The Determinants of Bank Net Interest Margins, Profitability and Non-performing Loans: Panel Evidence from South Asian Countries

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A Dissertation Submitted to the Graduate School of Economics and Management and the Thesis Committee of Tohoku University
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Dedicated to My Parents,

Umyana Zanzee, Zadyn Zahid

And

Sathi Zahid

Declaration

I, Md. Shahidul Islam, hereby declare to submit the dissertation titled "The Determinants of Bank Net Interest Margins, Profitability and Non-performing Loans: Panel Evidence from South Asian Countries" to the Graduate School of Economics and Management and the Thesis Committee of Tohoku University in partial fulfillment of the requirements for the degree of Doctor of Philosophy (Ph.D.) in Economics.

Abstract

The study presents the determinants of the bank profitability, net interest margins and the non-performing loans with the panel evidence from four South Asian countries i.e., Bangladesh, India, Nepal and Pakistan.

Earning profit and remaining profitable is very important to the bank management and its other stakeholders in particular and the national and the global economy as a whole. Modern banking business has been changed significantly both in theory and in practice after experiencing the numerous competition within the industry and from outside the industry, global economic crisis, rapid technological advancement and many other factors. As principle, banks accept the deposits from the surplus units of the society and extend loans and advances to the deficit units. But the theoretical definition of the bank and its business has been evolved due to the insertion of the economic theories over the time. The literature of the banking studies have been enriched due to the influential economic theories of asymmetric information, adverse selection issues, moral hazard problems, risk avoidance and the cost preference hypotheses and the hedging principles in addition to the traditional banking practices.

In practice, the state of global deregulation and the rapid technological advancement have added the increased notch of challenges for the banking business. The traditionally known 'banking is the business of trust' has been diversified and involved in many other activities like fund transfer, credit mechanism and many other off-balance sheet activities. Many non-bank financial institutions and even commodity producing industries and retailers have emerged in to the stage and taking the banks to the cutting edge competition. Also due to its nature of business, banking business is a highly regulated industry in an economy.

In this context, banks are facing continuous pressure to remain profitable. And in order to earn the optimum profit, a bank needs to increase the revenue and decrease the cost. We studied the determinants of banking profitability in general and the determinants of net interest margins as this is an important element of bank revenue and then the determinants of non-performing loans as this is a fixed cost burden. Another theoretical motivation for studying the determinants of net interest margins and the non-performing loans as these two variables found to be insignificant in the bank profitability determinants. So, we were curious to find out what are the particular determinants of bank interest margins and the non-performing loans.

For empirical reasons, we took sample of South Asian banks for number of reasons. Firstly, The South Asian countries are the home of 1.6 billion peoples among them 1.2 billion live in India. India is now the third largest economy in the world and the rest of the South Asian countries are also growing more than world average. In the region, we found that both nationalized and private commercial banks along with cooperative and specialized banks are operating with quiet competition. So, the sample of South Asian banks is lucrative for the research insight to the researchers now days. Secondly, among the sample countries, Bangladesh, India and Pakistan were the same country before 1947. We considered the similar socio-economic and the regulatory environment of the countries and studied their banking data altogether. Finally, in the past and contemporary literature, we found many cross country studies for the determinants of banking profitability, net interest margins and the non-performing loans, but in case of South Asia, the present study is a unique addition to the banking literature.

In chapter one, we presents the motivation and the brief survey of literature of our study. The non-concluding evidence of the past empirical research motivates us to study the determinants of banking profitability, net interest margins and the non-performing loans. Higher

profit by increasing the interest margins and also the mounting of non-performing loans in the bank-balance sheet are very costly to the bank management and to the society. We got the theoretical motivation for the present study as we wanted to test the economic theories to come up with empirical evidence.

In chapter two, using the GMM estimator, we empirically studied the bank-specific, industry specific and macroeconomics specific determinants of bank profitability of 259 commercial banks in the South Asian countries (Bangladesh, India, Nepal and Pakistan) for the period of 1997-2012. Empirical results show a low level of profit persistence and a late-hit of the global financial crisis in the banking sector in the region. We found no evidence for the traditional SCP hypothesis in relation to banking profit but financial solvency and managerial excellence have positive affiliation that support the cost preference hypothesis where higher profit of a firm is appropriated by the management of the firm. Cost of fund, liquidity, funding gap, term structure of interest rate and economic growth rate found negative influence while rate of inflation positively affect bank profit. Also to report that South Asian banks are operating with 'inefficient' manpower.

Chapter three discussed the determinants of net interest margins of banks (NIMs) in four South Asian countries (Bangladesh, India, Nepal and Pakistan) in the period 1997-2012 using panel data of 230 banks. The study is in line of Ho-Saunders (1981) dealership model and its later expansions but extended the model by adding new variable the relative size of the banks and also classifying the determinants of interest margins as bank specific, industry specific and macroeconomic specific variables. We found evidence that the famous Gertler-Kiyotaki (2011) hypothesis that a bank with higher equity will charge lower is insignificant rather the opposite view significantly affect net interest margins. We also found that liquidity, required reserve and

operating expenses to total asset ratios affect net interest margins positively while relative size of the banks, market power and economic growth affect inversely.

In chapter four we empirically studied the bank-specific, industry specific and macroeconomics specific determinants of non-performing loans of banks in the South Asian countries (Bangladesh, India, Nepal and Pakistan) for the period of 1997-2012. We found that moral hazard problems between the bank management and the depositors in addition to that between the bank management and the shareholders; and the adverse selection of borrowers by the bank significantly affect the bank credit risk. We also found evidence that bad management, cost inefficiency, income diversification, bank size, industry concentration ratio, inflation and GDP growth rate all significantly explain the levels of bank NPLs. Empirical results show a moderate degree of persistence of NPLs and a late-hit of the global financial crisis and regional shock in the banking sector of the region.

Our contemporary research on the determinants of the banking profitability, net interest margins and the non-performing loans will also have policy implications to the bank management, owners, depositors, clients and the regulators. Studies on a number of additional explanatory variables like the ownership structure, corporate tax rate, deposit insurance and the portfolio effect, those we could not test due to data limitation and potential multicollinearity problems could be apparently an interesting path for future research.

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Chapter 1

Introduction

1.1 Motivation for the research

A game between the two objective functions i.e., to maximize the revenue and to minimize the cost in order to optimize the profit for a bank is never ending. By increasing the fees, charges and the net interest margins or spread which is the difference between the lending and the borrowing rates, a bank can increase the revenue. But doing so can cause a costly state verification of credit rationing and increase the credit risk which will cause huge mounting of non-performing loans, apparently a fixed cost burden. This dilemma will lead to decrease the bank profitability.

As a socially responsible profit maximizing economic agent and as a financial intermediary bank accept deposits and make loans in their usual course of asset transformation services (Mishkin, 2013). The inherent characteristics of the banking business allow it to produce financial services to diversify risk and to create value to its stakeholders. The modern banking activities are beyond the traditional theory of the banking firm where it produces services as other firms produce goods or the theory of financial intermediation to differ from other economic

agents in case of business risk and capital structure. According to Hughes, Mester and Moon (2001), the newer banking theory is the combination of the theory of financial intermediation and the microeconomics of bank production.

Through the passage of time, banking business and its core competencies have been evolved significantly. Many non-banking organizations, money and capital market institutions and even the commodity manufactures have become the competitors of core banking services like fund channeling and the payment systems (Llewellyn, 1999). Increased challenges and the erosion of traditional monopoly are leading banking business to march from traditional to modern to electronic to the virtual banking. Due to the nature of the business, banks are subject to the heavy regulations to soften the competition, restriction of range of business activities and for prudential reasons (Degryse and Ongena, 2008).

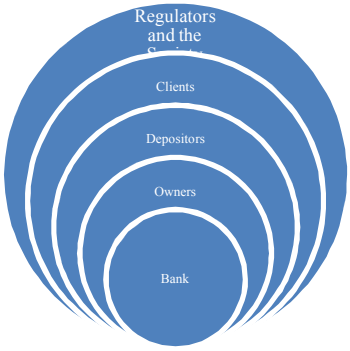


Figure- 1-1: Stakeholders of bank

These wide ranges of structural changes have made the banking business more concern about the earning of profit via increasing revenue and decreasing the cost. Also in order to face the internal competition in the traditional industrial organization approach of banking, they have

diversified their banking business from on-balance sheet activities to off-balance sheet activities and charging the optimal lending rate in their contemporary business operations.

In this background, we studied the factors determining the spread, overall banking profitability and the non-performing loans with empirical evidence from South Asian banks with the following objectives in mind:

- Due to increased globalization and the changing trends of the economics of banking, banks are facing amplified challenges and competition. So, banks must know the crucial determinants of the profitability, net interest margins and the non-performing loans in order to optimize their objective functions. We contribute to the non-concluding historical literature by addressing the moral hazard issues, asymmetric information and the adverse selection problems and their dynamic influences over the core banking objectives.
- We studied the determinants of net interest margins and the non-performing loans as these variables found to be insignificantly determining the bank profitability. This finding motivates us to further explore the research on the determinants of interest margins and the non-performing loans.
- For empirical studies, we took the South Asian banking sample for number of reasons. Firstly, the South Asian countries are the home of more than 1.6 billion peoples in which India consists more than 1.2 billion. India is now the third largest economy in the world and growing till with competitive advantages. In the sample countries both nationalized and private commercial banks along with foreign, specialized, regional and cooperative commercial banks are operating their banking business. For details, in Bangladesh, 4 nationalized and 39 private commercial banks are operating. Whereas in India, Nepal and

Pakistan the number of nationalized commercial banks is 27, 5 and 7, while the private commercial banks are 93, 30 and 66, respectively. So, with research insight South Asian banking (Bangladesh, India, Nepal and Pakistan) is a better sample for studies. Secondly, the most of the South Asian countries (Bangladesh, India and Pakistan) share the hierarchical similarities of culture, history, economy and others as they were the same country before their independence from the British in 1947. This similar socio-economic background paves us ways to study their banking systems all together in our present studies.

- In the near past many empirical studies[1] of the determinants of banking profitability, net interest margins and the non-performing loans have been carried out for the European, the USA and the Latin American banks but in case of South Asia, this study is a unique addition to the history of banking literature.

1.2 Brief literature survey

1.2.1 Brief theoretical review

History of the literature of banking studies has been changed significantly after the insertion of the information economics with the traditional approach. Bain (1956) in his famous structure-conduct- performance (SCP) hypothesis argued that higher concentration reduces competition resulting the increased banking profit but lowering the performance from social point of view. Demsetz (1973) and Peltzmann, (1977) challenged the SCP paradigm and rather proposed the so called efficiency hypothesis where efficient banks gain larger market share and

[1] Saunders and Shumacher study the determinants of net interest margins for the USA and the six EU countries, Abreu and Mendez (2002) study the banking profitability for the European countries and Bohachova (2008) studies the non-performing loans of the OECD countries for references.

higher profits. Later Berger (1995) distinguished between the X-efficiency and the scale efficiency of banking and their performance. Instead of using the Hirschman -Herfindahl Index (HHI), Panzar and Rosse (1987) introduced the firm elasticity of profit generation to distinguish between deferent levels of competition in the banking industry.

Townsend (1979) assumed the loan-loss monitoring is a costly-state verification paradigm in the game of credit rationing where a repayment schedule, an audit function and a penalty (or reward) function simultaneously work. Stiglitz and Weiss (1981) pointed on the adverse selection problem of lending as the borrowers vary in terms of their risk characteristics which have been privately observed.

Fama (1985) mentioned the possibility of unusual gain in financing from both the internal and external sources of fund for a bank using the lender-borrower information. Degryse, Kim and Ongena (2009) observed that the existence of the asymmetric information creates the credit market imperfect by distorting the lender-borrower relationship where the bank already acquired information of the borrower in a credit granting decision.

In a typical moral hazard setup, borrower has to take an action that will affect the return to the lender, yet the lender has no control over this action (Friexas and Rochet, 2008). According to the Innes (1990), in a principal-agent relationship, in which the agent is risk-neutral and has unlimited liability, moral hazard problems become trivial and are solved by making the agent (borrower) pay a fixed amount to the principal (lender) and become a residual claimant in the project.

The sources of bank rent in terms of spread have been discussed by Ho and Saunders (1981). In their famous dealership model, as an extension of the hedging hypothesis and the

expected utility approach, they proposed two stage model of bank interest margin determination. In stage one, bank charges interest margins due to transaction uncertainty and termed as the 'pure spread'. And in stage two, bank charges due to the probability of loan defaults, cost of regulatory reserve and cost of deposits. Allen (1988) extended the dealership model by introducing the portfolio effect to reduce the pure spread of margin determination.

Bernanke, Gertler and Gilchrist (BGG, 1999) showed the higher loan rate in case of increased default probability along with other macroeconomic conditions in their hazard function of the optimal debt contract. Bernanke, Gertler and Gilchrist (BGG, 1999) theory also emphasized on the firm credit-worthiness that potential borrower with high net worth needs to rely relatively little on external finance, faces less bankruptcy risk and thus could be charged with little premium on external financing. The Gertler and Kiyotaki (GK, 2011) hypothesis is also noteworthy in the theoretical studies of banking literature. According to the GK hypothesis, the less levered firm (bank) or whose net worth position is strong will charge less in case of optimal debt contract.

1.2.2 Brief empirical review

Ho and Saunders (1981) in their pioneering studies paved the ways for the empirical research on the sources of bank rent in terms of margins determination. They studied the comprehensive income and balance sheet data on major US banks for the period of 1976-IV to 1979-IV and found that the off-balance sheet income, regulatory reserve and bad loan significantly affect the interest rate margins of a bank. Keeton and Morris (1987) study present

that the local economic conditions and the risky behavior of banks were causing the higher non-performing loans in the US banks in their sample period of 1979-85.

Flannery (1981) empirically showed the impact of macroeconomic policy rates on the banking profitability in a state of interest rate risk where found the large banks were well hedged against the market interest rate risk in their study of 135 US banks.

Bourke (1989) study support the risk avoidance hypothesis of Edward- Heggested-Mingo (Edward and Heggested, 1973 and Heggested and Mingo, 1976) where higher concentration in banking markets encourages banks to hold less risky assets and modify their behavior in other ways. On the other hand, Molyneux et al. (1992) rejected the risk avoidance hypothesis but support the expense-preference hypothesis where the higher profit of a firm in a regulated industry may be appropriated in the form of higher payroll.

Angbazo (1997) showed that banks with more risky loans and higher interest rate risk exposure would select loan and deposit rates to achieve higher net interest margins. Saunders and Schumacher (2000) decomposed the bank interest margins into the regulatory components, market structure components and the risk premium components in their empirical studies for the sample of US and six European countries. Maudos and Guevara (2004) studied the dealership model using the single stage linear form also incorporating the direct measure of the degree of market concentration (the Lerner Index) for the banks in five European countries.

Berger and DeYoung (1997) found the inter relationship among the problem loan of a bank, its measured cost efficiency, state of moral hazard and the external conditions in their sample of US banks from 1985-94. Albertazzi et al. (2009, 2010) found evidence of relationship among the macro-prudential policies, taxation and the banking profitability in the Anglo-Saxon

countries. Louzis et. al. (2012) studied the determinants of non-performing loans from macroeconomic and the bank specific determinants of different types of loans.

Kunt and Huizinga (1999) studied the determinants of commercial bank interest margins and profitability as a function of bank specific, industry specific and macroeconomic specific variables for the banks of different continents for the period of 1988-95. Among others, Athanasoglu et al. (2008) study the determinants of banking profitability of Greek bank for the panel of 1985-2001 periods.

In this dissertation, we followed the reduced form equation approach over the structural form approach for the econometric design of our empirical analysis of the determinants of banking profitability, net interest margins and the non-performing loans. Both approaches have advantages and disadvantages. The structural model usually requires a theoretical model and explicit assumptions about the functional forms structural errors in order to recover the structural parameters of the function. Also each and every parameter implied from the first order conditions of the economic theory has its own economic meaning making an economic interpretation straight-forward. However, if the theory is not correct and is based on wrong assumptions and miss-specified then the parameters will produce biased and inconsistent estimation and many of the assumptions used to recover the structural estimates are untestable as cautioned by Timmins (2009). In order to avoid the risk of miss-specification of functional approach and having no strong confidence on the functions in the specification, we avoided the structural form estimation approach.

On the other hand, reduced form equation approach is flexible to summarize many effects both direct and indirect and they tend to be relatively simple in terms of data requirements and

also a robust estimator (Bayraktar, 2012). Reduced form approach produces consistent estimation of the coefficients even the functional form is unknown. On the contrary, reduced form equation approach can only estimate coefficients, not the structural parameters, and the economic interpretation is not easy. Since we were not confident enough in the theories and hypotheses implied in our models and therefore, we put more weight on robustness and used the reduced form equation approach.

Next, we estimated our regression equations using single equation approach and avoided to utilize system of equations approach. Parameters in system of equations would produce consistent and efficient estimations under the assumption that all of the equations are correctly specified. However, if any of the equations in the system is miss-specified, then this will contaminate the other equations in the system and produce inconsistent estimations.

On the other hand, if the point of interest is to get consistent estimates of the coefficients of a specific equation, then single equation approach is a reasonable choice (Anderson and Rubin, 1949). Moreover, single equation approach is robust even other equations are miss-specified. Conversely, the single equation approach has been criticized on the ground of inefficiency. Theoretically, we could estimate our models of equations using the system of equation approach but we did not as were not sure about the miss-specification of any of the equations. We adopted the single equation approach as it yield the robust estimation of the coefficients of an equation even if other equations in the system are miss-specified.

The question of endogeneity arises when we use the reduced form and single equation approach. The problem of endogeneity is that the error terms and the regressors are correlated yielding inconsistent estimates of the coefficients. We addressed a possible problem of

endogeneity (i) by assuming that the endogenous regressors do not change over time and thus using fixed effect model for the net interest margins determination and (ii) by combining the instrumental variables estimation with panel data method, to consistently estimate coefficients in the presence of unobserved effects and endogeneity in one or more time-varying regressors (Wooldridge, 2009) for the models of bank profitability and non-performing loans determination. Unfortunately, finding the good instrumental variables (those are highly correlated with the regressors but not with the error terms) are not easy. We used the generalized methods of moments (GMM) estimator of the Arellano and Bond (1991) paradigm that suggest the consistency and efficiency gains can be achieved by using all available lagged values of the dependent variable along with the exogenous regressors as instruments.

The present study also contributes to the literature as follows:

- In the past literature, we found many studies on the determinants of banking profitability, net interest margins and the non-performing loans as the functions of either bank specific or industry specific or the macroeconomic specific variables. But we studied the determinants of the banking profitability, net interest margins and the non-performing loans as the functions of bank-specific, industry specific and the macroeconomic specific variables using single linear form. In the sense, our studies differ from many of the past empirical literature.
- In our studies, we found the Gertler and Kiyotaki (2011) hypothesis is insignificant to determine the net interest margins of a bank. Instead of the risk avoidance hypothesis, our empirical result supports the cost preference hypothesis of profit determination. Also we found evidence that the adverse selection of borrowers by the banks is one of the main causes of non-performing loans that support the Stiglitz and Weiss (1981) hypothesis.

Our empirical studies show that in addition to the moral hazard problem between the bank management and the owners ('Moral hazard problem-I' according to Berger and DeYoung, 1997) a new type of moral hazard problem between the bank management and the depositors, which we call 'moral hazard type- II' also significantly, affect the non-performing loans of a bank.

- We studied the panel data of the banks of the South Asian countries for the period of 1997 to 2012, which are apparently large and contemporary in the literature of the determinants of banking profit, interest margins and non-performing loans.

1.3 Main findings of the research

We studied the determinants of the banking profitability, net interest margins and the non-performing loans in a coherent manner. We studied the determinants of banking profitability because like any other business organization, a bank always wants to optimize its objective function for profit. In order to optimize the profit, a bank needs to either increase the revenue or decrease the cost. Net interest margin is an important revenue item and the non-performing loans fall in the cost side for a bank. In the changing dynamics of banking business in now days, we then studied the determinants of the net interest margins and the non-performing loans as these are very important for the bank management and the other stakeholders of the bank to take the most effective decisions.

In chapter 2 we studied the determinants of banking profitability. In our empirical research, we found the evidence for cost preference behavior of the management in order to achieve higher

profits. We assumed that an excellent management team (costly to the organization though) is necessary for the persistence of banking profitability. We showed that a late-hit of the global financial crisis also affected the banking markets of the region.

In chapter 3 we devoted our work to find out the determinants of the bank net interest margins. We found contrast empirical evidence to the Gertler and Kiyotaki (2011) views regarding the role of net worth position to determine bank interest margins. Rather our finding satisfies the Ho and Saunders (1981) dealership views of positive spread for the financial intermediary business as they are special and customers are willing to pay for their specialness. We also found that the relative size of a bank in the industry has a deterministic role to the bank interest margins.

Chapter 4 delves with the determinants of non-performing loans. Empirically we found evidence that due to the adverse selection of borrowers, banks are assuming the higher non-performing loans. We assumed that by charging higher lending rate, banks are inviting the high-risk-high-return type customers because the safe sided customers are left behind as they cannot afford the higher premium. Along with the moral hazard issues among the bank management, the ownership and the depositors also causes higher bad loan problems. Moderate degree of persistence behavior of non-performing loans in the banks of the region signals the costly state of credit risk problems.

