Interest Rate Spreads, Loan Diversification and Market Discipline in Pakistan's Commercial Banking Sector

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Chapter 1

Introduction

The modern financial theory is based on three basic principles of optimal investment, absence of arbitrage and equilibrium in financial markets. In a rational world[1] with no market frictions, an optimal investment refers to expectations of maximum returns at every level of risk. The absence of arbitrage opportunity will ensure same price for an asset over various time periods. This would ensure that in a continuous time setting market clearing takes place by price adjustment eliminating any arbitrage possibility bringing financial markets into their equilibrium state. In a neoclassical world of Arrow Debreu (1954), a perfect market would exist if individual investors are too small to influence price formation, borrowers and lenders expect similar conditions, there are no discriminatory taxes, economies of scale and

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[1] In a rational utility setting, if U(A) > U(B), and U(B) > U(C), then U(A) > U(C). For more on rationality, please see Arrow (1987) and Sen (1987). For criticism of rational theory please see Taleb (2010) and Mandelbrot (2008).

scope exist, the financial instruments (*real rights and contingent claims*) are infinitely divisible with no transaction or bankruptcy costs and investors have complete information about present and future events that could impact the trading value of these assets.

In Arrow Debreu (1954) perfect world, financial assets are fairly priced and with symmetric information, savers and investors can locate each other without incurring any intermediation cost. However, in real world information asymmetries would occur and as a result financial intermediaries are needed to bring savers and investors together by creating financial instruments to satiate the needs of market participants. Financial intermediation is a process by which an intermediary (mostly financial institution) channel funds between deficit and surplus units[2]. The process of financial intermediation would incur cost which, as a source of imperfection, poses a challenge to the concept of complete markets. Despite the source of imperfection in a theoretical world, financial intermediaries are recognized as driving factor of economic growth. These financial intermediaries are expected to contribute towards efficient allocation of resources and mobilization of funds between savers and investors thus providing substantial basis for economic development.

The seminal analysis on financial structure and economic development leads back to Goldsmith (1969), who proposed that financial system would experience accelerated growth over national wealth. He suggested that the separation of saving

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[2] The classic case of channeling funds by financial intermediation is through a bank that transfers deposits to loans.

and investing units in an economy determines the relative size of a financial system reflecting a positive significance of financial intermediation on the economy. The relevance of this early proposition was fully revealed by the last decade of twentieth century when various empirical and theoretical evidences advocated the usefulness of a developed financial system for an economy. Levine (1997) supported this notion through optimal allocation of resources. He proposed that efficient allocation of capital in an economy would support economic growth. Similarly, Pagano (1993) suggested that innovations in financial development are likely to augment saving rates, contributing positively towards economic growth. However, this argument is followed with the caveat of some specific improvements in risk sharing and credit market that would actually result in lowering the saving rates and thus limiting growth rate.

The rationale of the existence of financial intermediaries and contribution in economic development can be classified into three main categories. These include information problems (*theory of asymmetric information*), transaction costs (*financial services*) and regulatory factors (*agency theory*). The primary reason for financial intermediation is informational asymmetries between participants of financial system. There could be *ex ante* asymmetries that would lead to adverse selection, *interim* ones, causing moral hazards and *ex post,* warranting need for audit or other costly monitoring or enforcement mechanisms. Financial intermediaries are expected to mitigate these explicit and implicit costs. Leland and Pyle (1977) demonstrate that financial intermediaries reduce asymmetric costs by acting as

information sharing coalitions. Diamond and Dybvig (1983) proposed financial intermediation as risk absorption capacity for depositors against idiosyncratic shocks that would negatively impact their liquidity. Diamond (1984) advocates the role of financial intermediaries as monitoring agents on behalf of surplus units, where households will place deposits with intermediaries who in turn would extend credit to deficit units and monitor their activities.

The existence of transaction costs is the second reason (in fact exogenous) for evolution of financial intermediation. The financial institutions would act on behalf of lenders and borrowers and exploit economies of scale and scope. The transaction costs would include monetary costs (Tobin 1963) and search costs, monitoring and audit costs (Benston and Smith 1976). The intermediaries would transform financial claims of depositors to advances portfolio while maintaining liquidity and diversification. This would enhance the efficiency, while mitigating transaction costs, between borrower and lender which is difficult to achieve in absence of financial intermediaries (Holmstrom and Tirole 2001). Therefore, with role of intermediation, savers and investors are likely to interact optimally at considerable low cost with more effective screening and monitoring of current and expected default risk.

The third justification of financial intermediaries relates to their role to regulate money creation and financing of an economy (Fama 1980, Merton 1985). The inherent risks and concerns of solvency in a financial system require the monetary and prudential supervision that is not possible in direct interaction of

savers and investors. Although, regulatory supervision of financial intermediaries is expensive but the potential benefits that emanate in form of safety for depositors are immense and considered as main economic rent extracted from monitoring and control (Fohlin 2000).

Given these reasons, it is important to understand what impact these factors would lead to in a financial system. Banks and all other financial intermediaries are likely to provide two main contributions. These include risk management and value creation. These intermediaries share risk of both deficit and surplus units in a competitive way given their size and superior ability of information acquisition and processing. The second aspect of intermediate activity is the value creation for lenders and borrowers. This value is created through financial services and various financial instruments that these intermediaries offer to the participants of financial system. However, this value creation sometimes contributes towards risk as increasing complexities embedded in financial instruments (real or synthetic) could result in a highly volatile risk profile.

To understand and develop a framework for mitigating risks to financial sector, supervisory authorities exercise prudent monitoring policies. Given the sensitive nature of financial sector, the Bank for International Settlement initiated the *Basel Committee on Banking Supervision* to propose guidelines for governance of banking sector[3]. The Basel framework constitutes of three main Pillars. Pillar 1

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[3] There have been three Basel Committee Accords, Basel I in 1988, Basel II (most comprehensive) in 2001 and Basel III in 2010 (still under development)

refers to minimum capital requirements; Pillar II states the supervisory review, while Pillar III is related to market discipline. The minimum capital requirement against risk weighted assets refers to core and non core capital that is adequate to absorb the risk emanating from credit, market, operational and unfunded risk. The core capital comprises of equity capital and disclosed reserves, while non core capital includes subordinated debt, revaluation surplus, hybrid instruments and other undisclosed reserves. The supervisory role is targeted to observe regulatory response to minimum capital requirements. This includes developing strategies to raise incremental capital against contingent risks. Furthermore, it encourages banks to develop and maintain internal risk management policies to monitor their risks. The proposition on market discipline is to complement supervision of regulators by imposing discipline from depositors, creditors and shareholders. To ensure maximum transparency and availability of information to assess financial health of a bank, Pillar III requires very comprehensive disclosures of risks and returns.

The financial intermediation in emerging economies is even more relevant. Most of the emerging economies have less developed capital markets that are subject to inefficiencies owing to speculation, infrequent trading, volatility shocks, market makers and constrained size. In such economies, the capital flow takes place through financial intermediaries – *mainly banks*. Pakistan is a developing economy, whose financial structure is not much different from other emerging economies. The financial system is dominated by banks who are the major suppliers of capital for the

businesses. Table 1.1 presents the share of commercial banks in financing corporate sector of Pakistan vis-à-vis debt and equity markets.

[Insert Table 1.1 about Here]

Since, intermediation is vital to support economic development it is relevant to study various issues related to financial intermediation. The following section provides an over view of the financial system of Pakistan.

1.1 Financial System of Pakistan

The financial system on the intermediation side in Pakistan comprises of Commercial Banks, Development Finance Institutions (DFIs), Microfinance Banks (MFBs), Non-banking Finance Companies (NBFCs) (leasing companies, Investment Banks, Discount Houses, Housing Finance Companies, Venture Capital Companies, Mutual Funds), Modarabas, Stock Exchange and Insurance Companies. Under the prevalent legislative structure the supervisory responsibilities in case of Banks, Development Finance Institutions (DFIs), and Microfinance Banks (MFBs) falls within legal ambit of State Bank of Pakistan while the rest of the financial institutions are monitored by other authorities such as Securities and Exchange Commission and Controller of Insurance.

Pakistan like other developing countries around the world, initiated financial system reforms in 1990s with the objective to instil competition within the financial institutions along with strengthening their governance and supervision as well as adopting a market based indirect system of monetary exchange and credit

management for improved resource allocation. The main line reforms included transformation from nationalized to privatized as well as a deregulated financial system. The deregulation entailed liberalization of financial regime governing the structure and operations of financial system, a shift from a directed system of credit and administered interest rates to a market based system of credit and interest rates and lastly re-establishing financial strength of banking institutions, resolution of non-performing loans thereby ensuring solvency of financial system.

These are broad categories of reforms encompassing a large number of reform oriented changes. Reforms took place gradually in several steps and were adjusted continuously according to their resulting impact and there were few reversals as well. The transition of the financial system of Pakistan from administered to a liberalized financial regime was largely completed in 2005.

As a result of these reforms, the structure of financial system was significantly altered. The ownership has predominantly been transferred from the public sector to the private sector. Furthermore, the closure or privatisation of Development Finance Institutions (DFIs) coupled with the entry of foreign banks subsequent to liberalization impacted the dynamics of financial system. The foreign banks, albeit with limited network and market penetration, have provided a source of economic competition to local banks. As a result of these reforms, the total number of banks has increased from 22 in 1990 to 40 in 2009. However, there are considerations regarding the operations of the banking system particularly after the transition is completed from administered to a liberalized financial regime. State

Bank of Pakistan requires each bank to have a minimum capital of Rs 13 billion till 2013. As a result of which wide spread mergers and acquisitions are taking place in the banking system of Pakistan. Banks are striving for a larger branch network for greater market penetration. Despite these changes, top five commercial banks still share the bulk of financial intermediation in every category. These five banks are National Bank of Pakistan, Habib Bank Limited, United Bank Limited, MCB Bank and Allied Bank. Although these banks have become less dominant in the last few years, their combined assets and the proportion of their deposits and advances is still more than all remaining banks. Figure 1.1 depicts the comparative share of top five banks in total assets, deposit base and loan portfolio in 2009.

[Insert Figure 1.1 about here]

The financial systems in most of the developing and underdeveloped countries are subject to structural, informational and institutional inefficiencies that ultimately lead to high margins between lending and borrowing rates of commercial banks. These high spreads emanate from elevated and volatile lending rates and leads to a higher cost of capital for the borrowers, consequently reducing investments or promoting only short term high risk ventures. The impact of relatively higher banking spreads could be devastating for businesses with less financial flexibility especially small and medium enterprises. Lastly, sustained high spreads is a vital indicator of the poor performance of financial system inter alia inadequacy of banking regulation and can ultimately retard economic growth.

Pakistan's banking sector has undergone financial liberalization with an aim of reduced government intervention and promotion of market based functioning. The major reforms were targeted at improving market structure by privatizing nationalized banks, lowering the entry barriers, enhancing the economies of scope for banks and promoting mergers and consolidation of financial institutions. Similarly, capital market reforms have been introduced to enhance the efficiency and transparency of capital markets to provide a meaningful medium for raising long term capital. However, it is surprising that despite these reforms which were aimed at eliminating market imperfection by reducing information asymmetries, moral hazards and speculative trading, the last decade has witnessed a limited number of Initial Public Offerings (IPOs) or Seasoned Offerings (SOs)[4]. Likewise, the bond markets have remained underdeveloped with very few issues of publicly placed Term Finance Certificates (TFCs) leaving banking and non banking financial institutions (NBFIs) as major source of short and long term capital as presented in Table 1.1.

1.2 Research Issues in Financial Intermediation in Pakistan

The theory of financial economics is concentrated around rational investment decisions aiming for optimal returns at a given level of relevant risk. This rationale is

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[4] The IPOs or SOs that took place between 2001 and 2010 were either a move towards increasing the outside shareholdings in public sector firms or were motivated to enhance the regulatory capital base (Banks) under Basel II framework.

based on the notion of free markets, where agents are *skilled*[5] to rebalance their expectations owing to change in preferences and risk level. Therefore, relevant risk and expected returns are the prime concern of a utility maximizing operator in any industry. However, the case of financial intermediaries is unique as their risk return choices receive special regulatory attention. The regulatory supervision is warranted because of the critical role these intermediaries contribute towards the economy. The growth financing in production sector, especially in emerging economies, mostly rely on commercial banks and non banking financial institutions.

As mentioned earlier, these banks would channel funds from households to corporate sector by creating synthetic instruments for depositors and borrowers. The banks would take short position by offering deposit claims and use these funds to establish a long position by purchasing contingent claims on corporate assets. The simultaneous short and long position by commercial banks would facilitate economic growth and form basis for banking spreads[6]. The spread is likely to compensate for monitoring costs, default risk, liquidity needs, price risk and other relevant factors. The major problem with emerging economies is a high spread emanating from less

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[5] An alternate school of thought propagates the dominance of chance over skills in free markets. "*I disagree with the followers of Marx and those of Adam Smith: the reason free markets work is because they allow people to be lucky, thanks to aggressive trial and error, not by giving rewards or "incentives" for skill*" – Nassim Nicholas Taleb (2007), "*The Black Swan: The Impact of the Highly Improbable*" pp. For more on this, please see Mandelbrot (2008).

[6] The simultaneous long and short position by commercial banks resembles an option trading strategy (Bull and Bear Spread, for more on this, please see "*LIFFE Options, a guide to trading strategies*"). Some researchers argue that commercial banks core business showed be viewed as a derivative security with a high risk profile (Ostaszewski, 1995).

compensation for short position (depositors), which could result in inefficiencies and ultimately hinder economics prospects.

Therefore, a vital issue for financial sector is to understand the determinants that contribute towards these spreads. The second critical aspect of these intermediaries is the level of risk they would undertake as risk management agents on behalf of their depositors. A significant portion of banks' assets is exposed to default risk which is a source of systemic risk in the financial sector. The banks deploy various risk management tools to mitigate any negative impact to financial health due to default of their borrowers. The Basel framework has special emphasis on managing credit risk by estimating default likely indicators of their potential borrowers and ability of banks to absorb any stress from a high probability of default. The Banks are expected to diversify their credit portfolios to minimize potential loss from non performance of one particular sector. However, in developed as well as developing economies, the banks would face a moral hazard of perceiving themselves as *too big to fail* (or assume no benefits from diversification), that they might find it appropriate to concentrate on selective sectors for maximizing financial gains. Such banks are expected to earn higher spreads by imposing high risk on depositors. These kind of risk exposures could be fatal for the financial system and economy because the cost of a bank failure is immense and previously earned high profits will not really matter if the cost of failure is too high. Lastly, to avoid the cost of failure and the devastating impact on economic scene, the performance of banks is under severe regulatory attention.

Basel II (2001) introduced the role of market discipline to compliment the statutory role of central bank and penalize bank management for their excessive risk taking. Under a market discipline regime of financial sector, the depositors (and other lenders) are expected to analyze the disclosed information and assess the correlation between risk and return to discipline management practices for a safer banking system. Again, for emerging countries, with structural constraints, it is interesting to observe the level of market discipline to supplement the traditional supervision by a statutory organization. Therefore, financial intermediaries are unique in at least three aspects. Primarily, they have a profitability profile with various firm level and macro determinants. Secondly, the risk appetite of these institutions is vulnerable and they could have incentives not to mitigate their risks (at cost of depositors) implying a high possible cost of failure. Lastly, they have strict regulatory supervision, and with transparent disclosure of information, they are expected to face discipline on managerial decisions by the stakeholders.

The above discussion suggests two main roles that financial institutions would play. The first one is their risk facilitation and management that emanates from the services they provide. The second aspect is the level of returns these intermediations should earn to compensate for assuming different risks. Moreover, with an extremely leveraged capital structure, the agency problem between managers and other stakeholders is expected to be high in financial institutions. This makes it critical to analyze the discipline (*if any*) bank depositors, creditors and shareholders could impose on bank managers to increase efficient risk return optimization. This

would warrant the analysis of financial institutions at three levels. Primarily, it is vital to study the level of core earnings and more importantly, the factors that would contribute towards this profitability. Secondly, with moral hazards, it is critical to analyze the aspect by studying the impact of diversification on credit portfolio to minimize the exposure towards credit risk and its contribution towards institution performance. Lastly, the consistent requirement of cost effective capital supply for future growth would be possible by maintaining depositors and creditors. This is possible if these stake holders are adequately compensated for various risks emanating from financial intermediation. If financial markets could impose some level of discipline, then inability to compensate stakeholders in accordance with their risk profile could lead to substantial increase in cost of capital.

Therefore, a vital research question would be to analyze, if these stakeholders could provide some mechanism to discipline the risk and return activities of the bank, especially in aftermath of Basel II. This research aims to address these three issues in detail in a post reform period. There are applied implications of this research for the banking sector of Pakistan in methodology of estimating risk exposures. On the estimation side, this thesis would propose, explain and use the iterative process of estimation of default likely indicator under Black Merton Scholes framework that is a vital input for Internal Ratings Based Approach (IRB) 7.

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[7] The default likely indicator (sometimes called probability of default) will be explained and calculated in for individual banks. For more on this, please see *Credit Risk – The Internal Ratings Based Approach in International Convergence of Capital Measurement and Capital Standards (2004)*. The iterative process is similar

Similarly, it will elaborate on estimation process of Value at Risk (VAR) using both Historical and Monte Carlo approach that forms substantial basis of market risk management. If default likely indicators and Value at Risk are estimated with some precision, this will provide banks with prudent estimate of capital adequacy requirement and will give them leverage to use extra capital for investing in profit making activities.

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to one adapted by KMV, while Commercial Banks in Pakistan are in very early stages of its implementation in IRB.

Chapter 2

The Determinants of Interest Rate Spreads in Pakistan's

Commercial Banking Sector

2.1 Introduction

Economic development critically hinges on patterns and levels of resource mobilization and allocation in any country. Resources are mobilized through savings which at the level of macro economy pave way for the allocation of resources for the purpose of consumption and investment. Similarly, investment depends critically on banking credit and the underlying lending system which enables the investors to borrow for the purpose of investing in real capital to enhance existing businesses or for establishment of a new business entity. In this way banking credit contributes to the generation of economic activity and eventually leads to higher national income and growth. Therefore, all economic players including households, businesses and public sector are sensitive towards the efficienct flow of resources from surplus to deficit units. Analysis of resource transfer through operations of banking system, therefore, has to contend with the price structure prevailing in the credit market.

The strong correlation of banking system stability with the economic growth and development of any country has only recently been appreciated. A glance at the recent economic history reveals that weaknesses in the financial systems were the root cause of the economic woes of most of the economies. The supervisory authorities around the world are striving to ensure safety and soundness of their respective financial systems so that they can play an active role in the economic development of their countries.

Privatized banks are free to lend so they will invariably extend credit at high rates for sake of profitability and pay lower returns on their deposits hence earning higher spreads. Moreover if there is concentration in the banking activities with a few banks, as is the case in Pakistan, it may lead to exercise of market power in order to earn higher margins. Moreover, higher margins may also be reflective of high intermediation cost and managerial inefficiencies. This acts as a disincentive to both saving and investment and hence reflects that the banking system is inefficient in performing its role of effective resource allocation.

The financial systems in most of the developing and underdeveloped countries are subject to structural, informational and institutional inefficiencies that ultimately lead to high margins between lending and borrowing rates of commercial banks. These high spreads emanate from elevated and volatile lending rates and leads to a higher cost of capital for the borrowers, consequently reducing investments or promoting only short term high risk ventures. The impact of relatively higher banking spreads could be devastating for businesses with less financial flexibility especially small and medium enterprises. Lastly, sustained high spreads is a vital indicator of the poor performance of financial system inter alia inadequacy of banking regulation and can ultimately retard economic growth.

