks may choose to focus on two approaches to measure interest rate risk (Basle Committee, 1997; Dermine and Bissada, 2002). The first approach to measure interest rate risk is with respect to the impact of a change of interest rate on the net interest income (NII) of the bank. The second approach measures the impact of a change in interest rates on the fair economic value of the equity of a bank.
This study focuses on the first approach. Since NIM is an important measure of efficient ALM in banks, it is important to identify the determinants of NIM. Various studies have been conducted to identify the determinants of NIM. In their seminal work, Ho and Saunders (1981) defined bank as an intermediary between intermediary between lenders and borrowers, and stated that the optimal pure spread depends on four variables: the degree of risk aversion, the market structure (proxy for competition), the average size of bank transactions, and the variance of the interest rate on loans and deposits (market risk). Since then number of studies have been carried out in this direction. Most of the studies in this context have used variables such as bank size (Bikker and Hu, (2002); Ben Naceur and Goaied (2008)), credit risk, and equity (Maudos and De Guevara (2004) & Ben Naceur and Goaied (2008)) as internal determinants of bank performance.

Few studies have investigated relevance of size as a determinant of NIM. Kasman et al (2010) evaluate the effects of financial reforms on the determinants of commercial bank net interest margin in the banking systems of the new EU member countries. The results show that size and managerial efficiency are negatively and significantly related to net interest margins. However, Bikker and Hu (2002) and Ben Naceur and Goaied (2008) find a positive and significant relationship between size and bank performance.

Studies have evaluated another variable, equity, as a determinant of NIM. Saunders and Schumacher (2000) carried out a study to identify the determinants of bank NIM in selected European countries and the US during the period 1988-1995 for a sample of 614 banks. They found out that the regulatory components in the form of interest-rate restrictions on deposits, reserve requirements and capital-to-asset ratios have a significant impact on banks NIMs.

Operating costs is yet another variable that finds a significant place in the literature. Maudos and Solis (2009) analyze net interest income in the Mexican banking system over the period 1993–2005. Their study models the net interest margin simultaneously including operating costs and diversification and specialization as determinants of the margin. They have attributed high margins mainly to average operating costs and to market power. They find that although non-interest income has increased in recent years, its economic impact is low.

Few studies find credit risk as an important determinant for NIM. Angbazo, L. (1997) show that the net interest margins of commercial banks reflect both default and interest-rate risk premia. The results in their study state that the net interest margins of money-center banks are affected by default risk, but not by interest rate risk, which is consistent with their greater concentration in short-term assets and off-balance sheet (OBS) hedging instruments whereas (super-) regional banking firms are sensitive to interest-rate risk but not to default risk. Miller and Noulas suggest a negative relationship between credit risk and profitability.

Thus we find that size, equity, credit risk and operating costs amongst others are some of the key variables used in the literature.

3. Data and Methodology
In this section we discuss the data sources, variables definitions, and the model specification employed in our investigation. Two models were tested in the present paper.

Data
Model 1 includes data from 55 banks (28 Public sector banks, 20 Private sector banks and 7 Foreign banks) operating in India for the year 2010. Model 2 includes only the data for 28 public sector banks. The data for all the banks were obtained from the various issues of Report on Trend and Progress of Banking in India, Statistical Tables Relating to Banks in India and the annual reports of the banks.
**Dependent variable**

The dependent variable here is Net Interest Margin (NIM) or spread which is the difference between cost of deposits and yield on loans earned by a bank divided by its total assets.

**Independent Variable**

As the NIM of a bank is an indicator of bank performance and efficiency, it is very important to study what are the explanatory factors that affect NIM.

**Dependent Variable**

*Capital Adequacy ratio*

Solvency risk is a measure of credit worthiness of a bank and arises when a bank is not able to pay the depositors on time. It is measured by the ratio of bank equity to total assets and is popularly known as capital adequacy ratio. Higher capital adequacy ratio indicates that a bank is well capitalized with regard to its perceived risk, thereby confirming long term bank solvency (Kasman, Tunc etc, 2010).

*Bank size*

The log of total assets of the banks is taken as a proxy for size in our study.

*Asset Quality*

The variable is represented by the bank’s ratio of non-performing assets to total assets.

*Management Efficiency*

Management efficiency is measured as a ratio of operating expenses to total assets.

*Borrowings*

Borrowings divided by total assets is used as an indicator of survival and profitability for the banks.