Chapter 2

The Determinants of Bank Profitability: Dynamic Panel Evidence from South Asian Countries[2]

2.1 Introduction

Due to increased pressure of globalization, deregulation, parallel competition from the non-banking financial institutions and volatile market dynamics, commercial banks constantly seek ways to remain profitable. Profitable banks can diversify their business, can hedge against adverse effects and can reward its stakeholders in many ways. So, understanding and regularly updating knowledge regarding the determinants of banking profitability is very important to the bank management for the existence, excellence and stability of banking firm as a financial intermediary and an important contributor to the economic development of a country. Thus, the research on the determinants of banking profitability seems lucrative to the researchers, bank management, financial market analysts and the regulators in the past and also will be equally important in the future.

[2] This chapter is based on the paper published with Nishiyama, Shin-Ichi, as co-author, titled The Determinants of Bank Profitability: Dynamic Panel Evidence from South Asian Countries in the *Journal of Applied Finance & Banking*, Vol. 6, No. 3, May 2016, pp. 77-97.

Past research on the determinants of banking profitability focused on both the bank specific and industry and macroeconomic specific variables. Following Short (1979) and Bourke (1989) a number of researchers studied banking profitability determinants using single linear model of either cross country or country specific banking data. Among others, Molyneux and Thornton (1992) examined the determinants of banks profitability operating in 18 European countries over the period 1986-1989 and Pasiouras et al. (2007) studied that of 15 EU countries. On the other hand, panel studies of Athanasoglu et al. (2008) and Dietrich et al. (2011) are on the banking profitability of Greek and Switzerland respectively. However, no single study was out of criticism due to insufficiently selection of variables or failure to implement the appropriate econometric methodology counting for profit persistency of banks (Athanasoglu, 2008).

In this paper, we empirically studied the determinants of banking profitability of South Asian countries that is Bangladesh, India, Nepal and Pakistan, using dynamic panel of 259 banks data for the period of 1997-2012. We viewed each country's banking sector in terms of a single representative agent and interested in profit determination in national basis. We studied the explanatory variables of banking profit determinants in terms of bank specific, industry specific and macroeconomic specific and incorporated new bank specific determinant-recurring earning power of bank and found that it positively and significantly affect banking profit.

Selection of our sample was also notable on the ground that most of our sample countries (Bangladesh, India and Pakistan) were under the rule of British colony for around two hundred years. We got the opportunity to study those countries' banking systems all –together considering likely regulatory, social and economic environments. In the near past we found similar studies on developed and developing countries of America, Europe, and Asia but in case

of South Asia, this study is a unique addition to the literature of the determinants of banking profitability.

The rest of the paper has been organized as follows: in section 2, we presented relevant literature on the determinants of bank profitability. In section 3 the empirical approach, data and sample description have been outlined. In section 4 the result and finally in section 5 we presented the conclusion and policy implications of our study.

2. 2 Banking profitability: review of the literature

Following Short (1979), Smirlock (1985) and Bourke (1989) previous literature viewed the bank profitability as a function of bank specific, industry specific and macroeconomic specific determinants. The bank specific variables may be termed as the microeconomic variables and can be directly found in the financial statements of a bank. On the other hand, the industry and the macroeconomic variables are the overall industry condition, regulatory and legal environment and the country specific conditions within which a bank operates its business. Explanatory variables used in the studies of banking profitability determinants found either to be categorical or related to the purpose of the study and the empirical researches focused on both the cross country studies and the studies on country specific data.

Studies by Molyneux and Thornton (1992), Demirguc-Kunt and Huizinga (1999), Abreu and Mendez (2002), Staikouras and Wood (2004), Goddard et al. (2004), Pasiouras and Kosmidou (2007) on bank profitability determinants investigated the cross country panel. On the other hand recent studies by Berger (1995), Naceur and Goaied (2008), Athanasoglu et al. (2008),

Dietrich et al. (2011) were among others on the single country's banking profitability determinants. Studies of Flannery (1981, 1983), Hanweck et al. (1984), Fraser et al. (2002), among others focused on the relationship between the volatility of market interest rates and the banking profitability. Outcome of the previous studies vary in terms of data set, type of data, period of study, set of explanatory variables and countries or region but have some commons as well.

Empirical studies on the determinants of banking profitability focus on the size, capital holdings or the equity to total assets ratio, credit risk, liquidity position and other operational efficiency indicators as the microeconomic determinants and the ownership structure, concentration indices, inflation, economic growth, regulatory policy rate, market interest rates as the industry and macroeconomic determinants.

Short (1979) in his paper examines how industry specific and the macroeconomic determinants like ownership structure, industry composition, monetary policy rate, interest rate along with bank specific asset growth significantly affect banking profit. Bourke (1989) study did not confirm the findings of Short (1979) but found evidence to support the Edward-Heggested-Mingo hypothesis[3].

Flannery (1981, 1983) found that large banks are well hedged against the interest rate volatility that means when market rates change, their revenues and costs adjust equally quickly, leaving net current operating earnings largely un- affected. However, Hanweck et al. (1984) evidenced those small commercial banks as a group has experienced increases profitability both absolute and relative to large banks in periods of rising interest rates.

[3] The Edward-Heggested-Mingo theory [Edward and Heggested (1973); Heggested and Mingo (1976)] that higher concentration in banking markets encourages banks to hold less risky assets and to modify their behavior in other ways.

The studies of Molyneux and Thornton (1992) in their cross country studies on European banking found positive relationship between the bank profit and the level of interest rates, bank concentration, ownership and the expense preference hypothesis[4].

In their seminal paper on commercial bank margin and profitability determinants, Demirguc-Kunt and Huizingla (1999) shows that the level of equity holdings, foreign ownership, GDP per capita, real interest rate, tax rate affect bank profit positively and significantly while the loans to total assets ratio, off-balance sheet income, customer and short term funding to total assets, overhead expenses and taxation reserves have significant inverse relationship with banking profit and the results also vary in developed and developing countries. Abreu and Mendez (2002) studied the profitability determinants of European banking and found that loan to assets and equity to assets ratio have positive impact on bank profit while unemployment affect negatively. Staikouras and Wood (2003) also studied the European banking profitability and their results show that among bank specific determinants loan to assets ratio, the loan loss provisions have inverse but the level of equity and funding gap positively affect bank profit. They found no evidence for the SCP hypothesis but the macroeconomic variables like interest rate variability and GDP growth rate affect banking profit negatively but market interest rate positively.

Goddard et al. (2004) also studied the bank profitability on European banking profitability and found no evidence for size-profitability relationship but positive effect of capital assets ratio on bank profit. Pasiouras et al. (2007) found significant positive relationship between banking profit and equity level, liquidity position, concentration, inflation and GDP growth rate

[4] The theory of expense preference hypothesis suggests that high profits earned by firms in a regulated industry may be appropriated in the form of higher payroll expenditures [see Molyneux and Thornton(1992) for further explanation].

but significant negative relationship between the banking profit and cost of fund and size variables in their banking profitability studies on 15 EU countries.

Athanasoglu et al. (2008) studied the banking profitability determinants on Greek banking and found that equity level, productivity inflation and cyclical output have significant positive relationship with bank profitability while that with loan loss provision and operating expenses is significantly negative. Their study also accounted no bank size-profitability relationship of the traditional SCP hypothesis.

In a recent study of Dietrich et al. (2011) on the Swiss banking profitability found equity to total assets ratio, cost-income ratio, deposit growth rate, funding cost, interest income share, effective tax rate and ownership structure negatively affect banking profit. On the other hand, prolonged banking experience, small banking over large one, GDP growth, and term structure of interest rate found positive relationship. They also accounted for the particular focus on the crisis and pre-crisis of the global finance. Albertazzi et al. (2009, 2010) studied the bank profitability with particular importance to the business cycle changes and the taxation effect.

Previous literature on the determinants of banking profitability studied extensively on the microeconomic determinants; sources of which are the financial statements of the banks. Investigative results also found on the traditional structure-conduct-performance hypothesis and the macroeconomic determinants of the bank profitability. However we did not find any conclusive deterministic role of the determinants whether bank, industry or macroeconomic specific.

We found that the previous literature ignored the importance of the recurring earning power which is actually the ability of the excellent management of a bank to generate consistent

profit. We extended the literature of bank profitability studies by incorporating this bank specific variable in our empirical study. The study considered the sample of the South Asian countries banking markets as a whole that is also new because no evidence of such study found in the past literature. Furthermore, the panel data of 259 commercial banks for the period of 1997-2012 which is relatively large that we studied empirically will allow the better insight into the factors determining the banking profitability.

2. 3 Empirical model of the bank profitability study

2.3.1. Econometric Model

The econometric model for the determinants of bank profitability is in the following linear form:

$$\boldsymbol{\Pi_{itk} = c + \sum_{j=0}^{J} \beta_j X_{it}^{j} + \sum_{l=0}^{L} \beta_l X_{it}^{l} + \sum_{m=0}^{M} \beta_m X_{it}^{m} + \varepsilon_{it}}$$

$$\textbf{where, } \boldsymbol{\varepsilon_{it} = \nu_i + \upsilon_{it}} \text{ .....Equation (2-1)}$$

Where, Π_{itk} is the profitability of bank i at time t and measured at parameter k (k = ROA_{it} and ROE_{it}) with i = 1,.....,N, t = 1,....., T and c is a constant term. The superscripts *j, l* and *m* of X_{it} denote the bank-specific, industry specific and macroeconomic specific determinants respectively. ε_{it} is the disturbance with ν_i the unobserved bank-specific effect and υ_{it} the idiosyncratic error. The error components of the regression model also distributed as ν_i ~IIN (0, σ_ν^2) and independent of υ_{it} ~ IIN (0, σ_υ^2).

Bank profits show a tendency to persist over time, reflecting impediments to market competition, informational opacity and/or sensitivity to regional/macroeconomic shocks to the

extent that these are serially correlated (Berger et al., 2000). Hence, we adopted a dynamic specification of a model that includes a lagged dependent variable among the regressors. The dynamic specification model of the profitability determinants is:

$$\boldsymbol{\Pi_{itk} = c + \delta\Pi_{i,t-1,k} + \sum_{j=0}^{J} \beta_j X_{it}^{j} + \sum_{l=0}^{L} \beta_l X_{it}^{l} + \sum_{m=0}^{M} \beta_m X_{it}^{m} + \varepsilon_{it}} \quad \text{..Equation (2-2)}$$

Where, $\Pi_{i,t-1}$ is the one-period lagged profitability at k parameter and δ is the speed of adjustment to the equilibrium. A value of $0 < \delta < 1$ implies the persistence of profitability in the industry but tends to return to the normality level. In a fairly competitive market, the value of δ will be nearly 0 whereas in a less competitive market the value will be close to 1.

Literature usually applies the fixed effects (FE) or the random effects (RE) modeling in static type of relationships but in dynamic relationships these models produce biased (especially when time dimension T gets smaller) and inconsistent estimates (see Baltagi, 2001).

Following Athanasoglu et al. (2008) we precede the following five step issues for the econometric model of profitability determinants.

First, we tested our data for non- stationarity using the Fisher test which does not require a panel to be balanced. This test is a question when the use of a relatively large T in a model of bank profitability may be criticized on grounds of non-stationarity. The null of non-stationarity has been rejected at 1% level[5].

[5] The relevant chi-squared ($\chi^2, 296$) -value for ROA = 1056.92 with ρ = 0.0000 and ROE = 980.83with ρ = 0.0000

Second, we examined whether the individual effects are fixed or random. The relevant Hausman test on model (2) confirms the evidence in favor of a FE modeling[6]. Also the estimation result confirms the existence of individual effect since the F-statistics is significant (F (81, 204) = 2.49, Prob > F = 0.0000). However, the least square (within) estimator of the FE model in the presence of a lagged dependent variable among regressors is both biased and inconsistent[7].

Third, we proceed with the estimation of our model using the one step generalized methods of moments (GMM) estimator of Arellano and Bond (1991) paradigm which suggest that consistency and efficiency gains can be obtained by using all available lagged values of the dependent variable along with the exogenous regressors as instruments. We used the one- step GMM estimation over the two-step because the two-step standard errors tend to be severely downward biased (Arellano and Bond 1991; Blundell and Bond 1998).

Fourth, we dealt with the problem of endogeneity with estimation of bank profitability. The question is whether capital variable (E/TA) and the credit risk variable (NPL/TL) are endogenous and predetermined or not. Theory suggest that capital and risk variables should be treated as endogenous and predetermined respectively when we measure profitability with ROE as dependent variable. To confirm such, we ran the same model twice separately in case of ROA and ROE respectively. First time we treated both variables as strictly exogenous and second time treated capital as endogenous and risk variable predetermined. Sargan test[8] for over-identifying

[6] The relevant Hausman test chi-squared statistics was $\chi^2, 13 = 496.72$ with p-value is 0.0000

[7] The Monte Carlo studies that measured the corresponding bias in the coefficients of the lagged dependent variables have found that the bias is significant for small values of T but goes to zero as T increases (see Judson and Owen, 1999).

[8] When we modeled E/TA and NPL/TL as exogenous variables, the $\rho = 0.00$ for both the models. In contrast, when we assumed E/TA as endogenous and NPL/TL as pre-determined, the $\rho = 0.00$ in ROA model but $\rho =$

restrictions indicates that no endogeneity and pre-deterministic assumptions are valid for ROA as dependent variable but opposite for ROE. That means we treated capital and risk variable exogenous in ROA model but capital variable as endogenous and risk variable pre-determined in ROE model.

Finally, we addressed the unobserved time effects in the error components of our model as follows:

$$\boldsymbol{\Pi_{itk} = c + \delta\Pi_{i,t-1,k} + \sum_{j=0}^{J} \beta_j X_{it}^{j} + \sum_{l=0}^{L} \beta_l X_{it}^{l} + \sum_{m=0}^{M} \beta_m X_{it}^{m} + \varepsilon_{it}}$$

$$\boldsymbol{\text{where, } \varepsilon_{it} = \nu_i + \lambda_t + \upsilon_{it}} \text{ .....Equation (2-3)}$$

Where λ_t is the unobservable time effect and we tested the joint significance of time effects as $\boldsymbol{H_0 = \lambda_2 = \lambda_3 = \lambda_T = 0}$. The relevant LM test[9] approves the inclusion of time dummies. We experimented for time dummies for all years jointly and separately but found the year dummies 2009 is significant (implying the late hit of the global recession in the sample region). Considering all these, we estimated the profitability determinants by the following dynamic equation:

$$\boldsymbol{\Pi_{itk} = c + \delta\Pi_{i,t-1,k} + \sum_{j=0}^{J} \beta_j X_{it}^{j} + \sum_{l=0}^{L} \beta_l X_{it}^{l} + \sum_{m=0}^{M} \beta_m X_{it}^{m} + \gamma D_{09} + \varepsilon_{it}}$$

$$\boldsymbol{\text{where, } \varepsilon_{it} = \nu_i + \upsilon_{it}} \text{ .....Equation (2-4)}$$

0.19 in ROE model that means the use of instruments for these two variables are not acceptable in ROA model but acceptable in ROE model.

[9] The relevant LM test chi-squared statistics was χ^2, 12 was 24.52 with p-value is 0.0173

2.3.2. Empirical determinants of bank profitability

We empirically studied the econometric model of bank profitability determinants developed in section 2.3.1 using 3 categories of proxy variables namely (a) firm specific, (b) industry specific and (c) macroeconomic specific (see table-1 for a summary of these variables).

2.3.2.1. The dependent variables

We used return on average assets (ROA) as the key profitability determinant of banks. ROA has emerged as the key ratio for the evaluation of bank profitability and has become the most common measure of bank profitability in the literature (Golin, 2001). ROA is an indicator of how profitable a company is relative to its total assets and gives an idea as to how efficient management is at using its assets to generate earnings. We defined ROA as the ratio of net income over average total assets expressed in percentage.

Return on average equity (ROE) is the second measure of profitability in our empirical study. We defined ROE as the amount of net income as a percentage of shareholders equity. ROE equals ROA time assets-equity ratio, often termed as equity multiplier or financial leverage. Problems of considering ROE as the profitability measure is authority often regulates the leverage position of a bank and also for accounting identity fact banks with lower leverage ratio generally report higher ROA but lower ROE. So, we considered ROA as the key determinant of bank profitability also relied on the average assets value to capture the changes during the fiscal year if any.

Table-2-1: Description of variables used in the study of profitability determinants

Variables	Notation	Description	Expected effect
Dependent variables			
Profit(Π)	ROA	Net income over average total assets (%)	
	ROE	Net income over average total equity (%)	
Independent variables			
(a). Bank-specific variables			
i. Equity to total assets ratio	E/TA	Equity to total assets ratio (%) is a measure of capital adequacy of respective bank	+/-
ii. Non-performing loan ratio	NPL/TL	Non-performing loan (%) over total loan is a proxy variable for credit quality or credit risk exposed to a bank	-
iii. Liquidity ratio	LA/D&STF	Liquid asset to total deposits and short term funding ratio (%) express the liquidity position of a bank	-
iv. Cost of fund ratio	IE/TD	Total interest expenses (%) over total deposit is a proxy for funding cost	-
v. Productivity ratio	OP/NoE	Operating profit per employee	+
vi. Recurring earning power	REP	Adjusted ratio of stable net income(net income less non stable earnings and taxes) over total assets	+
vii. Growth of total deposit	ΔTD	Annual growth rate (%) of deposit	+/-
viii. Bank size	ln(TA)	Natural logarithm of total assets of a bank	+/-
ix. Loan to deposit ratio	TL/TD	Total loan over total deposit ratio (%)	-
x. Interest income to Total loan ratio	TII/TL	Total interest income over total loan (%)	+
xi. Off-balance sheet income ratio	NNII/TA	Net non-interest income over total assets (%)	+
(b). Industry-specific variables			
xii. Hirschman-Herfindahl index	HHI	Sum of square of market share is a proxy for market structure variable	+/-
(c). Macroeconomic-specific variables			
xiii. Term spread of interest rate	R	Difference between the 10 year and 5 year treasury bond yield spread (%)	+/-
xiv. Rate of inflation	%Inf	Annual rate of inflation (%)	+
xv. Economic growth rate	%ΔGDP	Real growth rate in GDP (%)	-

2.3.2.2. The explanatory variables

(a) Bank-specific explanatory variables

(i) Equity to Total Assets ratio:

Equity to total assets ratio measures the capitalization strength of a bank considering the regulatory requirements regarding the minimum equity holdings. Anticipating impact of this variable on bank profitability is complex. The traditional risk-return hypothesis (invested money can render higher profits only if it is subject to the possibility of being lost) imply a negative relationship between bank capital and profitability because banks with higher equity to asset ratios are relatively safer in the event of loss or liquidation. Also considering the Berger (1995) model of one-period perfect capital markets with symmetric information where a negative relationship between equity and profitability exists, capital variable should be modeled as endogenous. On the other hand, better capitalized banks can effectively transform their creditworthiness into lowering their cost of fund and generating higher profitability. This assumption gets solid ground considering the recent trend of merger and acquisition also the ace of financial liberalization. Finally we hypothesized a significantly positive relationship between equity and ROA but significantly negative relationship between equity and ROE.

(ii) Non-performing loan ratio:

The ratio of nonperforming loan to total loan (NPL/TL) is the proxy variable for the credit risk exposure to a bank. In our study, we took impaired loan as the definition of non-performing loans. Facing the high regulations from the regulatory bodies and maintaining the quality of assets (loan is the largest head of a bank balance sheet), banks focus to keep a lower

non-performing loan ratio. Following this standard controlling nature, some literature term NPL is a pre-deterministic variable (see Athanasoglu, 2008). However, we expect negative relationship between non-performing loan and profitability.

(iii) Liquidity ratio:

Maintaining a sound liquidity position to safeguard against the liquidity risk is a vital policy of a commercial bank. We calculated the liquidity ratio (LA/D&STF) as the liquid assets of a bank over the deposits and short term funding in percentage form. Although a higher liquidity ratio reduces the liquidity risk but at the same time reduces the loanable fund of a bank which in turns reduces the banks' earning potential. Thus we expect liquidity position of a bank and its profitability negatively related.

(iv) Cost of fund ratio:

Total interest expenses over total deposit (IE/TD) is a proxy for funding cost and used to measure the impact of bank managements' efficiency over banks profitability. A bank with its excellent managerial efficiency will be able to collect low cost fund in a competitive but unstructured savings of the depositors providing sound bank profitability. A negative and statistically relationship is expected.

(v) Productivity ratio:

In a world of increased globalization and deregulations, banks must increase the productivity (i.e. the input-output ratio) for a stable earning and sustainable growth. It is possible to linearize the productivity growth ($\delta\pi$) [10] in a capital augmented production function but difficult when production function is labor augmented or both due to inefficiency of the workforce. Although it is a question whether bank performance (e.g. profitability, π) is capital or labor augmented, we expect positive relationship between productivity and profitability. We used the ratio of operating profit per employee as a proxy for productivity.

(vi) Recurring earning power:

We introduced the ratio of recurring earning power (REP)[11] of a bank in our econometric model of profitability determinants as a proxy for the stability of its earnings and sustainable managerial efficiency. Also the satisfied managers serve with their efficiency to earn sustainable profit. REP is defined as the adjusted ratio of stable net income (profit before taxes plus loan loss provisions less income from associates and extraordinary sources over total assets). We found no significant evidence of studies on the relationship between the REP and bank profitability in the previous literature. We expect that managerial excellence and profitability are positively related.