In order to measure the desirable state of efficiency of the banking system of Pakistan, it is critical to study the spreads and net interest margins as they have often been used as proxy variables for measuring intermediary efficiency for commercial banks. The purpose of this study is to analyze the various macro and firm level

determinants of the banking spreads in Pakistan. This paper would provide multiple contributions towards existing literature on banking spreads. Firstly, the previous studies on banking spreads in Pakistan mainly provide evidences that are skewed towards pre transition period (maximum till 2006). However, our discussion would provide an insight into the behavior of Pakistan's banking spreads in post transition periods (i.e. from 2004 – 2009). Secondly, unlike previous studies on banking spreads in Pakistan with limited explanatory factors, our empirical analysis includes substantially greater number of firm specific variables. These exhaustive variables would include every aspect of a bank's operation (core to noncore business) and are expected to reveal superior information about banking spreads. Some of these variables are already examined in other developing economies and therefore it would be interesting to investigate if they hold any relevance in Pakistan's case.

Lastly, we use at least two innovative firm specific variables that have not been considered before vis-à-vis banking spreads. The first factor is percentage of Public sector share in total deposits per bank. We feel that this factor would be relevant as Public sector entities are somewhat insensitive towards interest rate on their deposits with commercial banks. The second factor is probability of default (sometimes called distance to default) under Black Merton Scholes framework that was later adapted by Bank for International Settlement (BIS) and KMV risk metrics. Since capital base as risk absorption capacity and its reliance on market discipline is a vital feature of Basle Accord, it would be interesting to see if probability of default has any significance in banking spreads. The rest of the story is as follows. Section II

will provide a brief overview of the literature on determinants of banking spreads and Section III will discuss data, variables and research methodology.

2.2 Literature Review

There is exhaustive literature on the determinants of banking spreads both in developed and developing economies. Pakistan is a case of a developing economy; therefore, we will mainly focus on literature from similar countries. The underlying bank specific and economic variables depict similar behaviour across all developing countries and our set of variables and econometric methodology emanates from similar researches with few innovations particular to case of Pakistan.

Maudos and Solis (2009) investigated the determinants of net interest income in Mexican banking sector for the period between 1993 and 2005. Their sample constituted of 43 commercial banks with 289 annual observations of an unbalanced panel data. They observed high interest margins for Mexico, of approximately 5%, vis-à-vis international standards. They considered various explanatory factors to explain the behaviour of banking spreads. These included operating costs, volatility of interest rates, implicit interest payments, quality of management, non interest income, credit risk, degree of risk aversion, market risk, transaction size, liquidity, cost to gross income, GDP growth and inflation rate. The reported results reflected that except for liquidity all other variables were significantly related to interest rate spreads. They concluded that the high Mexican spreads are mainly a function

average operating costs and market power while non interest income, despite of increasing over the years, has low economic impact.

Beck and Hesse (2009) analysed factors explaining interest rate spreads in Uganda and compared with peer African countries for the period between 1999 and 2005. They used a panel data set of 1390 banks from 86 countries. They reported that variation of spreads was high both across countries and within countries across banks. The average margins were around 10.9% while a mean spread of 18.1% was observed. To explain the high variation in interest rate margins across countries, they used bank size, exchange rate depreciation, real t bill rate, liquidity ratio, concentration, inflation, GDP growth, institution development and overhead costs. They reported that that most of the bank specific as well as macroeconomic factor are relevant in explaining high banking margins in Uganda. However, the foreign banks and changes in market structure had no significant relation with interest rate spreads. They concluded that size, high t bill rates and institutional deficiencies explained large proportions of Ugandan interest margins.

Hawtrey and Liang (2008) studied the bank interest margins in fourteen OECD countries for the period 1987 to 2001. The explanatory variables they used were market structure, operating cost, degree of risk aversion, interest rate volatility, credit risk, scale effects (transaction size of loans and deposits), implicit interest payments, opportunity cost of bank reserves and managerial efficiency. They used a single step panel regression with fixed effects and found out significant coefficients for most of the variables. The transaction size and managerial efficiency (operating

efficiency to gross income) were negatively related to the margins that they attributed towards management efficacy in getting low cost deposits and extending loans at higher interest rates resulting in higher spreads. They concluded that market power, operating costs, risk aversion, volatility of interest rates, credit risk, opportunity cost and implicit interest payments have positive impact on overall interest rate spreads.

Norris and Floerkemeir (2007) used bank level panel dataset for Armenia to examine the factors explaining interest rate spreads and margins from 2002 to 2006. They employed a variety of bank specific and macro variables including overhead costs, bank size, non interest income, capital adequacy, return on assets, liquidity, deposit market share, foreign bank participation, real GDP growth, inflation, money market rate and change in the nominal exchange rate. Using both pooled OLS and fixed effect regression they concluded that bank specific factors of size, liquidity, ROA, market concentration, market power explain a large proportion of banking spreads.

Khawaja and Din (2007) investigated the determinants of interest rate spreads in Pakistan using panel data of 29 banks from 1998 to 2005. They used industry variables of concentration and deposit inelasticity (measured as interest rate insensitive current and saving deposits) and firm variables of market share, liquidity, administrative costs, asset quality and macroeconomic variables of real output, inflation and real interest rates. They concluded that inelasticity of deposit supply was the major determinant of interest rate spread. We feel that the results of this

study are unique to the sample period and we include a larger number of variables to analyse if in post transition period the firm specific and macroeconomic variables better explain the cross bank variations in spreads.

SBP Financial stability review (2006) analysed the efficiency of financial intermediation in Pakistan using banking spreads and net interest margin for the period 1997 to 2006. They employed bank specific indicators of non interest income, provision to NPLs, administrative costs, foreign ownership and industry specific variable of concentration and macroeconomic indicator of real GDP growth and interest rate volatility. The review concluded that all of the variables were significant in explaining interest rate spreads with administrative costs and foreign ownership explaining a higher proportion vis-à-vis other determinants.

Despite of using similar sample period, the two studies on Pakistan's banking spreads depict variation in results. Therefore, further empirical evidence could provide additional insight about the determinants of interest rate spread and margins using much recent dataset.

2.3   Research Methodology

2.3.1 Sample Criterion

We will use panel data of various bank specific and macroeconomic variables to analyse intermediation efficiency of commercial banks in Pakistan. Our sample is based on following criterion

1. The sample will be from post financial reform period and will include data from 2004 to 2009 (six years).

2. All banks should be listed public limited companies and data on balance sheets, income statements and stock prices should be available.

3. The foreign banks (not incorporated in Pakistan) shall be excluded since they constitute a minimal proportion in Pakistan's banking sector (both in term of total assets and network size).

4. In order to account for survivorship bias, the banks that were delisted or/and merged were not included.

Based on this sample criterion, we have an unbalanced panel for every year. Table 2.1 represents per year sample distribution.

[Insert Table 2.1 about here]

2.3.2 Dependent Variables

The literature on banking spreads proposes alternate definitions of intermediary efficiency. The most common of these include *Spread* and *Net Interest Margin* (NIM). These two are considered as superior measures to gauge intermediary efficiency because both these definitions are related to core intermediary business of the commercial banks. We will use both these definitions as dependent variables to proxy financial intermediation. These two variables will be measured as follows

$$Spread = \tau_{it} = \frac{r_{it}}{EA_{it} - EquityINV_{it}} - \frac{c_{it}}{IntLiab_{it}}$$

$$NIM_{it} = \frac{r_{it} - c_{it}}{EA_{it}}$$

Where *NIM* is Net Interest Margin, *r* represents interest revenue, *c* is interest expense, *EA* is total earning assets, *EquityINV* represents bank's investment in equities, *IntLiab* includes all interest bearing liabilities, while suffix *it* represents bank *i* at time *t*.

2.3.3 Independent Variables

The set of independent variables include firm specific and macroeconomic variables that could possibly explain the dynamics of banking spreads in Pakistan. We have classified the firm specific variables into operational and financial efficiency factors. These factors are explained below in detail.

Bank Size

Bank size is used to gauge the possibility of economies of scale in banking. The banks that enjoy economies of scale incur a lower cost of gathering and processing information resulting in high financial flexibility and ultimately high spreads. Similarly, banks with larger branch network can penetrate deposit markets and mobilize savings at a lower cost. To account for bank size, we will adopt two measures related to bank's financial standing and network size.

a)   Total Assets [log(TA$_{it}$)]

Our first variable in bank size would be log of total assets $log(TA_{it})$. The stronger asset base is expected to positively impact interest rate spreads [Maudos & Solis (2009)].

b) Network Size [λ_{it}]

The second variable relates to number of branches. In Pakistan, the network size is skewed towards few banks and dispersion in number of branches is substantially high. To account for this disparity, we will use a dummy variable ($\lambda_{it} = 1$) for all banks having a network size greater than 500. The branch size is likely to contribute positively towards intermediary efficiency [Beck & Hesse (2008)].

Operational Efficiency

The operational efficiency refers to the ability of the bank management to generate interest and non interest revenue by optimal deployment of assets and services at minimal cost through effective acquisition of funds. The operational efficiency is critical for the bank as it require efficient asset liability management, mobilization of low cost deposits and allocation of advances to high earning ventures at an acceptable risk level. This calls for the optimal combination of managerial skills in respective area of expertise. The innovation in the banking practices due to liberalization has led to other avenues of income generation through other value added services and off balance sheet activities providing an alternate but stable source of non interest revenue. Similarly, the contribution from investment portfolio (equities and mutual funds) has complimented bank's earnings and helped in sustaining overall profitability even in the periods of high liquidity and low interest

rates. The operational efficiency emanating from effective bank management enhances productivity and is expected to positively impact the interest rate spreads and margins. The following variables would be considered to measure operational efficiency.

a)   Market Power

The market power is measured by the market share of loans and deposits of a particular bank. The banks with high market shares of loans and deposits are likely to enjoy higher market power [Norris & Floerkemeier (2007)]. The banks dominating the banking system may collude to exercise market power leading to augmented interest rate spreads and super normal profits. On the contrary, even if they don't collude, a higher market power would result in higher spreads on standalone basis. The market share of loans and deposits will be calculated as follows.

$$\gamma_{Loans} = \frac{Loans_{it}}{\sum_{i=1}^{n} Loans_{it}}$$

$$\gamma_{dep} = \frac{Deposits_{it}}{\sum_{i=1}^{n} Deposits_{it}}$$

where γ_{Loans} and γ_{dep} represents loan market share and deposit market share respectively in proportion of n banks.

b)   Non Interest Income to Total Assets [(NII$_{it}$/TA$_{it}$)]

The non interest income to total assets refers to the contribution of non core business towards profitability. The non interest income includes commission, fee and

brokerage, capital gains, dividends and income from foreign exchange transactions. Banks with diversified and stable revenue sources are expected to influence the pricing of loan products and therefore may charge lower margins owing to cross subsidization of bank activities [Maudos & Solis (2009)].

c)   Return on Assets [ROA$_{it}$]

Return on Assets (ROA) explains the overall profitability of a bank emanating from the asset portfolio (both advances and investments). It is another effective measure for evaluating performance of a bank's management. A bank with higher profitability, otherwise, can afford to charge lower spreads [Norris & Floerkemeier (2007)]. However, on the contrary, banks with higher ROA could result in higher spreads with better performance of interest sensitive assets.

d)   Overheads to Total Assets [(OH$_{it}$/TA$_{it}$)]

Overhead costs include salaries and other administrative expense including wages, other staff costs, motor vehicles, premises, depreciation on fixed assets and other noninterest expenses. If a bank incurs high overhead costs in the process of providing services then it is likely to charge a higher spread to sustain its overall profitability [Brock and Suarez (2000)]

e)   Employee Productivity

The bank productivity is measured as per employee contribution in loan and deposits. It would be estimated as D$_{it}$/E$_{it}$ for deposits per employee and L$_{it}$/E$_{it}$ for loans per employee (In order to account for efficient use of resources, we further

include performing loans per employee). The higher ratio would indicate a larger contribution of employees in both loan and deposit market and such banks are expected to earn higher spreads.

Asset Quality

Asset quality refers to the performance of the loan portfolio. A higher share of non- performing loans could impair the bank performance in at least two ways. The loan losses immediately reduce the interest revenue bringing spreads under pressure. Simultaneously, banks are required to provision for classified loans thus increasing the non interest expenses resulting in a lower profitability. This explanation of asset quality warrants an inverse relationship between asset quality and banking margins. However, Angbazo (1997) argues that a diminution in asset quality calls for increasing loans loss provisions and banks are likely to charge higher spreads to compensate for the increase in loan loss reserves and consequently an increase in credit risk would result in increasing spreads. We will use two variables to estimate the asset quality.

a)   **Impaired Lending to Gross Advances [(NPL_{it}/GL_{it})]**

The estimate would be based on proportion of classified loans to total advances. A higher ratio of impaired lending to total finances depicts a deteriorating loan portfolio resulting in a decline (or increase) in spreads.

b)   **Sectoral Diversification**

The sectoral diversification refers to the diversified allocation and acquisition of funds. On deposit side, the public sector institutions are less likely to base their decision on the rate of return being offered by the banks. Therefore, a bank with higher proportion of public sector deposits is likely to enjoy lower cost of funds and is expected to earn higher margins. The deposit side variable (D_{Public}) will be estimated as proportion of public sector deposits to total deposits.

On the advances side, it is pertinent to measure the diversification of the loan portfolio in terms of share to the major sectors of the economy. Lending rates to various sectors could reflect the risk premiums that banks are likely to earn. Banks with high exposure to agriculture and consumer loans [SBP Financial Stability Review (2006)] are likely to be earning higher spreads compared to banks lending to manufacturing sector like textile and energy. There would be four sectoral variables incorporating the proportionate exposure to agriculture (L_{agr}), textile (L_{tex}), energy (L_{en}) and consumers (L_{cons}) [Beck & Hesse (2008)].

Liquidity [(LA_{it}/DD_{it})]

Liquidity measures the extent to which a bank is able to meet the withdrawal of funds. There is a trade off between liquidity and interest rate margins and banks with higher proportion of liquid assets are likely to generate lower spreads. We will measure the liquidity as ratio of liquid assets to demand deposits. The liquid assets would include cash and bank balances, deposits with banks, government securities, listed TFCs, listed equity investments and net reverse repos.

Risk Absorption Capacity

The risk absorption capacity refers to the cushion available with banks against unforeseen losses. The cushion against possible losses is central to financial structure of commercial banks. The recent crisis was triggered by excessive risk taking of financial sector that became worse with simultaneous erosion of banks' capacity to absorb various risks. This has warranted an increased significance of risk absorption capacity for the banking operations. A bank with higher risk absorption capacity is perceived to have resistance against credit and market risks and ultimately enjoy competitive borrowing profile both in deposit and interbank markets with low rate of return for the lenders. Therefore, a strong cushion is likely to positively impact the interest rate spreads. We will use three variables to proxy risk absorption capacity.

a) **Capital Adequacy Ratio [CAR_{it}]**

Capital adequacy ratio (CAR) is a regulatory scale (proposed by BIS in Basle Accord) to determine the bank's capacity to absorb losses arising from various risks. This ratio compares bank's core and non core capital with risk weighted assets and a minimum ratio[8] of 10% is required for a bank to have adequate capital (Before December 2009, the required capital adequacy was 8%). CAR is superior to equity to total assets for at least two reasons. Firstly, it recognises different risk levels for every asset and secondly, unlike accounting definition of equity, it considers two tiers of capital. The tier 1 consists of paid up capital and disclosed reserves and is

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[8] State Bank of Pakistan – "BSD Circular No. 07 of 2009", "BSD Circular No. 30 of 2008" and "BSD circular No. 16 of 2008".

expected to absorb the losses without requiring the liquidation of the bank. The tier 2 capital comprises of non core capital and includes undisclosed reserves, revaluation surplus, hybrid instruments and subordinated loans. The tier 2 capital is expected to minimize the losses of depositors in the extreme event of a bank's liquidation.

A strong capital adequacy is expected to have a positive impact on the spreads [Norris & Floerkemeier (2007)]. However, there is one caveat to this expectation. In Banks where CAR is exceptionally high, the asset deployment is likely to be low risk (for example government securities) and therefore could result in lower spreads.

b) Credit Ratings [δ_{it}]

Credit ratings are an opinion about the timely debt service capacity of an entity. The rating agency incorporates most of the qualitative and quantitative factors underlying the credit worthiness of a firm and provides a substantial view about the level of default risk. In order to include this independent opinion on a bank's capacity, we will use a dummy variable (banks with rating of AA – or higher, $\delta_{it} = 1$ and 0 otherwise). The banks with higher credit ratings are expected to have higher spreads and margins.

c) Default Likelihood Indicator

The traditional measures of default risk takes into account the volatility of book value of assets. However, in the extreme case of default, only the market value of assets would matter. The market value of assets (and related volatility) *per se* is

not evident because although market value of equity is observable but not all liabilities are marked to market. Merton (1974) proposed an asset value model to extract credit information embedded in equity markets using Black and Scholes (1973) option pricing framework.

The asset value model treats the firm's equity as a call option (European) on the assets of the firm having a maturity equal to the maturity of its debt and strike price equal to the amount paid to the creditors. The firm will be distant from default as long as market value of assets exceeds the amount of liabilities to be repaid. In option pricing framework, the market value of a bank's assets will follow a geometric Brownian motion of the form

$$dV_A = \mu V_A dt + \sigma_A V_A dW$$

where V_A is the bank's asset value, with a drift μ and volatility σ_A in a standard Wiener Process W. The equity of the bank V_E with liabilities X of maturity T, a risk free rate of r and a cumulative density function N of the normal standard distribution, can be modeled as

$$V_E = V_A N(d_1) - X e^{-rT} N(d_2)$$

with $d_1 = \dfrac{\ln\left(V_A/X\right) + (r + 1/2\sigma_A^2)T}{\sigma_A\sqrt{T}}$, and $d_2 = d_1 - \sigma_A\sqrt{T}$

The estimation of V_A is possible from the above equation if the value of σ_A is known.

To calculate σ_A we will adopt an iterative process as proposed by Vassalou and Xing (2004)[9]. Initially, the past 12 months daily prices for every bank will be used to estimate the volatility of equity σ_E. This estimate of volatility in equity will be used as a proxy for σ_A and daily V_A will be calculated given the V_E. In the next step the standard deviation of these V_A will be estimated that will be used as σ_A for the next iteration. This process will be repeated till both estimates of σ_A and σ_E converge within 0.0001. Once the converged value is obtained, we will re-estimate V_A for every bank and we will calculate drift μ as log of V_A. The X_i will be liabilities maturing within T (one year) and r will be daily yield on one year treasury bills. Once all these variables are in place, the default Likelihood Indicator (distance to default) can be estimated as

$$DLI_{it} = 1 - N\left[\frac{\ln\left(V_{Ai}/X_i\right) + (r + \frac{1}{2}\sigma_{Ai}^2)T}{\sigma_{Ai}\sqrt{T}}\right]$$

The lower probability of default would imply a low level of default risk and banks which are distant from default are expected to have high spreads.

