Determinants of Commercial Banks' Loan Pricing: Empirical Analysis using Dynamic Panel Data Model

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Abstract

This study investigated the determinants of commercial banks' lending behaviour in the Indian context. The study aimed to test and confirm the effectiveness of the monetary policy along with common determinants of commercial banks' lending and how it affects the lending decision of commercial banks in India. An understanding of commercial banks' loan pricing decisions can be useful for policy purposes in various ways. First, the price discovery in the loan market characterised with loan interest rates and their spreads over deposit interest rate and risk free yield on government securities, can reflect upon the competitiveness and efficiency of banks in financial intermediation through mobilisation of deposits from saving households and allocation of funds to investors for productive activities. Thus, loan interest rates can be associated with economic growth and macroeconomic stability. Second, for successful conduct of monetary policy through the interest rate channel by the authorities, it is required that commercial banks should adjust loan interest rates in tandem with policy actions. The model hypothesizes that there is functional relationship between the dependent variable and the specified independent variables. Using the dynamic panel data methodology and annual data for a sample of major 33 banks including public, private and foreign banks over the period 1996-2014, the study finds significant impact of various bank specific factors, regulatory and supervisory indicators and macroeconomic factors on the banks' loan interest rates and their spread over deposit interest rates.

Key Words: Banks, panel data, interest rates, net interest income, operating cost

JEL Codes: G20, G21, C230, E43, L10

Introduction

In the wake of balance of payment crisis, India adopted reform with a view to alleviate structural impediments to higher economic growth through a competitive and open economy model. At this juncture it was realized that economic reform cannot take place meaningfully without a revamp of financial system. Thus, the reform of banking sector was pursued based on the recommendation of a high level committee. The reform of banking sector emphasized on promoting a diversified, efficient and competitive financial system with the ultimate goal of improving the allocative efficiency of resources through operational flexibility, improved financial viability and institutional strengthening. In this

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pursuit, the banking sector reform encompassed various dimensions. First, the level of competition was gradually increased within the banking system by allowing greater participation of domestic private and foreign banks while allowing banks greater freedom in pricing and allocation of credit. Second, measures were taken to develop various segments of financial markets such as money, bond, credit, foreign exchange and equity segments, with the introduction of newer instruments with a view to allow banks and financial institutions and also savers and investors opportunities for diversification, optimization of return and risk on their portfolios and effective management of liquidity and other risks. Third, in order to ensure stability of the financial system, banks were subjected to international best practices in prudential regulation and supervision tailored to Indian requirements. The supervisory system was revamped under the ambit of the Board for Financial Supervision in view of the crucial role of supervision in the creation of an efficient banking system. Fourth, measures were taken to improve the institutional arrangements including the legal framework and technology platform for effective, cost efficient and sound payment and settlement system. Finally, in order to be consistent with the new institutional architecture for the financial system in general and the banking sector in particular, the monetary policy framework made a phased shift from direct instruments of monetary management such as cash reserve and statutory liquidity requirements to an increasing reliance on indirect instruments such as short term policy interest rate including repo and reverse repo rates. Thus, there was a shift from traditional quantum of money to interest rate channel of monetary transmission mechanism. This shift in policy framework envisaged that in an increasingly competitive and integrated financial market environment, banks will be guided by market conditions and their balance sheet pressures along with regulatory and prudential requirements while pricing their assets and liability components, which in turn would have consequential effect on credit to private sector and the real economy.

Furthermore, interest rates on both deposits and lending of banks have been progressively deregulated. After the initiation of financial sector reforms in the early 1990s, various steps were initiated to deregulate the lending rates of commercial banks. The credit limit size classes of scheduled commercial banks, on which administered rates were prescribed, were reduced into three slabs in April 1993. The slabs or credit limit size class under the revised guidelines consisted of three categories: (i) advances up to and inclusive of Rs. 25,000; (ii) advances over Rs. 25,000 and up to Rs. 2 lakh; and (iii) advances over Rs. 2 lakh. In October 1997, with regard to term loans of 3 years and above, the banks were given the freedom to announce separate Prime Term Lending Rates (PTLR), while PLR remained applicable to the loans taken for working capital and short-term purposes. Keeping in view the international practice and to provide further operational flexibility to commercial banks in deciding their lending rates, the Reserve Bank relaxed the requirement of PLR being the floor rate for loans above Rs.2 lakh. Banks were allowed to offer loans at below-PLR rates to exporters or other creditworthy borrowers including public enterprises on the lines of a transparent and objective policy approved by their respective boards. Thus beginning April 19, 2001 commercial banks were allowed to lend at sub-PLR rates for loans above Rs.2 lakh. Competition had forced the pricing of a significant proportion of loans far out of alignment with BPLRs and in a non-transparent manner. As a consequence, this had undermined the role of the BPLR as a reference rate. Furthermore, there was a public perception that there was under-pricing of credit for corporates while there could be overpricing of lending to agriculture and small and medium enterprises. The Base Rate represents the minimum rate below which it will not be viable for the banks to lend. The Base Rate system is applicable for loans with maturity of one year and above (including all working capital loans). Banks may give loans below one year at fixed or floating rates without reference to the Base Rate.

All these developments would certainly have implications on the interest margin and profitability of the banking industry. At the same time loan pricing decisions of banks have come under scrutiny on several occasions. Illustratively, in the wake of recent global crisis in 2008-09, the Reserve Bank of India pursued a softer interest rate policy stance to stimulate the economy by way of slashing the policy rate by 475 basis points. However, banks' response was inadequate with lending rates declining by 100 to 250 basis points. Subsequently, the Reserve Bank of India (RBI) raised the policy rate 13 times in response to hardening of the inflation condition. However, banks did not respond adequately in revising deposit and lending rates. In this milieu, the Reserve Bank of India set up a committee to review the system of benchmark prime lending rate. Based on the recommendations of the committee, a base rate system was introduced with effect from 2010-11. A year later, drawing lessons from the banks' response to the base rate system, the RBI again set up a committee to look into the pricing decisions of banks. For policy purposes, thus, it is necessary to understand which factors are important in influencing banks' loan pricing decisions. The above perspectives influenced us for studying banks' loan interest rates and their spreads in the Indian context. Moreover, studies on the subject are non-existent in the Indian context.

In the following, the study is presented in four sections. Section 1 presents review of literature followed by methodology and data in Section 2, summary statistics and empirical findings in Section 3 and Conclusion in Section 4.

1. The Literature

The seminal works of Klein (1971), Monti (1972) and Ho and Saunders (1981), have inspired numerous studies to analyse commercial banks' loan pricing decisions. Klein (1971) and Monti (1972) postulated a theory of banking firm and demonstrated how in a static setting demands and supplies of deposits and loans simultaneously clear both markets. The banking firm framework has been further explored by Zarruk (1989) and Wong (1997). Zarruk found that when the deposit supply function becomes more volatile, the bank's spread narrows, which implies a decline in the quality of the bank's assets. Wong pointed out that marginal administrative cost of loan is one the key factor in determining the interest rate spread. Carbó and Rodríguez (2005) developed the theoretical model by including both traditional and non-traditional activities, with the aim of studying the effect of specialization on bank margins in Europe using a multi-output model. For this purpose, they used a dynamic model taking into account the fact that banks needed to match the random supply of deposit with the random demand of lending and non-traditional activities.

Ho and Saunders (1981) developed a dealership model in which banks were assumed to be risk-averse utility maximizing intermediaries for collecting deposits and granting loans over a single-period. Transaction uncertainty arising due to the asymmetry between the supply of deposits and demand for loans and market power were considered two significant factors driving interest margins. Ho and Saunders (1981) also empirically estimated the model for the U.S. banks, using a two-step approach. In the first step, a regression model explained bank interest margin in terms of bank-specific factors such as implicit interest rate, opportunity cost of reserves, default premium, operating costs, and capital-asset ratio. The constant term of this regression represented an estimate of the 'pure spread' component for the banks, i.e. the portion of the margin that cannot be explained by bank-specific characteristics. In the second stage, they estimated a regression of pure spread against variables reflecting macroeconomic factors. The inclusion of a constant term in second step aimed at capturing factors that are neither bank-specific nor macroeconomic in nature but attributable to market structure and risk aversion.

McShane and Sharpe (1985), Allen (1988) and Angbazo (1997) have extended and modified the dealership model to a greater extent. McShane and Sharpe (1985) considered interest uncertainty from loan and deposit returns to money market rates. Allen (1988) extended the model for various types of loans with interdependent demands. Angbazo (1997) introduced credit and interest rate risk and interaction between the two into the theoretical model. The dealership model has been criticised on the grounds that it failed to recognize the bank as a firm having a certain production function associated with provision of the intermediation services (Lerner, 1981). The presence of cost inefficiencies associated with the production process across banks can have a distortionary effect on the margin. Thus, Maudos and Fernández de Guevara (2004) made an interesting contribution while expanding the theoretical model by considering the importance of operating costs, market power (Lerner index) and providing a detailed description of the link between riskiness and the margin. Their model specifically differentiated between market risk and credit risk, as well as their interaction as separate factors affecting the margin. The model was then estimated empirically for the main European banking sectors in the period 1992-2000. The opportunity cost variable (OC) is approximated, by the yield on Government securities investment. This variable is included in the profitability equation to reflect the substitution effect among different bank assets, and more specifically to capture the impact of changing remuneration conditions of substitutable assets for the traditional loans granted by banks (the assets for which banks are price-takers). The expected effect of this variable on bank net margin is unknown (Wong, 1997) and depends on the position (net lender or borrower) of the bank in the money market (Angbazo, 1997).