*Return on Assets*

Return on assets is defined as net profit divided by total assets and is a measure of bank profitability.

*Interest rate risk*

GAP analysis is a technique of asset liability management that is used as a measure of interest rate risk. It is calculated as the difference between rate sensitive assets (RSAs) and rate sensitive liabilities (RSLs) by grouping them into time buckets according to residual maturity. The sign and magnitude of GAPS in various time buckets can be used to assess potential earnings volatility arising from changes in interest rates. In this paper, the ratio of one year Gap to total assets is taken as an indicator of interest rate risk management capabilities of a bank.

**Model Specification**

Using EVIEWS 7.0, we model the equation using the Multiple Regression method of estimation. The program will generate the values of \( \alpha \) and \( \beta \) on the basis of the actual data. These values of \( \alpha \) and \( \beta \) are such that they minimise the error in the model as represented by \( \epsilon_t \).

The Linear multiple regression model used by our analysis is specified as follows:

\[
Y_{it} = \alpha + \beta X_{it} + \epsilon_t
\]
The above model can be written as
\[ \text{NIMTA} = \beta_1 + \beta_2 \text{EQTA} + \beta_3 \text{BORRTA} + \beta_4 \text{NPTA} + \beta_5 \text{ROA} + \beta_6 \text{OETA} + \beta_7 \text{TA} + \beta_8 \text{GAP1YR} + \epsilon \]

where
\[ \beta_1 \] is the constant and \[ \epsilon \] is the error term.

Table 1 summarizes the definitions of research variables and their predicted relationships.

### TABLE 1: DEFINITION OF RESEARCH VARIABLES USED IN THE ANALYSIS AND EXPECTED SIGNS OF COEFFICIENT

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Variables</th>
<th>Definition</th>
<th>Predicted Sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EQTA</td>
<td>EQUITY CAPITAL / TOTAL ASSETS</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>BORRTA</td>
<td>BORROWINGS / TOTAL ASSETS</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>ROA</td>
<td>RETURN ON ASSETS / TOTAL ASSETS</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>NPTA</td>
<td>NON PERFORMING ASSETS / TOTAL ASSETS</td>
<td>--</td>
</tr>
<tr>
<td>5</td>
<td>OETA</td>
<td>OPERATING EXPENSES / TOTAL ASSETS</td>
<td>--</td>
</tr>
<tr>
<td>6</td>
<td>TA</td>
<td>TOTAL ASSETS (TAKEN IN LOGS)</td>
<td>+</td>
</tr>
<tr>
<td>7</td>
<td>GAP1YR</td>
<td>GAP / TOTAL ASSETS</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>NIMTA</td>
<td>NET INTEREST MARGIN / TOTAL ASSETS</td>
<td></td>
</tr>
</tbody>
</table>

4. Results and Discussion

Correlation among independent and dependent variables used in the estimation is presented in Table 2. Our study tested the variables for multi-collinearity. Table 2 presents the results of the correlation among the independent and dependent variables. None of the variables are highly correlated and thus they will not cause the problem of multi-collinearity.