Bank Concentration

The primary macroeconomic variable that is vital to spreads is the bank concentration and competition structure. To account for competition we will use Herfindahl Index (H_t) for concentration of loans and deposits. The Herfindahl index

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[9] A similar iterative process is used by Moody's KMV to estimate the expected default frequency.

measures bank's size relative to its peers and is used to proxy the amount of competition. It is calculated as sum of squared of the market share of all banks in the industry. A higher Index is reflective of less competition and increasing market power for few banks. The estimation using square of market share provides additional weight to large firms that are more likely to influence the competition structure. The Herfindahl index for loans and deposits will be calculated as follows

$$H(L)_t = \sum_{i=1}^{n} S(L_i)^2$$

$$H(D)_t = \sum_{i=1}^{n} S(D_i)^2$$

where $H(L)_t$ and $H(D)_t$ represent Herfindahl index for loans and deposits respectively while $S(L_i)^2$ and $S(D_i)^2$ reflect squared loan and deposit market share of every bank. A positive association between concentration and interest rate margins is an indication of greater market power and less competition in banking system. Banks in highly concentrated market tend to collude and as a result higher interest rates are charged on loans and lesser rate of return is paid to depositors.

Interest Rate Volatility (σ_{Rft})

There are two aspects of interest rate volatility. The first one is related to interest rate risk. The volatility in money market yields changes the marginal cost of funds faced by banks and therefore provide benchmark for setting up target spreads.

The interest rate volatility will be measured as standard deviation of one year T Bill yield (σ_{Rft}). An increase in volatility is expected to increase interest rate spreads. The second aspect of volatility in interest rates relates to market risk. The Market risk refers to change in market value of assets due to a change in interest rate yield. An increasing interest rate would result in a revaluation deficit that warrants a provision in profit and loss account (held for trading securities and permanent impairment)[10] resulting in deterioration in profitability. On average 25% of a bank's earning assets are fixed income marketable securities that are sensitive to changes in interest rate yield. Therefore, to cater for market risk, the banks are inclined to charge higher spreads to compensate for possible provision against diminution in assets.

GDP Growth [g$_{GDP}$]

Business cycle affects are measured by growth in GDP of an economy. Changes in business cycle impact the credit worthiness of borrowers in terms of repayment capacity. In order to compensate against expected default emanating from the changing business cycles, the banks are likely to impose higher lending rates. In case of an accelerating GDP growth, the banks tend to charge lower spreads while in periods of stagnant or low growth the banks spreads are expected to increase [Saunders and Schumacher (2000)].

Financial Development Indicator (M2/GDP)

M2/GDP captures the degree of monetization in the financial system of an economy. It measures the overall size of the financial intermediary sector and is

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[10] State Bank of Pakistan "BP&RD Circular Letter No. 16 of 2007"

correlated with growth in GDP. A lower monetization of the financial system may reflect lower level of efficiency in intermediation activity leading to higher spreads.

2.3.4 Data and Econometric Model

The data is hand collected from financial statements of all banks for the period between 2004 and 2009. These include information from income statements, balance sheets, statement of changes in equity and notes accompanying these financial statements. The independent and bank specific dependent variables were computed in the manner described above. The daily stock prices for calculation of probability of default were extracted from Thomson Data Stream [11] . The macroeconomic variables were collected from various sources including website of State Bank of Pakistan, Business Recorder and Economic Survey of Pakistan.

We use an unbalanced panel of commercial banks and run the following regressions of spreads on bank specific and macroeconomic variables.

$$\tau_{it} = \alpha + \beta_1 log(TA_{it}) + \beta_2\lambda_{it} + \beta_3\gamma_{Loans} + \beta_4\gamma_{dep} + \beta_5(NII_{it}/TA_{it}) + \beta_6ROA_{it} +$$

$$\beta_7(OH_{it}/TA_{it}) + \beta_8(D_{it}/E_{it}) + \beta_9(L_{it}/E_{it}) + \beta_{10}(NPL_{it}/GL_{it}) + \beta_{11}D_{Public} + \beta_{12}L_{agr} + \beta_{13}L_{tex}$$

$$+ \beta_{14}L_{en} + \beta_{15}L_{cons} + \beta_{16}(LA_{it}/DD_{it}) + \beta_{17}CAR_{it} + \beta_{18}\delta_{it} + \beta_{19}PD_{it} + \beta_{20}H(L)_t +$$

$$\beta_{21}H(D)_t + \beta_{22}\sigma_{Rft} + \beta_{23}g_{GDP} + \beta_{24}(M2/GDP) + \varepsilon_{it} \ \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

We further use an alternate definition of spreads for robustness and run the regression of same independent variables on net interest margin.

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[11] The DataStream prices were extracted from terminal installed at Paris Dauphine

$$NIM_{it} = \alpha + \beta_1 log(TA_{it}) + \beta_2\lambda_{it} + \beta_3\gamma_{Loans} + \beta_4\gamma_{dep} + \beta_5(NII_{it}/TA_{it}) + \beta_6ROA_{it} +$$

$$\beta_7(OH_{it}/TA_{it}) + \beta_8(D_{it}/E_{it}) + \beta_9(L_{it}/E_{it}) + \beta_{10}(NPL_{it}/GL_{it}) + \beta_{11}D_{Public} + \beta_{12}L_{agr} + \beta_{13}L_{tex}$$

$$+ \beta_{14}L_{en} + \beta_{15}L_{cons} + \beta_{16}(LA_{it}/DD_{it}) + \beta_{17}CAR_{it} + \beta_{18}\delta_{it} + \beta_{19}PD_{it} + \beta_{20}H(L)_t +$$

$$\beta_{21}H(D)_t + \beta_{22}\sigma_{Rft} + \beta_{23}g_{GDP} + \beta_{24}(M2/GDP) + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Given the large numbers of variables it is least likely that, despite being a random variable, α is uncorrelated with any of the independent variables. Therefore, assumption of random effect would be too stringent and appropriate regression would be using fixed effects. Table 2.2 summarizes the variables and their expected signs.

[Insert Table 2.2 about here]

2.4 Empirical Results and Analysis

2.4.1 Descriptive Statistics

The bank specific descriptive statistics are reported in Table 2.3 from 2004 to 2009. On average, Royal Bank of Scotland (RBS) reported the highest spread for six years at 8.0% followed by Standard Chartered Bank Limited (SCBL) with mean spread of 7.1%. For the sample period, Samba has the lowest spread of 2.6% owing mainly to its poor asset quality with average non performing to gross loans of 38.5%. Despite of a high average spread of 6.9%, Bank Islami Pakistan (BIP) has a mean ROA of -8.0% that is a consequence of massive overheads. The average overheads to total assets for BIP remained at 4.9% that was significantly higher than all other banks in our sample.

[Insert Table 2.3 about here]

The proportion of public sector deposits to total deposit was maximum in nationalized banks (BOP 49.6% and BOK 45.4%, NBP: 37.5%) that in part explain above average spreads and margins for NBP and BOP. However, the spread for BOK was lower (4.3%) in nationalised banks mainly because of asset quality with NPLs to gross loans of 26.4%. The major exposure of banks was concentrated in textile sector with Habib Metro at 54.4%, Bank Al Habib at 42.0% and Soneri at 35.7%. In consumer sector, SCBL, RBS and Bank Alfalah (BAL) had notable average exposure during the sample period. The average capital adequacy ratio (CAR) was highest in Samba (42.6%) which coupled with its lowest asset quality contributes towards its constrained spread and interest margins. The DLI was maximum for HBL (20.6%) owing to its highly volatile equity prices that results in highly volatile market value of assets.

Table 2.4 compares the descriptive statistics of top six banks (based on total assets) with rest of the banks in our sample. The larger banks dominate spread and margins owing to their higher operational efficiency depicted by higher loans and deposits per employee, low overheads to total assets and better asset quality. These bigger banks have better diversification in loan portfolio while medium to small banks have their exposure concentrated in textile and consumer sector. The average capital adequacy and liquidity is higher for medium and small banks indicating their investment in low risk and liquid assets that result in lower return on assets vis-à-vis top six banks. It is interesting to note that medium to small banks have relatively

higher non-interest income to total assets as compared to larger banks indicating higher tendency to compliment their overall profitability from non interest sources.

[Insert Table 2.4 about here]

Table 2.5 reports average statistics of banks classified on the basis of their ownership. This includes foreign banks, private sector banks and public sector banks. This table reveal some interesting facts about performance and efficiency of these three classes of banks. The average spreads are maximum for public sector banks followed by private sector and foreign banks. The asset quality is worst for public sector banks that largely emanates from the politically motivated credit by such institutions. The overheads cost are highest for foreign banks resulting in the lowest ROA compared to private and public sector banks. The private sector and foreign banks have lower exposure in agriculture sector while they dominate in loans to textile sector and individuals. Lastly, public sector deposits are concentrated in public sector banks that partly explain their better spreads and profitability vis-à-vis private and foreign banks.

[Insert Table 2.5 about here]

Table 2.6 represents yearly statistics of bank specific variables. The spreads and margins are increasing over time owing to an increase in deposit and advances base (per employee contribution). However, it is interesting to note that the profitability was eroded with average ROA of -1.82% for 2008 and -0.87% for 2009. The regression in overall profitability can be partially explained by eroding asset

quality (NPLs to Gross Loans of 16.95% in 2009) that lead to higher provisioning and increasing overheads to total assets (FY08: 3.39%, FY09: 3.28%).

[Insert Table 2.6 about here]

The summary statistics of all independent and dependent variables are represented in Table 2.7. In macro variables, Herfindahl index for loans and deposits are 9.5% and 9.7% that represent a low concentration in advances and deposits markets. A Herfindahl index of less than 10% indicates a competitive market. Figure 2.1 is comparative representation of share of top six banks in loans and deposits markets. In 2004, top 6 banks account for 74% of total deposits and 71% of loans in Pakistan's banking sector. The share of top 6 banks has significantly reduced to 55% in deposit market while these large banks represent 57% of total loans in 2009. This is a clear evidence of transition of banking sector from a concentrated to competitive industry which is an outcome of deregulation of banking sector started in late 90s by the Government.

[Insert Figure 2.1 about here]

The interest rate volatility for the sample period remained modest with average of 0.7% with a standard deviation of 0.5%. The GDP growth rate has been volatile with a maximum of 8.9% and a minimum of 1.2% during the sample period. This is a reflection on the trends in business activity that prevailed during our study period.

[Insert Table 2.7 about here]

The correlations between bank specific variables are presented in Table 2.8. The spread has a positive correlation with total assets, market power, non interest income to total assets, public sector deposits, while it is negatively correlated with NPLs to gross loans, liquidity, CAR and DLI. The correlations coefficients of DLI with some of the other variables reveal some interesting facts. The correlation between DLI and NPLs to gross loans is positive indicating that a lower asset quality (increase in NPLs to gross loans) would augment the default likelihood. Similarly, there is a positive correlation between consumer exposure and DLI indicating a high risk associated with loans to individuals. The correlation with liquidity and CAR are negative representing a high default possibility with a decline in liquidity and capital adequacy.

[Insert Table 2.8 about here]

2.4.2 Regression Results

We estimate fixed effect regressions for two measures of intermediary efficiency (interest rate spread and net interest margin) on various firm and macro level variables using our panel of 25 banks for the period 2004 – 2009. The results for these regressions are summarized in Table 2.9 and Table 2.10. The results reveal a positive relation between bank size and interest rate spreads with significant coefficients for both log of total assets and branch network. Therefore, the larger banks are expected to have higher intermediary efficiency from economies of scale that emanate from substantial asset base and effective resource mobilization capacity from strong branch network. The coefficients on measures for operational efficiency

reveal some interesting results. The return on asset is significant and positive indicating higher spreads for banks with efficient use of assets. The positive relation between spreads and return on asset has profound policy implication. The banks with better return on assets have the leverage of reducing spreads and improving the intermediation efficiency of the financial system.

[Insert Table 2.9 and 2.10 about here]

The coefficient on deposit market share is significant but negative that contradicts the common intuition of a positive linkage between interest rate spreads and market power of deposits. The results remained robust both for spread and net interest margin regressions. Beck and Hesse (2009) argue that a negative relation provides evidence for the small financial system view (financial deepening indicator is not significant reflecting on the low level of monetization in the country) which inevitably is the case in Pakistan. The negative coefficient for deposit market share is an indication of banks mobilizing deposits by offering higher interest rate to depositors and thus earning lower interest rate spreads. These results provide evidence for an interest sensitive deposit market in Pakistan and these findings are in contradiction with Khawaja and Din (2007) who argued in favour of inelastic deposit supply. Since our sample period captures all post transition years, an interest sensitive deposit market is an encouraging indicator of a liberalized financial regime.

The overhead costs were highly significant for both spreads and interest rate margins. The positive sign depicts the need of high spreads to absorb the overheads cost. Therefore, banks with high overheads are expected to charge higher spreads to

maintain overall profitability. The deposit per employee was statistically significant for net interest margin suggesting that a higher contribution per employee towards deposit mobilization will improve the net interest margin of a bank. This further show that under a market based banking system employee efficiency is paramount. However, deposit per employee remained insignificant for spreads.

The sign on significant coefficient (at 1% for spreads and 5% for net interest margin) for gross loans per employee is also interesting to note. It depicts a negative relation between loans per employee and spreads. The rationale lies in quality of the loan portfolio with average non performing loans equalling 8% for the top six banks (while it is approximately 11% on average for remaining 19 banks). In order to account for the loan quality vis-à-vis employee productivity, we introduce a new variable of performing loans per employee. The coefficient on performing loans per employee is significant at 1% for both spread and net interest margin. These results suggest that employee productivity is vital for intermediary efficiency with the caveat of maintained asset quality. The variables of non interest income to total assets remained insignificant for our sample banks.

The asset quality variables provide valuable explanations for the behaviour of interest rate spreads. The first and foremost was the magnitude of nonperforming loans to gross loans that depicted a significantly negative relation with spreads. Therefore, these non performing loans are likely to reduce spreads substantially through a reduction in interest revenue. The subsequent significant measures of diversification include the share of public sector deposits in total deposits and bank's

exposure to textile sector. The coefficient of public sector deposits was statistically significant with a positive sign reflecting insensitivity of these deposits to interest rate offered by banks. Therefore banks with higher proportion of the government deposits to total deposits are likely to yield better returns on account of low interest cost associated with such deposits.

It is interesting to note, however, that another explanatory variable of market share of deposits yielded a negative coefficient suggesting on the relevance of interest rates for private sector depositors. Therefore, we conclude that the market for deposits has become competitive for private sector only as a result of financial liberalization and the impact on public sector deposits remains minimal and it is possible to acquire public deposits at relatively low cost.

We examined four sectoral diversification variables of loans to agriculture, textile, energy and consumers. The results revealed that the proportional loan to textile sector was significant with positive impact on spreads. The major exposure of Pakistani banks is in textile sector that over the years has notably contributed towards spreads. This is largely because the textile industry is the prime contributor to manufacturing sector and GDP of the country. In times of robust economic growth this sector is the major contributor to the GDP as well as to the profits of banking system. In times of an economic downturn the textile sector still remains a significant variable for banks in Pakistan. As the textile sector in Pakistan is mostly export driven, the recent global recession has seriously impacted the industry performance resulting in erosion of the repayment capacity of the borrower.

Similarly, the domestic issues of political instability coupled with energy crisis complemented the bad performance of textile sector in Pakistan thus increasing the default risk. Therefore, the banks with exposure to textile sector are expected to charge a higher risk premia in interest rate contributing positively towards spreads. Figure 2.2 represents overall asset quality in textile sector.

[Insert Figure 2.2 about here]

The increase in classified loans to gross loans is evident over the years that resulted in an increased credit risk in exposure to textile sector. The results remained consistent for net interest margins with significant coefficients on non performing loans, public sector deposit and loans to textile sector.

The liquidity coefficient is negative and significant at 1% indicating lower interest rate spreads for banks with higher proportion of liquid assets. The negative relation remained consistent even when the net interest margin was used. The high liquidity mainly arises from inability and/or reluctance of commercial banks to extend risky loans at competitive rates. Consequently, such banks tend to invest in short term liquid investments that yield lower interest revenue (or non interest income) and post pressures on spreads.

The variables of risk absorption capacity were significant for interest rate spread. As expected, we observe a negative relation of spreads with capital adequacy ratio since banks with higher CAR tend to have more investment in low risk assets that would yield lower returns resulting in lower spreads. The credit ratings have a positive relation with spreads since banks with higher credit ratings are expected to

raise funds (especially through interbank market and subordinated loans) at competitive rates that would lower their overall spreads. The significance of rating coefficient also provides support for the relevance of credit ratings towards the capital structure of commercial banks. Our estimate of probability of default is negative and significant at 1%. Therefore, an increase in probability of default is expected to reduce the spreads owing to increase in default premium. These results suggest that relevant credit (default) information can be extracted from the market prices of equity under Black Merton Scholes option pricing framework and such default information contributes towards banking risks and spreads. The risk absorption variables of ratings and probability of default remained significant in net interest margin, while capital adequacy ratio was insignificant.

The concentration measure of deposit is significant and negative. This reflects that deposit market is concentrated with big banks. This leads to high cost of deposit mobilization and managerial inefficiencies for the banking system as a whole and ultimately higher concentration leads to lower spreads and margins. The results remain consistent for net interest margin confirming a robust negative relation between deposit concentration and intermediary efficiency. However, we could not deduce a significant coefficient for loan concentration (neither for spreads nor for interest margin) for our sample period. The GDP growth was significant and positively related to variations in spreads and margins depicting the relevance of

trends in business activity towards intermediation efficiency[12]. The interest rate volatility and financial development indicator remained insignificant for our study period[13].

In order to investigate that our results are not driven by the unique features of public sector banks, we repeat the panel regression excluding National Bank of Pakistan, Bank of Punjab and Bank of Khyber. The results for reduced sample are reported in Table 2.11 that are similar to those of complete sample and we could not deduce any incremental significant variable. However, it is interesting to note that variable of CAR is now significant at 5% (10% in full sample) representing an increased role of capital adequacy in private sector banks. This is logical because public sector banks are backed by contractual guarantees and Government provides support by injecting more capital making CAR somewhat less relevant. On the contrary, private sector banks lack such leverage and are sensitive to their risk weighted assets and subsequent capital to absorb relevant risks.

[Insert Table 2.11 about here]

2.5   Conclusion

This paper analyzed the determinants of interest rate spreads and margins in Pakistan's commercial banking sector in the post transition period. Building on an

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[12] The results remained robust when we used deviation in GDP growth trends (first difference) instead of Year on Year absolute growth rates.

[13] In recent years an increase in currency in circulation was observed, therefore, to adjust for this increase we also used an alternate definition of financial development as (M2 – currency)/GDP. However, the financial deepening still remained insignificant both for margins and spreads.

exhaustive set of firm level and macro variables from the existent literature, we also analysed the impact of two innovative factors of default likelihood indicator and proportion of public sector deposits on intermediary efficiency. We found strong evidence of bank size in explaining interest rate spreads. Similarly, operational efficiency, asset quality, liquidity, risk absorption capacity and GDP growth were important determinants of banking spreads. In bank concentration, we found evidence for deposits concentration but loans concentration was not a relevant factor for our sample period. The interest rate volatility and financial development indicator was not significant.

These results provide important policy implications. Unlike Khawaja and Din (2007), we found a significant negative relation between deposit market share and spreads reflecting a shift from inelastic to interest rate elastic deposits. We feel that dynamics of banking system have changed as a consequence of the financial system reforms and therefore the banks are competing not only on services but also on product prices. Therefore, banks should cater to interest sensitive depositors to sustain their deposit base and spreads.