Taking inspiration from the theoretical literature, empirical studies have applied a variety of econometric models including ordinary least square, pooled least square (Demirguc-Kunt and Huizinga 1999, Angbazo 1997), fixed effect and random effect panel regression (Naceur and Goaied 2004, Maudos and Guevara 2003, Maudos and Solisc 2009, Hamadi and Awdeh 2012, Afanasieff et al. 2002) and dynamic panel data technique (Liebeg and Schwaiger 2007, Hossain, 2010). Broadly, the factors concerning the loan pricing can be summarized under four broad categories: (i) bank specific factors (ii) institutional, policy and regulatory factors (iii) market structure, and (iv) macroeconomic factors. Bank specific factors such as bank size, capitalization, liquidity, managerial efficiency, non-interest operating expenses, loan quality, deposit growth, interest rate risk, credit risk, ownership, non-interest incomes, and risk aversion are identified by multiple studies as the important determinants of interest margins. Regulatory and institutional factors subsume determinants such as implicit and explicit taxation (reserve requirements), central bank discount rate, and inter-bank rate. The market structure focuses on the competition in the banking sector (market power), bank concentration, and financial sector liberalization. Finally, the macroeconomic view focuses on inflation rate, GDP growth, exchange rate, interest rate policies, gross national savings, and investment and capital formation as factors driving interest spreads and margins in the banking system.

Leibeg and Schwaiger (2007) in a study of Austria and Hossain (2010) for Bangladesh found the negative influence of bank size on interest rate margins. On the contrary, Demirguc-kunt et al. (2004) in a cross-country study showed high net interest margins tend to be positively associated with market share of banks. Similarly, Berger and Humphrey (1997), and Altunbas et al. (2001) found economies of scale for larger banks whereas Vennet (1998) and Pallage (1991) found economies of scale for small banks or diseconomies for larger banks.

Estrada et al. (2006) argue that interest margin is positively affected by inefficiency. Similar studies by Hamadi and Awdeh (2012), Maudos and Guevara (2003), and Maudos and Solisc (2009) postulate that efficiency/quality of management is negatively correlated with net interest margin. Studies on credit risk show both negative and positive impact. Liebeg and Schwaiger (2007), Williams (2007), and Hamadi and Awdeh (2012) provided evidence of a negative impact of credit risk on the interest margin. On the contrary, Maudos and Guevara (2003), and Maudos and Solisc (2009) showed a positive sign for credit risk as well as interest rate risk.Hamadi and Awedh (2012) concluded with liquidity negatively correlated with net interest margins for domestic banks. However, Doliente (2003) in his study of Southeast Asia held a divergent view, while showing margins to be partially explained by liquid assets.

As regards to operating cost, risk aversion and loan quality; Liebeg and Schwaiger (2006), Maudos and Guevara (2003), Maudos and Solisc (2009), Doliente (2003), Mannasoo

(2012) and Hossain (2010) in their respective studies show a positive impact of either one or all of these variables on interest margin. Implicit taxes include reserve and liquidity requirements whose opportunity cost tend to be higher as they are remunerated at less than market rates. In contrast, explicit taxes translate into higher interest margins. Studies suggest that corporate tax is fully passed on to customers in poor as well as rich countries. This is aligned with the common notion that bank stock investors need to receive a net of company tax returns that is independent of the company tax (Demirguc-Kunt and Huizingia, 1999).

The empirical evidence regarding the impact of competition, most of the studies on banking structure generally produce ambiguous results. Studies like Liebeg and Schwaiger (2007), Maudos and Guevara (2003), and Maudosa and Solisc (2006) demonstrated that competition in banking sector positively affected interest margin. Chirwa and Mlachila (2004) found that interest rate spreads in Malawi increased significantly after implementation of financial liberalization reforms partially due to high monopoly power within the industry which effectively stifled competition. They concluded that high interest rate spreads in developing countries will persist if financial sector reforms do not alter the structure of banking system. Estrada et al. (2006) and Mannasoo (2012) provided evidence in support to this argument and concluded with market power as a key determinant of interest margin. Mendoza (1997) identified the low level of competition in the Belizean banking system as a primary reason for a higher interest spreads than in Barbados, a country with similar exchange rate regime and high reserve requirement. The price cost margin (PCM) is widely used as a measure of competition. However, the theoretical foundations of PCM as a competition measure are not robust. Theoretical papers like Amir (2003), Bulow and Klemperer (1999), Rosentahl (1980) and Stiglitz (1989) present models where more intense competition leads to higher PCM instead of lower margins. Boone (2008) assumes that more efficient firms (that is, firms with lower marginal costs) will gain higher market shares or profits, and that this effect will be stronger the heavier competition in that market is. In order to support this intuitive market characteristic, Boone develops a theoretical model, found to be more robust than any other methods, viz. PCM, HHI, H-statistic.

The studies support that macroeconomic factors are important determinants in explaining variations in interest margin. Afanasieff et al. (2002) uncovers the main determinants of bank interest spreads in Brazil and suggests that macroeconomic variables are most relevant elements. Studies have found inflation to be associated with higher interest margins as it entails higher transaction costs (Demirguc-Kunt and Huizingia, 1999). Birchwood (2004) explicitly examined the impact of macroeconomic influences on nominal and real interest spreads in the Caribbean region and concluded that inter-region differences may be due to economic cycles and inflation. As for impact of GDP growth on interest margin is concerned; Liebeg and Schwaiger (2006) and Hamadi and Awdeh (2012) have contrasting views. While the former argues that GDP growth rate has a positive impact the latter concludes economic growth to be negatively correlated to net interest margin. The introduction of intermediaries shifts the composition of savings toward capital, causing intermediation to growth promoting. In addition, intermediaries generally reduce socially unnecessary capital liquidation, again tending to promote growth (Bencivenga, 2009).

To summarize, the above discussion suggests that determinants and impacts of bank interest margins vary considerably. Multiple factors wholly or partially can contribute to high spreads and margins in a less developed financial system. Generally, interest spreads are fairly higher in developing countries than developed countries and a close examination across the empirical literature, therefore, reveals that large spreads occur in developing countries mainly due to a mix of factors explained above (Barajas et al. 1999, Brock and Rojas-Suarez 2000, Chirwa and Machila 2004, Beck and Hesse 2009).

2. Methodology

According to the literature, panel data analysis is used for analysing commercial banks' loan pricing decisions. This method is useful for identifying and measuring the effects that are simply not detectable in pure cross-section or pure time-series data. Panel data model is used to deal with the problem of heterogeneity. In addition, it can also be used to investigate the dynamic of change due to external factors which may affect dependent variables. Basically, panel data methodology comprises static and dynamic models. Static models again can be differentiated in terms of group effects, time effects, and both time and group effects. These effects are either fixed effect or random effect. A fixed effect model assumes differences in intercepts across groups or time periods, whereas a random effect model explores differences in error variances. Static panel data models are based on a key assumption, i.e., the absence of correlation between the error components with the explanatory variables. However, these models may cause the emergence of endogeneity problems so that when the model is estimated with the approach fixed-effect and random-effects estimator will produce biased and inconsistent (Verbeek, 2008). To solve the problem using static panel data, Arellano and Bond (1991) proposed an approach known as the Generalized Methods of Moments (GMM). This method helps to provide a more useful framework for comparison and assessment, and a simple alternative to other estimators, especially against the maximum likelihood. It is from this perspective that we have used the dynamic panel data methodology.