[10] In the Cobb-Douglas production function, $\pi = AL^{\beta}K^{\alpha}$ where L = labor, K = capital, A = total factor productivity, α and β are the output elasticities of capital and labor respectively, $\alpha + \beta < 1$ indicates decreasing return to scale. But in a perfectly competitive market, $\alpha + \beta = 1$ meaning constant return to scale (see Acemoglu 2009. pp. 36-42).

[11] This variable is different from the dependent variables ROA and ROE. We found ρ (ROA, REP) = 0.78 and ρ (ROE, REP) = 0.25 only (see table-5A of correlation matrix in the appendix).

(vii) Growth rate of total deposit:

As a financial intermediary, bank always eager to expand its market share of deposit in the deposit market in order to expand its loan operation. So, the impact of growth in deposit does not necessarily ensure the bank profitability. To crop up the advantage of higher deposit growth is related to the quality of credit management. Hence, the impact of this variable on bank profitability is not clearly anticipated in the present study.

(viii) Bank size:

We measured the bank size in terms of natural logarithm of its total assets. Although Smirlock (1985) argued that a growing bank size is positively related to bank profitability on the ground of economies of scale benefit but extremely large banks might become operationally inefficient due to bureaucratic complexity and 'too big to fail' reasons (Pasiouras et. al., 2007). So, this size-profitability relationship is still unpredictable also in our study.

(ix) Loan to deposit ratio:

We introduced the loan to deposit ratio (TL/TD) in our bank profitability determinants model to see the impact of asset-liability management on profitability of a bank. Loan to deposit ratio components are also interest rate sensitive meaning these balance sheet components are also affected by the interest rate risk literally called the duration gap (difference between rate sensitive assets and rate sensitive liabilities). Higher the ratio indicates the bank is effectively utilizing its fund to generate higher profit although possible bank run problem is associated with this scenario. On the other hand, a lower TL/TD means banks have excess liquidity and under performing their asset-liability management. In this scenario, banks will incur the excess

liquidity cost burden in addition to the cost of fund that will result a state of negative profitability. Entrop, O., et al. (2015) studied the relationship between duration gap and interest margin but the relationship between rate sensitive assets and liabilities with a bank's overall profitability (ROA or ROE) seems first we included in our present study. We expect a negative and significant relationship under the assumption of underperformance of asset-liability management.

(x) Total interest income ratio:

Total interest income over total loan (TII/TL) ratio indicates the loan pricing behavior of a bank. Certainly a commercial bank will try to charge higher on its loans and advances to optimize profit. Higher interest income will represents the higher profitability of a bank.

(xi) Off-balance sheet income:

Now a day banking business model has been diversified in many folds. Following Angbazo (1997), we examined the effect of off-balance sheet income on the banking profitability. In the name of loan commitments, standby letter of credit, commercial letter of credit, securities lending and trading, futures and forwards contracts, options, swaps, cards, service and penalty charges, capital gain on assets, property leasing etc. and other fee income, banks generate sizable portion of their total income. On the other hand, banks incur handsome operating and overhead expenses to generate off-balance sheet activities. We calculated off-balance sheet income ratio as the net non-interest income (non interest expense less non-interest income) over total assets (NNII/TA) and expect positive impact of this variable on banking profitability.

(b) Industry-specific variables

(xii) Hirschman-Herfindahl index:

Hirschman-Herfindahl index (HHI) is the proxy variable for the market concentration and its impact on bank profitability in our empirical study. This is a common and widely used measure of market concentration where higher concentration means lower competition and vice versa and calculated as the sum of square of market share *(*$HHI = \sum s_i^2$*.where* $\mathbf{s_i}$ is the share of total industry assets of each bank as calculated in our study). According to the structure-conduct-performance (SCP) hypothesis, banks in highly concentrated markets earn monopoly rents, because they tend to collude (Gilbert, 1984). This state of collusion may direct opposite scene also where smaller banks face tougher competition that result overall negative profitability. So, the theoretical relationship between concentration and bank performance is yet indeterminate and to be answered empirically.

(c) Macroeconomic-specific variables

(xiii) Term spread of interest rate:

We used the difference of yield spread of 10 year and 5 year treasury bonds as the proxy of term spread of interest rate (R) and its impact on the bank profitability. Maturity gap (borrowing short- lending long and vice versa) management is an important aspect of bank management because of interest rate sensitivity. Banks' revenues and costs will be adjusted with different speeds that will generate either profit or loss for the bank (Flannery, 1984). In a perfectly competitive capital market, where the banks also compete with the government to

collect funds may expect inverse relationship with the term spread of interest rate and its profitability.

(xiv) Rate of inflation:

Although there is no empirical consensus on the effect of inflation on the bank profitability, high inflation is generally associated with high interest rates and consequently increases bank profitability. In this study, we expect positive relationship with inflation and bank profit.

(xv) GDP growth rate:

Gross domestic product (GDP) growth rate affect the demand and supply of loans and deposits directly and thus influence the banking business. We assume that sound GDP growth ensures the stability of the economy and in that stable economic environment a bank's business risk reduces significantly. Following that risk return trade off banks profitability may reduce. Hence, we expect inverse relationship with GDP growth and bank profitability.

2.4 Sample and data description

To prove the econometric model of bank profitability determinants (equation 2-4) empirically we studied the unbalanced panel data of 259[12] South Asian banks over the period of 1997-2012. We defined banks as the financial intermediary that takes deposits and provide loans and advances in the ordinary courses of business. We excluded the data of Islamic banks from our sample as in India and Nepal there is no or very limited Islamic banking operation. For our analyses, we collected data from various sources. The dependent variable and the bank specific explanatory variables, we collected data from the *Bureau Van Dijk's Bank Scope database* (Bank Scope 2013) using the universal model of banking database. We took the primary data set from the Bank Scope but calculated by our own to get the Hirschman-Herfindahl index which we used as the industry specific explanatory variables. Finally, for macroeconomics specific variables, we collected data from two sources. We collected the data regarding the term spread of interest rate[13] from the *central banks websites* of the respective countries included in our study. From *International Financial Statistics (IFS) database (IFS 2014)*, we collected yearly data of rate of inflation and the growth rate of gross domestic product (GDP).

Table-2-2 presents the descriptive statistics of the empirical variables used in the present study. We see in South Asia, banks earned around 1% ROA while ROE was more than 14%. Among other key indicators, the non-performing loan to total loan ratio was quiet high (more than 8%) and the cost of fund averaged a slightly higher than 6.6%. Off balance sheet income

[12] By countries, India represents 60% banks in our total sample while Bangladesh, Nepal and Pakistan represent 12%, 10% and 18% respectively.

[13] Term structure of interest rate is proxied as the difference between the yields spread of 10 year and 5 year Treasury bonds (T-bond). Also for Nepal, we sampled the development bond yield as the equivalent to 5 year T-bond and the national savings certificates yield as equivalent to 10 year T-bond as they have no such classified maturity bonds.

was sound good meaning well diversified banking activities in the region. HHI over 13% means a fairly competitive banking industry.

Table-2-2: Descriptive statistics of the variables in profitability study

Variables	Mean	Median	Standard Deviation
Dependent variables			
Return on Average Asset (ROA)	0.9950	1.1450	3.3745
Return on Average Equity (ROE)	14.0171	15.3500	52.9610
Independent variables			
Bank specific			
Equity to Total Asset ratio (E/TA)	9.9883	7.0900	12.3830
Non-performing loan ratio (NPL/TL)	8.3432	4.2800	10.4056
Liquidity ratio (LA/D&STF)	19.7128	14.4250	28.8511
Cost of fund ratio (IE/TD)	6.6006	5.9190	6.8950
Productivity ratio (OP/NoE)	1.8171	.91552	17.5576
Recurring earning power (REP)	2.2024	2.3300	3.4296
Growth rate of total deposit (GTD)	2.8564	12.3719	11.3008
Size (lnTA)	7.1869	7.1252	2.0547
Loan to deposit ratio (TL/TD)	82.3890	74.5600	63.0041
Total interest income ratio (TII/TL)	72.3787	49.2800	19.4441
Off-balance sheet income (NNII/TA)	0.8787	.69450	3.3148
Industry specific			
Hirschman- Herfindahl index (HHI)	0.1360	0.0824	0.1156
Macroeconomics specific			
Term spread of interest rate (R)	1.0741	0.6000	1.2236
Rate of inflation (Inf%)	7.0261	6.3700	3.4116
GDP growth rate (GDP%)	6.1364	6.1800	2.2592

During the sample period rate of inflation was in single digit (7%) seems satisfactory and the regional average GDP growth rate was more than 6%.

2.5. Empirical results of the determinants of bank profitability

Table 2-3 in the following presents the regression output of equation 2-4 of the key bank profitability determinants (ROA) for the total sample period of 1997-2012. The first column of the table presents the list of the dependent and the deterministic variables while each column of model 1 and 2 represents the coefficient and standard error respectively. To see the stability and the significant of the coefficients, in model 1 we included all of the determinants while in model 2 only the bank-specific variables. The Wald-test confirms the fine goodness of fit of our panel data set and the Sargan-test shows no evidence of over-identifying restrictions. We used the Sargan test over Hansen for the over identifying restrictions because the Hansen test statistics can be greatly weakened by instrument proliferation (Roodman, 2009). According to the results of AB (AR1) test a negative first order autocorrelation exists but does not imply the inconsistency of the estimates. Inconsistency would imply if there is the second-order autocorrelation (Arellano and Bond, 1991) but is rejected by AB (AR2) test subsequently.

One thing to note that in model 1 compared to model 2, the number of observations has been reduced from 314 to 196 just because of adding some industry specific and macroeconomic specific variables. To find out the possible reasons, we ran the regressions several times just by adding variables one after another. Finally we found that the loss of observations in model 1 is due to the inclusion of the variable term spread of interest rate of which there are a significant number of missing values. Till we included the variable as this monetary policy variable not only capture the current but also the future course of actions and its possible impact on the current banking profitability.

Empirical results show a low degree of profit persistence in banking as the one-period lagged dependent variable (δ (one period lagged ROA) = 0.1076) is statistically significant also

justify the use of GMM dynamic panel estimation of our model. This level of profit persistency in the South Asian region seems similar market competition to the European region as Goddard et al. (2004) found statistical evidence of weak profit persistency. Among the bank-specific determinants, results show that capital plays a strong determinant of bank profitability. As expected, equity to total assets ratio positively and significantly affect ROA. Economically speaking for every 100 basis point (BP) increase in this variable will increase a bank ROA by over 16 BP. Also the rejection of endogeneity of equity variable confirms the existence of sound one-period perfect capital markets (Berger, 1995) in the region.

We found the expected negative coefficient of credit risk (NPL/TL) variable but statistically insignificant. The negative and highly significant coefficient of liquidity ratio (LA/D&STF) indicates the banks are in excess liquidity and thus under utilization of assets emerge. As seen banks forego around 3 BP of ROA for every 1% increase in LA/D&STF. Cost of fund negatively affects bank profitability as obvious. One alarming finding of the present study is the statistically significant and negative coefficient of the productivity ratio (OP/NoE) seems the inefficiency of the production inputs particularly the employees. As we discussed in section 2.3.2, in a state of decreasing return to scale such outcome will occur. Another indication of the result is probably in South Asian banking labor is dominating over technology and well behind the banking progress all over the world. Technological advancement and digitalization of banking may rescue the banks (Athanasoglu et al., 2008) from this poor productivity of the employees of South Asian banking. We found our expected positive and statistically significant relationship between the recurring earning power and banking profitability. Recurring earning power fits as a very good proxy for managerial excellence who generates more profit and pays more taxes, effectively manages the loan loss provisions and generates income from associates.

Economically for every 1% increase in the recurring earning power will add around 73 BP on ROA.

The present study found no statistical evidence that deposit growth rate and a bank size affect bank profitability. But rate sensitive assets and rate sensitive liabilities (TL/TD) ratio negatively and significantly affect the profitability of banking. Although the economic impact seems very small, probable explanation for the negative coefficient may be the portfolio managers were less aware regarding maturity gap and credit quality. We split the total income of a bank into interest income and off balance sheet income to check which portion significantly affects the bank profitability. We found positive coefficient for both the determinants but only found the off balance sheet income significantly affect the bank profitability when we considered only the bank-specific determinants (model 2).

Our empirical studies found negative but statistically insignificant coefficient for Hirschman-Herfindahl index. Berger (1995) and also other recent studies claim that concentration is usually negatively related to profitability once other effects are controlled rejecting the traditional SCP hypothesis. In this study we found the low degree of profit persistency and size has no significant effect on bank profitability that also support that in the South Asian banking market is fairly competitive and exist few scope of monopoly rent seeking behavior.

Table-2-3: Determinants of bank profitability (ROA) in South Asia, 1997-2012, total sample

Variables	Model-1(all determinants)		Model-2 (only bank-specific determinants)	
Dependent variable: **Return on average Assets (ROA)**	**Coeff.**	**S.E.**	**Coeff.**	**S.E.**
Independent variables				
Bank specific				
One period lagged ROA	.10760625*	0.056919	.16700547***	0.046182
Equity to Total Asset ratio	.15133647***	0.028000	.1339632***	0.023350
Non-performing loan ratio	-0.007028	0.019252	-0.016082	0.013626
Liquidity ratio	-.04288614***	0.010198	-.03681156***	0.008665
Cost of fund ratio	-.16775388***	0.052754	-0.059857	0.036788
Productivity ratio	-.43347373***	0.068875	-.32035509***	0.051464
Recurring earning power	.75176167***	0.118623	.73583202***	0.093714
Growth rate of total deposit	0.000046	0.000050	0.000020	0.000042
Size	0.175360	0.226166	0.092553	0.150589
Loan to deposit ratio	-.01439217**	0.006367	-.01490682***	0.005026
Total interest income ratio	0.000035	0.000046	0.000043	0.000028
Off-balance sheet income	0.112275	0.141199	.21824237**	0.102645
Industry specific				
Hirschman-Herfindahl index	-0.345839	0.666215		
Macroeconomics specific				
Term spread of interest rate	-.19451958***	0.074956		
Rate of inflation	.05226083**	0.024386		
GDP growth rate	-.07972443*	0.043628		
Year 2009 (Dummy)	-.25603382*	0.155230	-.23035388**	0.115331
Intercept	0.259592	1.911693	-0.214456	1.373978
Number of observations	*196*		*314*	
Wald-test (p-value)	*$\chi2(17) = 350.85$*	*0.0000*	*$\chi2(13) = 457.42$*	*0.0000*
Sargan-test (p-value)	*$\chi2(95)=166.31$*	*0.0000*	*$\chi2((104)=253.85$*	*0.0000*
AB test AR(1)(p-value)	*z = -1.7500*	*0.0700*	*z = -1.8900*	*0.0500*
AB test AR(2)(p-value)	*z = -1.1136*	*0.2655*	*z = -1.3114*	*0.1897*

Note: The table reports the regression output from GMM estimation of the bank profitability determinants. Coefficients that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. Sargan test is the test for over-identifying restrictions in GMM dynamic model estimation. AB test AR(1) and AR(2) refer to the Arellano-Bond test that average auto covariance in residuals of order 1 and order 2 is 0 (H_0: no auto correlation).

Turning to the macroeconomic determinants of bank profitability, we found the term spread of interest rate; rate of inflation and the GDP growth rate all significantly influence the banking profitability. The significant negative coefficient of term spread of interest rate indicates that banks do compete with government to satisfy the depositors to retain their savings. This hypothesis confronts the recent studies of Albertazzi et al. (2009) but support the findings of Fraser et al. (2002). Economically banks lose approximately 19 BP of profit for every 100 BP increase in the term structure of interest rates.

As expected, the significant positive influence of inflation on bank profitability indicates that the bank managers effectively anticipated the future upward movement of inflation but remains unanticipated by the bank clients. This existence of asymmetric information made some way of profit in South Asian banking. We also prove our hypothesis that in an expansionary economy banks operate their business in a relatively ease and less risky environment and thus can charge less from their customers. Hence we got negative coefficient of GDP growth rate as the determinant of bank profitability.

Finally, one of the important findings of our empirical studies on bank profitability determinants is the significant reduction of profitability in the South Asian countries as we term as the late hit of the global recession in the region. Our results show that banks approximately lose 26 BP of ROA in the year 2009.

Table 2-4 presents the regression output of the return on average equity (ROE) as the bank profitability measure. Overall we found consistent but relatively inferior coefficients and their statistical significant compared to return on average assets (ROA) as the bank profitability measure.

Table-2-4: Determinants of bank profitability (ROE) in South Asia, 1997-2012, total sample

Variables	Model-1(all determinants)		Model-2 (only bank-specific determinants)	
Dependent variable: **Return on average Assets (ROE)**	**Coeff.**	**S.E.**	**Coeff.**	**S.E.**
Independent variables				
Bank specific				
One period lagged ROE	.52418001***	0.113610	.42597704***	0.081668
Equity to Total Asset ratio	-3.9676741***	0.667903	-4.1063285***	0.519022
Non-performing loan ratio	0.182756	0.514501	-0.318888	0.302206
Liquidity ratio	-0.222673	0.220849	-0.093891	0.179014
Cost of fund ratio	-3.0388376**	1.240529	-0.808211	0.773543
Productivity ratio	0.232178	1.596769	-0.070620	1.164588
Recurring earning power	3.633552	2.661615	4.3750678**	2.032838
Growth rate of total deposit	0.000389	0.001214	-0.000337	0.000993
Size	6.868638	4.956729	0.600586	2.792117
Loan to deposit ratio	0.037761	0.138309	0.028622	0.107174
Total interest income ratio	0.000589	0.001010	0.000406	0.000582
Off-balance sheet income	2.188804	3.250615	-1.109140	2.242806
Industry specific				
Hirschman-Herfindahl index	28.088533*	15.410420		
Macroeconomics specific				
Term spread of interest rate	2.002792	1.730980		
Rate of inflation	-0.037337	0.560012		
GDP growth rate	-0.807143	1.043490		
Year 2009 (Dummy)	-8.4449765**	3.691096	-7.5645774***	2.654180
Intercept	-4.430819	41.456540	32.265954	25.317280
Number of observations	*196*		*314*	
Wald-test(p-value)	*$\chi2$ (17) = 135.91*	*0.0000*	*$\chi2$ (13)= 185.76*	*0.0000*
Sargan-test(p-value)	*$\chi2$ (179) = 194.36*	*0.0000*	*$\chi2$(247)=325.91*	*0.0000*
AB test AR(1) (p-value)	*z = -1.7045*	*0.0883*	*z = -1.8200*	*0.0680*
AB test AR(2) (p-value)	*z = -.69844*	*0.4849*	*z = -.78300*	*0.4336*

Note: The table reports the regression output from GMM estimation of the bank profitability determinants. Coefficients that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. Sargan test is the test for over-identifying restrictions in GMM dynamic model estimation. AB test AR(1) and AR(2) refer to the Arellano-Bond test that average auto covariance in residuals of order 1 and order 2 is 0 (H_0: no auto correlation).

Notably, we found significant negative coefficient of equity to total assets (E/TA) ratio proving our in- deterministic hypothesis discussed in section 2.3.2.2. That means increases in the amount of equity subsequently decrease the ROE. We also confirmed the profit persistence state in the sample region as the lagged ROE is positive and significant and SCP hypothesis still in effect in South Asian banking when we considered ROE as the measure of bank profitability.

2.6 Conclusion and implications

Using a comprehensive cross-country unbalanced panel data set with micro and macro level variables, this paper presents the empirical results on how bank specific, industry specific and macroeconomics specific factors affect the bank profitability. We followed the single stage model of profit determinants for the empirical study that included four South Asian countries' that is Bangladesh, India, Nepal and Pakistan banking sector data covering the period of 1997-2012. Our empirical findings are consistent with our theoretical analysis. Among the bank specific determinants, we found that equity level which is the proxy of financial strength and the recurring earning power of a bank positively affects its profitability. On the other hand, liquidity position of a bank, funding gap, cost of fund and productivity ratio found negatively and significantly affect banking profit. We found no evidence to support for the traditional SCP hypothesis as the proxy variable HHI was insignificant. Among the macroeconomic determinants we found the term spread of interest rate and macroeconomic growth rate of a country negatively influence bank profitability while inflation affect that positively.

The novel feature of our study is we successfully traced the significant deterministic role of managerial excellence in the name of recurring earning power on which previous literature paid little attention. Though it is low but significantly positive profit persistency behavior in the sample region justify our use of GMM estimator, an up-to date econometric methodology that we effectively addressed the issues that profits show a tendency to persist over time, reflecting impediments to market competition, informational opacity and/or sensitivity to regional/macroeconomic shocks. Our empirical result also shows that a late-hit of the global financial crisis affected the banking profitability in the South Asian countries.

Regarding the policy implications, we suggest the banks to take appropriate actions so that the credit risk would have appropriate reflection in banking profit as we found no significant negative

impact of default probability on banking profit that is contradictory to the established theory. Another issue for both the bank management and the regulatory authority to implement the digitalization and through to the state to electronic banking as the productivity ratio shows negative impact on banking profit indicating inefficient manpower. Hoping these initiatives will benefit the society as a whole. In this paper, we comprehensively addressed the question of how microeconomic and macroeconomic forces affect banking profitability. However, studies on a number of additional explanatory variables like corporate tax rates, competition among banks and other financial institutions, ownership structure, deposit insurance, rate of unemployment, information asymmetry, and portfolio effect, those could not be tested due to limitation of data and the degrees of freedom or for the potential multicollinearty problem, would be tested as the extension of the model. Implementing contemporary econometric methodology in the model would be fruitful insight of the literature and apparently an interesting path for future research.