Another important result is vis-à-vis employee efficiency and asset quality. Generally, an increase in loans per employee is likely to have a positive impact on interest rate spreads. However, in limited credit markets, the banks could indulge in aggressive and risky credit extensions for volume growths and compromising on asset quality. The negative relation of spreads with loans per employee and a positive relation with performing loan per employee clearly indicate that employee efficiency

would count if asset quality is maintained and therefore, banks should indulge in aggressive credit volumes only if they can control non performing loans through effective and prudent risk management procedures. These results are complimented by various asset quality indicators warranting the need of prudent credit extensions from banks as well as impose responsibility on central bank for effective surveillance of these credit decisions.

The risk absorption capacity is vital in intermediary efficiency due to presence of substantial uninsured liabilities (mainly deposits) in the financing mix. The credit rating component presents an independent view on both balance sheet and contingent off balance sheet risks. The significant coefficient of rating variable depicts an important role of credit rating agencies in identifying risk levels of a financial institutions and thus facilitating the intermediation role of these commercial banks. The default likelihood indicator provides support to the risk absorption capacity as determinant of interest rate spreads. Moreover, this confirms that relevant credit information can be extracted from the market prices of listed securities and regulators and lenders can use Black Merton and Scholes option pricing framework to assess the credit capacity of the obligor.

There are some important caveats to note. Our results could not produce significant results in favour of loan concentration or loan market share. This should not imply that loan market structure and competition in lending market is not related to interest rate spreads or margins but rather that loan concentration and market share variables could not proxy the loan market structure and competition for our sample period.

Similarly, we feel that the insignificant relation between spreads and interest rate volatility should be unique to our sample and further research can be done to explore in detail the term structure of interest rates and their impact on intermediary efficiency.

Chapter 3

Size, Diversification and Risk in Pakistan's Commercial Banks

3.1 Introduction

Diversification is perceived to play a vital role in risk management. The central bank imposes restrictions on exposure to a single sector to ensure diversification in credit portfolios[14]. This is based on the assumption that better diversification removes the systemic risk of a particular sector and reduces the probability of bank failure. In this context, banks with bigger size, in terms of total assets and branch network, are expected to be better diversified than smaller banks. The diversification capacity for larger banks is expected to emanate from the economies of scale and scope that they are likely to experience compared to smaller banks. However, there could be at least two reasons because of which banks may not diversify. First, they might have moral hazards which may increase concentration in their loan portfolio. This moral hazard is likely to emerge from "too big to fail" doctrine where larger banks are presumed to be safer than smaller banks and therefore, they might continue to grow without diversifying their risks by investing in few profitable sectors.

Furthermore, if bank perceives a bailout package from Government or the sponsors, they would be encouraged to undertake riskier ventures for higher profits and they will find no incentive to diversify. In this particular case we might not observe a significant relation between size of credit portfolio and diversification. Second, if diversification does not reduce risk and constraints bank profitability,

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[14] Regulation R 1, Prudential Regulations for Corporate and Commercial Banking, State Bank of Pakistan (2011), pp 14

banks will not have any incentive to diversify. In absence of economic benefits either from risk mitigation or enhanced performance bank management will be reluctant in diversification over and above prudential limits. The firm diversification is not only critical for banks but an exhaustive literature exist in corporate finance that discusses impact of firms' diversification on their performance with mix empirical evidence. Based on these propositions if we establish that banks are diversified but diversification has no impact on risk then it can be concluded that banks are diversifying only as per statutory requirement. Therefore, role of diversification as a risk mitigating tool, as suggested by traditional financial economic theory, is absent.

There could be another reason that might lead to concentration in loan portfolios. Banks maintain a regulatory capital that is calculated using a standardized approach where banks allocate capital cushion against their exposures. This capital acts as a buffer against contingent losses. Banks might have the tendency to allocate capital and take risk assuming that this cushion is adequate to absorb all expected and unexpected losses and as a result banks with higher capital adequacy may not diversify. There is an inherent problem with estimation of capital adequacy using the standardized approach. The banks do not assess the repayment capacity of their borrowers for capital allocation and will follow risk weights suggested by the central bank. In case of unrated clients (which constitute the major portion of customers), they will allocate a 100% risk weight. Banks with good borrowers will have a higher capital charge, while banks with bad borrower quality will not have their risks adequately covered. Moreover, banks get no capital benefit for diversification in

standardized approach. Therefore, banks might assume themselves to be risk remote by augmenting capital adequacy, simultaneously concentrating their portfolios in profitable sectors, which actually would result in hiding the credit risk under the rug and a single extreme event could burst the risk bubble resulting in contagion of bank failures.

In this article, we will study the relation of bank size, diversification and risk, using a panel of Pakistan's commercial banks from 2004 to 2009. The diversification to various sectors will be measured by the Herfindahl index; size will be proxy by the amount of total advances while bank risk would be estimated using asset quality measured by non performing loans ratio, the value at risk and the default likely indicator. The control variables for size and diversification are deposit ratio and equity to total assets while those for risk and diversification relationship would be non-interest expense to total assets, capital adequacy ratio and growth in GDP. Moreover, since NPLs are not likely to occur immediately after dispersion of the loan and only end of the year observations are available, we would introduce one lag of diversification (independent variable) to observe the impact of diversification on bank risks. The rest of the paper is organized as follows. Section 2 will present a brief literature survey, section 3 will discuss research methodology, empirical results are presented in section 4, while section 5 will conclude.

3.2 Literature Review

Berger et al (2010) studied the performance of 88 Chinese banks between 1996 and 2006. Their analysis was based on concentration versus diversified activities of banks in four areas. The economies of diversification to these banks was based on profit premiums and cost discounts. The profit premium and cost discounts were the difference between profits and costs of actual banks and a hypothetical concentrated firm. The diversification possibilities were classified according to geography, loans, deposits and assets. The measures of diversification were regressed on bank specific factors of cost efficiency, performance, risk, size, ownership, and conglomerate affiliation. The findings suggested a negative impact of diversification on bank performance in all activity areas. They observed a declining profit premiums and augmented cost factors for more diversified banks. The diseconomies of diversification were low in foreign bank and conglomerates suggesting that such banks were able to mitigate some of the negative impact of diversification. These findings were interesting for emerging markets in general and China in particular that have a constrained policy on foreign ownership in domestic financial institutions.

Elsas et al (2010) investigated the impact of earnings diversification on the shareholders' wealth. Their sample constituted of 380 banks from nine developed economies for the years between 1996 and 2008. The earning diversification was measured using Herfindahl Hirschman index based on various streams of revenues. The firm specific factors included performance measures of ROA, ROE, spread,

market based measures of cost of equity, market to book, beta and bank growth measures of vertical integration, equity growth, mergers and acquisition growth and organic growth. The results suggested that earnings diversification had a positive relation with bank profitability emanating from non interest businesses and cost efficiency. For the market based factors, they suggested that better bank performance leads to high bank valuations showing an indirect positive relationship between shareholders' wealth and revenue diversification resulting in conglomerate premium in banking sector. They noted that their results are in contradiction with the previous findings for two main reasons. Primarily, the positive relation between diversification and shareholder value is attributed to different measures of diversification that were used previously. Moreover, the literature tends to ignore diversification as an indirect source of value creation which was reported significant by Elsas et al (2010).

Rossi et al (2009) analyzed the impact of diversification on firm specific characteristic of banking risks, costs, profit efficiency and capitalization on 96 Austrian commercial banks between 1997 and 2003. The study tested the relation of diversification with three basic hypotheses including classical diversification, bank monitoring and economic capital. They reported a positive relationship of diversification with firm profits and a negative relation between diversification and banking costs and risks. They also observed that increase in diversification lowers the economic capital requirements for banks. The study further provided some evidence, albeit weak, on management behavior and luck hypotheses. The results

suggested that well managed banks are likely to achieve cost and profit efficiency through diversification and such firms are expected to warrant low provisions reducing overall realized risk of the bank. Lastly, the exogenous economic shocks, termed as bad luck hypothesis, are likely to lower bank performance even if they are otherwise diversified.

Lepetit et al (2008) studied the impact of non interest revenue on the risk structure of banks. They used a sample of 734 listed and non listed banks in 14 European countries from the period 1996 to 2002. To capture the level of earnings diversification, they employ an income statement approach by taking proportion of net non interest income to total operating income. The non interest income was then further classified on the basis of commission, fee and trading income. The risk variables used were based both on accounting and market data. The accounting measures comprised of standard deviation of ROA, ROE and loan loss provisions to net loans. The insolvency risk was proxy by Z score. The market risk measures included systematic risk, standard deviation of weekly stock returns, idiosyncratic risk and distance to default. Among income statement risk factors, they found out that banks with higher level of revenue diversification were prone to higher risks. These results remained robust for market based risk measures with risk being higher for banks where revenue diversification is driven by commission and fee income. Considering the banks size, they reported that small banks were less risky when they complement their operating income by trading activities, while larger banks were less exposed to risk if diversification is mainly in commission and fee based revenue.

They concluded that counter to common intuition trading activities do not increase the risk profile of a bank, rather for banks with constrained balance sheets they could lower the risks to asset quality and default.

Mercieca et al (2006) investigated the impact of diversification (earnings and credit portfolio) and bank size on risk adjusted performance and solvency risk of small European credit institutions. They included data from 15 countries comprising 755 small banks for the period between 1997 and 2003. The small banks were classified on basis of turnover and number of employees with a maximum of 50 million Euros in revenues and staff strength of less than 250 people. Herfindahl Hirschman Index was used to measure diversification while bank size was estimated by balance sheet assets. The risk adjusted variables of performance were ROA and ROE scaled by their respective standard deviations. To employ solvency risk accounting based Z score was used. The results suggested that earning diversification within or across sectors has no impact on small banks profitability. A negative relation was observed between non interest revenue and profitability discouraging small banks to diversify into non core activities. The size variable was relevant for the performance with a positive sign on the coefficient depicting better performance for relatively bigger banks within the sample. In loans diversification, risk adjusted performance was inversely related to diversification implying that banks with high loan concentration were more profitable in the sample period. Similarly, banks with less diversification had low solvency risk. They attributed these results to

relationship banking and low outreach of small banks where diversification does not add value to the performance.

3.3 Research Methodology

3.3.1 Sample Criteria

This study will use unbalanced panel data of Pakistan's listed commercial banks between 2004 and 2009 to analyze the impact of loans and revenue diversification on performance and risk profile. Our sample will be selected on the basis of following criteria

1. The sample period constitutes of post financial reform period of 2004 to 2009. This sample period also represent the time span when commercial banks were adapting the disclosure requirements proposed in pillar 3 of Basel accord. These requirements include disclosure of sector wise distribution of loan portfolios of commercial banks that is vital for our estimations.

2. Only public listed banks would be included with data available on balance sheet, income statement and stock prices for estimation of probability of default and value at risk.

3. The banks that were delisted or merged will not be included.

Based on these criteria, we get an unbalanced panel with a minimum of 21 banks for 2004 and a maximum of 24 banks in 2009. Table 3.1 represents our sample size for the study period.

3.3.2 Dependent and Independent Variables

This paper analyses the relationship between diversification and risk for the sample banks. We investigate three dimensions of this relationship. Firstly, as per common intuition, we investigate if banks with larger loan portfolios have better advances diversification than relatively smaller banks. Next, we study the impact of sectoral diversification of loans on the risk profile of bank based on accounting and market based risk measures. Therefore, we will have following regressions. These are reported in following equations

$$HIL_{it} = \alpha_i + \beta_1 \log(Adv_{it}) + \beta_2 \left[\frac{D}{TA} \right]_{i,t} + \beta_3 CAR_{i,t} + \varepsilon_{i,t} \qquad \text{.......(3).}$$

$$(NPL/Adv)_{it} = \upsilon_i + \gamma_1 (HIL)_{i,t-1} + \gamma_2 \left[\frac{OH}{TA} \right]_{i,t} + \gamma_3 CAR_{i,t} + \gamma_4 \Delta GDP_{i,t} + \varsigma_{i,t} \quad \text{.......(4).}$$

$$(DLI)_{it} = \tau_i + \mu_1 (HIL)_{i,t-1} + \mu_2 \left[\frac{OH}{TA} \right]_{i,t} + \mu_3 \Delta GDP_{i,t} + \mu_4 CAR_{i,t} + \phi_{i,t} \qquad \text{.......(5).}$$

$$(VAR)_{it} = \psi_i + \chi_1 (HIL)_{i,t-1} + \chi_2 \left[\frac{OH}{TA} \right]_{i,t} + \chi_3 \Delta GDP_{i,t} + \chi_4 CAR_{i,t} + \varpi_{i,t} \qquad \text{.......(6).}$$

Loan Diversification and Size

To observe the impact of size of loan portfolio on diversification, we will regress Herfindahl index with log of advances (proxy for loan size) after controlling for

direct and indirect sources of financing. The Herfindahl index (HIL) is calculated as under

$$HIL = \sum_{j=1}^{m} L_j^2 \; ,$$

where m represents the number of sectors to which banks would lend, L_j is the proportion of loan to sector j to total loans. In Pakistan, for reporting purposes, commercial banks have 34 sector categories so m will be 34 for each bank in our sample. The value of *HIL* will be between 0 and 1 with lower value representing higher diversification. Since, financing sources can impact the diversification decision we control for financing through deposits measured as proportion of deposits to total assets and capital by including capital adequacy ratio (CAR). Based on portfolio theory we expect a positive relation between loan size and diversification implying that bigger banks with larger loan portfolios should be better diversified owing to economies of scale and scope.

Risk Measures of Banking Firms

We employ both accounting (financial statements) and market based measures to explain the relation between risk and diversification. The independent variable will comprise of HHI to proxy diversification as explained earlier. The control variables will comprise of overhead to total asset and GDP growth rate, while for market based risk measures we will further control for capital adequacy. One point worth mentioning is use of lagged HHI for diversification. For accounting

based risk factor we will use one lag of HHI because the non performing loans are recognized after some lag[15]. The accounting based dependent variable of risk will be proportion of non performing loans to total loans. This ratio is a book measure of credit risk for the bank which impact both income and financial strength of the firm. The market based risk estimates will be Black Merton and Scholes default indicator as explained earlier and value at risk (VAR). We prefer VAR over beta to include idiosyncratic risk which is more relevant in this case.

VAR is referred to as the maximum loss that is expected in a given investment horizon. The ex post volatility ignores the direction of the investment movement. The observed volatility can be high because historical prices might have witnessed an abnormal increase which is not an indication of distress. VAR is considered a more appropriate measure of risk because unlike standard deviation or volatility it only considers the left tail of returns. In order to estimate VAR, Monte Carlo simulation to predict ex ante stock prices using a Geometric Brownian Motion (GBM) approach will be used and will calculate returns to estimate the worst case loss at 99% confidence interval. This process is repeated for each bank in the sample for every year and estimated VAR is used in our panel regression. The simulation process for price estimation is as follows.

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[15] The prudential regulations have following categories for recognizing non performing loans. A loan will be classified as substandard when mark up/principal is overdue by 90 days, doubtful when overdue by 180 days and a loss must be recognized if advances are overdue for a year.

Assume the price P for bank i, follows a GBM and this stochastic process can be expressed as

$$dP = \alpha Pdt + \sigma Pdz$$

where dz is the Wiener increment of $\varepsilon dt^{0.5}$, ε follows a normal distribution, α represent drift (or price differential) and σ represent volatility in price P. To estimate the growth in prices, total investment return μ will be used as a function of capital gain α and dividend yield δ. Mathematically, this can be written as

$$\mu = \alpha + \delta$$

where μ is also the risk adjusted discount rate for price P. The stochastic expression can be expressed as

$$dP = (\mu - \delta)\ Pdt + \sigma Pdz \qquad \text{.......(7).}$$

Assuming a risk neutral world, it is justified to replace μ by risk free rate r and the risk neutral price formation process will be

$$dP = (r - \delta)\ Pdt + \sigma Pdz \qquad \text{....(8).}$$

Equation 7 and 8 would represent the risk adjusted and risk neutral version of price formation process. Applying log normal transformation and combining with Ito's lemma, the following simulation equations for both risk adjusted (equation 9) and risk neutral equations (equation 10) would be formed.

$$P_t = P\exp\left[(\alpha - 0.5\sigma^2)\Delta t + \sigma N(0,1)\sqrt{\Delta t}\right] \qquad \text{.......(9).}$$

$$P_t = P \exp\left[(r - \delta - 0.5\sigma^2)\Delta t + \sigma N(0,1)\sqrt{\Delta t} \right] \qquad \text{......(10).}$$

The simulation of equation 9 and equation 10 will give stock price P_t at any future interval t with normal distribution $N\sim(0, 1)$. Once the expected prices are estimated, a back test for significance, and t statistics of mean difference would be conducted and it would suggest that risk adjusted equation provided a better estimate of ex ante prices. For every bank in the sample, future prices would be simulated using daily frequency. Once P_t is estimated, daily logarithmic returns would be estimated to calculate daily value at risk at 99%. This daily value at risk will then be annualized using continuous compounding for yearly estimation in panel regressions.

The traditional risk theory suggests a positive relation between HHI and risk. A high value of HHI reflects low diversification and this could lead to high non performing loans and hence credit risk. Similarly, market participants should perceive a well diversified bank to be of low risk and market based risk measures should reflect this perception. The expected signs are reported in Table 3.2.

[Insert Table 3.2 about here]

3.4 Empirical Results and Analysis

The descriptive statistics of our dependent and independent variables from 2004 to 2009 are presented in Table 3.3

[Insert Table 3.3 about here]

The cumulative total assets of our sample banks have increased by 100% from 121bln in 2004 to over 251bln in 2009. Similarly, total credit portfolio of sample banks increased by 87%, from 66bln to 124bln during the sample period. The credit quality has deteriorated with average non performing loans to gross advances ratio of 16.74% in 2009 compared to 10.55% in 2004. This signifies that despite of increasing loan exposure, banks might not have realized proportionately high profits from credit books owing to increasing level of classified loans. The increasing loan exposure could be alarming if the credit quality is compromised as a result of adverse selection or low diversification. The overall risk profile of the sample banks increased with average value at risk of 6.7% in 2004 to 9.4% in 2009. The default likely indicator increased from 2.3% to 3.8% from 2004 to 2009. Since, value at risk and default likely indicators are computed from market based information, the investor risk perception about banking firms have increased. The risk absorption capacity has reduced with a capital adequacy ratio of 17.4% in 2004 to 15.4% in 2009. The reduction in CAR coupled with augmented NPLs is indication of deteriorating risk absorption for the sample banks.

These variables could have a large variation depending on the bank size. In Pakistan top six banks account for 56% of banking assets. Table 3.4 presents average statistics for our sample period on basis of bank size (top six vs. rest of the banks).

[Insert Table 3.4 about here]

Concentration index (HHI) for bigger banks is 0.12 as compared to 0.21 for smaller banks. This signifies that banks with larger advances are better diversified

than smaller banks. The capital adequacy ratio based on standardized approach (as applicable in Pakistan) is 13.8% for larger banks while it is 17.0% for remaining banks. It is likely that relatively smaller banks with high concentration of their advances portfolios are trying to mitigate their concentration risk with an approximation cushion of CAR. The risk based indicators of NPLs to total loans and value at risk are low for the top six banks implying low risk as compared to rest of the banks. The larger banks depicted marginally better efficiency with overheads to total assets of 2.5% as compared to remaining banks that have an average ratio of 3%.

The fixed effect regression results for loan diversification are reported in Table 3.5.