According to the literature, theoretical arguments in favour of using dynamic panel data model for analysing loan pricing decisions of banks derive from asymmetric information and adverse selection perspective. Asymmetric information can lead to a sluggish adjustment process to the long-run equilibrium, implying for some delay in the response of market interest rates to changes in the policy rate depending upon bank characteristics. Specifically, we are thinking of a setup in which in the short run, banks solve an inter-temporal problem characterized by a cost of adjusting too slowly to this long-run equilibrium and a cost of moving too fast. This latter cost is due to adverse selection and moral hazard problems in the banking industry. For instance, if a bank increases the lending rate in response to an increase in the money market rate, the bank's adjustment to its new long-term equilibrium may involve attracting debtors that have a lower repayment probability, thereby lowering the bank's profits. At the same time, moral hazard arises because a higher interest rate gives debtors incentives to invest in riskier projects, which would also decrease the bank's profits. Lago-González and Salas-Fumás (2005) found that loan price adjustment speed first decreases and later increases with market concentration, which was consistent with predictions from models that assumed quantity adjustment costs. Under this framework, therefore, we assume that there are some adjustment costs stemming from asymmetric information. This is modelled as a quadratic loss function following Nickell (1985), Scholnick (1991), and Winker (1999), which is tractable because it generates a linear decision rule. The loss function for bank k in period t is the following:

$$\Gamma t,k = \sum^{\infty} \varphi_k^s \left[\Omega_{1,k}(r_{L,k,t+s} - \varphi_k \, r_{P,t+s})^2 + \Omega_{2,k}(r_{L,k,t+s} - r_{L,k,t+s-1})^2 \qquad Eq(2.1)$$

where Ω_1 and Ω_2 represent the weight that the bank gives to achieving the long-run target value for the lending rate (r_L) and the cost of moving to that target value, respectively. The variable (r_P) represents the policy rate of interest. Recall that φ_k is a function of the demand elasticity and the probability of repayment that bank k faces, whereas Ω_j, j = 1,2, depends on the bank's average loan risk. If the portion of past-due loans for bank k is higher, the adverse selection or moral hazard problem for that bank becomes more important and the bank will give more weight to changes in the interest rate, which implies a slower adjustment. On minimizing equation (2.1), we obtain

$$r_{L,k,t+s} = (\Omega_{1,k}/\Omega_{1,k} + \Omega_{2,k})\ \varphi_k\ r_{P,t+s} + (\Omega_{2,k}/\Omega_{1,k} + \Omega_{2,k})\ r_{L,k,t+s-1} \qquad Eq(2.2)$$

Equation (2.2) shows that the impact coefficient depends on the size of $\Omega_{1,k}$ relative to $\Omega_{1,k}$ + $\Omega_{2,k}$ and the mark up, φ_k. Therefore, the long-run coefficient is always larger than the short-term coefficient. The bank's loan risk determines φ_k and $\Omega_{2,k}$, the lower the probability of repayment (higher risk), the higher are both φ_k and $\Omega_{2,k}$. If the debtors are too risky and the effect on $\Omega_{2,k}$ is more important, the bank may not completely pass through a money market interest rate increase (in the short run) because it would stifle the debtors. In the long run, however, the interest rate charged will reflect the risk characteristic of the debtor. In other words, unpaid loans should have a negative effect on the impact coefficient and a positive effect on the long-term multiplier. Since a dynamic panel data model that accounts for risk persistence and endogeneity of the bank-specific controls, following the recent literature in panel data studies (e.g. Salas and Saurina(2002), Athanasoglou et al. (2008) and Merkl and Stolz (2009)) on banking related studies, Beck and Levine (2004), a dynamic approach is adopted in order to account for the time persistence in the loan pricing structure.

The main feature of a dynamic panel data specification is the inclusion of a lagged dependent variable in the set of explanatory variables i.e.

$$y_{i,t} = \alpha y_{i,t-1} + \beta(L)X_{i,t} + \eta_i + \varepsilon_{i,t}\ , |\alpha| < 1, i = 1,\ldots,N\ , t = 1,\ldots,T \qquad Eq(2.3)$$

where the subscripts i and t denote the cross sectional and time dimension of the panel sample respectively, $y_{i,t}$ is the lending rate, $\beta(L)$ is the lag polynomial vector, X_{it} *is* $(1 \times k)$ vector of explanatory variables other than $y_{i,t-1}$, η_i is the unobserved individual (bank specific) effects and $\varepsilon_{i,t}$ are the error terms.

As the lagged dependent variable, $y_{i,t-1}$ is inherently correlated with the bank specific effects, η_i, OLS estimation methods will produce biased and inconsistent parameters estimates. Equation (2.3) is consistently estimated utilizing the Generalized Method of Moments (GMM) as proposed by Arellano and Bond (1991) and generalized by Arellano and Bover (1995) and Blundell and Bond (1998). The GMM estimation of Arellano and Bond (1991) is based on the first difference transformation of equation (2.3) and the subsequent elimination of bank-specific effects:

$$\Delta y_{i,t} = \alpha \Delta y_{i,t-1} + \beta(L)\Delta X_{i,t} + \Delta\varepsilon_{i,t}, \qquad i = 1,\ldots,N, t = 1,\ldots,T \qquad Eq(2.4)$$

where Δ is the first difference operator. In equation (2.4), the lagged dependent variable, Δy_{it-1} is, by construction, correlated with the error term, $\Delta\varepsilon_{it}$ imposing a bias in the estimation of the model. Nonetheless, y_{it-2}, which is expected to be correlated with Δy_{it-1} and not correlated with $\Delta\varepsilon_{it}$ for $t = 3,\ldots,T$, can be used as an instrument in the estimation of (2.4), given that ε_{it} are not serially correlated. This suggests that lags of order two, and more, of the dependent variable satisfy the following moment conditions:

$$E[y_{i,t-s}\Delta\varepsilon_{i,t}] = 0 \; for \; t = 3,\ldots,T \; and \; s \geq 2 \qquad Eq(2.5)$$

A second source of bias stems from the possible endogeneity of the explanatory variables and the resultant correlation with the error term. In the case of *strictly exogenous* variables, all past and future values of the explanatory variable are uncorrelated with the error term, implying the following moment conditions:

$$E[X_{i,t-s}\,\Delta\varepsilon_{i,t}] = 0, \qquad t = 3,\ldots,T \; and \; for \; all \; s. \qquad Eq(2.6)$$

The assumption of strict exogeneity is restrictive and invalid in the presence of reverse causality i.e. when $E\,[X_{is}\varepsilon_{it}] \neq 0$ for $t < s$. For a set of *weakly exogenous* or *predetermined* explanatory variables, only current and lagged values of X_{it} are valid instruments and the following moment conditions can be used:

$$E[X_{i,t-s}\,\Delta\varepsilon_{i,t}] = 0, \qquad t = 3,\ldots,T \; and \; for \; s \geq 2. \qquad Eq(2.7)$$

The orthogonality restrictions described in (2.5) – (2.7) form the underpinnings of the one-step GMM estimation which produces, under the assumption of independent and homoscedastic residuals (both cross-sectionally and over time), consistent parameter estimates. Arellano and Bond (1991) propose another variant of the GMM estimator, namely the two-step estimator, which utilizes the estimated residuals in order to construct a consistent variance covariance matrix of the moment conditions. Although the two-step estimator is asymptotically more efficient than the one-step estimator and relaxes the assumption of homoscedasticity, the efficiency gains are not that important even in the case of heteroscedastic errors (e.g. see Arellano and Bond (1991), Blundel and Bond (1998) and Blundell et al. (2000)). This result is further supported by the empirical findings of Judson and Owen (1999), who performed Monte Carlo experiments for a variety of cross sectional and time series dimensions and showed that the one-step estimator outperforms the two-step estimator. Moreover, the two-step estimator imposes a downward (upward) bias in standard errors (t-statistics) due to its dependence to estimated values (as it uses the estimated residuals from the one-step estimator) (Windmeijer, 2005), which may lead to unreliable asymptotic statistical inference (Bond, 2002, Bond and Windmeijeir, 2002). This issue should be taken into account, especially in the case of data samples with relatively small cross section dimension (Arellano and Bond, 1991 and Blundell and Bond, 1998).

As noted above, the validity of the instruments used in the moment conditions as well as the assumption of serial independence of the residuals is crucial for the consistency of the GMM estimates. In line with the dynamic panel data literature, we test the overall validity of the instruments using the Sargan specification test proposed by Arellano and Bond (1991), Arellano and Bover (1995) and Blundel and Bond (1998). The Sargan test for over-identifying restrictions is based on the sample analog of the moment conditions used in the estimation process so as to determine the suitability of the instruments. Under the null hypothesis of valid moment conditions, the Sargan test statistic is asymptotically distributed as chi-square. Furthermore, the fundamental assumption that the errors, ε_{it}, are serially uncorrelated can be assessed by testing for the hypothesis that the differenced errors, $\Delta\varepsilon_{it}$ are not second order autocorrelated. Rejection of the null hypothesis of no second order autocorrelation of the differenced errors implies serial correlation for the level of the error term and thus inconsistency of the GMM estimates. However, as noted by Roodman (2009), the system GMM can generate moment conditions prolifically. Too many instruments in the system GMM over fits endogenous variable even as it weakens the Hansen test of the instruments' joint validity. Therefore, in order to deal with the instruments proliferation, this study will use two main techniques in limiting the number of instruments – such as using only certain lags instead of all available lags for instruments and combining instruments through addition into smaller sets by collapsing the block of the instrument matrix.

This study has used one-step system GMM estimation. However, for robustness checking, the two-step estimation in the system GMM was also considered. The success of the GMM estimator in producing unbiased, consistent and efficient results is highly dependent on the adoption of the appropriate instruments. Therefore, there are three specifications tests as suggested by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). First, the Hansen test of over-identifying restrictions, which tests the overall validity of the instruments by analysing the sample analogue of the moments conditions used in the estimation process. If the moment condition holds, then the instrument is valid and the model has been correctly specified. Second, it is important to test that there is no serial correlation among the transformed error term. Third, to test the validity of extra moment's conditions on the system GMM, the difference in Hansen test is used. This test measures the difference between the Hansen statistic generated from the system GMM and the difference GMM. Failure to reject the three null hypotheses gives support to the estimated model.