Appendix

Table-2-5: Correlation matrix for the variables used in bank profitability study*

	roa	roe	eta	npltl	ladstf	cof	opnoem	rep	gtd	lnta	ld	tiitr	nniita	hhi	ltint	inf	gdp
roa	1.00																
roe	-0.02	1.00															
eta	-0.14	-0.01	1.00														
npltl	-0.39	-0.52	-0.02	1.00													
ladstf	-0.03	-0.02	0.33	0.06	1.00												
cof	-0.37	-0.24	0.36	0.31	-0.24	1.00											
opnoem	0.21	0.36	0.17	-0.33	0.03	0.02	1.00										
rep	0.78	0.25	-0.03	-0.44	-0.05	-0.29	0.48	1.00									
gtd	0.00	-0.01	0.01	0.04	0.11	-0.09	-0.05	0.01	1.00								
lnta	-0.03	0.11	-0.23	-0.04	-0.56	0.06	0.07	0.03	-0.17	1.00							
ld	0.04	-0.02	0.20	-0.02	0.04	0.11	-0.02	0.08	0.01	-0.09	1.00						
tiitr	-0.06	0.00	-0.10	-0.04	-0.12	0.06	-0.06	-0.11	-0.01	0.13	-0.05	1.00					
nniita	-0.49	-0.23	0.29	0.37	0.26	0.14	-0.49	-0.68	0.04	-0.16	-0.03	0.07	1.00				
hhi	0.10	0.08	-0.02	-0.20	0.25	-0.07	0.13	0.04	0.07	-0.40	-0.01	-0.06	0.00	1.00			
ltint	0.12	0.14	-0.11	-0.15	0.25	-0.38	-0.01	0.14	0.03	-0.42	0.01	-0.10	-0.18	-0.02	1.00		
inf	-0.17	-0.18	0.25	0.29	-0.01	0.34	0.00	-0.17	0.04	0.19	0.05	0.07	0.33	-0.01	-0.31	1.00	
gdp	0.08	0.08	-0.13	-0.31	-0.27	-0.11	0.03	0.04	0.09	0.34	-0.05	0.02	-0.24	-0.13	-0.23	-0.39	1.00

*Output of Stata

** Refer to the table -2 of descriptive statistics for elaboration of the names of the variables

Chapter 3

The Determinants of Bank Net Interest Margins: A Panel Evidence from South Asian Countries[14]

3.1 Introduction

Existence of net interest margins (NIMs) or spread is the fundamental factor of banking as the financial Intermediary business. Spread is the difference between the weighted average of yields on assets (interest revenue) and liabilities (interest expense) - also called the bankers' mark-up (Allen, 1988). However a very high or low and volatile spread can cause severe bank management problem and can create distrust among the stakeholders of the banking business. There may be a strong relationship between the higher spreads and higher default rate. Again from bankers' perspective, there may be trustworthy causes to charge higher margins as the wealth maximizer candidate in the economy. From the societal perspective, the higher the interest margins, the lower will be the social welfare. So, regularly updating our knowledge on interest margin determinants is valuable for number of reasons including monitoring changing

[14] This chapter is based on the paper published with Nishiyama, Shin-Ichi, as co-author, titled The determinants of bank net interest margins: A panel evidence from South Asian countries, in the *Research in International Business and Finance* 37, May 2016, pp. 501-514. Elsevier, http://dx.doi.org/10.1016/j.ribaf.2016.01.024

trends in bank efficiency through time and evaluating whether bank margins are providing effective price signals to market players (Hawtrey and Liang, 2008).

In line of the Ho and Saunders' (1981) dealership model of banking where the banks receive deposits funds at random intervals, and subsequently, utilize these funds to satisfy stochastically received loan request has been studied for many years by different scholars in extended formats. Allen's (1988) studies on portfolio effects on spreads and Saunders- Schumacher's (2000) considerations for regulatory components, a market structure component and a risk premium component to determine the net interest margins of bank are notable. Angbazo (1997) studied the dealership model in single stage, considering the credit risk and also interest rate risk. Maudos and Guevara (2004) extended the dealership model viewing banks as the firm considering the operating expenses explicitly into account.

Kunt and Huizinga (1999) found that a larger ratio of bank assets to gross domestic product and a lower market concentration ratio lead to lower margins, controlling for differences in the bank activity, leverage and the macroeconomic environment in their 80 cross-country sample study. Bernanke, Gertler and Gilchrist (BGG) (1999) in their dynamic general equilibrium model to clear the credit market frictions in business fluctuations and Gertler and Kiyotaki (2011) in their macroeconomic paper on financial intermediation and credit policy in business cycle analysis also discussed about the effect of net worth of banking firms and default probability and their impact on margin determination.

In this paper, we tested the dealership model and its later extensions of bank interest margin determinants in case of four South Asian countries that is Bangladesh, India, Nepal and Pakistan, using fixed effect panel of 230 banks data for the period of 1997 to 2012. We viewed each

country's banking sector in terms of a single representative agent and interested in margin determination on national basis. We studied the explanatory variables of interest margins classifying as bank specific, industry specific and macroeconomics specific and incorporated new bank specific variable the relative size of the bank which we found significantly and inversely affect net interest margins of banks. In our empirical model, we included 15 deterministic variables which seems a populous model of interest margin determinants in terms of number of variables. Selection of our sample was also notable on the ground that most of our sample countries (Bangladesh, India and Pakistan) were under the rule of British colony for around two hundred years. Central banks of the respective countries regulate the Banking systems and formulate policies for the smooth functioning of the schedule commercial banks. In the sample countries both nationalized and private commercial banks along with foreign, specialized, regional and cooperative commercial banks are operating their banking business. For details, in Bangladesh, 4 nationalized and 39 private commercial banks are operating their banking business. Whereas in India, Nepal and Pakistan the number of nationalized commercial banks is 27, 5 and 7, while the private commercial banks are 93, 30 and 66, respectively. We got the opportunity to study those countries' banking systems all –together considering likely regulatory, social and economic environments. The similarities of the countries gave us opportunity to test our theoretical model empirically using fixed effect panel regression. We also ran country-wise fixed effect panel regression and presented in the paper along the base line regression result. In the near past we found similar studies[15] on developed and developing

[15] Kunt and Huizinga(1999) studied 80 developed and developing countries, Saunders and Schumacher's (2000) studies included USA and six EU countries, Maudos and Guevara (2004) studied 5 European countries. Also Afanisieff (2002) and Williams (2007) studied determinants of net interest margins on Brazilian and Australian banks respectively among others.

countries of USA, Europe, Australia and Latin America but in case of South Asia, this study is a unique addition to the literature of the determinants of bank net interest margins.

We organized the rest of the paper as follows: in section 2, we presented relevant literature on the determinants of net interest margins. In section 3 the empirical approach of our study and in section 4 the sample description has been outlined. In section 5 the result and finally in section 6 we presented the conclusion and policy implications of our study.

3.2 Theoretical background of the determinants of bank net interest margins

Starting point of bank net interest margins determinants can be attributed to the dealership model of Ho and Saunders (1981) as an extension of the hedging hypothesis and the expected utility approach. In their landmark initiative, they proposed the two stage model of interest margin determination. In stage one; they argued the existence of 'pure spread' as the price of providing immediacy of services in face of the uncertainty generated by asynchronous deposit supplies and loan demands. In stage two; they attempted to measure the amount of pure spread by considering number of imperfections and regulatory restrictions. According to the model, pure spread is the difference between the bank lending rate (P_L) and the deposit rate (P_D). As there exist transaction uncertainty, banks set their interest rates as a margin relative to the interest rate of the money market (p). These happens as,

$$\mathbf{P_D = p - a} \text{ and } \mathbf{P_L = p + b}$$

Where *a* and *b* are the margins for the provision of immediacy services. Thus, as the risk averse, utility maximizer, bank's pure spread (*S*) could be determined as follows:

$$S = P_L - P_D = a + b \quad \text{.....Equation (3-1)}$$

Lerner (1981) criticized the dealership model that it failed to recognize the bank as a firm having a certain production function associated with provision of the intermediation services. The presence of cost inefficiencies associated with the production process across banks can have a distortionary effect on the margin. The extension of the basic dealership model by Maudos and Guevara (2004) responded to this criticism by explicitly incorporating the role of operating costs and providing a detailed description of the link between riskiness and the margin in their one stage model of interest margin determinants which covered the data of 5 European countries to prove the model empirically.

Allen (1988) expanded the dealership model from a structure with one kind of loan and deposit to loans and deposits with many maturities that is the 'portfolio effect' apparent to margin determination. Angbazo (1997) studied the net interest margins of commercial banks reflect both default and interest rate risk premia. The study also showed that banks with more risky loans and higher interest rate risk exposure would select loan and deposit rates to achieve higher net interest margins and cross sectional differences in interest rate risk and liquidity risk are related to differences in off-balance sheet exposure.

Saunders and Schumacher (2000) conducted an international study on USA and European banks for the net interest margin determination for 1988-1995 period and found that implicit interest payments, opportunity cost, capital to asset ratio, market power and interest rate volatility affect net interest margins positively but they omitted any proxy variable for risk aversion and size of transaction in their model. Afanasieff et al. (2002) used a panel regression of 142 Brazilian banks and found that size of bank, opportunity cost and operating cost are

positively related to interest margins but a set of macroeconomic variables such as the market interest rate, the volatility of market interest rate, inflation rate and output growth heavily affect margins as well.

Valverde and Fernandez (2007) applied Ho and Saunders dealership model to a multi-output framework and showed that the relationship between bank margins and market power varies significantly across bank specializations. They conducted empirical studies for a sample of 19,322 European banks from Germany, Spain, France, the Netherlands, Italy, the UK and Sweden and found that market power increases as output becomes more diversified towards non-traditional activities. Hawtrey and Liang (2008) studied the determinants of bank interest margins using panel data covering the banking sector of fourteen OECD countries and found that national banking industry interest margins are influenced by market power, operational cost, risk aversion, interest rate volatility, credit risk, volume of loans, implicit interest payments and also quality of management. With a particular emphasis on the bank ownership structure, Fungacova and Poghosyan (2011) conducted empirical studies using panel data on the interest margin determinants in the Russian banking. They found that the impact of a number of commonly used determinants such as market structure, credit risk, liquidity risk and size of operations differs across ownership structure of banks but influence of operational cost and risk aversion are homogeneous. Among others, Tarus et al. (2012) studied the determinants of net interest margins of commercial banks in Kenya using pooled and fixed effect panel covering the period of 2000-2009. They found that operating expenses, credit risk and inflation are positively and market concentration and economic growth are negatively related to the net interest margins. Pasiouras et al. (2007) studied the banking margins of 15 EU countries while using DEA approach, Stewart

et. al. (2016) studied the efficiency of Vietnamese banking and found that the large and private banks are more efficient than the small and medium sized and the state owned banks.

In the literature of the determinants of interest margins of banks, we also recognize the studies of Bernanke, Gertler and Gilchrist (BGG, 1999). Another seminal study was conducted by Gertler and Kiyotaki (2011) where their macroeconomic viewpoint on the interest margin is that so called risk aversion or the net-worth position of banks negatively and the default risk positively influences the net interest margins of banks.

We got the motivation for our present study by the inconclusive nature of the empirical literature of the determinants of net interest margins of banks. We want to focus on the determinants of net interest margins by adding new variable the relative size of banks and also incorporating the explanatory variables both microeconomic and macroeconomic in the past literature in our contemporary cross-country study. A prior cross country study was conducted by Kunt and Huizinga (1999) using global 80 countries' data over the period 1988 to 1995, however their particular concern was exogenous influences such as macroeconomic indicators, tax rates and the degree of international ownership, all of which found significantly related to interest margins. Complementing their works, our study results, reported here focus on both microeconomic and macroeconomic determinants of the net interest margins of banks.

3.3 Empirical Approach of the study on the determinants of net interest margins

3.3.1. Econometric Model

The general model to be estimated for the determinants of net interest margins (NIMs) of banks in South Asian countries is of the following linear form:

$$\mathbf{NIM_{it}} = \mathbf{c} + \sum_{\mathbf{j=0}}^{\mathbf{J}} \boldsymbol{\beta}_{\mathbf{j}} \mathbf{X}_{\mathbf{it}}^{\mathbf{j}} + \sum_{\mathbf{l=0}}^{\mathbf{L}} \boldsymbol{\beta}_{\mathbf{l}} \mathbf{X}_{\mathbf{it}}^{\mathbf{l}} + \sum_{\mathbf{m=0}}^{\mathbf{M}} \boldsymbol{\beta}_{\mathbf{m}} \mathbf{X}_{\mathbf{it}}^{\mathbf{m}} + \boldsymbol{\varepsilon}_{\mathbf{it}} \qquad \mathbf{where,}\ \boldsymbol{\varepsilon}_{\mathbf{it}} = \boldsymbol{\nu}_{\mathbf{i}} + \boldsymbol{\upsilon}_{\mathbf{it}} \quad \text{.....Equation (3-2)}$$

Where, NIM_{it} is the net interest margin of bank i at time t where i = 1,.....,N, t = 1,....., T and c is a constant term. The superscripts *j, l* and *m* of X_{it} denote the bank-specific, industry specific and macroeconomic specific determinants respectively. ε_{it} is the disturbance with ν_i the unobserved bank-specific effect and υ_{it} the idiosyncratic error. The error components of the regression model also distributed as $\nu_i \sim IIN(0, \sigma_\nu^2)$ and independent of $\upsilon_{it} \sim IIN(0, \sigma_\upsilon^2)$.

We precede the following four step issues for the econometric model of NIM determinants.

Firstly, we tested our data for non- stationarity using the Fisher test which does not require a panel to be balanced. This test is a question when the use of a relatively large T in a model of net interest margins may be criticized on grounds of non-stationarity. The null of non-stationarity has been rejected at 1% level for every variable (see appendix table-3-8).

Secondly, we conducted Chow test ($H_0: \beta_1 = \beta_2$) to check for the structural break of the coefficients from our panel data if any. We divided our panel data into two sub-samples[16] where sub-sample1 consist observations from 1997 to 2007 and sub-sample 2 from 2008 to 2012

[16] We also conducted the Chow test dividing our sample at any point of time and found no evidence of statistically significant structural break.

because of the global financial crisis started from 2008 and found the null $H_0: \beta_{1997-2007} = \beta_{2008-2012}$ of the coefficients do not differ and could not be rejected at 1% level of significance (see appendix table 3-9).

Thirdly, we examined whether the individual effects are fixed or random. The relevant Hausman test (the null hypothesis that the individual effect and the explanatory variables are uncorrelated) for equation 2 confirms the evidence in favor of a FE modeling[17]. Also the estimation result confirms the existence of individual effect since the F-statistics is significant (F (149, 934) = 12.36 with p-value is 0.0000).

Fourthly, to continue with the fixed effect modeling of the net interest margins determination, we conducted the tests for endogeneity with suspect that non-performing loans possibly has the problem but we treated exogenous in our model. We performed the Durbin and Wu-Hausman tests after fitting the model with instrumental variable two-stage least square (IV2SLS) regression that assume the error term is i.i.d and the null of which is the variables are exogenous. We also conducted the Wooldridge test score that allow the robust variance after fitting the model with IV2SLS regression that provide statistics for the particular variable endogeneity and that based on the regression. In every cases (Durbin, Wu-Hausman and Wooldridge), we could not reject the null of exogenous and tested our model using fixed effect estimator because in absence of possible endogeneity, the use of IV or GMM against FE is the inevitable loss of efficiency (Baum et al. 2003) (see appendix table 3-10 for the details of the test statistics).

[17] The relevant Hausman test chi-squared statistics was $\chi^2, 17 = 50.31$ with p-value is 0.0000

Finally, we addressed the unobserved time effects in the error components of our model as follows:

$$\mathbf{NIM_{it}} = \mathbf{c} + \sum_{\mathbf{j=0}}^{\mathbf{J}} \boldsymbol{\beta}_{\mathbf{j}} \mathbf{X}_{\mathbf{it}}^{\mathbf{j}} + \sum_{\mathbf{l=0}}^{\mathbf{L}} \boldsymbol{\beta}_{\mathbf{l}} \mathbf{X}_{\mathbf{it}}^{\mathbf{l}} + \sum_{\mathbf{m=0}}^{\mathbf{M}} \boldsymbol{\beta}_{\mathbf{m}} \mathbf{X}_{\mathbf{it}}^{\mathbf{m}} + \boldsymbol{\varepsilon}_{\mathbf{it}} \quad \textbf{where, } \boldsymbol{\varepsilon}_{\mathbf{it}} = \boldsymbol{\nu}_{\mathbf{i}} + \boldsymbol{\lambda}_{\mathbf{t}} + \boldsymbol{\upsilon}_{\mathbf{it}} \text{ .....Equation (3-3)}$$

Where λ_t is the unobservable time effect and we tested the joint significance of time effects as $\boldsymbol{H_0 = \lambda_2 = \lambda_3 = \lambda_T = 0}$. The relevant LM test[18] approves the inclusion of time dummies. We experimented for time dummies for all years jointly and separately but found the year dummies 2007 and 2008 are significant. Considering all these, we estimated the determinants of net interest margins by the following fixed effect panel equation:

$$\mathbf{NIM_{it}} = \mathbf{c} + \sum_{\mathbf{j=0}}^{\mathbf{J}} \boldsymbol{\beta}_{\mathbf{j}} \mathbf{X}_{\mathbf{it}}^{\mathbf{j}} + \sum_{\mathbf{l=0}}^{\mathbf{L}} \boldsymbol{\beta}_{\mathbf{l}} \mathbf{X}_{\mathbf{it}}^{\mathbf{l}} + \sum_{\mathbf{m=0}}^{\mathbf{M}} \boldsymbol{\beta}_{\mathbf{m}} \mathbf{X}_{\mathbf{it}}^{\mathbf{m}} + \boldsymbol{\gamma} \mathbf{D_{07}} + \boldsymbol{\gamma} \mathbf{D_{08}} + \boldsymbol{\varepsilon}_{\mathbf{it}}$$

$$\textbf{where, } \boldsymbol{\varepsilon}_{\mathbf{it}} = \boldsymbol{\nu}_{\mathbf{i}} + \boldsymbol{\upsilon}_{\mathbf{it}} \text{ .....Equation (3-4)}$$

3.3.2. Variables

The econometric model developed in the section 3.3.1 to determine the net interest margins of banks in the South Asian countries requires proxy variables to prove the model empirically. We have used 3 categories if explanatory variables namely (i) bank specific, (ii) industry specific and (iii) macroeconomic specific variables also summarized in table 1 below. In total we used 15 explanatory variables of which 11 are bank specific, 1 industry specific and 3 macroeconomic specific.

[18] The relevant LM test chi-squared statistics was χ^2, 12 = 3.27 with p-value= 0.0003.

3.3.2.1. Dependent variable

Net interest margins (NIM): In our econometric model of determinants of net interest margins, net interest margins (NIM) is the dependent variable. We defined net interest margins of a bank as the difference between interest income and interest expense divided by total assets.

Table-3-1: Description of variables used in the study of net interest margins determinants of banks

Variables	Description	Expected effect
Dependent variable: Net interest margins (NIM)	Difference between interest income and interest expense over total assets	
Independent variables		
(a). Bank-specific variables		
i. Relative size of the bank	Ratio of total assets of a bank to the total assets of the banking industry	-
ii. Non-performing loan (NPL)	Non-performing loan to total loan ratio	+
iii. NPL* SDint	NPL times SD of short term interest rates	+/-
iv. Liquid assets to total assets ratio	Liquid assets to total assets ratio	+
v. Equity to total assets ratio	Equity to total assets ratio	+
vi. Total loan to total deposit	Total loan to total deposit ratio	+
vii. Log (loan)	Log (loan)	+
viii. Net non-interest income ratio	Non-interest expense less non-interest revenue over total assets	+
ix. Reserve ratio	Reserve to total assets ratio	+
x. Operating expenses to total assets ratio	Operating expenses over total assets ratio	+
xi. Operating expenses to Gross income ratio	Operating expenses over gross income ratio	+
(b). Industry-specific variables		
xii. Hirschman-Herfindahl index	Sum of square of market share is a proxy for market structure variable	+/-
xiii. CR3	Concentration ratio of top 3 banks assets to industry assets	+/-
(c). Macroeconomic-specific variables		
xiv. SD of short term interest rate	Annualized standard deviation of monthly average of daily call money rates	+
xv. Rate of inflation	Annual rate of inflation (%)	+
xvi. Growth rate of GDP	Real economic growth rate as a % change in GDP	-

3.3.2.2. Explanatory variables:

(a) Firm specific explanatory variables

(i) Relative size of the bank:

Relative size of the bank is used as the proxy variable of information asymmetry in our econometric model of determinants of net interest margins. We want to see how information asymmetry affects the net interest margins of banks. But it is hard to find the information asymmetry variables from the disclosed chapters of the bank information from their financial statements. Then we aimed to characterize banks as small and large (relative size) in terms of their holding of assets. We calculated the relative size of the bank as the ratios of total asset of bank *i* to the total banking industry asset of the economy. Relative size of the bank in our model as explanatory variable, answers the question of whether the large banks are charging more or less in relation to the small banks or not. Our hypothesis is that, holding others remaining constant, the relative size of the bank affect the net interest margin inversely.