[Insert Table 3.5 about here]

We observe negative coefficient for size of loan portfolio and deposit to total assets while a positive coefficient for capital adequacy. The negative relation between size of credit portfolio and concentration index implies that banks with higher advances portfolio are better diversified (low HHI value) as compared to banks with moderate or low exposure to advances. The larger banks have higher economies of scope and they can tap diversified sectors with higher outreach as compared to banks that are constrained with size. Moreover, such banks on basis of revenue volumes can afford to earn relatively low profits from certain sectors if the economic value of diversification is high. The coefficient on deposits to total assets is interesting to interpret. The banks with more reliance on deposits as source of

funds are better diversified with low value of HHI. Therefore, banks practice prudent asset liability management by investing core sources of funds in diversified credit portfolio. The capital adequacy provides an approximate cushion against credit, market and operational risks and it is not surprising that banks with high cushion, albeit approximate, have a low tendency to diversify. All coefficients are statistically significant at 95%.

The regression results for non performing loans as measure of accounting based risk are reported in Table 3.6.

[Insert Table 3.6 about here]

The regression results did not give a significant coefficient for diversification variable, while overhead to total assets and capital adequacy were significant. The coefficient on capital adequacy is negative representing that banks with higher capital adequacy are experiencing low loan losses. The insignificant relation between non performing loans and diversification reflects that banks find no benefit from diversification. These two results are alarming for the risk taking behavior in commercial banks. If banks find no benefit from diversification they will be tempted to extend credit to selected profitable sectors building up credit risk in their portfolios. Secondly, the significant coefficient on CAR represents that banks are assuming risk on the basis of regulatory capital. In Pakistan, banks are following a standardized approach for allocation of risk weights and based on this "one size fits all" approach, 100% risk weights are assigned to all unrated corporate sector clients.

This will understate the risk of exposures that have constrained repayment capacity while at the same time would require an overstated capital charge for good borrowers. Moreover, CAR is capital allocation not only for credit risk but also against other risks including market and operational. This will result in a moral hazard for the banks, if they assume CAR as a cushion against loan losses, banks can walk away from diversification by maintaining higher regulatory capital. This will result in piling up credit risk in advances portfolios of the commercial banks.

The insignificance of diversification benefits for banks has a policy implication for central bank. This entails that State Bank of Pakistan should encourage banks to move to an internal rating based approach, as proposed by Basle II, that provides banks with better risk coverage of their clients. The internal rating based approach also provide implicit diversification benefits in calculating regulatory capital by considering correlation within assets and explicit benefits against liquidity risk through advanced measurement approach. Adapting these internal risk modeling approaches will encourage banks to diversify their credit portfolios. The regression results for market based risk variables are reported in Table 3.7 and 3.8.

[Insert Table 3.7 and 3.8 about here]

Since market based risk measures are based on market perceptions it is not surprising that we find a significant relation between diversification variable and value at risk and profitability of default. The market places a higher risk for banks which are concentrated in their credit positions while they place a low risk for banks which are better diversified. The control variables of overhead to total assets and

capital adequacy are also significant implying relevance of capital adequacy as overall risk absorption cushion and operational inefficiencies as a factor that contributes towards risk. All factor loadings are significant at 95%.

3.5 Conclusion

The aim of this article was to analyze two propositions about risk and diversification. Primarily, we examined if larger banks are better diversified than smaller banks. Secondly, we investigated if banks find any benefit in diversification. We analyzed this proposition by observing if diversification results in risk reduction. The risks that were considered consisted of both accounting and market based risks, while we used Hirschman Herfindahl Index to capture sectoral diversification.

The result on bank size and diversification were not surprising and we observed significant relation between larger banks and diversification index. Larger banks were better diversified than smaller banks and this is understandable because of their outreach coupled with strong capacity to mobilize funds. However, the results were surprising for the impact of diversification on risk. We could not deduce a significant relation between diversification and non performing loans suggesting that banks will find no economic benefit by diversifying their advances portfolio and this will bring a moral hazard. Banks will not diversify and concentrate on prime borrowers to maximize profits ignoring the risk. Moreover, we observe significant coefficient on capital adequacy ratio signaling that banks at large are relying on capital adequacy as the cushion and continue to pile up risk in their portfolios. The

credit portfolio will become riskier and riskier and one extreme event could trigger a systemic failure. The market based risk measures showed a positive relation with diversification reflecting investors' concerns about diversification vis-à-vis banking credit risk. There is a strong policy implication for risk management that should be considered by the central bank. SBP should seriously consider a transition of one size fits all standardized approach to internal rating based approach which provides diversification benefits in calculating regulatory capital. If banks get economic benefits from diversification they will attempt to diversify their portfolios that will lower the risk profile of credit portfolios enhancing the strength of financial system.

Chapter 4

Market Discipline: Evidence from Market for Uninsured Liabilities and Bank Equity- The Case of Pakistan

4.1   Introduction

The vulnerability of financial sector, towards various risks, is critical both for the economy and related stakeholders. The devastating impact of systemic risks towards the financial system is evident in almost all banking crises. To mitigate the negative impact of banking risks towards economy, financial sector is strongly regulated across all economies of the world. This involves monitoring of a bank's risk activities and ensuring adequate risk absorption capacity through different statutory requirements (capital adequacy, statutory liquidity reserve requirements, minimum paid up capital etc).

Historically, the onus of monitoring the financial system remained with the state that regulated financial institutions through central banks. However, despite stringent controls, banking systems kept on facing turbulent situations challenging policy makers to introduce alternative measures of surveillance that could complement the regulatory supervision. One such measure is to introduce and promote the disciplinary role of private agents (depositors, bondholders and shareholders). Pillar III of Basel Accord II (2001) introduced the concept of market discipline for uninsured liabilities (mainly deposits) as a vital component of prudent banking. This involves promotion of transparency by dissemination of information related to associated risks. An important step, for providing transparent information to evaluate bank condition by investors, was introduced in Basle II that requires online dissemination of financial statements. Based on this disclosure, depositors and investors are expected to evaluate a bank's risk level and should align their

preferences accordingly. In case of an increase in risk level, they should either demand a higher risk premium or else diversify their portfolios to satisfy their risk appetite. Therefore, market discipline by private agents such as depositors refers to two different aspects that should not be confused with each other. The first aspect is related to the ability of stakeholders to monitor and identify a changes in the banks' fundamentals, while the second aspect is concerned with the power of these stakeholders to influence the actions of bank management by demanding higher required rate of returns. The presence of market discipline could be beneficial in at least three ways. Primarily, with market discipline in place, the banks indulging in excessive risk taking activities are likely to pay a higher risk premium to depositors. The increased cost on deposits will act as a penalty for risky banks and will moderate banks' risk taking behavior. Secondly, in a market discipline mechanism the cost of bank supervision would be low as government regulation is complemented by market participants. Lastly, the market discipline in banking sector will enhance efficiency by forcing inefficient institutions to become efficient or else exit the system. The empirical literature on the subject is aimed at establishing that whether, in banks, the various associated risks are priced in uninsured liabilities or publicly traded capital securities (stocks and bonds). Based on the nature of uninsured liabilities and capital market securities, the empirical investigation can be classified into three categories. These include market discipline for

i). Uninsured liabilities (bank deposits)

ii). Subordinated debt

iii). Bank equity

The discipline in market for deposits and subordinated debt is similar as analyses are based on impact of banking risks on cost of deposits and subordinated debt (or interest rate margins). Similarly, if external agents from capital markets impose discipline on banking stocks, the required return for the stock market investors should price the bank specific risk premium. Mirza and Alexandre (2009) provide evidence that asset quality, specific to commercial banks measured as ratio of non performing loans to gross loans, is a systematic risk factor that is priced in European financial stock by investors who demand higher rate of return from those bank stocks whose above stated ratio is higher.

Among these three categories, market for subordinated debt provides a unique rationale for accurate evaluation of banking risks. The banking deposits in some countries are safeguarded through deposit insurance or contractual guarantees. Even in absence of such insurance or explicit guarantees, the regulators are cautious towards systemic risk of depositors and regulatory framework employs various caveats to mitigate any risk to bank deposits. On the contrary, the subordinated loans are not insured and expected loss in case of default for subordinated debt is substantially high as compared to depositors owing to the junior claim for such debt. Therefore, in case of bankruptcy subordinate debt is compensated after all other obligations and is senior only to the equity holders. This would warrant the accurate and continuous evaluation of financial condition of a bank by the unsecured subordinate debt holders.

The role of subordinate debt for imposing market discipline is considered so critical that proposal on mandatory subordinated debt has been extensively discussed by policy makers and researchers especially in emerging markets[16] that are subject to fragile financial systems, less developed capital markets and weak supervisory capacities. In emerging markets, the relevance of market discipline is critical as financial system is dominated by banks and the role of financial markets is limited leaving financial intermediaries as major source of raising capital. Pakistan's banking sector has undergone financial liberalization with an aim of reduced government intervention and promotion of market based functioning. The major reforms were targeted at improving market structure by privatizing nationalized banks, lowering the entry barriers, enhancing the economies of scope for banks and promoting mergers and consolidation of financial institutions. Similarly, capital market reforms have been introduced to enhance the efficiency and transparency of capital markets to provide a meaningful medium for raising long term capital. However, it is surprising that despite these reforms that were aimed at eliminating market imperfection by reducing information asymmetries, moral hazards and speculative trading, in the last decade, Pakistan has witnessed a limited number of Initial Public (IPOs) or Seasoned offerings (SOs)[17]. Likewise, the bond markets have remained underdeveloped and illiquid with very few issues of publicly placed Term

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[16] For more on mandatory subordinated debt and its relevance for emerging markets, please see Karacadag and Shrivastava (2000)

[17] The IPOs or SOs that took place between 2001 and 2010 were either a move towards increasing the outside shareholdings in public sector firms or were motivated to enhance the regulatory capital base (Banks) under Basel II framework.

Finance Certificates (TFCs) leaving banking and non banking financial institutions (NBFIs) as major source of short and long term capital. On the contrary, despite tremendous increase in market activity over the last decade with notable trading volumes and upsurge in index value, the failure of stock markets as a platform to raise fresh equity capital could partly be attributed to the high volatility and speculative component[18] that hinders businesses to raise capital from a turbulent source. Recent evidence by Afzal and Mirza (2010) demonstrate that depositors of Pakistan's commercial banking sector are interest rate sensitive based on risk perception about the bank. This finding provides a valid case for the investigation of existence of market discipline by depositors.

Table 4.1 summarizes the statistics of Karachi Stock Exchange for last five years. The number of new listings for both debt and equity instruments per year clearly represent the lack of market activity for raising capital.

[Insert Table 4.1 about here]

Given this sort of market activity, we could not expect market discipline in its strong form. However, another unique feature of Karachi Stock Exchange is high turnover of banking stocks (unlike most of the others developed and emerging markets, where financial stocks are subject to non synchronous trading[19] and firm

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[18] For more on speculative bubble in Karachi Stock Exchange, please see Mirza and Afzal (2009)

[19] Lieven et al. (2007)

specific variables dominate in pricing of banking stocks[20]) and active trading, if complimented with bank fundamentals, could act as a source of enforcing market discipline. Table 4.2 presents the average (five years) turnover for various sectors in Karachi stock Exchange. Banking sector is most active contributing approximately 46% of the average shares traded in last five years. This makes it interesting to observe if capital markets are imposing some sort of market discipline on the volume leading sector.

[Insert Table 4.2 about here]

With these characteristics of financial system of Pakistan, it would be interesting to observe if bank depositors and participants from capital markets are imposing discipline on bank managers. It is surprising that despite these financial reforms and adaptation of Basel II, there is no empirical research to establish the presence of market discipline in Pakistan. Therefore, this study would be the primary research to analyze the dynamics of market discipline in the post reform period (2004-2009).

Using an unbalanced panel of listed banks for a period of six years for this study some preliminary evidence of market discipline in Pakistan's commercial banking sector was found. It was established that there was support to the notion that bank specific variables and stock prices reveal important risk related information and banks offer compensation when they are perceived risky. Since banks provide a

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[20] Mirza and Alexandre (2009) provide evidence that asset quality, specific to commercial banks measured as ratio of non performing loans to gross loans, is a systematic risk factor that is priced in European financial stock.

premium for high risk, we could not find evidence that increase in risk could result in deposit switching. These findings provide some preliminary insight about the dynamics of market discipline in Pakistan. This study also contributes by suggesting sophisticated quantitative procedure for risk estimation that can be used by financial institutions to adapt Internal Rating Based approach. The rest of the story is as follows. Section 2 will provide a brief literature review, section 3 will build on methodology, section 4 will present empirical findings while section 5 will conclude.

4.2   Literature Review

Fonseca and Gonzalez (2010) studied the influence of market discipline imposed by depositors by comparing the relation of cost of deposits and bank capital buffers. Their study comprised of panel of 1,337 banks from 70 countries spanned over a period between 1992 and 2002. The capital buffer was measured as the proportion of excess (difference between actual and required capital) and required regulatory capital while the cost of deposits was ratio of interest expense to interest bearing liabilities in excess of treasury rate. The results favoured the notion of market discipline with a significant positive coefficient for deposit cost. They concluded that market discipline would penalize the banks with low risk absorption capacity by augmenting the cost of deposits. Such banks would then increase the capital buffers to reduce the perceived risks and ultimately benefit by low cost of deposits. This study was mainly based on banking firms fundamental information and ignored market based risk measures. Shimizu (2009) provided evidence on market based variables to examine the impact of market discipline.

Shimizu (2009) analysed the discipline imposed by depositors using stock market information. They argued that informed participants in the stock market based their investment decisions on analytical information that was not disclosed in the financial statements. This is not directly observable by the uninformed depositors so they can rely on stock market information to assess the financial health of a bank. They used a sample of Japanese banks and studied the determinants of variation in deposit base. The determinants included bank specific variables (profitability, capital adequacy etc), contagion variable of growth in stock prices and some important macro variables. They found evidence of a significant relationship between fall in stock prices and withdrawal of deposits. They concluded that a fall in share price would signal a higher probability of bank failure and will result in a higher withdrawal rate. A combination of bank specific factors and market based variables was examined by Uchida and Satake (2009).

Uchida and Satake (2009) investigated the hypothesis of market discipline imposed by depositors and market investors on Japanese banks between 2000 and 2005 using an inefficiency framework of banking costs and profits. They ranked the cost and profit factors based on various discipline and control variables. The discipline variables included bank listing, proportion of subordinated loans, subordinated bonds, straight bonds, convertible bonds and deposits to total assets ratio. Moreover, they included dummies for bank compliance with international standard of the capital adequacy and if the bank constitutes the part of a banking holding company. The control variables included bank size, loan to deposit ratio,

interest margin and number of bank branches. The results reported a significant

negative relation between depositors and cost inefficiency. They concluded that

depositors are the prime source of market discipline and in banks with greater

number of depositors the management was found to face immense pressure to reduce

cost inefficiencies. All these studies provided evidence on market discipline imposed

by depositors and shareholders. The role of subordinated debt in imposing market

discipline was analysed by Gropp et al (2006)

Gropp et al (2006) studied the impact of stock and bond market information

on bank fragility in a sample of 103 US banks between 1991 and 2003. Moody's

KMV[21] distance to default was the lead indicator from equity markets while spread

on subordinated debt was the proxy from debt markets. The bank fragility was

measured as a downgrade to speculative rating of C or below by FITCH ratings. The

results showed that both distance to default and spread on subordinated debts were

able to predict the bank fragility with distance to default predicting the crisis at least

18 months in advance, while the spread could predict fragility only 12 months in

advance. They conclude that equity market data provided more valuable information

for the participants to forecast and differentiate between good banks and weak banks.

Goyal (2005) examined the discipline imposed by subordinate debt holders on

excessive risks taking by US banks using panel data between 1974 and 1995 and a

sub period of relatively less regulatory supervision of 1981 - 1988. The influence of

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[21] Moody's KMV distance to default is based on extraction of default information
from market prices based on Black, Merton and Scholes option pricing framework
and its relevance to corporate liabilities.

market discipline was analysed by observing the impact of banks' risk exposure on yield spreads and restrictive debt covenants. The results supported evidence of market discipline in yield spreads as well as debt covenants. A significant negative relation was observed between risk incentives and restrictive covenants that reflected a possible decrease in excessive risk taking in presence of prudent debt covenants. This disciplinary feature of debt covenants was even more evident in a moderately regulated sub period. They concluded that inclusion of restrictive covenants in subordinated debt act as disciplinary tool and can substitute some regulatory monitoring.

Maechler and McDill (2006) reported the impact of depositor discipline by analyzing the choice of deposit insurance vis-à-vis risk tolerance and spread premium of US banks between 1987 and 2000. The research was dynamic as depositor reaction and bank response was modeled simultaneously. The factors determining the proportion of uninsured deposits included price variables, bank specific factors (size, capital, growth in assets etc) and some macroeconomic variables (GDP, Inflation etc). The results provide evidence in favor of depositor discipline with significant coefficients on bank fundamentals reflecting that uninsured depositors are sensitive towards bank fundamentals. Therefore, for bigger and stronger banks, the uninsured depositors would require a lower premium as compared to small and weaker banks. The bank response towards depositors was price sensitive with significant coefficients for pricing variables suggesting that banks could increase the proportion of uninsured deposits by raising the interest

rates. They concluded that depositor behavior and bank response seemed to impact the risk premium as well as the risk appetite of bank managers by limiting very high level of risks. The investor reaction to credit events as source of market discipline was studied by Bremer and Pettway (2002).

Bremer and Pettway (2002) addressed the issue of market discipline from a different aspect. They studied the impact of ratings downgrade on share price and the manager reaction to this decline. The credit ratings reflect the capacity of a bank to service its obligations and a downgrade would signal a reduction in creditworthiness. They used various event windows to estimate the reaction of stock price to a downgrade announcement. The sample constituted of 73 announcements of 49 Japanese banks spanned over a period between 1986 and 1998. The results provided weak evidence for market discipline with significant sensitivity of stock prices to credit ratings downgrade announcements; and they also found that market participants were able to differentiate strong and weak banks. However, the management reaction to this penalty was non existents. This lack of managerial response to market discipline was consistent with results of Anderson and Campbell (2000) that relates the managerial inefficiencies in Japanese banks to corporate governance. Bremer and Pettway (2002) identified lack of supervision in Japanese financial system and concluded that disclosure requirements of Basel were not sufficient to impose rigorous discipline.

Bongini et al (2002) compared the extent of information that could be extracted from a set of variables to indicate bank fragility. The sample constituted of

East Asian banks between 1996 and 1998 while the variable sources comprised of balance sheet data (CAMEL ratings), stock market prices and credit ratings. The research was based on both ex post and forecasted ex ante estimates. The results showed unique patterns of information from the three set of variables. The ex post balance sheet variables provided significant information to discriminate between the banks of varying financial health. The stock price and rating variables did not provide any information that could be used by the investors to impose market discipline. The ex ante estimates favoured equity market variables followed by balance sheet sources, while rating variable remained insignificant. They conclude that multiple sources of public information were likely to provide confusing signals and investors in less developed financial systems should rely on multiple indicators of bank fragility to enforce market discipline.

4.3   Research Methodology

4.3.1 Sample Criteria

This study employed panel data of various bank specific, equity market and macroeconomic variables to empirically examine whether the depositors and equity market investors impose some market discipline on Pakistan's commercial banking sector. The sample was selected based on following criteria.

1. The sample period constitutes of post financial reform period of 2004 to 2009. This sample period also represent the time span when commercial banks were adapting

the disclosure requirements proposed in pillar 3 of Basel Accord II and III (2006, 2010) .