We have measured competitiveness index using Augmented Relative Profit Difference method (Ansari, 2013). Boone (2008) proposed a competition measure based on Relative Profit Differences (RPD) with robust theoretical properties. Using bank level panel data set we test the empirical validity of the Augmented RPD (ARPD) measure for competition in Indian loan market. Theoretically, the loan market competition increases in two ways. First, competition increases when the produced services of various banks become closer substitutes and when entry cost decline. Boone et al (2004) prove that market shares of more efficient banks, i.e., with lower marginal costs, increase both under stronger substitution and amid lower entry costs. So the following relationship between market share and marginal cost can be setup (Leuvensteijn, 2007).

$$\ln(s_i) = \alpha + \beta \ln(mc_i) \qquad Eq(2.8)$$

where the loan market share of bank i, $(s_i) = (\text{loan})_i/\text{total loan}$, and parameter β is the Boone measure of competition. The stronger competition is, the stronger this effect will be, and the larger, in absolute terms since marginal costs are unobservable, we have to calculate marginal costs from *Translog Cost Function (TCF)* with the linear homogeneity in the input prices and cost exhaustion restrictions using individual bank observations. Such a function assumes that the technology of an individual bank can be described by one multiproduct production function. Under proper conditions, a dual cost function can be derived from such a production function, using output levels and factor prices as arguments. A TCF is a second-order Taylor expansion around the mean of a generic dual cost function with all variables appearing as logarithms. It is a flexible functional form that has proven to be an effective tool in explaining multiproduct bank services. The TCF has the following form:

$$\ln(c_{it}) = \alpha_0 + \sum \alpha_{di} + \sum t\delta_t d_t + \sum\sum \beta_j \ln\left(x_{ijt}\right) d_i + \sum\sum\sum \gamma_{jk} \ln\left(x_{ijt}\right) \ln(x_{ikt})\, d_i + \nu_{it} \quad Eq(2.9)$$

where the dependent variable c_{it} reflects the production costs of bank i(i= 1, .., N) in year t (t =1, .., T) in d_i dummy for type category of the bank, that is, public sector banks, private sector banks or foreign sector bank. The variable dt is a dummy variable, which is 1 in year t and otherwise zero. The coefficient γ_{jk} indicates general substitution parameters between inputs and outputs. The explanatory variables x_{ikt} represent three groups of variables (k = 1,...,K.). The first group consists of ($K1$) bank output components, such as loans, securities and other services (proxied by other income). The second group consists of ($K2$) input prices, such as wage rates, deposit rates (as price of funding) and the price of other expenses (proxied as the ratio of other expenses to fixed assets). The third group consists of (K-$K1$-$K2$) control variables (also called 'netputs'), *e.g.* the capital equity ratio. The parameters δ_t are the coefficients of the time dummies and υ_{it} is the error term.

The marginal costs of output category j = l (of loans) for bank i in year t, mc_{ilt} are defined as:

$$\mathrm{mc}_{ilt} = \frac{\partial c_{it}}{\partial x_{ilt}} = (c_{it} / x_{ilt}) \frac{\partial \ln(c_{it})}{\partial \ln(x_{ilt})} \qquad Eq(2.10)$$

The term $\partial\ln(c_{it})/\partial\ln(x_{ilt})$ is the first derivative of TCF. This leads to the following equation of the marginal costs for output category loans (l) for bank I *du*ring year t,

$$\mathrm{mc}_{ilt} = (c_{it} / x_{ilt})(\beta_l + 2\gamma_l \ln(x_{ilt}) + \sum \gamma_{lk} \ln(x_{ikt})\, d_i) \qquad Eq(2.11)$$

Given the estimated marginal costs from the previous section, we are now able to estimate the Boone measure by using the following equation

$$\ln(s_{it}) = \alpha + \sum \beta_t \ln(mc_{it}) + \sum \gamma_t d_t + u_{it} \qquad Eq(2.12)$$

where s stands for market share, mc for marginal costs, i refers to bank, and t to year; d_t are time dummies, and u_{it} is the error term. This provides us with the coefficient β, the Boone Competitiveness Index.

The models estimated in this study after incorporating the competitiveness index (ARPD) is as follows.

$$BLR_{i,t} = \alpha BLR_{i,t-1} + \theta mp_t + \gamma ARPD_t + \beta ARPD_t * mp_t + \sum \alpha_k X_{i,t} + \eta_i + e_{i,t} \qquad Eq(2.13)$$

and

$$IRS_{i,t} = \alpha IRS_{i,t-1} + \theta mp_t + \gamma ARPD_t + \beta ARPD_t * mp_t + \sum \alpha_k X_{i,t} + \eta_i + e_{i,t} \qquad Eq(2.14)$$

where,

$\mathrm{i = 1 \ldots n, k = 1 \ldots m, t = 1 \ldots T}$ and X is the vector of control variables and bank specific characteristics viz., bank size, CRAR, loan maturity, Managerial efficiency, product diversification, Return on equity, Bank liquidity and asset quality. Finally, ηi is a bank-specific effect.

3. Sample and Empirical Analysis

In our empirical analysis we have considered alternative measures of banks' loan pricing decisions in terms of dependent variables pertaining to loan interest rate and the spread of loan interest rate over deposit interest rate. From an applied perspective, the empirical analysis based on the dependent variable loan interest rate spread rests on the assumption of a complete adjustment of loan interest rate ($r^1_{L,t}$,$r^2_{L,t}$ and $r^3_{L,t}$) with respect to deposit interest rate ($r^1_{D,t}$,$r^2_{D,t}$ and $r^3_{D,t}$) and the spread is attributable to host of other factors. In the second instance, we relax this assumption and thus, study the loan interest rate as the dependent variable as a function of various explanatory variables including the deposit interest rate. In this context, it is useful to take note of a caveat here. In the real world, commercial banks' loan portfolio could comprise numerous borrowers with different loan interest rates, reflecting upon different characteristics of borrowers. A similar argument could hold for numerous depositors. Accordingly, empirical research works have to rely on a derived measure of loan and deposit interest rates based on banks' balance sheet data. In our empirical exercise, we have experimented with three measures of loan interest rates based on annual balance sheet data for total interest income generated from loans $R_{L,t}$ and advances and the outstanding loans 'L' as shown below:

$$r_{L,t}^{1} = \frac{R_{L,t}}{L_t} \qquad Eq(3.1)$$

$$r_{L,t}^{2} = \frac{R_{L,t}}{L_{t-1}} \qquad Eq(3.2)$$

$$r_{L,t}^{3} = \frac{R_{L,t} + R_{L,t-1}}{L_t + L_{t-1}} \qquad Eq(3.3)$$

The first measure BLR1 ($r_{L,t}^{1}$) could account for effective loan interest rate. The second measure BLR2 ($r_{L,t}^{2}$) recognises that the interest income earned in the current period relates to loans extended in the beginning of the year (previous year). The third measure BLR3 ($r_{L,t}^{3}$) recognises stock-flow (SF) concept, i.e., banks could not only earn interest income from loans extended in the previous period but also current period. In the same manner, we derived deposit interest rates ($r_{D,t}^{1}$, $r_{D,t}^{2}$ and $r_{D,t}^{3}$).

As regards the explanatory variables, we have used policy and regulatory variables pertaining prudential capital to risk weighted assets ratio (CRAR) consistent with the India's monetary policy and banking sector regulation frameworks. For bank specific variables, we have indicators of bank size (SIZE) defined in terms of ratio of a bank's total assets to the banking industry aggregate measure, liquidity ratio, i.e., liquid assets less liquid liabilities to total assets ratio, operating cost to assets ratio as an indicator of managerial efficiency, asset quality measured by gross non-performing loans to total loans ratio, earnings and profitability in terms of return on equity (ROE), product diversification represented by non-interest income to total asset ratio, and loan maturity defined as the share of term loans in total loans. For macro variables, we have used real GDP growth rate and inflation rate for the wholesale price index. Our sample comprises 33 banks comprising 27 public, three private and three foreign banks, which together account for the bulk of commercial banking system in India by way of three-fourth share in total deposits, credit, investment and other indicators. Here the majority of the sample comprises the public sector banks. We may not be able to control for the ownership variable here due to very less numbers of bank sampling units under private and foreign sector bank groups.

3.1 Descriptive Statistics

In this study, we investigated how commercial banks' loan pricing decisions could be influenced by host of factors, using dynamic panel data methodology and annual accounts data of 33 commercial banks over the period 1997 to 2014. The data source is publicly available data published by Reserve Bank of India under 'Statistical Tables Relating to Banks in India. Table.1 and Table.2 provide descriptive statistics for the variables used in our study. Loan interest rate and their spreads over deposit interest rates showed some moderation during 2002-2007 as compared with the late 1990s. For the more recent period from 2008, loan spreads have shown some firming up as compared with the first half of the 2000s but they remain lower than the late 1990s. This trend also was observed in terms of cross-section variability (standard deviation) of loan interest rates and spreads. Deposit interest rates more or less showed lower variability than loan interest rates during the late 1990s, except the year 1997. However, unlike the loan and deposit interest rates, the yield on investment in government securities and their spread over deposit interest rates showed some stability in terms of cross-section variation during 1996 to 2014. Stylised facts show an improvement in managerial efficiency of banks in terms operating cost to income ratio.