(ii) Non-performing loan (NPL):

Non-performing loan to total loan which actually the default risk of bank *i* has been used as the explanatory variable in our model. We defined impaired loans as the non-performing loans. Many of the past literature expressed this variable as credit risk or default risk and calculated differently. For example, Ho and Saunders (1981) used default premium (DPi) as the ratio of net loan chargeoffs to total earning assets in their two stage model of determining net interest margins of banks. Maudos and Guevara (2004) proxied credit risk as loans to total assets ratio. According to the Bank for International Settlements (BIS, 1999) loans are the largest and most obvious source of credit risk for most banks but we think this approach is too pessimistic to

measure the credit risk for banks. However, this is natural for banks to charge additional on the initial margins on lending if the borrower's probability of being default is high. We expect ceterus paribas, a positive relationship between non-performing loan and the net interest margins.

(iii) Interaction between non-performing loan (NPL) and Standard deviation of short term interest rate (SDint):

This interaction variable has been used in our econometric model of determining the net interest margins of banks to see whether they are jointly affect the dependent variable or not. Use of this variable has been supported by the previous literature for example Maudos and Guevara (2004), Hawtrey and Liang (2008) among others.

(iv) Liquid asset to total asset ratio:

Following Angbazo (1997), we used the variable liquid asset but calculated differently for our modeling. Angbazo (1997) used liquid asset to liabilities to proxy for the liquidity risk as the determinant of net interest margins. However, in our model, liquid asset (extracted from the Bank Scope database as the total earning assets) to total asset is a proxy for the liquidity position of the bank. We argue that banks are not only provider of liquidity on demand to the liability side but also on the asset side in the form of providing loan commitments and so on. Banks whose liquidity position is better than others may charge extra margins on the loans they provide. For this, a positive sign is expected.

(v) Equity to total asset ratio:

The variable measures the capitalization of a bank considering the regulatory requirements regarding the minimum equity holdings. Following McShane and Sharpe (1985), we also used equity to total asset ratio as the proxy of degree of risk aversion of banks. Among others, Saunders and Schumacher (2000), Maudos and Guevara (2004) used the variable in the same way but Hawtrey and Liang (2008) used different approach to calculate the risk averseness of the banks by dividing securities plus other assets by volume of loans.

Regarding the relationship between equity to total asset ratio and the net interest margins of banks, we found contrast literature in the past. Macroeconomic stream like Gertler and Kiyotaki (2011) framework argued that the rise in net worth (equity) relative to the capital stock reduces the expected default probability, everything else equal. The underlying economics of that proposition is that banks can charge lower margins where default probability is lower.

On the other hand, mainstream banking and finance literature expect positive sign arguing that customers are willing to bear (pay for) bank regulatory taxes in return for the positive externality related to bank monitoring. That is 'banks are special' and customers are willing to pay for that specialness (as cited by Saunders and Schumacher, 2000). To address the systematic risk and other regulatory reasons, banks maintain certain equity level. So, everything remains constant, the risk averse bank tends to charge more as the interest margins. Hence, we expect the positive relationship between equity to total asset ratio and the net interest margin of bank.

(vi) Total loan to total deposit ratio:

Differences in the standard deviations of deposit strength and the loan strength (long run relationship) explain the heterogeneity in bank's price setting behavior (Gambacorta, 2008). In our model of determinants of net interest margins of banks, we applied this total loan to total deposit ratio as the explanatory variable to see whether the funding strength (how much of the total loan have been financed through deposit and other sources of funding) has any significant deterministic power to banks' price setting or in other words net interest margins. In this study, we expect positive sign between total loan to total deposit ratio and the net interest margin of bank.

(vii) Log (loan):

Ho and Saunders (1981) showed that size of transaction and banks' interest margins are positively related. Maudos and Guevara (2004) also stated that banks apply large margins on sizable volume of loans. But the reality is different. We see big-loan-customers enjoy special discounted rate (prime rate) on their borrowings. Also, banks enjoy the economies of scale benefit of processing and maintenance cost of big loans which reduces banks operating cost to revenue. As Hawtrey and Liang (2008) expected negative relationship between log (loan) and interest margins arguing that increased volume of loans should result in a reduction of unit costs, which achieves economies of scale and results in narrower margins. Again, McShane and Sharpe (1985) assumed that size of the transaction is invariant across trading banks and time. We used the logarithm of total loan as the proxy for size of operation or so called *scale effect* in our model and expect positive relationship between log (loan) and net interest margin of a bank.

(viii) Net non-interest income:

Modern banking and their services have been expanded in many folds so their sources of income and heads of expenditures. A bank incurs cost of deposits as the largest volume of interest expenses and the interest income on loans as the largest volume of interest income. Other than the interest income that is the non-interest income may include service and penalty charges, capital gain on assets sales, property leasing etc. On the other hand, expenses not included in the cost of deposits like almost all operating and overhead costs will be included as non-interest expenses.

Net non-interest income as the proxy for implicit interest payment and an explanatory variable to determine the net interest margin of banks can be found in many previous literature. Among others, Ho and Saunders (1981), Angbazo (1997), Saunders and Schumacher (2000) calculated this as the net non-interest income (non-interest expense less non-interest revenue) divided by earning assets whether Maudos and Guevara (2004) expressed the same as the percentage of total assets. We followed the later approach and expected that, everything else remaining constant, an increase in the net non-interest income will affect a bank's net interest margin positively.

(ix) Reserve to total asset ratio:

Portion of deposits that a bank must hold but cannot lend out is the required reserve. This is one of the regulatory variables of central banks to conduct monetary policy. Although, this safeguards the depositors against sudden *run out of banks* but for banks, holding every penny from the deposit amount reduces the loanable funds so as reduce the probability of earning more

interest income on loans or from investing in the financial markets. The larger the volume of required reserve, the greater will be the opportunity cost. In our econometric model of determinants of net interest margins of banks, we used *cash and due from banks* from bank scope database as the proxy measure for required reserve. Our hypothesis is, holding other things remaining constant, the larger the volume of required reserve of a bank, the more will be the net interest margin.

(x) Operating expenses to total assets ratio:

Operating expenses of a bank includes non-interest expenses like overhead and administrative cost, maintenance of properties and others. Controlling for these costs promotes efficiency of the bank and enhances the competitiveness as well. Among others, Kunt et. all. (1999), Maudos and Guevara (2004), Hawtrey and Liang (2008) studied the effect of overhead expenses on determining interest margins of banks. We also employed the operating expenses to total asset ratio in our model to see how this variable affect the net interest margins of a bank. Principally, if a bank's unit operating expenses is relatively higher (less efficient), that bank will try to compensate that by charging additional on the regular margins. So, a positive sign has been expected.

(xi) Operating expenses to gross income ratio:

Operating expenses to gross income ratio captures the bank management's efficiency showing the amount of expenses for every one dollar of income generated to the firm. According to Angbanzo (1997) as well as Maudos and Guevara (2004) the higher the quality of

management of a bank, the higher the interest margins that will be imposed by the bank, on the ground that a high quality of administration implies a high yield and low cost composition of assets and liabilities. On the other hand Gischer and Juttner (2002) argued inverse relationship between the quality of management and the net interest margins of banks but failed to prove their hypothesis empirically. In our empirical model of determinants of net interest margins, our hypothesis is that bank may charge higher margins for their excellent service offered to the customers.

(b) Industry specific explanatory variable

(xii) Hirschman-Herfindahl index:

We used the Hirschman-Herfindahl Index (HHI) in our econometric model of determinants of net interest margins of banks to find out the relationship between market concentration and the net interest margins in South Asia. Hirschman-Herfindahl index has been defined as the sum of squares of individual bank asset shares in the total banking sector assets for a country. This is a common and widely used measure of market concentration where higher market concentration means lower competition and vice versa. Past literature has contrasting views regarding the relationship between market concentration and interest margins of banks. Most of the recent studies[19] on the developed countries found positive sign coefficient for the variable. But Hesse (2007) and Fungacova and Poghosyan (2011) who studied Kenyan and Russian banking respectively found negative relationship between market structure and the net

[19] Angbanzo (1997), Saunders and Schumacher (2000), Maudos and Guevara (2004), Williams (2007) for reference.

interest margins of banks. We expected positive relationship between the market concentration and net interest margins of banks supportive to the Ho and Saunders' (1981) proposition that, if a bank faces relatively inelastic demand and supply functions in the markets in which it operates, it may be able to exercise monopoly power by demanding a greater spread than it could get if banking markets were competitive.

(c) Macroeconomics specific explanatory variables

(xiii) Standard deviation of short term interest rate (SDint):

Past literature used variety of measures to proxy for the volatility of interest rates and its impact on the net interest margins of banks, including rates on short term money market rates to medium and long term capital market rates. For our model of determinants of net interest margins of banks, we used the annualized standard deviation of monthly average of daily call money rates. Based on the monthly average of the daily call money rates, we have calculated the annual standard deviation. We also assumed that there will be positive impact of the SDint on the net interest margins of banks.

(xiv) Rate of inflation:

Although there is no empirical consensus on the effects of inflation on interest margins, high inflation rates are generally associated with high interest rates and therefore, higher interest margins. Even if inflation is not anticipated by banks, in the short term interest rates may not reflect the increased inflation, but in the medium and long term, banks will adjust their interest rates to compensate for the inflation premium and will increase the interest margins (Tarus et al.,

2012). Kunt et al. (1999) found a positive relationship between inflation and the net interest margins in their study with global evidences from 80 countries. On the other hand, Abreu and Mendes (2003) found inverse relationship between rate of inflation and net interest margins of banks on a cross country study of Portugal, Spain, France and Germany. Our hypothesis is rate of inflation affect net interest margins positively.

(xv) Growth rate of gross domestic product (GDP):

Growth rate of GDP or economic growth rate of a country is important variable to influence the determinants of net interest margins of banks. Growth rate of GDP affect directly the demand and supply of deposits and loans and thus the banking activities. Kunt et al. (1999), Tarus et al. (2012) studied the importance of economic growth rate to determine bank interest margins and found inverse relationship. We also argue that economic growth brings prosperity to the economy. Investors find various scope of investment and create green fields for the banks for financing. Banks can do business in a relatively ease environment and thus may charge little as interest margins. Hence, our hypothesis is that growth rate of GDP significantly and negatively affects net interest margins of banks.

3.4 Sample and data description of the study

In our econometric model of the determinants of net interest margins of banks, we studied 230 banks of four countries in South Asia between 1997-2012 periods to test the model empirically. By countries, India represents 53% banks in our total sample while Bangladesh, Nepal and Pakistan represent 14%, 13% and 20% respectively. We defined banks as the financial intermediary who takes deposits and provide loans and advances in the ordinary courses of business. We excluded the data of Islamic banks from our sample as in India and Nepal there is no or very limited Islamic banking operation. For our analyses, we collected data from various sources. The dependent variable and the bank specific explanatory variables, we collected data from the *Bureau Van Dijk's Bank Scope database* (Bank Scope 2013) using the universal model of banking database. We took the primary data set from the Bank Scope but calculated by our own to get the Herfindahl Index and Concentration Ratio (CR3) which we used as the industry specific explanatory variables in the baseline model and also to perform the robustness check. Finally, for macroeconomics specific variables, we collected data from two sources. We collected the data regarding interest rate volatility from the *central banks websites* of the respective countries included in our study. We took the monthly averages of the daily call money rates and later calculated the annual standard deviation at our own. From *International Financial Statistics (IFS) database (IFS 2014)*, we collected yearly data of rate of inflation and the growth rate of gross domestic product (GDP).

Table-3-2 in the following presents the summary statistics of the determinants of net interest margins. In South Asian countries, in our study period, average net interest margin was 2.98% with 3.28% standard deviation. Relative size of the bank was 3.21% and the non performing loan rate was 8.1% on an average. Liquid asset to total asset ratio averaged 86.02%

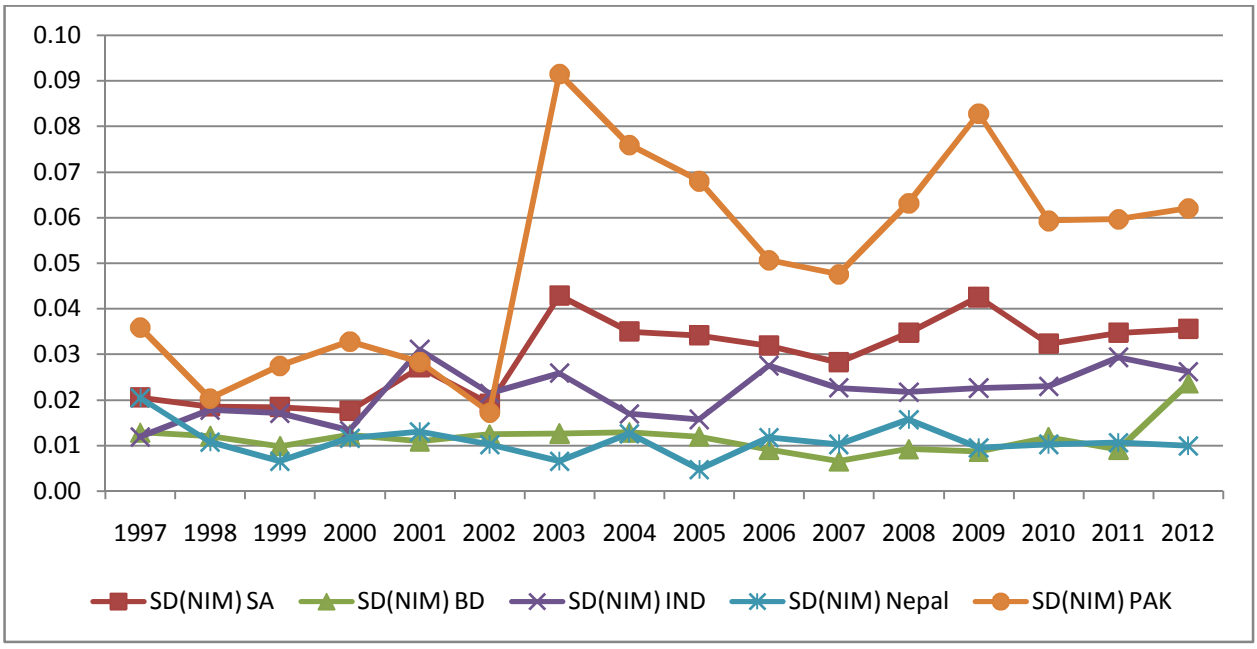
whereas equity to total asset ratio average was 11.58% with 13.36% standard deviation. Among others, average required reserve ratio was 5.64% and operating expense to total asset ratio was 2.98% on an average.

Average value of Herfindahl Index 0.1398 indicates the existence of sound competitive banking environment in the South Asian countries. Average rate of inflation was slightly more than 7% and South Asian nations grew about 6% in our sample period.

Table-3-2: Summary statistics of the determinants of net interest margins in South Asia from 1997-2012

Variables	Mean	Median	Standard Deviation
Dependent Variable			
Net Interest Margins (NIM)	0.0298	0.0278	0.0328
Independent Variables			
Bank Specific			
Relative size of the Bank	0.0321	0.0100	0.0687
Non-performing Loan	0.081	0.0414	0.1045
NPL*Sdint	0.1053	0.0429	0.1805
Liquid Asset-Total Asset Ratio	0.8602	0.8866	0.1244
Equity - Total Asset Ratio	0.1158	0.0833	0.1336
Total Loan-Total Deposit Ratio	3.3642	0.7565	31.1396
Log(Loan)	2.8274	2.9015	0.9829
Net non-interest Income	0.0066	0.0065	0.0364
Reserve to Total Asset Ratio	0.0564	0.0532	0.0563
Operating Expenses - Total Asset Ratio	0.0298	0.0208	0.0484
Operating Expenses - Gross Income Ratio	1.6771	1.0000	6.0076
Industry Specific			
Hirschman-Herfindahl Index	0.1398	0.0838	0.118
CR3	0.5614	0.5412	0.1804
Macroeconomics Specific			
Standard Deviation of short term interest rate	1.3558	1.0241	1.1605
Rate of Inflation	0.0704	0.0637	0.0347
Growth rate of GDP	0.0597	0.0607	0.0227

Figure-3-1: Yearly standard deviation (SD) of net interest margins (NIM) in South Asian Countries



From figure -3-1, we observe the higher dispersion of net interest margins of banks in Pakistan and may be the lower in case of banks in Bangladesh over the sample period.

3.5 Empirical findings of the determinants of net interest margins

We used fixed effect model to capture the specific characteristics of each group, using the within-group estimator. First, we will present our baseline model result of the pooled estimation. Then robustness checking of our baseline model and in the later part of this section we will demonstrate the country-wise regression results. In all the cases, we allowed for individual heterogeneity and used robust standard error[20].

3.5.1. Baseline result

Result of our baseline model of fixed effect regression, where we assumed each country's banking sector as a single representative firm, has been presented in table 3-3. The first column of the table present the list of the dependent and independent variables but the independent variables have been presented in quite classification of bank specific, industry specific and macroeconomic specific variables respectively. Another feature of the presentation of table 3-3 is that there are two models- model 1 and model 2. Two columns of each of the model 1 and model 2 present the coefficient and robust standard error respectively. In model 1 we included the explanatory variable –relative size of the bank but excluded in model 2. We did so to see the particular effect of this variable to determine net interest margins as the previous literature ignored the importance of this variable. We found that relative size of the bank plays an important role in determining net interest margins of banks. We see the inverse relationship between the relative size of banks and the net interest margins and support our hypothesis that the larger banks charge smaller interest margins and vice versa. In particular, a 1% rise in the value of relative size of the banks would decrease net interest margins by 5 basis points. We also

[20] Confirmed by LM Heteroskedasticity test and the test statistics (p-value) are presented in the respective tables.

have confirmed the justification of inclusion of this variable in our baseline regression model by checking the R^2. In model 2, where we excluded this variable, the R^2 is 0.2559 while in model 1, where we included the variable of relative size of the banks, the R^2 is 0.2785. Non-performing loan (NPL), which also capture the so called credit risk exposure of the banking firm, found negative coefficient but statistically insignificant in our study. This result opposes the major studies in the past like Ho and Saunders (1981), Angbazo (1997), Saunders and Schumacher (2000), Maudos and Guevara (2004), Hawtrey and Liang (2008), mostly of the developed countries. This finding is also in contrast the macroeconomic framework of Bernanke, Gertler and Gilchrist (BGG) (1999) where they assumed that default probabilities and default premia rise when the aggregate return to capital is lower than expected. In counter, Williams (2007), Hesse (2007) and Fungacova and Poghosyan (2011) who studied on Australian banking, Kenyan and Russian banking respectively, found credit risk is negatively related to net interest margins.

Equity to total asset ratio (E/TA) is positively related to the net interest margins of banks with statistically significant impact. We found that if the equity to total asset ratio increases by 1% then net interest margins of banks would increase by 6 basis points. As we stated in section 3.2.1 (v) that past literature has collided expectations regarding the relationship between equity to total asset ratio and the net interest margins of banks. In the mainstream banking and finance literature expect positive sign arguing that 'banks are special' and customers are willing to pay for that specialness. In the macroeconomics literature, Gertler and Kiyotaki (2011) framework argued the rise in net worth (equity) relative to the capital stock reduces the expected default probability so banks can charge lower margins holding other things remain constant. However, result of this paper support our hypothesis that solvent banks charge higher net interest margins.

Table – 3-3: Determinants of net interest margins of banks in South Asia, 1997-2012, total sample

Variables	Model 1		Model 2	
Dependent Variable: Net Interest Margins (NIM)	Coeff.	Robust S.E.	Coeff.	Robust S.E.
Independent Variables				
Bank Specific				
Relative size of the Bank	-.0534710***	0.0162		
Non-performing Loan	-0.0189274	0.0128	-0.0207224	0.0125
NPL*Sdint	0.0037163	0.0052	0.0030803	0.0049
Liquid Asset-Total Asset Ratio	.0335484***	0.0105	.0356274***	0.0103
Equity - Total Asset Ratio	.0617174***	0.0171	.0691133***	0.0176
Total Loan-Total Deposit Ratio	0.0000466	0.0000	0.0000456	0.0000
Log(Loan)	-0.0024743	0.0023	-0.0025971	0.0022
Net non-interest Income	0.0250899	0.0763	0.020344	0.0753
Reserve to Total Asset Ratio	.0460142**	0.0194	.0595361***	0.0200
Operating Expenses - Total Asset Ratio	.2356114***	0.0887	.2254025**	0.0868
Operating Expenses - Gross Income Ratio	0.000009	0.0000	0.000014	0.0000
Industry Specific				
Hirschman-Herfindahl Index	-.0123611***	0.0042	-.0115318**	0.0045
Macroeconomics Specific				
Standard Deviation of short term interest rate	0.0001399	0.0003	0.0002134	0.0003
Rate of Inflation	0.0025375	0.0161	0.0119517	0.0170
Growth rate of GDP	-.0300378*	0.0173	-.0339689*	0.0174
Year 2007 (Dummy)	-.0032401***	0.0008	-.0034266***	0.0008
Year 2008 (Dummy)	-.0019203**	0.0008	-.002483***	0.0009
Constant	0.0000242	0.0120	-0.004565	0.0117
Number of observations	*1101*		*1101*	
R^2	*0.2785*		*0.2559*	
Wald test (p value)	*F (17, 149) = 7.32*	*(0.0000)*	*F (16, 149) = 7.62*	*(0.0000)*
Hausman Test, χ^2 (p-value)	*50.31*	*(0.0000)*	*30.84*	*(0.0058)*
LM Heteroskedasticity test, χ^2 (p-value)	*3.30E+05*	*(0.0000)*	*3.90E+05*	*(0.0000)*

Note: The table reports the regression output from Fixed Effect estimation of the net interest margins determinants. Coefficients that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. Wald test is the test for the goodness of fit of the model while Hausman test confirm the justification of using fixed effect estimator and LM heteroskedasticity test justify the use of robust standard error for the models.