### TABLE 2: CORRELATION AMONG INDEPENDENT AND DEPENDENT VARIABLES

<table>
<thead>
<tr>
<th>Variables</th>
<th>NIMTA</th>
<th>EQTA</th>
<th>BORRTA</th>
<th>NPTA</th>
<th>ROA</th>
<th>OETA</th>
<th>TA</th>
<th>GAP1YR</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIMTA</td>
<td>1.000000</td>
<td>0.234461</td>
<td>0.547811</td>
<td>-0.602171</td>
<td>0.186418</td>
<td>0.520649</td>
<td>-0.225979</td>
<td>-0.083452</td>
</tr>
<tr>
<td>EQTA</td>
<td>0.234461</td>
<td>1.000000</td>
<td>-0.101501</td>
<td>-0.248574</td>
<td>-0.186923</td>
<td>-0.243779</td>
<td>0.259864</td>
<td>0.072144</td>
</tr>
<tr>
<td>BORRTA</td>
<td>0.547811</td>
<td>-0.101501</td>
<td>1.000000</td>
<td>-0.031978</td>
<td>0.445871</td>
<td>0.266692</td>
<td>-0.120853</td>
<td>-0.174338</td>
</tr>
<tr>
<td>NPTA</td>
<td>-0.602171</td>
<td>-0.248574</td>
<td>-0.031978</td>
<td>1.000000</td>
<td>0.302381</td>
<td>0.362923</td>
<td>-0.139118</td>
<td>0.000224</td>
</tr>
<tr>
<td>ROA</td>
<td>0.186418</td>
<td>-0.186923</td>
<td>0.445871</td>
<td>0.302381</td>
<td>1.000000</td>
<td>0.173004</td>
<td>-0.161981</td>
<td>-0.083077</td>
</tr>
<tr>
<td>OETA</td>
<td>0.520649</td>
<td>-0.243779</td>
<td>0.266692</td>
<td>0.362923</td>
<td>0.173004</td>
<td>1.000000</td>
<td>-0.082532</td>
<td>-0.025331</td>
</tr>
<tr>
<td>TA</td>
<td>-0.225979</td>
<td>0.259864</td>
<td>-0.120853</td>
<td>-0.139118</td>
<td>-0.161981</td>
<td>-0.082532</td>
<td>1.000000</td>
<td>-0.092212</td>
</tr>
<tr>
<td>GAP1YR</td>
<td>-0.083452</td>
<td>0.072144</td>
<td>-0.174338</td>
<td>0.000224</td>
<td>-0.083077</td>
<td>-0.025331</td>
<td>-0.092212</td>
<td>1.000000</td>
</tr>
</tbody>
</table>

Tables 3 and 4 present two regression models – Model 1 for Public Sector, Private sector and Foreign banks and Model 2 for only Public sector banks. The results show that for model 1 Return on assets, Non-performing assets, Capital adequacy, Operating expenses have a statistically significant impact while Size, Gap and Borrowings have no impact on NIM. For model two Operating expenses, Return on assets, Capital adequacy and GAP are the most important drivers of net interest margin. Borrowings, Non-Performing Assets and Size have no impact on the NIM of the bank.
TABLE 3: DETERMINANTS OF NET INTEREST MARGIN – MODEL 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.143927</td>
<td>0.145571</td>
<td>0.988704</td>
<td>0.3286</td>
</tr>
<tr>
<td>BORTA</td>
<td>0.002512</td>
<td>0.027342</td>
<td>0.325768</td>
<td>0.2664</td>
</tr>
<tr>
<td>EQTA*</td>
<td>0.000187</td>
<td>2.29E-05</td>
<td>8.193229</td>
<td>0.0000</td>
</tr>
<tr>
<td>NPTA*</td>
<td>-0.336331</td>
<td>0.040976</td>
<td>-8.208041</td>
<td>0.0000</td>
</tr>
<tr>
<td>ROA*</td>
<td>0.001638</td>
<td>0.000378</td>
<td>4.334031</td>
<td>0.0001</td>
</tr>
<tr>
<td>OETA**</td>
<td>0.186938</td>
<td>0.094087</td>
<td>1.986866</td>
<td>0.0536</td>
</tr>
<tr>
<td>TA</td>
<td>-0.023761</td>
<td>0.016042</td>
<td>-1.481190</td>
<td>0.1462</td>
</tr>
<tr>
<td>GAP1YR</td>
<td>-0.013832</td>
<td>0.038478</td>
<td>-0.359472</td>
<td>0.7211</td>
</tr>
</tbody>
</table>

R Squared | Adjusted R Squared | Standard Error of Regression
0.804807 | 0.776242 | 0.776242

TABLE 4: DETERMINANTS OF NET INTEREST MARGIN – MODEL 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.008077</td>
<td>0.005980</td>
<td>-1.350601</td>
<td>0.1834</td>
</tr>
<tr>
<td>BORTA</td>
<td>0.012632</td>
<td>0.029392</td>
<td>0.429778</td>
<td>0.6694</td>
</tr>
<tr>
<td>EQTA*</td>
<td>0.013366</td>
<td>0.004171</td>
<td>3.204492</td>
<td>0.0025</td>
</tr>
<tr>
<td>NPTA</td>
<td>-0.000739</td>
<td>0.000667</td>
<td>-1.107345</td>
<td>0.2739</td>
</tr>
<tr>
<td>ROA*</td>
<td>0.007683</td>
<td>0.001318</td>
<td>5.830197</td>
<td>0.0000</td>
</tr>
<tr>
<td>OETA*</td>
<td>1.132138</td>
<td>0.117184</td>
<td>9.661214</td>
<td>0.0000</td>
</tr>
<tr>
<td>TA</td>
<td>0.000572</td>
<td>0.000457</td>
<td>1.251202</td>
<td>0.2172</td>
</tr>
<tr>
<td>GAP1YR**</td>
<td>-0.000132</td>
<td>6.00E-05</td>
<td>-2.208380</td>
<td>0.0322</td>
</tr>
</tbody>
</table>

R Squared | Adjusted R Squared | Standard Error of Regression
0.922575 | 0.910792 | 0.001638

* Significant at 1%.
** Significant at 5%.
*** Significant at 10%.