Year	**Loan Maturity**	**Product Diversification**	**Managerial Efficiency**	**Return on Equity**	**Size**
1996	29.5(13.3)	1.4(0.6)	3.2(0.9)	19(8.9)	3.0(2.7)
1997	33.0(15.3)	1.4(0.6)	2.9(0.5)	13.7(8.1)	3.0(2.6)
1998	34.5(15.2)	1.5(0.7)	2.7(0.5)	14.9(7.2)	3.0(1.8)
1999	35.4(12.4)	1.3(0.6)	2.7(0.5)	14.2(7.0)	3.0(1.7)
2000	36.1(13.1)	1.4(0.5)	2.5(0.5)	14.6(6.7)	3.0(1.6)
2001	36.4(11.6)	1.4(0.5)	2.7(0.5)	13.1(7.7)	3.0(2.8)
2002	40.3(13.1)	1.7(0.6)	2.4(0.5)	15.3(7.2)	3.0(2.4)
2003	43.5(12.7)	1.9(0.5)	2.4(0.4)	19.3(7.5)	3.0(2.3)
2004	48.1(10.7)	2.0(0.5)	2.3(0.5)	22.2(6.1)	3.0(2.0)
2005	53.0(11.1)	1.5(0.5)	2.2(0.6)	15.9(6.2)	3.0(3.8)
2006	55.3(10.9)	1.1(0.5)	2.1(0.4)	13.8(5.4)	3.0(3.6)
2007	58.0(11)	1.1(0.5)	1.9(0.4)	15.8(4.1)	3.0(3.4)
2008	57.5(11.6)	1.3(0.6)	1.7(0.5)	16.2(4.8)	3.0(3.5)
2009	58.2(12.4)	1.3(0.7)	1.6(0.4)	16.2(4.7)	3.1(3.6)

2010	57.7(12.5)	1.2(0.5)	1.6(0.4)	16.0(4.9)	3.1(3.5)
2011	56.5(12.1)	1.0(0.4)	1.7(0.4)	15.1(3.9)	3.2(3.4)
2012	55.3(10.9)	1.1(0.5)	2.1(0.4)	13.8(5.4)	3.0(3.6)
2013	58.0(11)	1.1(0.5)	1.9(0.4)	15.8(4.1)	3.0(3.4)
2014	57.5(11.6)	1.3(0.6)	1.7(0.5)	16.2(4.8)	3.0(3.5)

(Figures in bracket are std.dev)

Table 2. Descriptive statistics

year	IRS1	IRS2	IRS3	BLR1	BLR2	BLR3
1996	5.5(1.7)	9.1(7.7)	5.1(1.1)	12.4(2.3)	17.3(9.1)	11.8(1.2)
1997	6.6(1.5)	4.2(15.2)	6.1(1.3)	14.0(2.0)	17.0(6.9)	13.3(1.8)
1998	5.1(1.4)	5.9(2.1)	5.8(1.3)	12.1(1.4)	14.7(2.1)	13(1.5)
1999	4.5(1.1)	5.0(1.5)	4.7(1.1)	11.7(1.4)	14.0(1.9)	11.9(1.3)
2000	3.8(0.9)	5.2(1.8)	4.1(0.9)	10.9(1.0)	13.7(1.8)	11.2(1.1)
2001	3.8(1.1)	5.0(1.7)	3.8(1.0)	10.7(1.0)	13.0(1.3)	10.8(0.9)
2002	3.1(1.4)	4.4(1.8)	3.3(1.3)	9.6(1.6)	12.1(1.6)	10.0(1.5)
2003	3.5(1.1)	4.1(0.9)	3.3(0.9)	9.4(0.9)	11.0(1.3)	9.5(0.9)
2004	3.4(1.0)	4.2(1.2)	3.5(1.0)	8.2(0.9)	9.8(1.1)	8.8(0.9)
2005	3.2(0.9)	5.3(3.9)	3.3(0.9)	7.3(0.8)	10.1(3.6)	7.7(0.9)
2006	3.3(1.0)	4.8(1.0)	3.2(0.9)	7.3(0.5)	9.6(0.7)	7.3(0.5)
2007	3.5(0.9)	4.9(1.2)	3.4(0.9)	8.0(0.6)	10.5(0.8)	7.7(0.5)
2008	3.5(1.2)	4.5(1.6)	3.5(1.1)	9.0(0.8)	11.2(1.1)	8.5(0.7)
2009	4.1(1.6)	4.9(1.8)	3.8(1.4)	9.8(1.3)	11.9(1.5)	9.4(1.0)
2010	3.8(1.4)	4.3(1.2)	3.9(1.5)	8.9(0.9)	10.3(0.8)	9.3(1.1)
2011	3.9(0.8)	5.0(0.9)	3.9(1.1)	8.6(0.7)	10.5(0.8)	8.7(0.7)
2012	3.8(0.9)	5.2(1.8)	4.1(0.9)	10.9(1.0)	13.7(1.8)	11.2(1.1)
2013	3.8(1.1)	5.0(1.7)	3.8(1.0)	10.7(1.0)	13.0(1.3)	10.8(0.9)
2014	3.7(1.1)	4.8(0.9)	3.6(0.9)	10.4(0.9)	11.0(1.3)	10.5(0.9)

(Figures in bracket are std.dev)

However, the return on equity variable showed greater cross-section variability than loan interest rate spreads. The non-interest income ratio, reflecting product diversification, showed an increasing trend during 1997-2007 and some moderation thereafter. The size variable exhibited steady trend during the sample period, reflecting banks' ability to maintain their competitiveness in financial intermediation. Banks, however, showed substantial variation in terms of net liquidity ratio than loan and deposit interest rates. Loan maturity showed an increasing trend during the sample period.

3.2 Empirical Findings

The empirical findings are presented in Tables 3 and 4, pertaining to alternative measures of loan interest rate and its spread over deposit interest rate. The findings bring to the fore various interesting insights about the determinants of banks loan pricing decisions as discussed below.

Table.3: Determinants of Interest rate spread(IRS)

Variables	**IRS1**			**IRS2**			**IRS3**		
Interest Rate spread	Coef.	Std. Err.	z	Coef.	Std. Err.	z	Coef.	Std. Err.	z
IRS(t-1)	0.192***	0.035	5.500	-0.030***	0.010	-3.110	0.483***	0.018	26.480
Policy Rate(mp)	0.330***	0.018	18.760	0.426***	0.012	34.170	0.256***	0.011	24.330
Competitiveness Index(ARPD)	-0.729***	0.076	-9.590	-0.141**	0.059	-2.400	-0.626***	0.034	-18.690
mp*ARPD	-0.504***	0.049	-10.210	-0.807***	0.086	-9.380	-0.555***	0.028	-19.200
Loan Maturity	0.018**	0.007	2.420	-0.033***	0.004	-7.790	0.007***	0.002	2.850
Managerial In-Efficiency	0.373***	0.059	6.310	0.731***	0.113	6.450	0.189***	0.045	4.230
Product diversification	-0.292***	0.074	-3.970	-0.100	0.065	-1.530	-0.320***	0.072	-4.450
Return on equity	0.017***	0.005	3.370	0.009	0.005	1.580	0.003	0.003	0.950
size	-0.176	0.110	-1.600	-0.192***	0.057	-3.360	-0.150***	0.051	-2.940
Bank liquidity	0.006***	0.002	2.770	-0.064***	0.001	-58.970	0.007***	0.001	4.580
Asset quality	0.003	0.013	0.240	-0.112***	0.008	-14.230	0.005	0.006	0.920
CRAR	0.002	0.021	0.100	0.076***	0.012	6.500	0.008	0.012	0.730
GDP growth	0.040***	0.015	2.690	0.024**	0.011	2.090	0.053***	0.006	8.590
Inflation	0.184***	0.013	14.190	0.168***	0.009	18.310	0.128***	0.007	18.410
Intercept	0.933***	0.077	12.090	0.370	0.624	0.590	0.821***	0.063	12.870

Note: ***, ** and * indicate the level significance at the 1%, 5% and 10%, respectively.