Total loan to total deposit (TL/TD) ratio which captures the funding channel(s) of the banks for loans and advances found positive coefficient but insignificantly related to the net interest margins of banks. Log (Loan) which also be termed as the size of the operation of banks has insignificant relationship to the net interest margins of banks according to our baseline study on South Asian banking. This outcome fails to prove our initial hypothesis that size of operation and net interest margins of banks are positively related. But South Asian banking scenario seems different from the hypothesis. Net non interest income (the ratio of the difference between non-interest expense and non- interest revenue to total asset) found to be insignificant.

Reserve to total asset ratio and net interest margins of banks are positively related and the relationship is statistically significant. The result is also supportive to the baseline dealership model of net interest margins determination of Ho and Saunders (1981) and also the subsequent expansion and their studies of the model so as our initial hypothesis that everything else constant, increase in cost of reserve will cause increase in interest margins of banks. That is if the bank's cost of holding regulatory reserve increases, banks subsequently shift that cost burden to the customers. Economically speaking, a 1% rise in the required reserve ratio will increase the net interest margins by 4 basis points. We found positive and statistically significant relationship between operating expense to total asset ratio and the net interest margins of banks in our South Asian banking studies. The baseline result states that a 1% increase in operating expense to total asset ratio will raise the net interest margins by 23 basis points. The variable covers the level of efficiency of a bank. We proved our hypothesis that efficient banks (here in our study, in terms of cost or cost efficiency) may charge lower margins or in other way, customers are paying higher to the less efficient banks in South Asia. Operating expenses to gross income ratio or the quality of management found insignificantly related to the net interest margins of banks.

Market structure (Hirschman-Herfindahl index) of banking in South Asian countries and net interest margins of banks are inversely related and found statistically significant. This result disproves our initial hypothesis that higher market concentration will create scope for charging higher interest margins for banks. This divert outcomes of the studies may arise question regarding the significant differences in the market structures of the different economic background economies and their impact on determination of net interest margins for their banking market.

Among the macroeconomics specific variables, we found standard deviation of short term interest rate (SDint) and the rate of inflation have no significant relationship in determining the net interest margins of banks. Growth rate of Gross Domestic Product (GDP) and net interest margins are negatively and statistically significantly related. That is if the economy grows at 1% then we can expect a 6 basis points reduction in the net interest margins of banks. The economics of thinking so is that when GDP grows, economic expansion also becomes visible. In that expansionary economy bank can expand their business and thus will be able to charge less form their customers. Finally we found the year dummies for 2007 and 2008 are statistically significant and inverse sign indicates net interest margins of banks for these particular years went down in the South Asian banking industry.

3.5.1 Robustness check

Table 3-4 presents the robust result of our baseline model of determinants of net interest margins. We conducted the robustness check for our baseline model by using the Concentration Ratio (CR3) as an alternative measure of Hirschman-Herfindahl index (HHI). CR3 has been calculated as the ratio of assets of largest 3 banks to the total asset of the banking industry (Fungacova at all, 2011).

However, using CR3 as an alternative measurement of market structure, we found no change in signs and no significant change in values of the coefficients of the explanatory variables. The reported estimation results, presented in table 3-4, confirm that the results obtained for the baseline model remain valid.

Table – 3-4: Robustness check for the determinants of net interest margins of banks in South Asia, 1997-2012, total sample (using CR3 as alternative of Hirschman-Herfindahl Index)

Variables	Model 1		Model 2	
Dependent Variable: Net Interest Margins (NIM)	Coeff.	Robust S.E.	Coeff.	Robust S.E.
Independent Variables				
Bank Specific				
Relative size of the Bank	-.0586098***	0.017506		
Non-performing Loan	-0.017594	0.012426	-0.019163	0.012063
NPL*Sdint	0.004189	0.005031	0.003455	0.004775
Liquid Asset-Total Asset Ratio	.0331235***	0.010382	.035481***	0.010053
Equity - Total Asset Ratio	.0624012***	0.016311	.0705259***	0.016957
Total Loan-Total Deposit Ratio	0.000046	0.000039	0.000045	0.000039
Log(Loan)	-0.001357	0.002186	-0.001405	0.002129
Net non-interest Income	0.030981	0.074349	0.026406	0.073516
Reserve to Total Asset Ratio	.0446023**	0.019820	.0591119***	0.020614
Operating Expenses - Total Asset Ratio	.2301797**	0.089439	.2182878**	0.087492
Operating Expenses - Gross Income Ratio	0.000001	0.000027	0.000008	0.000029
Industry Specific				
CR3	-.0076967***	0.002924	-.0067789**	0.003077
Macroeconomics Specific				
Standard Deviation of short term interest rate	-0.000066	0.000329	-0.000005	0.000331
Rate of Inflation	0.003139	0.013590	0.012003	0.013779
Growth rate of GDP	-.0357376**	0.015798	-.0401286**	0.015634
TE 2007	.0044404***	0.001490	.0042731***	0.001504
TE 2008	.0022103*	0.001192	.0021938*	0.001180
Constant	-0.000422	0.012313	-0.006095	0.011881
Number of observations	*1101*		*1101*	
R^2	*0.2766*		*0.2490*	
Wald test (p value)	*F (17, 149) = 6.88*	*(0.0000)*	*F (16, 149) = 7.62*	*(0.0000)*
Hausman Test, χ^2(p-value)	*64.89*	*(0.0000)*	*28.52*	*(0.0027)*
LM Heteroskedasticity test, χ^2 (p-value)	*9.60E+07*	*(0.0000)*	*2.20E+07*	*(0.0000)*

Note: The table reports the regression output from Fixed Effect estimation of the net interest margins determinants. Coefficients that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. Wald test is the test for the goodness of fit of the model while Hausman test confirm the justification of using fixed effect estimator and LM heteroskedasticity test justify the use of robust standard error for the models.

3.5.2 Country-wise regression result

We estimated the explanatory equation of the determinants of net interest margins of banks for each of the country's banking sector included in our baseline model. Our aim was to see the country variation due to differences in legislative, supervisory or the institutional context (if any) and their impact on determining the net interest margins. Another intention to do so as our fixed effect regression model does not determine the country specific variation (if any) by using country dummies in the regression equation. Table 3-5 presents the regression output of the determinants of net interest margins with country wise variation. We found the relative size of the bank significantly determine the net interest margins in Nepalese banking as the coefficient is statistically significant bearing inverse sign as of the base line regression model.

Non-performing loan positively and significantly affect the net interest margins in Bangladesh and Nepal but in Pakistan it's effect is negative while in India it has no deterministic effect. We also found evidence of joint effect of non-performing loans and the short term money market rates on the net interest margins in Bangladesh as the coefficient of NPL*Sdint is significantly negative. Liquid asset to total asset ratio found significant and positively determine the net interest margins of banks in Bangladesh and Pakistan but the evidence nullified the case for India and Nepal. Equity to total asset ratio found highly significant and positively related to net interest margins in each of the country's banking systems. Economically speaking, for every 1 percent increase of equity to total assets ratio will increase net interest margins by 9, 5, 7 and 6 basis points in Bangladesh, India, Nepal and Pakistan respectively. Total loan to total deposit ratio is positively and significantly determine the net interest margins of banks in India, Nepal and Pakistan. Log (loan) plays significant and positive role in the banking market of Bangladesh and Nepal. Net non interest income is positively and significantly related to net interest margins

of banks in Bangladesh and India. Whatever the margins in the banking markets of Bangladesh and India, can be attributed to this variable largely. For every 1 percent increase in net non interest income will result about 56 and 24 basis points increase in net interest margins in Bangladesh and India respectively. For Nepal, the impact of net non interest income on determining interest margins of banks is negative and statistically significant. In Pakistan, this is insignificant. Regulatory requirement of reserve to total asset ratio positively affect the net interest margins of banks in all of the countries in the sample study but found statistically significant for Bangladesh and Pakistan.

Operating expenses to total asset ratio is highly significant and has positive impact to determine net interest margins of banks in all the countries included in our study. In Bangladesh and Nepal, lion's share of the net interest margins is determined by this variable. For every 1 percent increase in operating expense to total asset ratio, interest margins will increase by around 71, 28, 62 and 26 basis points in Bangladesh, India, Nepal and Pakistan banking markets respectively. Also the operating expenses to gross income ratio negatively and significantly affect the net interest margins of banks in Bangladesh. According to the country specific regression, evidence found that the traditional Structure-Conduct-Performance (SCP) hypothesis still exists in the banking market of Pakistan where Hirschman-Herfindahl index i.e. the market structure negatively and significantly affect the interest margins of banks.

Table – 3-5: Country-wise regression of determinants of net interest margins of banks, 1997-2012, total sample

Variables	Bangladesh		India		Nepal		Pakistan	
Dependent Variable: Net Interest Margins (NIM)	Coeff.	Robust S.E.	Coeff.	Robust S.E.	Coeff.	Robust S.E.	Coeff.	Robust S.E.
Independent Variables								
Bank Specific								
Relative size of the Bank	-0.0276	0.0210	-0.0485	0.0440	-.062838**	0.0237	-0.0279	0.0225
Non-performing Loan	.029126*	0.0163	-0.0023	0.0149	.068874*	0.0394	-.046664*	0.0244
NPL*Sdint	-.0063269*	0.0033	0.0005	0.0061	0.0000	0.0195	0.0229	0.0156
Liquid Asset-Total Asset Ratio	.10574***	0.0380	-0.0023	0.0084	0.0430	0.0259	.13199***	0.0337
Equity - Total Asset Ratio	.099904**	0.0414	.051556***	0.0189	.078885**	0.0366	0.0641*	0.0432
Total Loan-Total Deposit Ratio	0.0028	0.0120	.0000274***	0.0000	.0084326**	0.0040	.0017042***	0.0003
Log(Loan)	.015516**	0.0069	-0.0021	0.0033	.010997*	0.0055	-0.0053	0.0068
Net non-interest Income	.56968***	0.1104	.24567***	0.0647	-.8017***	0.2563	-0.0035	0.1131
Reserve to Total Asset Ratio	.10648**	0.0446	0.0105	0.0224	0.0264	0.0310	.14432**	0.0643
Operating Expenses - Total Asset Ratio	.70804**	0.2733	.28296***	0.0905	.62391**	0.2571	.26181*	0.1404
Operating Expenses - Gross Income Ratio	-.030709***	0.0070	0.0000	0.0000	0.0007	0.0004	0.0000	0.0001
Industry Specific								
Hirschman-Herfindahl Index	0.0003	0.0211	0.0034	0.0126	0.0012	0.0033	-.03227*	0.0168
Macroeconomics Specific								
Standard Deviation of short term interest rate	0.0004	0.0003	-.0009908**	0.0004	-0.0006	0.0009	-0.0028	0.0020
Rate of Inflation	-0.0425	0.0288	-0.0146	0.0172	-.050598*	0.0271	0.0233	0.0359
Growth rate of GDP	.075896**	0.0278	-0.0065	0.0156	0.0616	0.0977	-.13236*	0.0677
Constant	-.12521***	0.0444	.027925**	0.0107	-0.0472	0.0284	-.07802*	0.0406
Number of observations	131		597		123		250	
R^2	0.7945		0.2950		0.5678		0.4854	
Wald test (p value)	F (15, 27) = 484.65	0.0000	F (15, 65) = 13.24	0.0000	F (15, 22) = 2231.12	0.0000	F (15, 32) = 135.23	0.0000
Hausman Test, χ^2 (p-value)	118.21	0.0000	31.86	0.0000	37.22	0.0020	163.09	0.0000
LM Heteroskedasticity test, χ^2 (p-value)	31951.19	0.0000	4559.92	0.0000	3169.69	0.0000	530000	0.0000

Note: The table reports the regression output from Fixed Effect estimation of the net interest margins determinants. Coefficients that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. Wald test is the test for the goodness of fit of the model while Hausman test confirm the justification of using fixed effect estimator and LM heteroskedasticity test justify the use of robust standard error for the models.

Among the macroeconomic specific variables, we found short term interest rate (SDint) is significant and negatively related to net interest margins of banks in India although the coefficient is not so large. Rate of inflation significantly and negatively affect the net interest margins of banks in Nepal but insignificant for other countries although the sign of the coefficient is negative for Bangladesh and India and positive for Pakistan. The coefficient of the growth rate of GDP is positively significant for Bangladesh and the opposite for Pakistan while found statistically insignificant to determine the net interest margins of banks in India and Nepal.

3.6 Conclusion and implications of the study

We studied a comprehensive cross –country panel data set with bank-level, industry-level and macroeconomic –level explanatory variables and present the empirical results on how bank specific, industry specific and macroeconomics specific factors affect the interest margins of banks. We started from the dealership model of Ho and Saunders (1981) and later extension by other authors but followed the single stage model of margin determination and included four South Asian countries' that is Bangladesh, India, Nepal and Pakistan banking sector data covering the period of 1997-2012. Our empirical findings are consistent with our theoretical analysis. Among the bank specific determinants, we found the liquid asset to total asset ratio, equity to total asset ratio, reserve to total asset ratio and operating expenses to total asset ratio are positively related and the relative size of the bank is negatively related to the interest margins of banks. Unfortunately our result does not support significant relationship between non-performing loan or the default risk and the interest margins.

A negative concentration effect found in the South Asian banking may be due to the high concentration of the foreign banks those charge lower interest margins. A market characterized by foreign banks has lower interest margin because of superior management or production technology (Tarus et al. 2012). However, the macroeconomic variables like standard deviation of interest rate and the rate of inflation found insignificantly related to interest margins. But the economic growth has significant and negative relationship with bank interest margin which suggest that national economic prosperity provides sound interest margin compensation to the banks. We conducted our panel empirical study employing both fixed effect and random effect estimations but fixed effect model performs better and generates the preferred specification. Robust standard error has been incorporated for the base line model, the robustness check and the country-wise regression which ensure the correct inferences from the estimation.

Regarding policy implications, we suggest the banks to take appropriate actions so that the default probability would have proper reflection in determining the interest margins. For the regulatory bodies, we recommend liberal policy actions for new entrants that could contribute to the improvement of the competitive environment in the industry in order to reduce the cost of financial intermediation to facilitate the society as a whole.

In terms of directions for future research, studies on a number of additional explanatory variables like the competition among banks and other financial institutions, ownership structure, deposit insurance, information asymmetry, portfolio effect would be tested as the extension of the model. Due to limitation of data and the degrees of freedom or for the potential multicollinearty problem, we could not have fruitful insight of the literature but doing such could be apparently an interesting path for future research.

Appendix:

Table: 3-6: Empirical findings regarding some key determinants of banks net interest margin in the past literature

Authors	Angbanzo	Saunders & Schumacher	Demirguc-Kunt & Huizinga	Maaudos & Guevara	Williams	Hesse	Fungacova & Poghosyan
Year	1997	2000	2000	2004	2007	2007	2011
Journal/Working paper	JBF	JIMF	WB Econ Review	JBF	FMII	WB Policy Research Paper	Economic Systems
Market Structure	+	+	+	+	+	-	-
Credit Risk/Non-performing loan	+	N/A	+	+	-	-	-
Sample	USA	Germany, Spain, France, UK, Italy, Switzerland, USA	80 countries worldwide	France, Germany, Italy, Spain	Australia	Nigeria	Russia
Estimation Method	GLS	Cross-sectional OLS for each year	Pooled WLS	FE OLS	Pooled OLS, GLS Random effects OLS	Pooled OLS, FE OLS, Median LS	FE OLS

Note: +, -, and? Indicate positive significant, negative significant and insignificant respectively.

Table: 3-7: Correlation matrix*of the variables studied for the model of bank net interest margins determinants

Variables**	npl	npl*SDint	lr	eta	tltd	lln	nnii	re	oeta	oegi	share	hhi	cr3	SDint	inf	gdp	_cons
npl	1.00																
nplsdint	-0.50	1.00															
lr	0.33	-0.07	1.00														
eta	0.33	-0.01	0.12	1.00													
tltd	-0.02	0.01	-0.01	-0.02	1.00												
lln	0.22	0.04	-0.14	0.22	-0.02	1.00											
nnii	0.02	-0.03	-0.09	0.10	0.00	-0.28	1.00										
re	0.18	0.01	0.56	0.13	0.01	-0.05	-0.10	1.00									
oeta	-0.08	0.04	0.11	-0.08	-0.01	0.28	-0.66	0.06	1.00								
oegi	-0.05	0.02	-0.05	0.00	0.00	-0.01	0.04	-0.03	-0.05	1.00							
share	-0.05	-0.05	0.05	0.19	0.00	0.00	-0.03	0.19	-0.05	0.03	1.00						
hhi	-0.01	-0.03	-0.07	0.08	-0.01	0.16	-0.02	-0.06	0.01	-0.02	0.03	1.00					
cr3	-0.02	0.05	0.03	-0.09	0.01	-0.13	0.06	0.02	-0.07	0.05	0.03	-0.77	1.00				
sdint	0.33	-0.60	0.09	-0.06	-0.02	-0.05	0.05	-0.10	-0.06	-0.01	0.04	-0.15	0.09	1.00			
inf	0.03	-0.01	0.18	-0.22	0.00	-0.56	0.07	0.12	-0.10	0.00	0.15	-0.19	0.29	-0.01	1.00		
gdp	0.08	0.12	0.00	0.07	-0.05	0.02	0.04	-0.08	0.02	0.06	-0.06	0.14	-0.21	-0.11	-0.03	1.00	
_cons	-0.46	0.05	-0.78	-0.28	0.01	-0.29	0.21	-0.57	-0.27	0.03	-0.12	0.08	-0.11	-0.07	-0.04	-0.07	1.00

Note: *Output of Stata and ** refer to the table -1 of summary statistics for elaboration of the names of the variables

Table: 3-8: Test of non-stationarity of the variables used in the study

Variables	χ^2	*P-value*
Relative size of the Bank	1379.24	0.0000
Non-performing Loan (NPL)	1056.91	0.0000
NPL*Sdint	616.64	0.0000
Liquid Asset-Total Asset Ratio	1069.58	0.0000
Equity - Total Asset Ratio	1036.23	0.0000
Total Loan-Total Deposit Ratio	1112.83	0.0000
Log(Loan)	725.24	0.0000
Net non-interest Income	1226.79	0.0000
Reserve to Total Asset Ratio	1250.44	0.0000
Operating Expenses - Total Asset Ratio	1269.96	0.0000
Operating Expenses - Gross Income Ratio	1499.26	0.0000
Hirschman-Herfindahl Index	615.74	0.0000
Standard Deviation of Short term interest rate (Sdint)	1552.23	0.0000
Rate of Inflation	1252.47	0.0000
Growth rate of GDP	730.61	0.0000

Note: The table presents the Augmented Dickey Fuller test (Fisher type, which does not require a panel to be balanced) results where the null of non-stationarity have been rejected for all the variables at 1% level of significance.

Table: 3-9: Chow test result

Variables	*F-Stat.*	*P-value*
Relative size of the Bank	3.66	0.0423
Non-performing Loan (NPL)	1.66	0.1995
NPL*Sdint	0.49	0.4842
Liquid Asset-Total Asset Ratio	4.90	0.0236
Equity - Total Asset Ratio	3.64	0.0301
Total Loan-Total Deposit Ratio	1.04	0.3092
Log(Loan)	0.01	0.9422
Net non-interest Income	0.09	0.7596
Reserve to Total Asset Ratio	4.99	0.0270
Operating Expenses - Total Asset Ratio	4.63	0.0210
Operating Expenses - Gross Income Ratio	0.02	0.8981
Hirschman-Herfindahl Index	2.64	0.1438
Standard Deviation of Short term interest rate (Sdint)	0.02	0.8758
Rate of Inflation	0.26	0.6136
Growth rate of GDP	5.61	0.0246

Note: The table represents the F statistics of Chow test the null of which is H_0: $\beta_{1997-2007} = \beta_{2008-2012}$ could not be rejected at 1% level of significance.

Table: 3-10: Test for endogeneity

Variables	*Statistics*	*P-value*
The Durbin (score), $\chi^2(1)$	0.182476	0.6693
Wu-Hausman F statistics, F (1, 1083)	0.179522	0.6719
Wooldridge statistics for the robust score, $\chi^2(1)$	0.081248	0.7756
Wooldridge statistics for the robust regression, F (1, 1083)	0.08101	0.7760.

Note: The table represents the relevant test statistics for the non-performing loans in the net interest margins model and the null that the variables are exogenous could not be rejected.

Chapter 4

The determinants of non-performing loans: dynamic panel evidence from South Asian countries

4.1 Introduction

Prolonged existence of non-performing loans (NPL) in the bank balance sheet causes the severe bank management problems as it not only deteriorate the asset quality of the bank but also reduce its earning and moral hazard problems between the bank and its funding channels mostly attributed to the depositors. On the other hand, high levels of NPL in the economy also signal the bankruptcy possibilities of the borrowers resulting the worsening of business environment and economic conditions of a country. Due to rapid globalization and financial liberalization, the role of banks' in the economic development of a country increased in many folds. But the problems of non-performing loans saddle a bank and cause the prolonged economic stagnation of a country or even the global financial crisis. Reinhart and Rogoff (2010) pointed that NPL can be instrumented as the signal of banking crisis. Hence, this area of research of the problems and the determinants of non-performing loans of banks is equally and in increased importance to the

academics and the researchers in present and as it was in the past. Understanding the factors determining the NPLs and solving for those is important to the bank management and the regulatory bodies in order to apposite functioning of the bank and to rehabilitate the economy.