2. Only public listed banks would be included with data available about their balance sheet, income statement and stock prices.

3. The survivorship bias will be addressed by excluding merged or delisted banks.

4. The three government banks (National Bank of Pakistan, Bank of Punjab and Bank of Khyber) have contractual guarantees for depositors. These guarantees make them default remote entities on their primary obligations and hence market discipline could play little role. Moreover, their lending and borrowing profile is different because of Government intervention. In particular, asset liability structure of NBP is different from other commercial banks because of its role as de-facto regulator. The robustness tests would exclude these three banks from the panel of proposed sample of banks.

Based on this criterion, final sample constitutes of an unbalanced panel. The number of banks in sample each year is presented in Table 4.3.

[Insert Table 4.3 about here]

The information on bank fundamental variables, on annual basis, will be extracted from the yearly financial reports of the respective banks while capital market data will be extracted from the website of Karachi Stock Exchange.

4.4 Estimating for Market Discipline

As mentioned earlier, the literature on market discipline propose three types of markets that can be examined to ascertain market discipline. In Pakistan's case, only two of these three markets are relevant. These include market for uninsured liabilities and market for bank equity mainly because of significant presence of deposits and shareholders' equity in banks' capital structure. The subordinated debt does not constitute an important source of financing in Pakistan's commercial banks, mainly because of negligible existence of debt markets and will be excluded from this analysis. Moreover, subordinated debt in Pakistan is mainly through private placement of group/holding firms, so being insiders, they are not likely to impose discipline in its essence. Lastly, subordinated debt in Pakistan's banks is primarily to meet regulatory capital which otherwise have low access to equity markets and limited retained earnings due to constrained profitability.

The nonexistent debt markets pose a policy challenge with respect to implementation of Basel II where subordinated debt has dual implications. The capital adequacy framework (Pillar 1) considers subordinated debt as regulatory capital (Tier II) and augments the risk absorption capacity. The subordinated debts are junior claimants and therefore are exposed to maximum potential loss. Such investors have greatest motivation to discipline (Pillar 3) the banks compared to depositors (primary claim, contractual guarantees, insurance) and shareholders

(limited liability). Based on this argument many researchers [22] proposed for a mandatory subordinated debt policy for commercial banks capital even in the developing economies. This will not only facilitate the development of debt markets in Pakistan but also enhance the monitoring function of capital markets and thus trimming the excessive risk appetite of commercial banks ensuring a smooth transition to Basel II.

4.4.1 Dependent Variables

The financial economics theory present two main rationales in risk and return relationship. Primarily, the risk and return should be correlated and an increase in risk level would increase the required rate of return. If markets exhibit some discipline, the depositors should be able to differentiate between high risk and low risk banks and penalize excessive risk taking by augmenting the cost of deposits/funds by requiring a high return. The cost of funds will be estimated as

$c_{it} = \left(\dfrac{IE_{it}}{IntLiab_{it}} \right)$, where c_{it} represent percentage cost of capital, IE_{it} represent interest paid to depositors and $IntLiab_{it}$ would reflect all interest bearing liabilities, for bank i at time *t*.

The second aspect relates to the risk tolerance of the participants. Investors have their own own utility function of risk and they will not choose assets which are beyond their risk limits even if such assets are offering a high risk premium. In the

[22] For more on this, please see Hamalainen et al. (2010), Ahmed (2009), Fan et al (2003)

presence of market discipline this phenomenon for banks will generally result in deposit switching from high to low risk banks. A switch in deposit would be estimated as year on year change on deposits. Mathematically, this variable will be represented as $\Delta D_t = \lambda_{it} = \dfrac{D_{it} - D_{it-1}}{D_{it-1}}$, with λ_{it} as change in deposits in year t, D_{it} as deposits of bank i in year t, and $D_{it\,-1}$ as deposits of bank i in year $t - 1$.

4.4.2 Independent Variables - Market for Uninsured Liabilities

In order to test for market discipline in deposit market the rating supervision system of CAMEL will be followed. The CAMEL represents five factors that are related to risk and risk absorption capacity. These are capital adequacy, asset quality, management, earnings, and liquidity. In addition to CAMEL, two control variables of banks size that would be measured as log of total assets and a macro variable of growth in gdp will also be employed. We use a panel data set from 2004 to 2010 for sample banks would be used and various accounting measures would be extracted from the annual reports. The following fixed effects model for cost of deposits will be estimated for bank fundamental variables.

$$c_{it} = \alpha_i + \beta_1 CAR_{it} + \beta_2 (NPL_{it} / GL_{it}) + \beta_3 (REV_{it} / INV_{it})$$
$$+ \beta_4 (OH_{it} / TA_{it}) + \beta_5 ROA_{it} + \beta_6\ LIQ_{it} + \beta_7 Log(TA)_{it} + \beta_8 \Delta gdp_t + \varepsilon_{it} \qquad \text{................(11)}$$

Capital Adequacy Ratio (CAR)

In this equation, CAR will be regulatory capital adequacy ratio that is vital part of every bank's disclosure. Capital adequacy represents the capital buffer against contingent losses. Banks with strong CAR are considered less vulnerable to

shocks and are considered as low risk bank. If market discipline exists, a high CAR would result in low cost of funds representing a negative relation with interest rate on liabilities.

Asset Quality of Advances and Investments

Asset quality (AQ) would be measured as proportion of nonperforming loans to gross loans portfolio. A high ratio would represent a high proportion of nonperforming loans in total loans would be an indicator of bad asset quality. Banks with bad asset quality are expected to be disciplined by increasing the cost of the deposits. Asset quality for investment portfolio is also which is measured as proportion of revaluation surplus to investment portfolio. A higher revaluation surplus would indicate better risk absorption capacity for the bank and such banks are expected to experience a low cost of deposits. For management performance a non interest expenditure to total assets ratio will be used as proxy. A high ratio would indicate higher proportion of overhead indicating inefficiency on part of managers and such inefficiencies would warrant a high cost of deposits.

Earnings and Liquidity

The earnings will be measured by return on assets (ROA) and highly profitable banks as measured by ROA are likely to have lower cost of deposits. The liquidity needs of bank would arise from demand deposits. Therefore, liquidity is calculated as percentage of liquid assets to demand deposits. Banks with stronger liquidity should have low cost of funds. The bigger banks are expected to enjoy

economies of scale in deposits. This would put smaller banks at a disadvantage, so to control for large variations, bank size will be a critical variable.

The deposit switching variable will be estimated by adjusting the previous by using the percentage in deposits as the dependent variable. The equation will take the following form

$$\frac{\Delta D_{it}}{D_{it-1}} = \alpha_i + \beta_1 CAR_{it} + \beta_2 (NPL_{it} / GL_{it}) + \beta_3 (REV_{it} / INV_{it}) + \beta_4 (OH_{it} / TA_{it}) + \beta_5 ROA_{it}$$
$$+ \beta_6 LIQ_{it} + \beta_7 Log(TA)_{it} + \beta_8 \Delta gdp_t + \varepsilon_{it} ....(12)$$

4.4.3 Independent Variables – Market for Bank Equity

Primary advantage of stock market information is that unlike accounting variables which reflects past transaction, the stock prices are forward looking. Moreover, informed traders, fund managers, and financial analysts in these markets have greater information and a superior capacity to analyze this information. Therefore, the discipline of imposing higher cost of funds or penalizing bad banks by deposit switching can be based on information extracted from stock prices. The fixed effect regression models would be

$$c_{it} = \alpha_i + \beta_1 \delta_{it} + \beta_2 VAR_{it} + \beta_3 DLI_{it} + \beta_4 B / M_{it} + \beta_5 Ln(MV_{it})$$
$$+ \beta_6 \frac{\Delta P_t}{P_{t-1}} + \beta_6 \Delta gdp_t + \varepsilon_{it} \cdots\cdots(13)$$

$$\frac{\Delta D_{it}}{D_{it-1}} = \alpha_i + \beta_1 \delta_{it} + \beta_2 VAR_{it} + \beta_3 DLI_{it} + \beta_4 B / M_{it} + \beta_5 Ln(MV_{it})$$
$$+ \beta_6 \frac{\Delta P_t}{P_{t-1}} + \beta_6 \Delta gdp_t + \varepsilon_{it} ....(14)$$

a)   Systematic Risk δ_{it}

A firm's systematic risk reflects its sensitivity to stock market as a whole. Firms with higher systematic risk would experience shocks to equity and a negative shock is expected to erode the buffer against losses since in financial sector, equity would perform more as a source of risk absorption capacity rather than a mean of financing. Hamada (1969), Breen and Lerner (1973) provide theoretical analyses that suggest that differences in the 'beta' of each firm should be related to differences in their risk and financial management activities. Therefore, one might expect that the estimated 'beta' would reflect each firm's risk and return characteristics. Since beta is not directly observable we will estimate it using Sharpe (1964) single index model. The daily returns of each year would be regressed on index returns to obtain the estimate of relevant risk. This will take the form $R_{it} = \alpha_i + \delta_i R_{mt} + \varepsilon_t$, with R_{it} as return on individual stock and R_{mt} as return on market index. To account for possible autocorrelation and heteroscedasticity of unknown form, beta would be estimated using Generalized Method of Moments (GMM) approach as it does not require the normal distribution of disturbance term. The market return will be proxy by return on KSE 100 index. However, it is felt that KSE 100 might be a misrepresentative, so a synthetic value weighted bank index (based on all listed banking stocks and weights rebalanced every six months) will be created to provide a robust estimate of relevant risk. A high coefficient on relevant risk would be perceived negative by the depositors and this would result in increased cost of deposit and a high possibility of switching.

b) Value at Risk

In order to estimate the total risk, we will use a more sophisticated tool of value at risk (VAR) will be used to analyze its impact on cost of funds. VAR is referred to as the maximum loss that is expected in a given investment horizon. The ex post volatility ignores the direction of the investment movement. The observed volatility can be high because historical prices might have witnessed an abnormal increase which is not an indication of distress. VAR is considered a more appropriate measure of risk because unlike standard deviation or volatility it only considers the left tail of returns. In order to estimate VAR, Monte Carlo simulation to predict ex ante stock prices using a Geometric Brownian Motion (GBM) approach will be used and will calculate returns to estimate the worst case loss at 99% confidence interval. This process is repeated for each bank in the sample for every year and estimated VAR is used in our panel regression. The simulation process for price estimation is as follows.

Assume the price P for bank *i*, follows a GBM and this stochastic process can be expressed as

$$dP = \alpha P dt + \sigma P dz$$

where dz is the Wiener increment of $\varepsilon dt^{0.5}$, ε follows a normal distribution, α represent drift (or price differential) and σ represent volatility in price P. To estimate the growth in prices, total investment return μ will be used as a function of capital gain α and dividend yield δ. Mathematically, this can be written as

$$\mu = \alpha + \delta$$

where μ is also the risk adjusted discount rate for price P. The stochastic expression can be expressed as

$$dP = (\mu - \delta)\ Pdt + \sigma Pdz \quad \ldots \ldots \ldots \ldots \ldots \ldots (15)$$

Assuming a risk neutral world, it is justified to replace μ by risk free rate r and the risk neutral price formation process will be

$$dP = (r - \delta)\ Pdt + \sigma Pdz \quad \ldots \ldots \ldots \ldots (16)$$

Equation 15 and 16 would represent the risk adjusted and risk neutral version of price formation process. Applying log normal transformation and combining with Ito's lemma, the following simulation equations for both risk adjusted (equation 17) and risk neutral equations (equation 18) would be formed.

$$P_t = P\exp\left[(\alpha - 0.5\sigma^2)\Delta t + \sigma N(0,1)\sqrt{\Delta t}\right] \qquad \ldots \ldots \ldots \ldots (17)$$

$$P_t = P\exp\left[(r - \delta - 0.5\sigma^2)\Delta t + \sigma N(0,1)\sqrt{\Delta t}\right] \qquad \ldots \ldots \ldots \ldots (18)$$

The simulation of equation 17 and equation 18 will give stock price P_t at any future interval t with normal distribution $N\sim(0, 1)$. Once the expected prices are estimated, a back test for significance, and t statistics of mean difference would be conducted and it would suggest that risk adjusted equation provided a better estimate of ex ante prices. For every bank in the sample, future prices would be simulated using daily frequency. Once P_t is estimated, daily logarithmic returns would be estimated to

calculate daily value at risk at 99%. This daily value at risk will then be annualized

using continuous compounding for yearly estimation in panel regressions.

c)   Default Likely Indicator (DLI)

The traditional measures of default risk takes into account the volatility of

book value of assets. However, in the extreme case of default, only the market value

of assets would matter. The market value of assets (and related volatility) *per se* is

not evident because although market value of equity is observable but not all

liabilities are marked to market. Merton (1974) proposed an asset value model to

extract credit information embedded in equity markets using Black and Scholes

(1973) option pricing framework.

The asset value model treats the firm's equity as a call option (European) on

the assets of the firm having a maturity equal to the maturity of its debt and strike

price equal to the amount paid to the creditors. The firm will be distant from default

as long as market value of assets exceeds the amount of liabilities to be repaid. In

option pricing framework, the market value of a bank's assets will follow a

geometric Brownian motion of the form

$$dV_A = \mu V_A dt + \sigma_A V_A dW$$

where V_A is the bank's asset value, with a drift μ and volatility σ_A is a standard

Wiener Process W. The equity of the bank V_E with liabilities X of maturity T, a risk

free rate of r and a cumulative density function N of the normal standard distribution,

can be modeled as

$$V_E = V_A N(d_1) - Xe^{-rT} N(d_2)$$

with $d_1 = \dfrac{\ln\left(V_A/X\right) + (r + 1/2\sigma_A^2)T}{\sigma_A\sqrt{T}}$, and $d_2 = d_1 - \sigma_A\sqrt{T}$

The estimation of V_A is possible from the above equation if the value of σ_A is known.

To calculate σ_A we will adopt an iterative process as proposed by Vassalou and Xing (2004)[23]. Initially, the past 12 months daily prices for every bank will be used to estimate the volatility of equity σ_E. This estimate of volatility in equity will be used as a proxy for σ_A and daily V_A will be calculated given the V_E. In the next step the standard deviation of these V_A will be estimated that will be used as σ_A for the next iteration. This process will be repeated till both estimates of σ_A and σ_E converge within 0.0001. Once the converged value is obtained, we will re-estimate V_A for every bank and we will calculate drift μ as log of V_A. The Xi will be liabilities maturing within T (one year) and r will be daily yield on one year treasury bills. Once all these variables are in place, the default likely indicator (distance to default) can be estimated as

$$DLI_{it} = 1 - N\left[\frac{\ln\left(V_{Ai}/Xi\right) + (r + 1/2\,\sigma_{Ai}^2)T}{\sigma_{Ai}\sqrt{T}} \right]$$

The lower DLI would imply a low level of default risk and banks which are distant from default are expected to have low cost of funds.

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[23] A similar iterative process is used by Moody's KMV to estimate the expected default frequency.

d)   Book to Market and Size (Market Cap)

Fama and French (1992) proposed an extension of CAPM by adding two more factors. Fama and French noted that two classes of stocks have performed better than the market as a whole. These included stocks with small market capitalization and stocks with high book value per share to price (market value) ratio. Since these stocks yielded higher return than market, FF commented that such phenomenon is explained by the existence of *size* as well as *value* premium in addition to the market risk premium of systematic risk. The high book value to market value ratio stocks were termed as value stocks while low book value to market value ratio stocks were termed as growth stocks. The size factor measures the additional returns investors receive for participating in stocks with comparatively small market capitalization. The stocks with high book to market and low market caps are considered to be risky and depositors should demand high interest rates for the risk compensation.

e)   Stock Returns/ Price Relatives

The equity of a firm represents shareholders' contingent claim on firm assets and future cash flows. Therefore, stock market prices are expected to reflect the value investors would place on the future prospects of the firm. Moreover, the price formation process is also a strong reflection of expectations from informed investors (including insider information) who have superior skills to analyze bank's fundamentals and consequently stocks are expected to be fairly priced and depositors can deduce valuable information about perceived financial position of the bank from

stock prices. We estimate average intraday stock returns for bank equity and use as explanatory variable for cost of funds and deposit switching. If returns are large, this would indicate proportional increase in prices representing investors' confidence about the future of the bank and in the presence of market discipline, depositors should require a low rate of return. Similarly, banks with high stock returns are not expected to experience a high variation in deposits.

Lastly, Macroeconomic variable of GDP is taken to control for factors that may cause broad movements in the availability of deposits to the banking system. The expected signs of independent variables are reported in exhibit 4.1.

[Insert Exhibit 4.1 about here]

4.5 Empirical Results

a)   Market for Uninsured Liabilities

The fixed effect regression results for deposit costs are reported in Table 4.4.

[Insert Table 4.4 about here]

The results demonstrate significant coefficients loadings on many explanatory variables. The asset quality variables for both investment and advances books are significant at 99% representing strong impact of these factors on cost of funds. The loan quality was measured as proportion of nonperforming loans to total advances and a higher ratio will represent a deteriorated asset quality of the bank. As

mentioned earlier, non performing loans will put pressure on both profitability and asset liability management of the bank. Therefore, banks with infected portfolios will be subject to a higher degree of credit risk and this will warrant a higher cost to compensate depositors. A positive coefficient on non performing advances signals the presence of credit risk premium that banks with low asset quality would pay in form of higher cost of deposits. The asset quality of investment and trading portfolio was measured as proportion of revaluation surplus to investments. A revaluation surplus represents spread between market and purchase price of investments and provides cushion against contingent risks. The revaluation surplus is classified as Tier II capital and banks with higher revaluation surplus are expected to have high risk absorption capacity and can attract depositors at low cost. The negative coefficient on revaluation surplus to investments, reflect that banks with higher revaluation surplus can mobilize funds at low cost because of their low risk profile perception of depositors. Similar results were observed for liquidity with significant negative coefficients. This represents that banks with higher liquidity are likely to enjoy low cost of deposits owing to a low liquidity risk. This is in line with the concept of market discipline where depositors would be satiated by low returns if they perceive low risk for the bank. The regulatory capital adequacy ratio was significant at 95% with negative coefficient representing low cost of funds for bank that have strong capital adequacy. Lastly, overhead to total assets was marginally significant at 90% with positive coefficient reflecting that with inefficiencies owing to higher overheads, depositors will be sceptical requiring higher compensation for

the funds. We could not deduce significant result in favour of bank size and profitability. The insignificance of bank size coefficient can be interpreted in plausible ways. Firstly, in context of market discipline this would reflect that depositors do not consider total assets as a relevant variable for risk and place more value on specific risk factors (credit risk, liquidity risk) or risk absorption capacity (revaluation surplus, CAR) that have significant coefficients with appropriate signs. However, it is worthwhile to note that when we proxy size by market value of equity, we observe a significant coefficient (as reported in market for bank equity in Table 4.6). The second aspect of this insignificant coefficient supports notion of market discipline in an indirect way. The irrelevance of total assets towards cost of deposits refutes general convention of low cost of deposits for larger banks which in fact is also in line with our earlier observation of interest rate sensitive deposits. This would require banks to improve on efficiency (both in profitability and risk management) to tap low cost funds. These results provide support to the common observation of small banks offering higher rate of return to depositors as a compensation for risk due to constrained balance sheets.

b)   Market for Bank Equity

The average descriptive statistics for dependent and independent variables are reported in Table 4.5. Cost of funds for the sample banks increased over years with a minimum of 3.26% in 2005 and 6.83% for 2009 representing an overall increase in cost of borrowings. The systematic risk as measured by beta coefficient (both for KSE 100 and Bank Specific Index) also increased showing an increase in risk

perception by stock market participants. The estimates of systematic risk from bank index are relatively higher than those of KSE 100 and were increasing in the later years. This is logical because of the global banking crisis that had some impact on the local banks and increased risk was priced by the equity markets. A similar pattern was observed in value at risk and default likely indicator. The information extracted from stock price data reflect an overall increase in risk perception and an increase in cost of funds is probably to compensate for the incremental risk.