Table. 4: Determinants of bank lending rate(BLR)									
Variables	BLR1			BLR2			BLR3		
Bank Lending Rate	Coef.	Std. Err.	z	Coef.	Std. Err.	z	Coef.	Std. Err.	z
Lrate(t-1)	0.083***	0.028	2.960	0.046**	0.020	2.270	0.243***	0.021	11.740
Policy Rate(mp)	0.266***	0.023	11.350	0.350***	0.018	19.510	0.310***	0.013	23.500
Competitiveness Index(ARPD)	-0.441***	0.075	-5.910	-0.048	0.122	-0.400	-0.223***	0.050	-4.490
mp*ARPD	-0.618***	0.109	-5.650	-0.576**	0.196	-2.940	-0.644***	0.090	-7.200
Cost of deposit funds	1.238***	0.025	49.830	0.898***	0.041	21.870	1.029***	0.023	44.560
Return on investment	-0.376***	0.027	-13.860	0.082**	0.026	3.150	-0.346***	0.030	-11.560
Loan Maturity	0.018***	0.007	2.650	-0.017**	0.007	-2.500	0.008*	0.004	1.690
Managerial In-Efficiency	1.026***	0.164	6.250	0.507**	0.203	2.500	0.625***	0.069	9.030
Product diversification	-0.185**	0.074	-2.500	0.192	0.136	1.410	-0.224***	0.033	-6.790
Return on equity	0.015**	0.005	3.250	0.005	0.008	0.670	0.001	0.003	0.210
size	-0.218***	0.045	-4.800	0.153***	0.043	3.600	-0.112	0.085	-1.320
Bank liquidity	0.007***	0.002	3.610	-0.055***	0.003	-16.360	0.009***	0.001	7.260
Asset quality	0.059***	0.012	5.030	-0.092***	0.015	-5.950	0.008	0.005	1.550
CRAR	0.050***	0.016	3.100	0.047***	0.014	3.290	0.051***	0.012	4.260
GDP growth	0.116***	0.016	7.390	0.027**	0.013	2.010	0.077***	0.009	8.230
Inflation	0.162***	0.017	9.690	0.157**	0.015	10.600	0.086***	0.009	9.120
Intercept	1.629**	0.667	2.440	2.463***	0.979	2.520	0.774*	0.424	1.820

Note: ***, ** and * indicate the level significance at the 1%, 5% and 10%, respectively.

The empirical analysis brings to the fore two crucial perspectives pertaining to the interest rate pass-through or the impact of policy rate on loan interest rate and its spread over deposit interest rate. First, policy rate could have statistically significant positive effect on loan interest rates but the magnitude of impact, as measured by the size of the coefficient of policy rate, could be quite moderate. This could suggest imperfect policy pass-through of monetary transmission mechanism and the rigidity in loan pricing decisions of banks due to various factors as explained by other explanatory variables in the study.

Second, other than policy rate, the loan pricing decision of commercial banks depends on the loan market competitiveness. The ARPD co-efficient and its interaction with the policy rate are negative and highly significant. The pass-through coefficient could be calculated using ($\frac{\theta+\beta * ARPD_t}{1-\alpha}$) formula. The interest rate pass-through (IRPT) under IRS varies from 8 to 16 per cent whereas under BLR specification the IRPT varies from 54 to 59 per cent for the mean ARPD level 0.385.

Third, the banks recover the cost of deposit funds from borrowers and earn a positive spread. In our empirical findings, this could be attributable to the intercept term under SRS specification as given in the table 3. We find the intercept term varying between 0.37 to 0.93 percentage points. Alternatively, under the BLR specification, the coefficient of deposit interest rate varies from 0.90 to 1.2 under different scenarios as in the Table 4. These findings suggest that in the loan pricing decision bank recovers all its cost of funds from the borrowers.

Fourth, the capital to risk adjusted assets ratio (CRAR) has a statistically significant positive effect on loan pricing. An interesting aspect of CRAR impact is that it is higher under BLR1 and BLR3 specifications. The positive impact of CRAR on loan pricing is consistent with various other studies. According to Saunders and Schumacher (2000), banks hold capital to insulate themselves against both expected and unexpected credit losses, and therefore, its impact could be attributable to banks' risk aversion. Specifically, while capital requirements constitute the minimum level, banks often endogenously choose to hold more capital against unexpected credit losses or market discipline may induce them to hold more capital (Flannery and Rangan, 2004). However, holding equity capital is a more expensive funding source than debt (because of tax and dilution of control reasons). Thus, banks that have relatively high capital ratio for regulatory reasons or credit reasons could be expected to cover the increase in the average cost of capital. This could be achieved by operating with higher loan interest rate and its spread over deposit interest rate. Berger (1995) finds that there is no relationship between ROE and capital during normal times, which may reflects the fact that the smaller competitive advantage of capital during normal times may be offset entirely by the negative effect of higher capital on ROE. Gambacorta and Mistrulli (2004) suggested that bank capital is a potentially critical factor affecting banks' behaviour, particularly in times of financial stress and showed that bank capital affects lending even when regulatory constraints are not binding and that shocks to bank profits, such as loan defaults, that can have a persistent impact on lending. Another viewpoint is that since capital is considered to be the most expensive form of liabilities, holding capital above the regulatory minimum is a credible signal of creditworthiness on the part of the bank (Claeys and Vennet, 2003) and thus, it is expected to have positive influence on banks' loan interest rates.

Fifth, a positive relationship, *a priori,* is expected between asset quality variable and bank loan interest rate, reflecting the notion that banks tend to push the cost of non-performing loans to customers. Moreover, a neoclassical finance theory perspective entails that higher credit risk is expected to be associated with higher return in terms of loan interest rate. A contrarian perspective entails that banks are likely to follow softer loan interest rate policy in order to avoid more loan defaults. But our results show that it is not consistent in loan pricing or in the determination of spread. Asset quality of loans and advances as reflected in gross non-performing loans ratio has statistically significant and positive in IRS1/BLR1 and IRS3/BLR3, the two specifications of loan interest spread and bank lending rate but negative impact on the second specification under both the spread and lending rate measures. This result could be attributable to two scenarios. The negative impact of asset quality on loan interest rate spread could imply for banks' ability to mobilising deposits at lower cost.

Sixth, managerial efficiency which is measured by non-interest operating expenses to average assets ratio, implies for expensive services arise in processing loans and the servicing of deposits. At the same time, some portion of operating cost may arise on account of non-funded activities with regard to a variety of banking transaction services. Thus, two scenarios arise here. One, banks may recoup some or all of such costs by factoring into loan pricing. Two, banks may recover a portion of such costs from non-funded activities by way of other non-interest income, thereby, leaving a fraction of operating cost to loan interest rate charged to borrowers. As per the analysis, we found that a positive effect of managerial inefficiency, i.e., higher operating cost ratio on loan interest rates and their spread over deposit interest rates. From the Tables 3 and 4, we can see that the operating cost put on average 50 to 100 percentage point weights on the loan pricing which is positive and highly significant. This is a critical finding because such effects turn out in the presence of non-interest income variable, characterising product diversification.

Seventh, a stable and sustainable banking system entails that banks should earn sufficient profit to satisfy shareholders while keeping credit and liquidity risks under tolerable levels. The return on equity (ROE) measures the rate of return on the money invested by common stock owners and retained earnings by the bank. It demonstrates a bank's ability to generate profits for shareholders' equity (also known as net assets or assets minus liabilities). In other words, ROE shows how well a bank uses investment funds to generate growth. Interest income is clearly a function of the yield curve and credit spreads posited under the stress scenario, but what the net impact of rising or falling rates are on bank profitability remains ambiguous, perhaps in part because of interest rate hedging strategies (English 2002). Bikker and Hu (2002), found that provisioning for credit losses rises when the cycle falls, but less so when net income of banks is relatively high, which reduces procyclicality. As expected it is positive in all the specifications but is significant under first specification (IRS1/BLR1). From the Table 3 and 4, we see that the coefficient varied from 0.1 per cent to 1.5 per cent under different scenarios viz. current loan interest rate, lagged loan interest rate spread and stock-flow measure of loan interest rate.

Eighth, the role of liquidity is found to be very important in loan pricing decisions of banks. The liquidity ratio increases, liquidity risks increases implying a higher margin set by banks. Our results show a positive and significant differential impact of banks' liquidity with regard to differential measure of loan interest rates. However, banks with more liquid assets are expected to find it easier to fund loans on the margin, so there may be a negative sign for this variable. Under the second specification we have a negative and significant impact of liquidity on loan pricing.

Product diversification measured by the non-interest income variable has a significant negative coefficient in all our specifications suggesting possible cross-subsidization of traditional lending activities. However, Stiroh and Rumble (2006) have shown that diversification gains are frequently offset by the costs of increased exposure to volatile activities. The results in Tables 3 and 4 shows that the coefficient of non-interest income (the income share of commission and fee income) are negative and significant. Our results are consistent with the hypothesis that banks decrease their lending rate when they are more reliant on fee generating products. The coefficient ranges from 18% to 22% depending on the lending rate structure chosen for the analysis. Under the case of interest rate spread the coefficient ranges from 10% to 32% which is significant under all the three specification.

The role of loan maturity in loan pricing derives from the terms of lending and asset-liability management perspectives (Ranjan and Dhal 2003). In the Indian context, the introduction of maturity-based pricing reflects bank's continuous commitment to safeguard its financial strength based on sound banking principles, while striving to provide resources for development lending at the lowest and most stable funding costs and on the most reasonable terms. Brock and Franken (2002), found that the matched maturity spreads are conceptually similar to bid-ask spreads in securities markets, an idea that was originally put forward by Ho and Saunders (1981). In contrast, the long spread captures the premium that banks charge for bearing duration risk. The brokerage function and term transformation functions of banks are blurred in the Net Interest Margins (NIMs) and Average Spreads, since all interest income and expenses are aggregated to create implicit returns on assets and liabilities. Nevertheless, the NIM and the Average Spread are important because aggregation highlights the overall profitability of bank management across different loan and deposit activities, as well as the role of noninterest income activities. According to Segura and Suarez (2012) banks' incentive is not to set debt maturities as short as savers might ceteris paribus prefer, however, it comes from the fact that there are events (called systemic liquidity crises) in which their normal financing channels fail and they have to turn to more expensive sources of funds. In this context, we find that the coefficients are positive and significant in first and third specifications of the model. The coefficient of the maturity ranges from 0.1 per cent to 2 per cent, which indicates that in Indian banking system, there is no evidence of discount to the customers to keep a long term relationship and hence, pricing is done accordingly.