Over the past decades, majority of the research on the determinants of non-performing loans viewed NPLs as the functions of macroeconomic and bank specific determinants. Macroeconomic views of the determinants of NPL focus primarily on the macro-prudential factors. Fundamentals of the theoretical relationships between the NPL and the macroeconomic factors can be found in the Bernanke, Gertler and Gilchrist (BGG, 1998) framework of 'financial acceleration' and later expansion by Gertler and Kiyotaki (2011) where credit market is pro-cyclical and the role of asymmetric information and frictions affect the credit market. Rinaldi and Sanchis-Arellano (2006) found household disposable income; unemployment and monetary conditions have strong relationship with non-performing loans in the European Union banking.

Literature of the microeconomic determinants of non-performing loans emphasizes on the bank-specific factors. Berger and DeYoung (1997) analyzed the Granger-causality relationship between the NPLs and his so called 'bad luck', 'bad management', 'skimping' and 'moral hazard, where the empirical variables were cost efficiency and the capital adequacy. Among others, Williams (2004) followed the Berger and DeYoung hypotheses and came out the same kind of relationship in the European banking.

Salas and Saurina (2002) studies of Spanish banking during 1985 to 1997, found that along with macroeconomic factors the bank specific variables also explain the future changes in NPLs of banks. Similar strand of literature include Louzis et al. (2012), who studies the determinants of NPL in Greek banking. However, no single study was out of criticism due to

insufficiently selection of variables or failure to implement the appropriate econometric methodology (Athanasoglu, 2008).

We study the determinants of bank non-performing loans as a function of macroeconomic factors, industry specific factors and the bank specific factors using the Generalized Methods of Moments (GMM) estimator for the panel data of 259 banks in the South Asian countries (Bangladesh, India, Nepal and Pakistan) for 1997 to 2012.

This paper will be interesting to the concern researchers, readers, management personnel and the policy makers as we showed that 'adverse selection' of borrowers by the bank in case of credit selection causes higher non-performing loans. We found the individual bank's lending rate positively affect the bad loan ratio not the macroeconomic policy rates. Charging higher rates, bank set aside the safe side borrowers as they cannot afford and create rooms for the borrowers whose business type is high-risk high-return; that could result the higher non-performing loans.

This study empirically showed that in addition to the Berger and DeYoung's (1997) 'moral hazard' hypothesis between the shareholders and the bank management; another 'moral hazard II' between the depositors and the bank management also affect the credit quality of a bank. We showed that when a bank having excess liquidity, its management feels the cost of liquidity burden and disburse loans and advances without proper screening and ultimately mounting the higher ratio of non-performing loans. In other words, depositors, as a third party cannot monitor the cost of excess liquidity but facing the moral hazard problems as a result of bad loans contracts.

The sample selection for this study was also notable on the ground that most of our sample countries (Bangladesh, India and Pakistan) were under the rule of British colony for

around two hundred years. We got the opportunity to study those countries' banking systems all –together considering likely regulatory, social and economic environments. In the near past we found similar studies on developed and developing countries of America, Europe, and Asia but in case of South Asia, this study is a unique addition to the literature of the determinants of bank non-performing loans.

For the rest of the paper, we organized as follows: in section 2, we presented relevant literature on the determinants of bank non-performing loans. In section 3 the empirical approach of our study and in section 4 the sample description has been outlined. In section 5 the result and finally in section 6 we presented the conclusion and policy implications of our study.

4.2 **The literature of the determinants of non-performing loans**

The literature in the past viewed the determinants of bank non-performing loans (NPL) as a function of bank specific and macroeconomic factors. The bank specific factors may be termed as the microeconomic variables and can be directly found in the financial statements of a bank. On the other hand, the macroeconomic variables are the overall economic, regulatory and legal environment within which a bank operates its business. Extensive literature review found the three streams of literature on the determinants of non-performing loans are macroeconomic stream, microeconomic stream and the synthesis of macro and microeconomic stream.

Studies on the macroeconomic determinants of non-performing loans focus on the external events such as the overall macroeconomic conditions, which are likely to affect the borrowers' capacity to repay their loans. The classical literature studying the interactions between the macroeconomic environment and financial fundamentals are the models developed by Bernanke and Gertler (1989), Kiyotaki and Moore (KM, 1997), Bernanke, Gertler and

Gilchrist (BGG, 1998) and Gertler and Kiyotaki (GK, 2011). BGG (1998) developed the framework of 'financial accelerator' where credit markets are pro-cyclical and the role of asymmetric information between the borrowers and lenders affect the credit market shocks whereas KM (1997) and GK (2011) models allow the business cycle fluctuations and the role of frictions in case of credit market imperfections, respectively.

Rinaldi and Sanchis-Arellano (2006) studied the macroeconomic determinants of the non-performing loans of 7 European Union countries and found strong relationship between the credit risk and the household disposable income, rate of unemployment and the monetary conditions of a country. Ali and Daly (2010) investigated that the same set of macroeconomic conditions affect the default rates of Australia and the US banking differently but the later one found to be more sensitive. The problem of NPL found to be positive to the increase in the nominal interest rates and the number of bankruptcies and negative to the higher CPI inflation, economic growth and property price inflation in Hong Kong, according to the studies of Shu (2002).

Bohachova (2008) found the pro-cyclical nature of default risk where the banks accumulate risks more rapidly in economically good times and some of these risks materialize as asset quality deterioration during recessions in the OECD countries. In the same line, Nkusu (2011) empirically studied the panel of 26 advanced economies and found that macroeconomic vulnerabilities deteriorate the credit portfolios of banks. Espinoza and Prasad (2010), in their dynamic panel estimates over 1995-2008 period of GCC countries showed the persistence of non-performing loans and the inverse relationship with economic growth and the interest rates. Castro (2013) employed dynamic panel data approach to study the macroeconomic determinants of credit risk in Greece, Ireland, Portugal, Spain and Italy (GIPSI) and found that credit risk is

negatively affected by the GDP growth rate and the share and housing price indices but positively affected by the unemployment rate, interest rate, credit growth and an appreciation of the real exchange rate. Skarica (2014) found the primary cause of high levels of NPL is the economic slowdown and deterioration in the state of employment and inflation in the seven central and Eastern European countries in the period of Q:3 2007 and Q:3 2012.

Group of literature on microeconomic determinants of non-performing loans were interested more at the variability of NPL across banks attributes to the bank level factors. Berger and DeYoung (1997) evidenced the four mutually non-exclusive two-way causalities over the default risk in their studies of the US commercial banks during the period of 1985-94. They found that 'bad luck', 'bad management', 'skimping' and 'moral hazard' could affect the same bank at the same time. They argued that, bad luck could befall a poorly managed bank that also happens to be skimping on loan monitoring costs and for any loss of capital due to these factors, banks respond to moral hazard incentives and take increased risks. Williams (2004), Podpiera and Weil (2008) and Louzis, Vouldis and Metaxas (2010) studies follow the Berger and DeYoung (1997) hypotheses and came out with same kind of results who studied the European savings banks, Czech banks and Greek banking sectors for different time periods, respectively.

Keeton and Morris (1987) found that banks taking higher risk including in the form of excess lending eventually incur greater losses. In a comparative study of the credit risk determinants of banks in the developed and the emerging economies, Ahmad and Ariff (2007) found that regulatory capital and the management quality significantly determine banks credit portfolios.

As the synthesis of macroeconomic and the microeconomic determinants of non-performing loans, Salas and Saurina (2002), using the GMM estimation technique for the panel data from 1985-1997 of Spanish commercial and savings banks found that GDP growth rate, firm and family indebtedness, rapid past credit or branch expansion, inefficiency, portfolio composition, size, net interest margins, capital ratio and the market power significantly affect the credit risk of a bank. In a similar kind of study, Louzis et al. (2012) found that along with GDP growth rate and unemployment rate, inefficiency and performance indicators also greatly explain the credit problems of Greek banking sector. Rajan and Dahl (2003) found the terms of credit and macroeconomic and business conditions affect the NPLs in the Indian banking. Festic and Repina (2011) studied the five EU countries (Bulgaria, Romania, Estonia, Latvia and Lithuania) and found that macroeconomic slowdown and skimping on loan supervision are important for the deterioration of credit quality.

Among others Zribi and Boujelbene (2011) concluded that the macro prudential policies and the regulatory capital and ownership structure significantly affect the NPL of Tunisian banks. Chaibi and Ftiti (2015) studied the French and German banking sector and found a set of macroeconomic variables like GDP growth, interest rate, unemployment and exchange rate along with the bank specific variables like loan loss provisions, inefficiency and the firm size affect the non-performing loans ratio of the banks.

This study focuses on the synthesis of the macroeconomic and the bank specific determinants of non-performing loans of banks in the South Asian countries. We extended the literature of the determinants of non-performing loans by empirically showing that instead of macroeconomic policy rates, the individual bank's lending rate and the information asymmetry between the depositors and the bank is prominently determine the NPL. In this study, the panel

data of 259 commercial banks for the period of 1997-2012 which is relatively large that we studied empirically will allow the better insight into the factors determining the banking credit risk.

4.3 Empirical Approach of the determinants of non-performing loans study

4.3.1. Econometric Model

We viewed the determinants of non-performing loans as the function of bank-specific (p), industry specific (q) and the macroeconomic specific (r) variables.

NPL = f {p (.), q (.), r (.)} and the fitted linear equation will be in the following form:

$$\mathbf{NPL_{it}} = \mathbf{c} + \sum_{\mathbf{p=0}}^{\mathbf{P}} \boldsymbol{\beta}_{\mathbf{p}} \mathbf{X}_{\mathbf{it}}^{\mathbf{p}} + \sum_{\mathbf{q=0}}^{\mathbf{Q}} \boldsymbol{\beta}_{\mathbf{q}} \mathbf{X}_{\mathbf{it}}^{\mathbf{q}} + \sum_{\mathbf{r=0}}^{\mathbf{R}} \boldsymbol{\beta}_{\mathbf{r}} \mathbf{X}_{\mathbf{it}}^{\mathbf{r}} + \boldsymbol{\varepsilon}_{\mathbf{it}}$$

$$\textbf{where, } \boldsymbol{\varepsilon}_{\mathbf{it}} = \boldsymbol{\nu}_{\mathbf{i}} + \boldsymbol{\upsilon}_{\mathbf{it}} \text{ .....Equation (4-1)}$$

In the equation 4-1, NPL_{it} is the ratio of non-performing loans of bank i at time t where i = 1, ..., N, t = 1,....., T and c is the constant term. The superscripts *p, q* and *r* of X_{it} denote the bank-specific, industry specific and macroeconomic specific determinants respectively. ε_{it} is the disturbance with ν_i , the unobserved bank-specific effect and υ_{it} the idiosyncratic error. In the model we assumed the error term is distributed as $\nu_i \sim IIN(0, \sigma_\nu^2)$ and independent of $\upsilon_{it} \sim IIN(0, \sigma_\upsilon^2)$.

Salas and Saurina (2002) and Louzis et al. (2012) among the recent studies on the determinants of non-performing loans observed the significant time persistence behavior of NPL. The behavior of time persistence can be captured by adding the one-period lagged term of the dependent variable as one of the independent regressors. In that dynamic setting, our model looks as:

$$\mathbf{NPL_{it}} = \mathbf{c} + \boldsymbol{\delta}\mathbf{NPL_{i,t-1}} + \sum_{\mathbf{p=0}}^{\mathbf{P}} \boldsymbol{\beta}_{\mathbf{p}}\mathbf{X}_{\mathbf{it}}^{\mathbf{p}} + \sum_{\mathbf{q=0}}^{\mathbf{Q}} \boldsymbol{\beta}_{\mathbf{q}}\mathbf{X}_{\mathbf{it}}^{\mathbf{q}} + \sum_{\mathbf{r=0}}^{\mathbf{R}} \boldsymbol{\beta}_{\mathbf{r}}\mathbf{X}_{\mathbf{it}}^{\mathbf{r}} + \boldsymbol{\varepsilon}_{\mathbf{it}} \qquad \text{..Equation (4-2)}$$

In equation 4-2, $\mathrm{NPL}_{\mathrm{i,t-1}}$ is the one-period lag of non-performing loans and the coefficient δ capturing the speed of adjustment. A value of δ in between 0 and 1 implies the level of persistence of non-performing loans.

According to Baltagi (2001), in a dynamic type relationship when T gets relatively smaller the use of fixed effect (FE) or the random effect (RE) modeling produce biased and inconsistent coefficients. Considering that point, we continue to study the determinants of non-performing loans after the experiment of following steps:

In the first step, we conducted the Fisher test for the unbalance panel where the null of non-stationarity has been rejected at 1% significance level (see appendix table 3-11). Then we performed the Hausman test for our econometric model to see whether the error components are fixed or random. Although the statistics of the Hausman test[21] favors fixed effect modeling but in presence of lagged dependent variable as the regressors in the model, the FE (within) estimator produce biased and inconsistent beta coefficients (see Judson and Owen, 1999).

[21] The relevant Hausman test chi-squared statistics was $\chi^2, 11 = 3905.20$ with p-value is 0.0000

We moved to the generalized methods of moments (GMM) estimator of the Arellano and Bond (1991) paradigm that suggest the consistency and efficiency gain can be achieved by using the instrumental variables[22]. We followed the one-step GMM estimation where the one-period lag values of the exogenous regressors have been used as the instrumental variables.

We also conducted the Sargan test to see whether the over identification assumption for the equity to total assets (E/TA) variable as endogenous is valid or not. To test so, first we considered the equity variable endogenous and then as exogenous and ran the regression. We found[23] no endogeneity problem with the equity variable and thus treated as exogenous regressors. At the end, we dealt with the unobserved time effects in the error terms as:

$$\mathbf{NPL_{it}} = \mathbf{c} + \boldsymbol{\delta}\mathbf{NPL_{i,t-1}} + \sum_{\mathbf{p=0}}^{\mathbf{P}} \boldsymbol{\beta}_{\mathbf{p}}\mathbf{X}_{\mathbf{it}}^{\mathbf{p}} + \sum_{\mathbf{q=0}}^{\mathbf{Q}} \boldsymbol{\beta}_{\mathbf{q}}\mathbf{X}_{\mathbf{it}}^{\mathbf{q}} + \sum_{\mathbf{r=0}}^{\mathbf{R}} \boldsymbol{\beta}_{\mathbf{r}}\mathbf{X}_{\mathbf{it}}^{\mathbf{r}} + \boldsymbol{\varepsilon}_{\mathbf{it}}$$

$$\textbf{where, } \boldsymbol{\varepsilon}_{\mathbf{it}} = \boldsymbol{\nu}_{\mathbf{i}} + \boldsymbol{\lambda}_{\mathbf{t}} + \boldsymbol{\upsilon}_{\mathbf{it}} \text{ .....Equation (4-3)}$$

The λ_t term in the error components capture the unobservable time effect and the null of the joint significance as $\boldsymbol{H_0 = \lambda_2 = \lambda_3 = \lambda_T = 0}$. The LM test[24] statistics approves the inclusion of time dummies. After experimenting for time dummies for all years jointly and separately, we found the year dummies 2003, 2009 and 2010 are significant. Considering all

[22] According to Baum et al. an instrumental variable must satisfy two requirements: it must be correlated with the included endogenous variable(s) and orthogonal (deviations transformed instead of differencing) to the error process.

[23] In both the cases ρ = 0.00 which means the question of endogeneity is irrelevant for capital variable in NPL modeling.

[24] The relevant LM test chi-squared (χ^2,12) statistics was = 85.73 with p-value = 0.0000.

these, we estimated the determinants of non-performing loans by the following dynamic equation:

$$\mathbf{NPL_{it}} = \mathbf{c} + \boldsymbol{\delta}\mathbf{NPL_{i,t-1}} + \sum_{\mathbf{p=0}}^{\mathbf{P}} \boldsymbol{\beta}_{\mathbf{p}} \mathbf{X}_{\mathbf{it}}^{\mathbf{p}} + \sum_{\mathbf{q=0}}^{\mathbf{Q}} \boldsymbol{\beta}_{\mathbf{q}} \mathbf{X}_{\mathbf{it}}^{\mathbf{q}} + \sum_{\mathbf{r=0}}^{\mathbf{R}} \boldsymbol{\beta}_{\mathbf{r}} \mathbf{X}_{\mathbf{it}}^{\mathbf{r}} + \boldsymbol{\gamma}\mathbf{D_{03}} + \boldsymbol{\gamma}\mathbf{D_{09}} + \boldsymbol{\gamma}\mathbf{D_{10}} + \boldsymbol{\varepsilon}_{\mathbf{it}}$$

$$\mathbf{where},\ \boldsymbol{\varepsilon}_{\mathbf{it}} = \boldsymbol{\nu}_{\mathbf{i}} + \boldsymbol{\upsilon}_{\mathbf{it}} \quad \text{.....Equation (4-4)}$$

4.3.2. Empirical determinants of non-performing loans of banks

For this empirical study of the econometric model of the determinants of non-performing loan developed in section 4.3.1, we have used 3 categories of proxy variables namely (a) firm specific, (b) industry specific and (c) macroeconomic specific (see table-4-1 for a summary of these variables).

4.3.2.1. The dependent variables

Non-performing loan ratio

We used the ratio of nonperforming loan to total loan (NPL/TL) as the dependent variable in our model. By non-performing loans, we mean the volume of impaired loans and by definition, a loan is impaired when, based on current information and events, it is probable that a creditor will be unable to collect all amounts due according to the contractual terms of the loan agreement (see FASB, 2008). Alternatively, this ratio has been used to proxy the credit risk measures in many of the past literature (see V. Castro, 2013, B. Imbierowicz et. al., 2014).

4.3.2.2. The explanatory variables

(a) Bank-specific explanatory variables

(i) Return on assets

We used return on average assets (ROA) as the proxy for the bank performance which negatively influences the levels of non-performing loans of a bank. Past performance can reflect the high quality of management (Louzis et. al., 2012), leading to a low level of NPL.

Table-4-1: Description of variables used in the study of non-performing loans of banks

Variables	Notation	Description	Expected effect
Dependent variables			
Non-performing loan ratio	NPL/TL	Non-performing loan (%) over total loan is a proxy variable for credit quality or credit risk exposed to a bank	
Independent variables			
(a). Bank-specific variables			
Return on average assets	ROA	Net income over average total assets (%)	-
xvii. Equity to total assets ratio	E/TA	Equity to total assets ratio (%) is a measure of capital adequacy of respective bank	-
xviii. Cost to income ratio	C/TI	Total cost over total revenue (%)	-
xix. Bank size	ln(TA)	Natural logarithm of total assets of a bank	-
xx. Off-balance sheet income ratio	NNII/TA	Net non-interest income over total assets (%)	-
xxi. Liquidity ratio	LA/D&STF	Liquid asset to total deposits and short term funding ratio (%) express the liquidity position of a bank	-
xxii. Growth of total loan	GTL	Annual growth rate (%) of loan	-
xxiii. Interest income to Total loan ratio	i	Total interest income over total loan (%)	+
(b). Industry-specific variables			
xxiv. Concentration ratio	CR3	Sum of total assets of largest three banks over that of the industry	-
(c). Macroeconomic-specific variables			
xxv. Standard deviation of short term interest rate	SDint	Annualized standard deviation of monthly average of daily call money rates	+
xxvi. Term spread of interest rate	R	Difference between the yields spread of 10 year and 5 year Treasury bonds, R (%)	+
xxvii. Rate of inflation	%Inf	Annual rate of inflation (%)	-
xviii. Economic growth rate	%GDP	Real economic growth rate as a % change in GDP	-

(ii) Equity to Total Assets ratio

The ratio of equity to total assets measures the capitalization strength of a bank considering the regulatory requirements regarding the minimum equity holdings. Anticipating impact of this variable on bank non-performing loan is negative as low financial capital will cause high non-performing loan (Berger and DeYoung, 1997). To address the 'moral hazard' hypothesis, when third party is bearing the risk of the excessive risk taking cost of another party but cannot easily be charge for or prevent that risk taking behavior of the bank, we expect equity to total assets ratio will significantly affect bank non-performing loan ratio.

(iii) Cost to income ratio

Cost to total income ratio is the proxy for inefficiency variable and we expect statistically significant and negative relationship to the non-performing loan. Berger and DeYoung (1997) examined different intertemporal relationships of this measured cost efficiency/inefficiency and those subsequently affect the non-performing loan of a bank. In their so called 'bad luck' hypothesis, increases in problem loans due to exogenous effects precede the decreases in measured cost efficiency whereas in 'bad management' hypothesis have the opposite temporal order where low measured cost efficiency occur before causing higher problem loans. On the other hand, according to their 'skimping' hypothesis, when management chose short run cost efficiency in exchange of long run profitability will experience the mounting of non-performing loans in their balance sheet.

(iv) Bank size

Bank size has been measured in terms of natural logarithm of a bank's total assets and assumed the predictive capacity of this variable is negative over NPL under the 'diversification' hypothesis where the theoretical argument that larger banks are mostly diversified to manage their loan portfolio and 'bad' borrowers (Zribi and Boujelbene, 2011).

(v) Off-balance sheet income

Banking business has been diversified many folds now a day. Following Louzis et. al. (2012), we examined the effect of off-balance sheet income on NPL and expect a statistically significant negative relationship. The net non-interest income (non interest expense less non-interest income) over total assets (NNII/TA) has been taken as the proxy for the off-balance sheet income and expects positive impact of this variable on non-performing loans.