Capital Adequacy
Capital turns out to be an important determinant of bank margins, in both the models emphasizing the need to maintain relatively high capital adequacy levels to ensure stability and maintain the confidence of depositors. The ratio has a positive relationship with NIM as banks need more interest income in order to maintain high levels of capital. This is consistent with the hypothesis that well-capitalized banks are subject to less expected bankruptcy costs and hence lower cost of capital (Berger, 1995). Thus,

Asset Quality
Asset Quality has the expected negative sign for both the models and is significant for model 1. Our results are consistent with the findings of Rudra Sensarma and Saurabh Ghosh (2004) who argue that banks with high NPAs are expected to have shifted their loan portfolio away from risky activities which would have otherwise adversely affected their spreads. The less risky activities where these banks would have moved into would bring them lower returns. Empirical literature also suggests that poor asset quality and low levels of liquidity are the two major causes of bank failures.

Size
The coefficient of total asset is insignificant in both our model indicating that size is not a determining variable for NIM. Smirlock (1985) finds a positive and significant relationship between size and bank profitability. Demirguc-Kunt and Huizinga (2000) suggest that the extent to which various financial, legal and other factors (e.g. corruption) affect bank profitability is closely linked to firm size.

Operating Expenses

A high NIM alone cannot make a bank profitable as a substantial portion of NIM can be eroded by operating expenses and credit costs, including provisions for bad assets and write-offs (Mint, October 31, 2010). Operating expenses appear to be an important determinant of profitability closely related to the notion of efficient management in our study.

Return on Assets

Return on assets is a measure of bank profitability and gives an idea as to how efficient management is at using its assets to generate earnings. ROA in many studies emerges as the key ratio for the evaluation of bank profitability (IMF, 2002). The ratio is significant for both the models in our study.

Borrowings

Abreu (2002) found that well capitalized banks face lower expected bankruptcy costs and thus lower funding costs and this resulted into better profitability. Borrowings are not significantly associated with NIM of a bank. The coefficient is insignificant for both models 1 and 2.

GAP

Management of Interest rate risk is one of the critical components of market risk management in banks. Excessive interest rate risk adversely affects a bank’s financial condition in the current year as also in the future. For Model 1 GAP is not significant. For Model 2 Gap is significant at 5% level of confidence. This finding is in accordance with the interpretation that public sector banks with a greater degree of interest rate risk will require higher net interest margin to compensate for higher risk of default.

5. Conclusions and Policy Implications

We employ a multiple regression model using data from 55 banks for 2010 to identify the determinants of NIM. We find that Capital Adequacy, Asset Quality, Operating Expenses, Return on assets and GAP have a significant impact while Borrowings and Size of the bank have no impact on NIM.

Following the recent economic crisis and the increased pressure on the bottom-line of the banks, the investigation of bank net interest margins is crucial since they include important information about the efficiency of banking systems. The analysis suggests that banks may require an extra net interest margin to cover the high operating expenses as the results show that this is a very significant driver of net interest margin. Similarly, it will be of interest to policy makers and regulators to understand that higher equity to total assets ratio not only influences the performance of a bank positively but also lowers the need for external funding. The ratio is used as a signal of banks’ credit worthiness with a higher ratio indicating that a bank is well capitalized with regard to the solvency risk in the near future. Our results clearly show the importance of capital adequacy rules as a means to prevent banks from taking excessive risks and as a tool for maintaining depositor confidence. Finally, high NPAs in a bank reduce the spread and are associated with low NIM.

A recent report by RBI (published in the Financial Stability Report in December 2011) has identified deterioration in asset quality as one of the most significant risks to the Indian financial system (Financial Express, June 2012). Banks definitely face a higher risk and a tougher challenge this time
around with the slowing down of the domestic economy due to high inflation and the global economy facing the brunt of the Euro zone crisis

References