Lastly on the bank specific variables, bank size is found to be very important in the loan price decision of banks. According to the literature, larger banks are expected to have greater market power and better access to government safety net subsidies relative to smaller banks. Relatively smaller banks may be at a competitive disadvantage in attracting the business of larger loan customers. Accordingly, bank size is expected to influence bank's lending activities differentially. However, our results show differential negative effects of bank size on different measures of loan interest rate and its spread over corresponding deposit interest rate. The theoretical model predicts a positive relationship between the size of operations and margins, since for a given value of credit and market risk, larger operations are expected to be connected to a higher potential loss. On the other hand, economies of scale suggest that banks that provide more loans should benefit from their size and have lower margins. Therefore, we do not have particular prior information regarding the expected sign of this coefficient. The coefficients of size range from 11% to 22% under the bank lending rate whereas it ranges from 15% to 19% under the interest spread. In the Indian context only the State Bank of India has a bigger size (22%) and rests are within the range of 1 to 5 per cent. So the loan pricing power may not be working due the competition in the loan market in India.

Macroeconomic factors such as growth and inflation are expected to influence the loan market from demand as well as supply sides. From a theoretical standpoint, there is a positive relationship between economic activity and banks' spreads. As the economy expands, the demand for loans increases and this in turn can lead to higher lending rates, which can serve to widen spreads. This in turn can exert upward pressure on lending rates and in turn, banks' spread. Bikker and Hu (2002), emphasis on the bank profitability and business cycle relationship and found that profit appear to move up and down with the business cycle, allowing for accumulation of capital in boom periods. Provisioning for credit losses rise when the cycle falls, but less so when net income of banks is relatively high, which reduces procyclicality. Economic activity is proxied by the growth rate of real gross domestic product. Within Indian context, the expected sign is positive. The coefficient ranges from 9 to 19 per cent depending on various measures of spreads and lending rates. This is consistently positive and significant. On the other hand, inflation is included because if inflation shocks are not passed on equally in terms of magnitude as well as speed to deposit and lending rate, then the spread would change. As expected the impact of inflation on interest spread is positive and significant.

4. Conclusion

We investigated the commercial banks' loan pricing decisions which could be influenced by host of factors, using dynamic panel data methodology and annual accounts data of 33 commercial banks over the period 1997 to 2014. The data source is publicly available data published by Reserve Bank of India under "Statistical Tables Relating to Banks in India". The determinants of loan interest rate and spreads were classified into (i) regulatory and policy variables such as banks prudential regulatory variables, repo rate (ii) bank specific variables pertaining to capital adequacy, asset quality, managerial efficiency, earnings, liquidity, bank size, loan maturity, cost of funds, competition and (iii) macro variables including the rate of growth of GDP and WPI inflation rate.

This study found an intuitive result that the interaction between policy rate and the competitiveness in the banking sector has a negative and highly significant coefficient.

While comparing the maximum likelihood value of all the three specifications, we found that the third specification has the highest value, then the next highest is for first specification and the least value is for the second specification in the static framework of panel regression. Based on these findings we can conclude that the third specification is the better proxy which could be used to measure the lending rate.

The main finding of our study is that bank spreads positively impacted by the policy indicators. At the same time, loan interest rate could be influenced by various bank specific and macro factors. Regarding the bank specific variables, loan interest rates and their spreads showed statistically significant positive relationship with operating cost, profitability and capital adequacy, loan maturity, asset quality, bank size and liquidity indicators. Macro variables such as GDP growth and inflation rate showed positive impact on loan interest rates. These findings highlight the roles of operating efficiency, risk aversion, asset-liability management, and credit risk management in commercial banks loan pricing decisions.

The managerial in-efficiency is a significant determinant of loan pricing decision, which put an upward pressure on the loan pricing. As mentioned earlier, the competition in the loan market reduces the policy pass-through. Hence both the managerial in-efficiency and the loan market structure work as counter balancing. In order to get higher policy rate pass-through the banking system should be efficient as well as competitive.

References

Afanasieff T., P. Lhacer, and M. Nakane. 2002. "The Determinants of Bank Interest Spreads in Brazil." *Working Paper*, Banco Central Do Brazil, Brasilia.

Allen, L. (1988), "The Determinants of Bank Interest Margins: A Note", *Journal of Financial and Quantitative analysis*, 23.

Allen, F., and Santomero, A. M.(2001), "What Do Financial intermediaries Do?", *Journal of Banking and Finance,* 25 (2).

Altunbas, Y., Evans, L and Molyneux, P. (2001), "Bank Ownership and Efficiency", *Journal of Money, Credit and Banking*, vol. 33(4), 26-54.

Amir, R. (2003), "Market Structure, Scale Economies and Industry Performance", CORE Discussion Paper Series 2003/65.

Angbazo, L. (1997): "Commercial Bank Net Interest Margins, Default Risk, Interest-Rate Risk, and off-Balance Sheet Banking", *Journal of Banking and Finance*, 21, 55-87.

Ansari, J. (2013), "A New measure of competition in Indian loan markets", *International Journal of Finance and Banking Studies*, 2(4), 45-59.

Arellano, M., and Bond, S. (1991), "Some Tests of Specification for Panel Data: Monte-Carlo Evidence and an Application to Employment Equation", *Review of Economic Studies,* 58.

Arellano, M., and Bover, O. (1995), "Another Look at the instrumental-Variable Estimation of Error Components Models", *Journal of Econometrics,* 68, 29--52.

Athanasoglou, P., S. Brissimis and M. Delis (2008), "Bank-Specific, industry-Specific and Macroeconomic Determinants of Bank Profitability", *Working Paper Series* 25, *Bank of Greece.*

Barajas, A., R. Steiner, and N. Salazar (1999): "Interest Spreads in Banking in Colombia 1974-96", *IMF Staff Papers*, 46, 196-224.

Beck, Thorsten & Hesse, Heiko (2009), "Why are interest spreads so high in Uganda?," *Journal of Development Economics*, 88(2), pages 192-204

Bencivenga, V. R. and Bruce D. Smith (1991), "Financial intermediation and endogenous growth", *The Review of Economic Studies*, Vol. 58, 195-209

Berger, A.N. (1995), "The Profit-Structure Relationship in Banking - Tests of Market-Power and Efficiency-Structure Hypotheses", *Journal of Money, Credit and Banking,* 27, P. 404-431.

Bikker, J. and Hu, H. (2002), "Cyclical Patterns in Profits, Provisioning and Lending of Banks and Pro-cyclicality of the New Basel Capital Requirements", *Banca Nazionale Del Lavoro Quarterly Review,* 55, 143–175.

Blundell, R., and Bond, S.(1997), "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models", *Discussion Paper*, No 97-07. University College London.

Bond, S.R and F. Windmeijer(2002), "Finite sample inference for GMM Estimators in linear panel data models", *Cemmap Working Paper* series No. CWP04/02, Institute of Fiscal Studies, London

Boone, J. (2008), " A new way to measure competition",*The Economic Journal*, 188: 1245-1261.

Brock, P. L., and L. Rojas-Suarez (2000), "Understanding the Behavior of Bank Spreads in Latin America", *Journal of Development Economics*, 63, 113-134.

Brock, P. and Franken, H. (2002), "Bank Interest Margins meet Interest Rate Spreads: How Good is Balance Sheet Data for analyzing the Cost of Financial intermediation?" mimeo

Bulow, J. and Klemperer, P. (1999), "Prices and the winner's curse", *RAND Journal of Economics*, vol. 33 (1),1–21.

Carbó, S. And Rodríguez, F. (2005). "Pricing Strategies in European Banking: Specialization, Technology and intertemporal Smoothing, in Balling", M., Lierman, F., Mullineux, A.W. (Eds.), Competition and Profitability in European Financial Services, Routledge Studies in the European Economy, Routledge, London.

Chirwa, E. W. and Mlachila, M. (2004), "Financial Reforms and Interest Rate Spreads in the Commercial Banking System in Malawi", *IMF Staff Papers*, 51(1), 96-122

Claeys, S., and Vennet, V.R. (2008). Determinants of Bank Interest Margins in Central and Eastern Europe: A Comparison With the West. Economic Systems 32 (2), 197–216.

Demirguc-Kunt, A., and H. Huizinga (1999), "Determinants of Commercial Bank Interest Margins and Profitability: Some international Evidence". *World Bank Economic Review,* 13, 379-408.