(vi) Liquidity ratio

Higher liquidity ratio reduces the liquidity risk of a bank and fosters the ability of the management for loan servicing and monitoring that result the lower levels of non-performing loan. On the other hand, excess liquidity is a good proxy of moral hazard problems between the bank management and the depositors because they cannot monitor and make the management bound for effective utilization of the fund. We calculated the liquidity ratio (LA/D&STF) as the liquid assets of a bank over the deposits and short term funding in percentage form and expect a statistically significant and inverse relationship with non-performing loan.

(vii) Growth rate of total loan

One of the fundamentals of bank management is loan management which is directly related to the quality control of the credit disburse. By increasing the volume of loans, management may try to offset or reduce the ratio of non-performing loans to total loans. We expect the growth of total loan will significantly reduce the non-performing loan ratio of a bank.

(viii) Interest income to total loan ratio

We introduced the ratio of interest income to total loan as the proxy for the lending rate of a bank and how this affects the credit quality of its balance sheet. The intuition of such introduction was to compare the predictive nature of the individual lending rate and the macroeconomic policy rates. Again, higher individual bank lending rate will invite the risky borrowers whose business type is high risk- high return type because the safe side customers may not afford the higher cost of loans. In that sense, we may assume that due to the adverse selection of borrowers by the bank is one of the main reasons of higher non-performing loans. Our hypothesis is the higher the lending rate; the higher will be the default risk as such rate deteriorates the borrowers' ability and also the willingness to repay the loan.

(b). **Industry-specific variables**

(ix) Concentration ratio

Concentration ratio (CR3) is the proxy variable for the market concentration and its impact on bank non-performing loan in our empirical study. This is a common and widely used measure

of market concentration where higher concentration means lower competition and vice versa and calculated as the ratio of the sum of total assets of largest three (3) banks to that of the industry. According to the structure-conduct-performance (SCP) hypothesis, banks in highly concentrated markets earn monopoly rents, because they tend to collude (Gilbert, 1984) and thus deteriorate the market competition. We expect the negative influence of higher concentration on NPL because in absence of perfectly competitive market scenario, borrowers may feel reluctant to repay the loans.

(c). **Macroeconomic-specific variables**

(x) Standard deviation of short term interest rate

As the proxy for the short term lending rate, we used the annualized standard deviation of monthly average of daily call money rates (SDint) and expect the positive relationship with the non-performing loan ratio of a bank.

(xi) Term spread of interest rate

Term spread of interest rate is the proxy variable for the long term interest rate in our present study. We used the difference of yield spread of 10 year and 5 year treasury bonds as the proxy of term structure of interest rate (R) and its impact on the bank non-performing loan ratio. Previous literature (see Castro, 2013, Nkusu, 2011) emphasized the impact of long term interest rate on the problem loan of a bank. An increase in the lending rate simultaneously weakens the

debt servicing capabilities of a borrower hence we expect positive relationship with NPL of a bank.

(xii) GDP growth rate

Stable Gross domestic product (GDP) growth rate represents the stability of an economy and thus affect the demand and supply of loans and deposits directly. We assume that as GDP growth ensures the stability of the economy and in that stable economic environment a borrowers' business risk reduces significantly and increases the ability of debt servicing (Salas and Saurina, 2002). We expect statistically significant inverse relationship with GDP growth and non-performing loan of a bank.

(xiii) Rate of inflation

The effect of inflation on the non-performing loan ratio of a bank is not deterministic in the past literature. Theoretically, inflation should reduce the real value of debt and hence make debt servicing easier but also high inflation may pass through to nominal interest rates, reducing borrowers' loan servicing capacity (B. Skarika, 2014). Although Rinaldi and Sanchis-Arellano (2006) reported positive relationship, following Shu (2002), we expect inflation and NPL will have statistically significant inverse relationship.

4.4 Sample and data description

In this research of the determinants of the non-performing loans of banks, we studied the unbalanced panel of 259[25] South Asian banks over the period of 1997-2012. By banks we mean the financial intermediary who takes deposits and provide loans and advances in the ordinary courses of business. We excluded the data of Islamic banks from our sample as in India and Nepal there is no or very limited Islamic banking operation. For our analyses, we collected data from various sources. The dependent variable and the bank specific explanatory variables, we collected data from the *Bureau Van Dijk's Bank Scope database* (Bank Scope 2013) using the universal model of banking database. We took the primary data set from the Bank Scope but calculated by our own to get the concentration ratio (CR3) which we used as the industry specific explanatory variables. For macroeconomics specific variables, we collected data from two sources. We collected the data of short term money market rates[26] and the term spread of interest rate[27] from the *central banks websites* of the respective countries. From *International Financial Statistics (IFS) database (IFS 2014)*, we collected yearly data of rate of inflation and the growth rate of gross domestic product (GDP).

In table-4-2 in the following the descriptive statistics of the empirical variables used in the present study has been presented. As we see in South Asia, the non-performing loan to total loan ratio was quiet high (more than 8%) in the studied period.

[25] By countries, India represents 60% banks in our total sample while Bangladesh, Nepal and Pakistan represent 12%, 10% and 18% respectively.
[26] We used the annualized standard deviation of monthly average of daily call money rates as the proxy of short term interest rates.
[27] Term structure of interest rate is proxied as the difference between the yields spread of 10 year and 5 year Treasury bonds (T-bond). Also for Nepal, we sampled the development bond yield as the equivalent to 5 year T-bond and the national savings certificates yield as equivalent to 10 year T-bond as they have no such classified maturity bonds.

Among other key indicators, ROA was around 1% and the cost to income ratio was more than 61%. Also the average equity to capital ratio was around 10% and the liquid assets to the deposit and short term funding 19.71% indicates the quiet level of solvency of the South Asian banks. Average rate of inflation was slightly higher than 7% and the South Asian nation's GDP grew more than 6% on an average during the period.

Table-4-2: Descriptive statistics of the variables of non-performing loans model

Variables	Mean	Median	Standard Deviation
Dependent Variable			
Non-performing loan ratio (NPL/TL)	8.3432	4.2800	10.4056
Independent variables			
Bank specific			
Return on Average Assets (ROA)	0.9950	1.1450	3.3746
Equity to Total Asset ratio (E/TA)	9.9883	7.0900	12.3831
Cost to income ratio (C/TI)	61.2300	48.5100	53.5445
Size (lnTA)	7.1870	7.1253	2.0547
Net non-interest income ratio (NNII/TA)	0.8788	0.6945	3.3148
Liquidity ratio (LA/D&STF)	19.7128	14.4250	28.8512
Growth rate of total loan (GTL)	26.7537	19.7450	46.5776
Interest income to total loan ratio (i)	12.4542	10.5900	19.9496
Industry specific			
Concentration ratio (CR3)	0.5598	0.5412	0.1798
Macroeconomics specific			
Short term interest rate (Sdint)	1.3430	0.9992	1.1464
Term spread of interest rate (R)	1.0741	0.6000	1.2237
GDP growth rate	6.1365	6.1800	2.2592
Rate of inflation	7.0261	6.3700	3.4116

4.5 Empirical results of the study on the determinants of non-performing loans

4.5.1. The baseline result

Table 4-3 in the following presents the GMM regression output of equation 4-4 of the determinants of non-performing loans (NPL) of the banks in South Asia for the total sample period of 1997-2012. The first column of the table presents the name of the dependent and the deterministic variables including bank specific, industry specific and macroeconomic specific while each column of model 1, model 2 and model 3 presents the coefficient and standard error respectively.

The Wald-test confirms the fine goodness of fit of our panel data set and the Sargan-test shows no evidence of over-identifying restrictions. According to the results of AB (AR1) test a negative first order autocorrelation exists but does not imply the inconsistency of the estimates. Inconsistency would imply if there is the second-order autocorrelation (Arellano and Bond, 1991) but is rejected by AB (AR2) test subsequently.

Empirical results show a moderate degree of persistence of non-performing loans in South Asian banking as the one-period lagged dependent variable (δ (one period lagged NPL/TL) = 0.3860449) is statistically significant also justify the use of GMM dynamic panel estimation of our model. This level of persistence of NPL in the South Asian region seems similar to the French and German banking market (Chaibi et. al., 2015).

Table-4-3: Determinants of non-performing loan (NPL) of banks in South Asia, 1997-2012, total sample

Variables	Model1		Model2		Model3	
Dependent variable: Non-performing loan ratio (NPL/TL)	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Independent variables						
Bank specific						
One period lagged NPL/TL	.38604***	0.03275	.38268***	0.03312	.2555***	0.04235
Return on Asset (ROAA)	-.89498***	0.08190	-.89981***	0.08228	-.85744***	0.08573
Equity to Total Asset ratio (E/TA)	-.22691***	0.04090	-.22004***	0.04128	-.25058***	0.04735
Cost to income ratio (C/TI)	-.00558*	0.00300	-.00548*	0.00301	-0.00445	0.00310
Size (lnTA)	-2.588***	0.27484	-2.6939***	0.27950	-2.2267***	0.37601
Net non-interest income ratio (NNII/TA)	-.22295*	0.13306	-.23793*	0.13396	0.04667	0.16507
Liquidity ratio (LA/D&STF)	-.04484***	0.01200	-.04534***	0.01216	-.03005**	0.01320
Growth rate of total loan (GTL)	-.04396***	0.00597	-.04433***	0.00631	-.04023***	0.00690
Interest income to total loan ratio (i)	.36009***	0.05069	.36556***	0.05105	.29436***	0.05846
Industry specific						
Concentration ratio (CR3)	-2.4719***	0.80702	-2.4921***	0.82473	-2.604**	1.14280
Macroeconomics specific						
Short term interest rate (Sdint)			-0.04647	0.07552	-0.02061	0.08061
Term spread of interest rate (R)					-0.0531	0.14793
GDP growth rate	-.35605***	0.04973	-.347***	0.05090	-.23719***	0.06644
Rate of inflation	-.08256**	0.04103	-.07584*	0.04128	-.08165*	0.04657
Year 2003 (Dummy)	1.3335***	0.35420	1.287***	0.36302	1.2001	0.93165
Year 2009 (Dummy)	.78418***	0.23774	.73405***	0.24331	.67239**	0.26626
Year 2010 (Dummy)	1.5772***	0.24039	1.5915***	0.24644	1.4354***	0.27692
Intercept	29.078***	2.48970	29.913***	2.55090	26.69***	3.36610
Number of observations	639		632		502	
Wald test (p-value)	*$\chi2(15)$ = 1675.96*	0.0000	*$\chi2$ (16) = 1646.42*	0.0000	*$\chi2$ (17) = 462.37*	0.0000
Sargan test(p-value)	*$\chi2$ (97) = 432.55*	0.0000	*$\chi2$ (97) = 425.98*	0.0000	*$\chi2$ (84) = 356.51*	0.0000
AB test AR(1)(p-value)	*z = -2.2202*	*0.0264*	*z = -2.2588*	*0.0239*	*z = -1.8947*	*0.0581*
AB test AR(2)(p-value)	*z = -2.0702*	*0.1257*	*z = -2.032*	*0.2076*	*z = -1.2372*	*0.2160*

Note: The table reports the regression output from GMM estimation of the determinants of non-performing loan of banks. Coefficients that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. Wald test shows the fine goodness of fit of the model while Sargan test is the test for over-identifying restrictions in GMM dynamic model estimation. AB test AR(1) and AR(2) refer to the Arellano-Bond test that average auto covariance in residuals of order 1 and order 2 is 0 (H_0: no auto correlation).

The statistically significant negative coefficient of the performance variable (proxied by return on asset (ROA) implies the 'bad management' hypothesis where performance serves as a proxy for the quality of management and lowering the levels of non-performing loans.

Results support the 'moral hazard' hypothesis that low capitalized banks leads to an increase in non-performing loans. Statistically significant coefficient of capital variable (E/TA) indicates that for every 1 percent decrease in equity to total asset ratio would increase NPL by approximately 23 basis points.

Empirical evidence found that 'skimping hypothesis' is also persists in the South Asian banking region. Short-run cost efficiency burgeon the future level of NPL. Our empirical results support the so called 'diversification hypothesis' in both proxied variables size (lnTA) and net non-interest income ratio (NNII/TA). Statistically significant negative coefficients of both the deterministic variables predict that banks having the capabilities of income diversification in terms of size and other non-interest income will have low levels of non-performing loans.

We found empirical evidence in favor of the 'liquidity hypothesis' that banks with no liquidity shortage become able to expand their loans and advances and can reduce the non-performing loans ratio significantly. Numerically speaking, if a bank can increase the liquid assets to deposit and short term funding and subsequently increase the total loans by 1 percentage point then the NPL is supposed to be reduced by 4 basis point.

Also we empirically proved that in the South Asian banking, rather than macroeconomic policy rates, individual bank's lending rate significantly determines its non-performing loan ratio. In model 1 of table-4, we included the individual bank lending rate as the determinant of NPL. Whereas, in model 2 and model 3, we included the short term lending rate (proxy of which is the

annualized standard deviation of monthly average of daily call money rates, SDint) and the long term interest rate/term spread of interest rate (proxied by the difference between the yields spread of 10 year and 5 year Treasury bonds, R) as the determinants of NPL. Models outcome show, if the bank increases its lending rate by 1 percent then its NPL ratio goes up by 36 basis points which are statistically significant whereas the coefficients of the SDint and R are statistically insignificant.

Industry factor is also a significant determinant of non-performing loans in South Asia. Our proxy variable concentration ratio (CR3) is statistically significant and having negative coefficient means the higher ratio of non-performing loan is significantly due to the lack of fare competition in the banking industry.

As our hypothetical expectation, the systematic factors affect the non-performing loan ratio of individual bank inversely. GDP growth rate significantly reduces the NPL. Also the significant negative coefficient of inflation rate implies that higher inflation weakens the borrowers' ability to debt service by reducing their real income and these findings are consistent to the previous literature (see Chaibi et al. 2015).

Our empirical results also evidence that in the year of 2003, 2009 and 2010, the non-performing loan was significantly high may be due to the hit of the global recession which was confirmed by the positive coefficients of the year dummies in the baseline model.

4.5.2. Robustness check

In table-4-4 we presented the result of our empirical model of the determinants of non-performing loans in South Asia using the fixed effect[28] panel estimator as an alternative to the GMM estimator.

However, we found no change in signs and no significant change in values of the coefficients of the explanatory variables in the alternative estimator which confirm that our baseline GMM estimation output is robust and the coefficients of the estimation can be interpreted with confidence.

[28] The Hausman test allows the null hypothesis that the individual effect and the explanatory variables are uncorrelated, rejected in all the cases.

Table-4-4: Robustness check (Fixed effect estimator as an alternative to GMM estimator) of the determinants of non-performing loan (NPL) of banks in South Asia, 1997-2012, total sample

Variables	Model1		Model2		Model3	
Dependent variable: Non-performing loan ratio (NPL/TL)	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Independent variables						
Bank specific						
Return on Average Assets (ROA)	-.29541**	0.11459	-.3269***	0.11357	-.24456***	0.0946
Equity to Total Asset ratio (E/TA)	-.17608***	0.04761	-.17636***	0.04745	-.47348***	0.04425
Cost to income ratio (C/TI)	.02456***	0.00564	.02502***	0.00557	.01126**	0.0046
Size (lnTA)	-3.5787***	0.33512	-3.6271***	0.34529	-1.585***	0.46202
Net non-interest income ratio (NNII/TA)	-1.4154***	0.17854	-1.5544***	0.18002	.42223**	0.20303
Liquidity ratio (LA/D&STF)	.03345*	0.01843	.03282*	0.01852	.02712*	0.0162
Growth rate of total loan (GTL)	-.04813***	0.00688	-.06076***	0.00807	-.03899***	0.00684
Interest income to total loan ratio (i)	0.12737*	0.08085	.14825*	0.08087	0.1046	0.07403
Industry specific						
Concentration ratio (CR3)	-5.201***	1.2007	-5.0306***	1.1942	-4.5399***	1.2959
Macroeconomics specific						
Short term interest rate (Sdint)			-.37423***	0.13045	-.25632**	0.11137
Term spread of interest rate (R)					-0.24544	0.17054
GDP growth rate	-.40553***	0.08368	-.40277***	0.08552	-.19983**	0.08981
Rate of inflation	-.28727***	0.06852	-.26805***	0.06887	-.21166***	0.0596
Year 2003 (Dummy)	1.2868*	0.67518	0.91775	0.67769	0.45174	1.2951
Year 2009 (Dummy)	0.62774	0.45839	0.30917	0.46391	0.39496	0.39086
Year 2010 (Dummy)	2.1735***	0.45633	2.3779***	0.45519	2.0481***	0.41501
Intercept	42.554***	2.6669	43.63***	2.7281	26.969***	3.9521
Number of observations	825		811		669	
R2	0.4713		0.4899		0.379	
Wald test (p-value)	F (14, 684) = 43.55	0.0000	F (15, 669) = 42.83	0.0000	F(16, 526) = 20.06	0.0000
Hausman test, $\chi 2$ (p-value)	39.5.20	0.0000	1443.44	0.0000	123.82	0.0000

Note: The table reports the regression output from Fixed Effect estimation of the determinants of NPL. Coefficients that are significantly different from zero at the 1%, 5% and 10% level are marked with ***, **, and * respectively. Wald test is the test for the goodness of fit of the model while Hausman test confirm the justification of using fixed effect estimator.

4.6 Conclusion and implications of the study

We studied the cross-country panel data set with micro and macro level variables and present the empirical results on how bank specific, industry specific and macroeconomics specific factors affect the bank non-performing loans. We followed the single stage model of NPLs determinants for the empirical study that included four South Asian countries' that is Bangladesh, India, Nepal and Pakistan banking sector data covering the period of 1997-2012. Our empirical findings are consistent with our theoretical analysis and significantly positive persistence of NPLs behavior in the sample region justify the use of GMM estimator, an up-to date econometric methodology that we effectively addressed the issues that profits show a tendency to persist over time, reflecting impediments to market competition, informational opacity and/or sensitivity to regional/macroeconomic shocks.

Among the bank specific determinants, statistically significant coefficients of the proxy variables support the Berger and DeYoung's (1997) 'bad management', 'skimping' and 'moral hazard' hypotheses and the Louzis et al. (2012) 'diversification' and 'too big to fail' hypotheses. The findings also support that 'moral hazard II' where the depositors are mainly affected and the 'adverse selection' of borrowers by the banks are also significantly affect the level of non-performing loans of a bank. Significantly negative coefficients of inflation and GDP growth rate reveal the 'bad luck' hypotheses of Berger and DeYoung (1997) where the external elements affect the mounting of NPLs. In case of South Asia, concentration ratio of banks still has some deterministic capacity of non-performing loans along with some adverse effect of the global financial crisis.

For the policy implications, we suggest the banks to take appropriate actions to achieve cost efficiency and the excellence of management so to address the moral hazard and adverse selection issues to minimize the non-performing loans ratio. The policy makers should focus the macro prudential policies so that the bank level lending rate remains within justified range to reduce the credit risk problems of each bank. Hoping these initiatives will benefit the society as a whole.

In this paper, we comprehensively addressed the question of how microeconomic and macroeconomic forces affect the non-performing loans of a bank. But studies on a number of additional explanatory variables like corporate tax rates, ownership structure, deposit insurance, rate of unemployment, and portfolio effect, those could not be tested due to limitation of data and the degrees of freedom or for the potential multicollinearty problem, would be tested as the extension of the model.

Appendix

Table-4-5: Correlation matrix* of the variables studied for the model of the determinants of non-performing loans of banks in South Asia

Variables**	npltl	roa	i	eta	ladstf	cti	lnta	gtl	nniita	cr3	gdp	inf	ltint	sdint	_cons
L.npltl	1														
roa	-0.1508	1													
i	0.3061	-0.2478	1												
eta	0.2795	-0.2408	0.0231	1											
ladstf	-0.5165	0.1037	-0.2717	-0.2112	1										
cti	-0.157	0.2829	0.1156	0.0562	0.0465	1									
lnta	0.1036	0.001	-0.1808	0.121	0.0078	-0.0014	1								
gtl	-0.2126	-0.0448	-0.0769	-0.0181	0.074	0.0364	0.0339	1							
nniita	-0.144	0.3205	-0.3011	-0.2617	0.035	-0.1725	0.2357	0.0381	1						
cr3	-0.0426	0.0469	-0.1655	-0.0584	0.0402	-0.0236	0.2043	0.0941	0.0519	1					
gdp	-0.1192	-0.0464	0.1476	-0.0639	0.0342	0.038	0.3403	-0.0394	0.175	0.0101	1				
inf	0.2694	-0.0664	-0.0203	-0.0926	-0.0959	-0.1173	-0.2529	-0.0882	-0.0452	-0.047	-0.1092	1			
ltint	-0.0312	0.0563	0.0619	-0.0482	-0.0282	0.0471	-0.0448	-0.0425	-0.1188	0.1962	-0.2015	-0.3663	1		
sdint	0.0832	-0.0413	0.0947	-0.0836	-0.0649	-0.021	-0.017	-0.1213	0.0977	-0.0732	0.0784	0.0364	-0.3027	1	
_cons	-0.2301	0.0371	-0.0287	-0.2077	0.0501	-0.0634	-0.4931	-0.0412	-0.1779	-0.3233	-0.4239	0.1455	0.0537	-0.0213	1

* Output of Stata

** Refer to the table-1 of summary statistics for elaboration of the names of the variables

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