[Insert Table 4.5 about here]

The fixed effect regression results for cost of funds using KSE 100 index are reported in Table 4.6. We find a highly significant negative coefficient on size variable suggesting that banks with strong equity base are likely to have low cost of funds. This is expected because a strong capital base provides substantial risk absorption capacity against unforeseen losses. The default likely indicator and value at risk were significant and positive demonstrating a direct relation between these risk valuables and cost of funds and an increase in these variables are likely to impose a higher cost of borrowings. The control variable of GDP growth was negative suggesting that an increase in economic activity would result in increase in surplus units that will enable banks to mobilize deposits at low cost. The book to market variable was moderately significant with a positive sign suggesting a direct relation between value stocks and cost of deposits. The value stocks are perceived to be riskier and banks with high book to market ratio are expected to compensate their

depositors with higher returns. We could not find a significant relation between cost of deposits and stock returns.

[Insert Table 4.6 about here]

We have some interesting results on the variable for systematic risk. When beta was estimated using KSE 100 index, the variable was significant at 10% with a positive coefficient. However, the results from Table 4.7 suggest that when beta of bank stocks was estimated using a more representative synthetic market index (in this case bank specific), the variable was highly significant and positive depicting that an increase in market risk will be compensated by higher returns for depositors and creditors. It is also interesting to note that in the presence of more representative market risk, two other risk measures of VAR and DLI lose their explanatory power.

[Insert Table 4.7 about here]

This would mean that VAR and DLI also explain in part, market risk, which is captured by beta if an appropriate stock market index in used. There is no change in size and GDP growth variables and they remained negative and highly significant. We could not find evidence in support of incremental price changes. The overall model fit was satisfactory with adjusted R^2 of 52.8% when KSE 100 index was used as proxy for market return. This showed a marginal increase to 55.2% when the synthetic bank index was used as a proxy for market returns (Rm) for beta estimation. These results support the presence of market discipline albeit a moderate one as about 55% of the variation in cost of funds was explained by our market based risk measures. The significance of these variables also suggest that market

prices of bank shares reveal important information that can be useful in assessing the risk profile of banking firms.

It would be worthwhile to mention that the significance of size factor (both in Table 4.6 and 4.7) could ultimately lead to a moral hazard. Since banks with strong equity base are likely to be big banks and will be assumed to have adequate cushion to absorb losses, the "*too big to fail*" fallacy could result in such banks taking additional risks without compensating the stakeholders. These incremental risks could lead to a *black swan* event, resulting in a transition from "too big to fail" to "too big to save".

c)   Market Discipline and Deposit Switching

We attempted to study the deposit switching behaviour using both bank specific and prices based risk measures but could not find substantial evidence in support. The asset quality of credit book was significant at 99%, while capital adequacy ratio was significant at 95%. These findings reinstate the value relevance of advances towards credit risk of the bank. Similarly, regulatory capital was an important determinant of depositors' choice for its role of risk absorption capacity. Macroeconomic control variable of GDP growth and size based on market value of equity was significant and negative providing rationale for presence of strong equity. All other variables were insignificant and therefore, overall explanatory power of results for deposit switching was low with adjusted R^2 of 29.3%. Results are presented in Table 4.8 and Table 4.9.

[Insert Table 4.8 and Table 4.9 about here]

There could be plausible reasons for inability of proposed models to explain deposit switching. One possible explanation could be that with increase in risk profile as perceived by the financial markets, the banks offer higher returns to satiate the risk appetite of depositors and therefore, the depositors and other creditors have no motivation to switch their bank. In order to test for this rationale, we augment our model for deposit switching by cost of deposits. Table 4.10 presents the regression results when cost of deposits is used as an explanatory variable for deposit switching along with our market based variables.

[Insert Table 4.10 about here]

Although, the overall goodness of fit did not increase, but the cost of deposits were highly significant and negative suggesting that banks can retain their clients by compensating them for the incremental risks[24]. However, we do not stress on this hypothesis due to a weaker explanatory power and strongly feel that deposit switching behaviour should be examined in greater depth beyond the notion of market discipline[25].

4.6   Conclusion

The aim of this paper was twofold. First, we wanted to examine the evidence for market discipline in the post financial system reform period in Pakistan.

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[24] Afzal and Mirza (2010) present evidence that Pakistan's banking deposits are interest rate sensitive

[25] These results remained robust when we used quarterly and semi annual data frequency, Historical, Variance Covariance and mean reverting approach for VAR and SMB and HML factors for size and value respectively.

Secondly, we wanted to provide robust estimation procedures for various risk measures that are proposed by Basel Accord for risk management in banks. We estimated various market based risk factors to analyze their impact on the cost deposits for a sample of listed commercial banks in Pakistan.

Our findings support presence of market discipline by significant coefficients on our risk factors. In bank specific factors, the cost of deposits and borrowing was significantly related to capital adequacy, asset quality of loans and investment portfolio as well as liquidity. Similarly, in market based risk measures, borrowing costs were related with probability of default, value at risk and market based size. These findings depict sensitivity of investors towards banking risks in general. Although, the sample period was relatively short but this primary evidence is beneficial to report that market for bank equity could impose some discipline and banks' stock prices reveal relevant information set about the risk profile of a bank. For the first time, we provide comprehensive estimation procedures for value at risk and default likely indicators using Pakistan's data set. These variables are critical for Internal Rating Based approach under Basel framework and our empirical contribution can be used by risk managers of commercial banks to adapt appropriate risk management tools.

The presence of market discipline could be beneficial in at least three ways. Primarily, with market discipline in place, the banks indulging in excessive risk taking activities are likely to pay a higher risk premium to depositors. The increased cost on deposits is likely to act as a penalty for risky banks and will moderate banks'

risk taking behaviour. Secondly, in a market discipline mechanism the cost of bank supervision for monitoring the banks risk taking activities would be low as government regulations designed for the purpose would be complemented by market discipline imposed by participants. Lastly, market discipline in banking sector will enhance banks' efficiency by forcing inefficient institutions to become efficient or else exit the system due to falling market prices of their equities.

It is worth mentioning that disciplinary feature of capital markets could be increased by making the presence of subordinate debt in banks' capital mandatory to support the regulatory capital. At present, the subordinated debt is used by large banks merely to offset the impact of revaluation deficit in Tier II capital or by smaller banks it is used to their restricted excess to equity markets. The subordinated debt holders are junior claimants and therefore are exposed to maximum potential loss. Such investors have greatest motivation to discipline (Pillar 3) the banks compared to depositors because they enjoy (primary claim, contractual guarantees, insurance) and shareholders because they enjoy (limited liability). Based on this argument many researchers[26] have argued in favour of the presence of mandatory subordinated debt policy for commercial banks in developed as well as in developing economies. If such policy is implemented then if will not only facilitate the development of debt markets in Pakistan but also enhance the monitoring function of capital markets thus trimming the excessive risk appetite of commercial banks, and hopefully ensuring the implementation of Basel framework in its true sense.

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[26] For more on this, please see Hamalainen et al. (2010), Ahmed (2009)

Chapter 5

Conclusion

The aim of this thesis was to explore three issues that are critical to financial intermediation specifically in the period of implementation of Basel Accord. These three issues related to interest rate spreads, risk taking dynamics of commercial banks and role of agents to impose market discipline to complement traditional role of state. These issues are important for the functioning of financial system especially in developing economies as high banking spreads brings inefficiencies that reduce investment and are a vital indicator of the poor performance of the financial system and therefore could ultimately retard economic growth. Similarly, it is important to understand the role of diversification in credit portfolios, which are the source to banking spreads, to mitigate concentration risk. If banks find no relevance of diversification, they will continue to grow without diversifying building up risk in their portfolio that could trigger a systemic failure. Lastly, the role of monitoring the banking system has been traditionally performed by the central bank. Basel II introduced the concept of external discipline to subordinate the state's role enhancing prudence and lowering central bank's monitoring cost. The significant banking disclosure requirement for various risks was meant to provide better information to the external agents who can assess this information and through their actions penalize banks for bad management. Therefore, it is important to analyse if in Pakistan stakeholders impose some discipline on commercial banks.

To investigate these research questions, in the first instance, the thesis analyzed determinants of interest rate spreads and margins in Pakistan's commercial

banking sector in the post transition period. The results demonstrated strong evidence of bank size in explaining interest rate spreads. Similarly, operational efficiency, asset quality, liquidity, risk absorption capacity and GDP growth were important determinants of banking spreads. These results provide important policy implications. Counter to common intuition in Pakistan, we feel that dynamics of banking system have changed as a consequence of the financial system reforms and therefore the banks are competing not only on services but also on product prices. Therefore, banks should cater to interest sensitive depositors to sustain their deposit base and spreads. The result about employee efficiency was interesting. In limited credit markets, the banks could indulge in aggressive and risky credit extensions for volume growths and compromising on asset quality. The negative relation of spreads with loans per employee and a positive relation with performing loan per employee clearly indicate that employee efficiency would count if asset quality is maintained and therefore, banks should indulge in aggressive credit volumes only if they can control non performing loans through effective and prudent risk management procedures.

The risk absorption capacity is vital in intermediary efficiency due to presence of substantial uninsured liabilities (mainly deposits) in the financing mix. The default likelihood indicator provides support to the risk absorption capacity as determinant of interest rate spreads. Moreover, this confirms that relevant credit information can be extracted from the market prices of listed securities and regulators and lenders can use Black Merton and Scholes option pricing framework

to assess the credit capacity of the obligor. The results could not deduce significant relation of spreads with interest rate volatility. The case might be that the insignificant relation between spreads and interest rate volatility should be unique to this sample and further research can be done to explore in detail the term structure of interest rates and their impact on intermediary efficiency.

The second research question was related to two propositions about risk and diversification. Primarily, it was examined that whether larger banks are better diversified than smaller banks. Secondly, the thesis investigated if banks find any benefit on risk mitigation by diversifying their credit portfolios. This was studied by observing if diversification results in risk reduction. The result on bank size and diversification were not surprising and a significant relation between larger banks and diversification index was observed. Larger banks were better diversified than smaller banks and this is understandable because of their outreach coupled with strong capacity to mobilize funds.

However, the results were surprising for the impact of diversification on risk. The relation between diversification and non performing loans was not significant suggesting that banks will find no economic benefit by diversifying their advances portfolio and this will give rise to a moral hazard. Banks will not diversify and concentrate on prime borrowers to maximize profits ignoring the risk. Moreover, a significant coefficient on capital adequacy ratio signal that banks at large are relying on capital adequacy as the cushion and continue to pile up risk in their portfolios. The credit portfolio will become riskier and riskier and one extreme event could

trigger a systemic failure. The market based risk measures showed a positive relation with diversification reflecting investors' concerns about diversification vis-à-vis banking credit risk. There is a strong policy implication for risk management that should be considered by the central bank. SBP should seriously consider a transition from one size fits all standardized approach to internal rating based approach which provides diversification benefits in calculating regulatory capital. If banks get economic benefits from diversification they will attempt to diversify their portfolios that will lower the risk profile of credit portfolios enhancing the strength of financial system.

The third research question was finding the evidence for market discipline in the post financial system reform period in Pakistan. The findings support presence of market discipline by significant coefficients on risk factors. In bank specific variables, the cost of deposits and borrowing was significantly related to capital adequacy, asset quality of loans and investment portfolio as well as liquidity. Similarly, in market based risk measures, borrowing costs were related with probability of default, value at risk and market based size. These results depict sensitivity of investors towards banking risks in general. Although, the sample period was relatively short but this primary evidence is beneficial to report that market for bank equity could impose some discipline and banks' stock prices reveal relevant information set about the risk profile of a bank. The thesis also present comprehensive estimation procedures for value at risk and default likely indicators using Pakistan's data set. These variables are critical for Internal Rating Based

approach under Basel framework and our empirical contribution can be used by risk managers of commercial banks to adapt appropriate risk management tools.

The presence of market discipline could be beneficial in following plausible ways. In presence of market discipline, banks indulging in excessive risk taking activities are likely to pay a higher risk premium to depositors. The increased cost on deposits is likely to act as a penalty for risky banks and will moderate banks' risk taking behaviour. Furthermore, in a market discipline mechanism the cost of bank supervision for monitoring the banks risk taking activities would be low as government regulations designed for the purpose would be complemented by market discipline imposed by participants. Lastly, market discipline in banking sector will enhance banks' efficiency by forcing inefficient institutions to become efficient or else exit the system due to falling market prices of their equities.

It is worth mentioning that disciplinary feature of capital markets could be increased by making the presence of subordinate debt in banks' capital mandatory to support the regulatory capital. At present, the subordinated debt is used by large banks merely to offset the impact of revaluation deficit in Tier II capital or by smaller banks it is used to their restricted excess to equity markets. The subordinated debt holders are junior claimants and therefore are exposed to maximum potential loss. Such investors have greatest motivation to discipline (Pillar 3) the banks compared to depositors because they enjoy (primary claim, contractual guarantees, insurance) and shareholders because they enjoy (limited liability). Based on this

argument many researchers[27] have argued in favour of the presence of mandatory subordinated debt policy for commercial banks in developed as well as in developing economies. If such policy is implemented then it will not only facilitate the development of debt markets in Pakistan but also enhance the monitoring function of capital markets thus trimming the excessive risk appetite of commercial banks, and hopefully ensuring the implementation of Basel framework in its true sense.

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[27] For more on this, please see Hamalainen et al. (2010), Ahmed (2009)

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Appendix - Figures and Tables

Figure 1: Share of Top Five Banks 2009
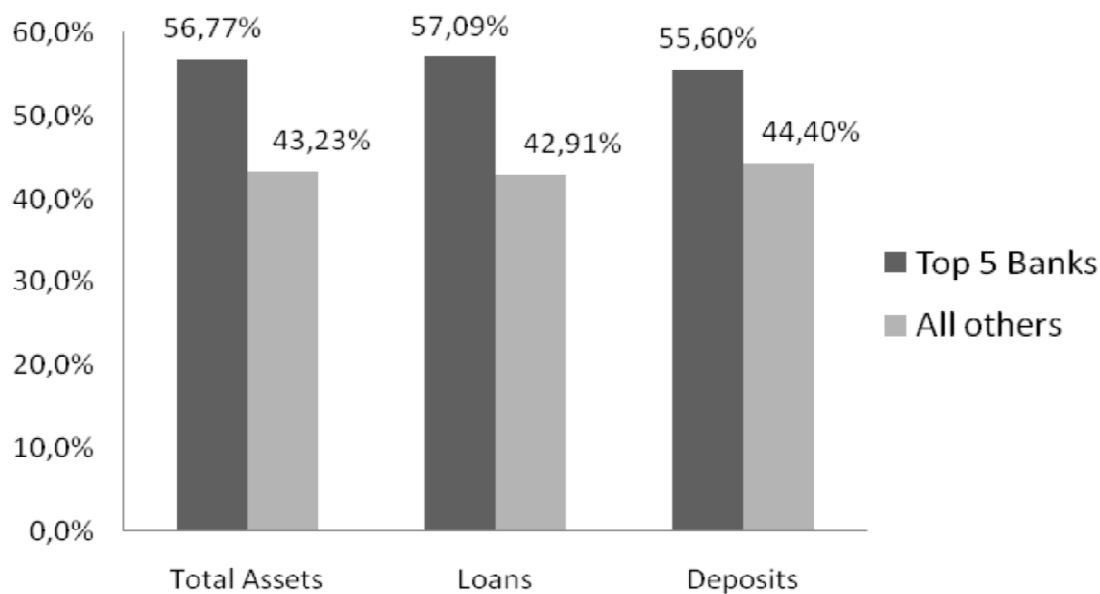
Table 1.1: Corporate Financing by Financial System (PKR in Billion)

Year	Banks	IPO	TFC	Total Financing	Bank Financing as % of Total
2004	873	21.70	0.00	894.70	97.57%
2005	1076	9.80	6.60	1092.40	98.50%
2006	1270	3.00	3.00	1276.00	99.53%
2007	1520	4.90	4.00	1528.90	99.42%
2008	2016	6.90	12.60	2035.50	99.04%
2009	2065	1.10	0.00	2066.10	99.95%

Table 2.1
Sample Distribution 2004 – 2009

Year	2009	2008	2007	2006	2005	2004
No of Banks	25	25	25	24	21	21

Table 2.2
Expected Signs of Coefficients

Bank Specific Variables	Variable	Expected Sign
Bank Size	Total Assets	+
	Network Size	+
Operational Efficiency	Loan Market Share	+
	Deposit Market Share	+
	Non Interest Income to Total Assets	-
	Return on Assets	- or +
	Overheads to Total Assets	+
	Deposits per Employee	+
	Loans per Employee	+
Asset Quality	Impaired Lending to Gross Advances	+ or -
	Public Sector Deposits to Total Deposits	+
	Loans to Agriculture to Total Advances	+
	Loans to Textile to Total Advances	-
	Loans to Energy to Total Advances	-
	Loans to Consumers to Total Advances	+
Liquidity	Liquid Assets to Demand Deposits	+
Risk Absorption Capacity	Capital Adequacy Ratio	+ or -
	Credit Ratings	+
	Probability of Default	-
Macro Level Variables		
Bank Concentration	Herfindahl Index for Loans	+
	Herfindahl Index for Deposits	+
Interest Rate Volatility	Volatility in T Bills Yield	+ or -
GDP Growth	YoY Growth in GDP	+
Financial Development Indicator	M2/GDP	-