Demirguc-Kunt, Asli, Laeven, Luc, Levine, Ross (2004),"Regulations, Market Structure, institutions, and the Cost of Financial intermediation", *Journal of Money, Credit and Banking*, 36(3 Part 2), 593-622.

Doliente, J.S. (2003), "Determinants of Bank Net Interest Margins of Southeast Asia", Mimeo University of the Philippines.

English, W., B. (2002), " Interest Rate Risk and Bank Net Interest Margins", *BIS Quarterly Review,* 67-82.

Estrada D, Gomez E, Orozco (2006), "Determinants of interest margins in Colombia", *Borradores de Economia 393*, Banco de la Republica de Colombia.

Flannery, M.C. (1989), "Capital Regulation and insured Banks's Choice of individual Loan Default Rates", *Journal of Monetary Economics*, No. 24, 235-58.

Gambacorta, L., (2008), "How Do Banks Set Interest Rates?", *European Economic Review*, 52 (5), 792–819.

Gambacorta, L., Mistrulli, P. E. (2004), "Does Bank Capital Affect Lending Behavior?", *Journal of Financial Intermediation*, 13 (4), 436–457.

Hamadi, H., and Awdeh, A. (2012), "The Determinants of Bank Net Interest Margin: Evidence from the Lebanese Banking Sector", *Journal of Money, Investment and Banking*, 23, 85-98.

Ho, T. S. Y., and A. Saunders (1981), "The Determinants of Bank Interest Margins: theory and Empirical Evidence", *Journal of Financial and Quantitative analysis*, 16, 581-600.

Hossain, M. (2010), "Financial Reforms and Persistently High Bank Interest Spreads in Bangladesh: Pitfalls in Institutional Development? ", February, *MPRA Paper No. 24755,*

Klein, M.(1971) "A Theory of the Banking Firm", *Journal of Money, Credit and Banking*, 3(2), 205-218.

Lago-González, R. and Salas-Fumás, V. (2005), "Market Power and Bank Interest Rate Adjustments", *Banco De España, Documentos De Trabajo*, N. 539.

Lerner, E. M. (1981), "Discussion: the Determinants of Banks Interest Margins: Theory and Empirical Evidence", *Journal of Financial and Quantitative Analysis*, Vol. XVI, No. 4., 601-602.
Levine, R. (2002), "Bank-Based or Market-Based Financial Systems, Which Is Better?", *Journal of Financial intermediation*, 11, 265--301.

Leuvensteijn, V, M., J.A. Bikker, A. van Rixtel, and C. Kok Sorensen (2007), "A new approach tomeasure competition in the loan markets of the euro area*", ECB Working Paper* Series No. 768.

Levine, R.(1997), "Financial Development and Economic Growth: Views and Agenda", *Journal of Economic Literature*, Vol. 35, 688-726

Liebeg and Schwaiger , (2007), "Determinants of Bank Interest Margins in Central and Eastern Europe", *Financial Stability Report*, No 14, Oesterreichische Nationalbank (Central Bank of Austria)

Liebeg, D. and M. S. Schwaiger (2007), "What Drives the Interest Rate Margin Decline in EU Banking – the Case of Small Local Banks". Kredit and Kapital.

Mannasoo, K. (2012), "Determinants of bank interest spread in Estonia", *Bank of Estonia Working Paper Series*, WP No. 2012-1, Bank of Estonia.

Mendoza, Patricia (1997), "The Cost of Commercial Bank Credit in Belize: Contributing Factors and Policy Implications," Research Department, Central Bank of Belize.

Maudos, J. and De Guevara, F. J. (2002). "Factors Explaining the Evolution of the Interest Margin in the Banking Sectors of the European Union. *Instituto Valenciano De Investigaciones Economicas (IVIE)*. Mimeo.

Maudos, J., and De Guevara, F. J. (2004), "Factors Explaining the Interest Margin in the Banking Sectors of the European Union", *Journal of Banking and Finance,* 28 (9), 2259–2281.

Maudos, J. and De Guevara, F. J. (2007), "The Cost of Market Power in Banking: Social Welfare Loss vs. Cost Inefficiency", *Journal of Banking and Finance,* 31 (7), 2103–2125.

Maudos, J., and Solísc, L. (2009), "The Determinants of Net Interest income in the Mexican Banking System: an Integrated Model", *Journal of Banking and Finance*, 33 (10), 1920–1931.

Mcshane, R. W., and Sharpe, I. G. (1985) "A Time Series/Cross Section analysis of the Determinants of Australian Trading Bank Loan/Deposit Interest Margins: 1962-1981", *Journal of Banking and Finance*, 9, 115-136.

Merkl, C., Stolz, S. (2009), "Banks' Regulatory Buffers, Liquidity Networks and Monetary Policy Transmission", *Applied Economics*, 41 (16).

Monti, M. (1972), "Deposit, Credit and Interest Rate Determination under alternative Bank Objective Functions", in Karl Shell and Giorgio P. Szego, Eds., *Mathematical Methods in Investment and Finance*, North-Holland, Amsterdam, 431-454.

Naceur, S. B. Goaied, M. (2004),"The value relevance of accounting and financial information: panel data evidence", *Applied Financial Economics*, 14(17), 1219-1224.

Naceur, S. B. Goaied, M. (2008), "The Determinants of Commercial Bank Interest Margin and Profitability: Evidence from Tunisia", *Frontiers in Finance and Economics*, 5 (1): 106–130

Nickell, S. (1985), "Error Correction, Partial Adjustment, and All That: An Expository Note", *Oxford Bulletin of Economics and Statistics*, 47(2), 119-129.

Pallage, S.J. (1991), "An econometric study of the Belgian banking sector in terms of scale and scope economies", *Brussels Economic Review*, vol. 130, 125-143.

Poirson, H. (2009), 'Monetary Policy: Communication and Transparency", Chapter 10 in India: Managing Financial Globalization and Growth" ed. by K. Kochhar and C. Kramer (2009, International Monetary Fund).

Ranjan, R. and Dhal, S. (2003),"Non-Performing Loans and Terms of Credit of Public Sector Banks in India: An Empirical Assessment", *Reserve Bank of India Occasional Papers*, 24(3), 81-121

Roodman, D. (2009), "A Note on the Theme of Too Many Instruments", *Oxford Bulletin of Economics and Statistics*, 71(1), 135-158.

Saunders, A., and L. Schumacher (2000), "The Determinants of Bank Interest Rate Margins: an international Study", *Journal of international Money and Finance*, 19, 813-832.

Stiglitz, J. (1989), "Imperfect information in the product market", p. 769-847 in: R. Schmalen-see, R. Willig (Eds.), Handbook of Industrial Organization Vol. I. Amsterdam.

Stiroh, K. (2004), "Diversification in Banking: Is Non-Interest Income the Answer?", *Journal of Money,Credit and Banking* 36, 853--882.

Stiroh, K., and Rumble, A. (2006), "The Dark Side of Diversification: the Case of US Financial Holding Companies", *Journal of Banking and Finance*, 30, 2131–2161

Salas, V., and J. Saurina (2002), "Credit Risk in Two Institutional Regimes: Spanish Commercial and Savings Banks," *Journal of Financial Services Research* 22 (3), 203–24.

Scholnick, B. (1991), "Testing a Disequilibrium Model of Lending Rate Determination: The Case of Malaysia." *IMF Working Paper* 84. International Monetary Fund, Washington.

Segura, A., and Suarez, J. (2012), "Dynamic Maturity Transformation", *Working Paper, CEMFI.*

Van Leuvensteijn, M., Sorensen, C. K., Bikker, J.A. and Van Rixtel, A. M. (2008), "Impact of Bank Competition on the Interest Rate Pass-Through in the Euro Area", *European Central Bank Working Paper Series*, No. 885.

Vennet, V. R. (1998), "Cost and Profit Dynamics in Financial Conglomerates and Universal Banks in Europe", Paper Presented at the *SUERF/CFS Colloquium*, Frankfurt, 15–17 October.

Verbeek, M. (2008), "A Guide to Modern Econometrics", John Wiley &Sons,Ltd. 3rd Edition.

Williams, B. (2007), "Factors Determining Net Interest Margins in Australia: Domestic and Foreign Banks," *Financial Markets, Institutions and Instruments,* 16(3),145-165.

Windmeijer, F. (2005), "A finite sample correction for the variance of linear efficient two-step GMM estimators", *Journal of Econometrics*, 126(1).

Winker, P. (1999), "Sluggish Adjustment of Interest Rates and Credit Rationing: An Application of Unit Root Testing and Error Correction Modeling." *Applied Economics* 31(3), 267–77.

Wong, K. P. (1997), "The Determinants of Bank Interest Margins Under Credit and Interest Rate Risks", *Journal of Banking and Finance*, 21, 251-271.

Zarruk, E. R. (1989), "Bank Spread with Uncertain Deposit Level and Risk Aversion", *Journal of Banking and Finance*, 13, 797-810.

Zarruk, E. R. and Madura, J. (1992), "Optimal Bank Interest Margin Under Capital Regulation and Deposit Insurance", *Journal of Financial and Quantitative Analysis,* 27 (1), 143-149.