Table2.3
Bank Wise Average Statistics
2004 – 2009

Bank	Spread	NIM	Total Assets (Mlns)	Non Interest Income to Total Assets	ROA	Overhead to Total Assets	Deposits per Employee (Mlns)	Loans per Employee (Mlns)	NPLs to Gross Loans	Public Sector Deposits	Loans to Agriculture	Loans to Textile	Loans to Energy Sector	Loans to Individuals	Liquidity (X)	CAR	DLI
ABL	5.8%	5.2%	267639.7	1.2%	4.6%	2.5%	23.7	16.6	9.8%	11.7%	5.3%	19.6%	11.0%	3.2%	1.3	13.2%	4.6%
AHBL	4.6%	4.3%	17681.1	1.0%	-0.4%	3.3%	31.1	23.6	13.5%	17.8%	0.0%	6.7%	6.5%	12.5%	2.9	33.6%	0.3%
Askari	5.4%	4.6%	170613.3	1.5%	1.2%	1.6%	27.0	20.5	6.1%	24.8%	3.0%	20.9%	4.2%	15.9%	1.9	10.5%	6.0%
Atlas	3.0%	1.8%	14739.8	0.5%	12.4%	4.1%	18.0	13.9	8.6%	14.3%	0.1%	14.5%	3.4%	5.3%	17.7	29.6%	0.0%
Al Habib	4.3%	3.8%	130627.1	1.2%	1.6%	2.3%	36.1	25.4	0.8%	13.7%	2.2%	42.0%	5.8%	3.7%	1.0	11.5%	11.3%
BAL	4.4%	3.4%	279130.0	1.3%	1.8%	2.5%	33.0	20.7	3.6%	23.8%	4.5%	16.9%	6.3%	25.3%	1.7	9.4%	2.2%
BIP	6.9%	4.6%	13967.1	1.0%	-8.0%	4.9%	13.7	6.5	3.6%	6.0%	3.5%	15.0%	1.4%	15.4%	2.6	27.2%	0.0%
BOK	4.3%	3.4%	28931.5	1.4%	2.7%	1.8%	32.7	17.1	26.4%	45.4%	3.1%	2.7%	6.0%	7.4%	3.7	17.7%	0.1%
BOP	6.7%	2.7%	139639.8	1.8%	2.5%	1.7%	33.6	26.0	7.1%	49.6%	5.6%	26.1%	1.2%	2.9%	1.8	9.5%	7.0%
FBL	4.7%	0.6%	123410.9	2.0%	3.7%	2.0%	38.3	33.2	6.3%	8.7%	3.1%	16.2%	7.2%	16.2%	2.1	12.1%	5.9%
HBL	6.3%	5.9%	614681.6	1.6%	2.9%	2.9%	34.1	25.6	9.5%	15.3%	6.7%	21.0%	5.0%	12.2%	1.8	11.4%	20.6%
JS Bank	4.2%	2.3%	20638.6	1.3%	4.6%	3.5%	116.5	16.3	3.0%	8.5%	3.5%	10.6%	1.4%	15.9%	2.2	32.5%	0.0%
KASB	4.8%	1.8%	31665.8	1.4%	-2.0%	2.9%	26.0	19.8	12.6%	14.1%	0.9%	20.2%	1.2%	15.1%	2.0	4.2%	0.0%
MCB	7.3%	4.5%	367326.6	1.5%	3.9%	2.0%	24.7	18.9	5.8%	3.4%	1.5%	15.7%	8.5%	8.9%	1.5	17.8%	12.7%
Meezan	5.4%	4.8%	52083.5	1.6%	2.8%	3.0%	25.8	18.4	2.8%	0.3%	0.3%	32.1%	2.2%	18.1%	1.5	11.2%	0.0%
Habib Metro	3.2%	3.1%	134867.2	1.5%	1.7%	1.5%	51.0	40.4	1.6%	12.9%	2.7%	54.4%	0.9%	1.5%	1.5	11.2%	6.5%
My Bank	6.1%	3.1%	26532.1	2.3%	-0.1%	2.8%	23.2	16.9	20.7%	14.2%	1.3%	19.6%	0.1%	2.1%	1.6	16.9%	0.2%
NBP	6.1%	5.7%	701108.8	1.8%	4.2%	2.1%	88.1	51.7	12.3%	37.5%	5.0%	16.3%	10.5%	17.1%	1.3	16.0%	12.5%
NIB	4.2%	3.2%	76960.7	3.0%	-1.1%	2.3%	19.2	15.8	14.0%	13.4%	0.4%	32.4%	1.2%	16.0%	2.2	11.5%	0.0%
RBS	8.0%	4.7%	102791.3	2.8%	-1.1%	5.8%	18.3	15.0	13.0%	2.8%	1.2%	14.4%	3.3%	30.7%	1.5	10.7%	5.7%
Samba	2.6%	2.3%	13742.3	0.9%	-0.6%	5.8%	12.6	8.3	38.5%	12.0%	0.3%	16.7%	17.7%	25.6%	4.5	42.6%	0.0%
SCBL	7.3%	7.2%	195078.2	2.2%	1.7%	3.4%	66.2	63.9	6.4%	3.5%	1.0%	13.4%	10.1%	32.4%	1.4	11.7%	0.3%
Silk	3.9%	2.0%	53987.2	0.8%	-6.2%	2.6%	22.3	16.9	22.7%	14.3%	0.2%	14.3%	1.5%	5.9%	4.1	7.8%	0.0%
Soneri	4.4%	3.1%	71381.5	1.4%	2.4%	1.7%	36.3	25.2	3.5%	20.4%	2.1%	35.7%	0.9%	4.6%	2.4	11.0%	1.0%
UBL	6.4%	6.0%	449322.8	1.7%	3.3%	2.8%	64.1	49.3	8.6%	16.9%	6.1%	20.5%	6.3%	17.1%	1.5	11.2%	7.1%

Table 2.4
Bank Specific Statistics
Top Six vs. Rest of the Banks (2004 - 2009)

		Spread	NIM	Total Assets (Mlns)	Non Interest Income to Total Assets	ROA	Overhead to Total Assets	Deposits per Employee (Mlns)	Loans per Employee (Mlns)	NPLs to Gross Loans	Public Sector Deposits	Loans to Agriculture	Loans to Textile	Loans to Energy Sector	Loans to Individuals	Liquidity (X)	CAR	DLI
Top Six Banks	Average	6.0%	5.1%	446534.9	1.5%	3.4%	2.5%	44.6	30.5	8.3%	18.1%	4.8%	18.3%	7.9%	14.0%	1.5	13.2%	10.0%
	Median	6.2%	5.5%	408324.7	1.5%	3.6%	2.5%	33.6	23.1	9.1%	16.1%	5.1%	18.3%	7.4%	14.6%	1.5	12.3%	9.8%
	Min	4.4%	3.4%	267639.7	1.2%	1.8%	2.0%	23.7	16.6	3.6%	3.4%	1.5%	15.7%	5.0%	3.2%	1.3	9.4%	2.2%
	Max	7.3%	6.0%	701108.8	1.8%	4.6%	2.9%	88.1	51.7	12.3%	37.5%	6.7%	21.0%	11.0%	25.3%	1.8	17.8%	20.6%
Rest of the Banks	Average	5.0%	3.3%	74702.1	1.6%	1.0%	3.0%	28.8	22.3	11.1%	15.6%	1.8%	21.5%	4.0%	13.0%	3.1	17.0%	2.3%
	Median	4.6%	3.1%	53987.2	1.4%	1.6%	2.8%	26.0	18.4	7.1%	13.7%	1.3%	16.7%	2.2%	15.1%	2.1	11.5%	0.2%
	Min	2.6%	0.6%	13742.3	0.5%	-8.0%	1.5%	12.6	6.5	0.8%	0.3%	0.0%	2.7%	0.1%	1.5%	1.0	4.2%	0.0%
	Max	8.0%	7.2%	195078.2	3.0%	12.4%	5.8%	66.2	63.9	38.5%	49.6%	5.6%	54.4%	17.7%	32.4%	17.7	42.6%	11.3%

**Top six banks based on average total assets from 2004 to 2009

Table2.5
Banks Average Statistics 2004 - 2009
(Ownership Classification)

	Spread	NIM	Total Assets	Non Interest Income/ Total Assets	ROA	Overhead to Total Assets	Deposits per Employee	Loans per Employee	NPLs to Gross Loans	Public Sector Deposits	Loans to Agriculture	Loans to Textile	Loans to Energy Sector	Loans to Individuals	Liquidity (X)	CAR	DLI
Foreign Banks	4.9%	3.5%	114672.4	1.8%	0.3%	3.2%	31.9	25.8	12.1%	10.2%	1.5%	23.4%	5.6%	19.1%	2.3	14.3%	2.3%
Private Sector Banks	5.3%	3.9%	168985.9	1.3%	2.0%	2.9%	36.5	21.4	8.2%	13.9%	2.8%	20.2%	4.3%	10.1%	3.1	17.7%	4.9%
Public Sector Banks	5.7%	3.9%	289893.4	1.7%	3.1%	1.9%	51.5	31.6	15.2%	44.2%	4.5%	15.0%	5.9%	9.1%	2.2	14.4%	6.5%

Table 2.6
Year wise Statistics of Bank Specific Factors

	2004		2005		2006		2007		2008		2009	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Spread	3.50%	3.59%	4.56%	4.63%	4.34%	4.79%	4.62%	4.05%	6.87%	6.58%	6.57%	6.45%
NIM	3.12%	3.30%	4.04%	3.87%	3.28%	3.16%	3.31%	3.33%	4.10%	4.54%	4.64%	4.35%
Total Assets (Mlns)	59190.2	67890.5	77283.3	91502.4	71870.3	89039.5	104267.9	141234.3	113046.9	138241.5	135635.1	149867.2
Non Interest Income/Total Assets	1.80%	1.53%	1.39%	1.22%	1.59%	1.25%	1.73%	1.84%	1.57%	1.38%	1.23%	1.09%
ROA	17.41%	12.89%	1.62%	1.75%	1.38%	1.79%	0.16%	1.43%	-1.82%	0.32%	-0.87%	0.22%
Overhead to Total Assets	2.22%	1.99%	2.32%	2.14%	2.56%	2.37%	2.57%	2.18%	3.39%	2.78%	3.28%	2.81%
Deposits per Employee (Mlns)	46.127	25.012	27.041	26.207	31.089	30.657	29.318	29.670	27.446	27.372	31.898	28.501
Loans per Employee (Mlns)	29.948	17.384	19.096	19.488	26.051	22.373	20.218	19.131	22.126	21.596	20.553	18.969
NPLs to Gross Loans	10.55%	8.32%	7.87%	3.69%	7.31%	4.63%	6.89%	5.22%	12.52%	7.88%	16.95%	12.40%
Public Sector Deposits	15.92%	15.98%	17.58%	14.72%	18.08%	13.49%	15.68%	14.29%	16.61%	14.00%	15.87%	12.51%
Loans to Agriculture	2.80%	2.00%	2.86%	1.35%	2.16%	0.87%	2.15%	1.19%	3.01%	1.75%	2.99%	1.23%
Loans to Textile	31.91%	24.94%	21.21%	19.51%	19.41%	17.83%	20.51%	16.85%	20.69%	16.82%	20.72%	16.65%
Loans to Energy Sector	4.43%	3.11%	3.07%	1.36%	3.05%	1.27%	4.61%	3.38%	6.97%	4.99%	8.13%	5.92%
Loans to Individuals	11.04%	10.01%	13.54%	11.81%	14.33%	14.34%	15.42%	13.41%	12.86%	11.32%	11.49%	12.23%
Liquidity (X)	4.473	1.742	3.163	1.817	3.137	2.050	2.743	1.969	1.749	1.486	1.638	1.531
CAR	17.41%	12.89%	14.83%	12.54%	18.36%	12.80%	17.53%	11.46%	13.43%	10.81%	15.27%	13.01%
DLI	2.36%	0.07%	5.56%	0.81%	5.11%	1.95%	4.97%	1.35%	4.11%	0.99%	2.31%	0.00%

Table 2.7
Summary Statistics of Dependent and Independent Variables
(2004 – 2009)

		Mean	Median	SD	MIN	MAX
	Spread	0.050	0.048	0.021	0.000	0.122
	NIM	0.038	0.038	0.022	-0.015	0.092
	Total Assets (Mln)	96126.3	108092.4	3.6	3686.7	944232.8
Market Power	Loans	0.044	0.030	0.048	0.000	0.198
	Deposits	0.044	0.026	0.049	0.000	0.224
	Non Interest Income to Total Assets	0.015	0.014	0.010	0.000008	0.090
	ROA	0.011	0.013	0.051	-0.300	0.262
	Overheads to Total Assets	0.027	0.024	0.014	0.000	0.079
Per Employee (in Mlns)	Deposits	27.956	27.866	10.901	1.530	52.860
	Gross Loans	20.430	19.531	9.019	0.450	44.639
	Good Loans	18.588	18.476	8.995	0.384	43.932
	NPLs to Gross Loans	0.104	0.069	0.104	0.00009	0.482
	Public Sector Deposits	0.163	0.135	0.136	0.000	0.513
Loans	Agriculture	0.026	0.013	0.032	0.000	0.154
	Textile	0.210	0.185	0.123	0.000	0.577
	Energy	0.048	0.031	0.055	0.000	0.290
	Individuals	0.129	0.113	0.099	0.000	0.452
	Liquidity	2.228	1.678	2.049	0.010	19.870
	CAR	0.157	0.122	0.124	0.000	0.710
	DLI	0.041	0.003	0.061	0.000	0.231
Herfindahl	Deposits	0.097	0.092	0.012	0.085	0.122
	Loans	0.095	0.094	0.010	0.084	0.111
	Interest Rate Volatility	0.007	0.007	0.005	0.001	0.016
	GDP Growth	0.051	0.045	0.027	0.0121	0.089
	M2/GDP	0.445	0.460	0.027	0.390	0.470

Table2.8

Correlation Matrix of Bank Level Variables

	Spread	NIM	Total Assets (Mlns)	Mkt Share Loans	Mkt Share Deposits	Non Interest Income to Total Assets	ROA	Overheads	Deposit per Employee (Mlns)	Gross Loans per Employee (Mlns)	Good Loans per Employee (Mlns)	NPLs to Gross Loans	Public Sector Deposits	Loans to Agriculture	Loans to Textile	Loans to Energy	Loans to Consumers	Liquidity	CAR
NIM	0.60																		
Total Assets	0.40	0.42																	
Mkt Share Loans	0.31	0.42	0.82																
Mkt Share Deposits	0.29	0.42	0.81	0.99															
Non Interest Income to Total Assets	0.08	0.04	0.08	0.06	0.04														
ROA	0.06	0.12	0.20	0.27	0.27	0.08													
Overheads	0.24	0.12	-0.25	-0.17	-0.17	0.01	-0.32												
Deposit per Employee	0.03	0.02	0.46	0.27	0.27	0.07	0.11	-0.43											
Gross Loans per Employee	-0.08	-0.10	0.43	0.24	0.21	0.16	0.15	-0.46	0.90										
Good Loans per Employee	0.11	0.08	0.43	0.23	0.21	0.16	0.18	-0.47	0.87	0.98									
NPLs to Gross Loans	-0.02	-0.14	-0.26	-0.17	-0.16	-0.15	-0.14	0.29	-0.26	-0.31	-0.48								
Public Sector Deposits	0.12	0.09	0.14	0.17	0.21	-0.09	0.06	-0.27	0.35	0.21	0.14	0.20							
Loans to Agriculture	0.10	0.21	0.38	0.43	0.43	0.03	0.22	-0.09	0.20	0.14	0.14	-0.10	0.29						
Loans to Textile	0.13	0.04	0.17	0.01	-0.01	0.14	0.07	-0.20	0.43	0.46	0.51	-0.32	-0.11	-0.02					
Loans to Energy	0.19	0.28	0.23	0.23	0.25	-0.13	-0.07	0.28	0.02	-0.05	-0.09	0.26	-0.01	0.06	-0.20				
Loans to Consumers	0.16	0.20	0.08	0.11	0.12	0.16	-0.03	0.40	-0.24	-0.19	-0.16	-0.03	-0.17	-0.08	-0.30	0.27			
Liquidity	-0.35	-0.29	-0.23	-0.27	-0.26	-0.11	-0.13	0.12	-0.13	-0.11	-0.12	0.18	-0.01	-0.18	-0.24	-0.01	0.01		
CAR	-0.22	-0.06	-0.50	-0.23	-0.22	-0.25	-0.14	0.28	-0.37	-0.40	-0.38	0.19	-0.15	-0.18	-0.31	0.27	0.12	0.22	
DLI	-0.23	-0.25	0.61	0.73	0.69	0.06	0.16	-0.18	0.29	0.32	0.34	0.24	-0.13	0.32	0.12	0.11	0.03	-0.21	-0.17

Table 2.9
 Panel Regression Results - Interest Rate Spreads on Selected Variables
Dependent Variable: Interest Rate Spread

	Independent Variables	Coefficient	Std. Error	t-ratio	p-value	
	Constant	-0.2698	0.3154	-0.8553	0.3942	
Bank Size	Total Assets	0.0085	0.0037	2.3284	0.0222	**
	Network Size	0.0201	0.0052	3.885	0.0002	***
Operational Efficiency	Loan Market Share	0.2417	0.199	1.2145	0.2278	
	Deposit Market Share	-0.693	0.1581	-4.3832	0.000	***
	Non Interest Income to Total Assets	0.1185	0.0935	1.267	0.2085	
	Return on Assets	0.0564	0.0245	2.3047	0.0235	**
	Overheads to Total Assets	0.3039	0.0505	5.865	0.000	***
	Deposits per Employee	0.0003	0.0003	1.0069	0.3167	
	Gross Loans per Employee	-0.0064	0.0022	-2.9344	0.0043	***
	Performing Loans per Employee	0.0055	0.0021	2.6514	0.0095	***
Asset Quality	Impaired Lending to Gross Advances	-0.0836	0.0366	-2.287	0.0277	**
	Public Sector Deposits to Total Deposits	0.0532	0.0258	2.064	0.0431	**
	Loans to Agriculture to Total Advances	-0.0732	0.0454	-1.6111	0.1107	
	Loans to Textile to Total Advances	0.0808	0.0308	2.6222	0.0103	**
	Loans to Energy to Total Advances	-0.0056	0.0295	-0.1907	0.8492	
	Loans to Consumers to Total Advances	0.0318	0.0234	1.3586	0.1778	
Liquidity	Liquid Assets to Demand Deposits	-0.003	0.001	-2.935	0.0046	***
Risk Absorption Capacity	Capital Adequacy Ratio	-0.0271	0.0136	-1.9839	0.0504	*
	Credit Ratings	0.0139	0.0049	2.8216	0.0059	***
	DLI	-0.0019	0.0006	-3.228	0.0016	***
Bank Concentration	Herfindahl Index for Deposits	-0.9011	0.3734	-2.4132	0.0174	**
	Herfindahl Index for Loans	0.0269	0.0178	1.5142	0.1335	
Interest Rate Volatility	Volatility in T Bills Yield	-0.6519	0.7648	-0.8523	0.3964	
GDP Growth	YoY Growth in GDP	0.01028	0.0033	3.0250	0.0031	***
Financial Development Indicator	M2/GDP	-0.0021	0.0354	-0.0591	0.9530	
	Adjusted R-squared	0.7125				
	Durbin-Watson	2.0433				

   *** represent significance at 1%, ** at 5% and * at 10% respectively

Table 2.10
Panel Regression Results - Net Interest Margin on Selected Variables
Dependent Variable: Net Interest Margin

	Independent Variables	Coefficient	Std. Error	t-ratio	p-value	
	Constant	-0.1467	0.4932	-0.2974	0.7669	
Bank Size	Total Assets	0.0048	0.0025	1.9006	0.0599	*
	Network Size	0.0186	0.0061	3.0471	0.0029	***
Operational Efficiency	Loan Market Share	0.1572	0.2404	0.6539	0.5149	
	Deposit Market Share	-0.6215	0.1646	-3.7751	0.0003	***
	Non Interest Income to Total Assets	0.0089	0.1132	0.0783	0.9378	
	Return on Assets	0.0662	0.0281	2.3543	0.0208	**
	Overheads to Total Assets	0.2500	0.0426	5.8650	0.000	***
	Deposits per Employee	0.001	0.0004	2.6517	0.0092	***
	Gross Loans per Employee	-0.0035	0.0015	-2.3634	0.0203	**
	Performing Loans per Employee	0.0011	0.0003	4.056	0.001	***
Asset Quality	Impaired Lending to Gross Advances	-0.0555	0.0325	-1.7053	0.0909	*
	Public Sector Deposits to Total Deposits	0.0289	0.0159	1.8201	0.0721	*
	Loans to Agriculture to Total Advances	-0.0105	0.0326	-0.3231	0.7472	
	Loans to Textile to Total Advances	0.049	0.0172	2.8552	0.0051	***
	Loans to Energy to Total Advances	0.0039	0.0069	0.5698	0.5703	
	Loans to Consumers to Total Advances	0.0323	0.0239	1.3495	0.1806	
Liquidity	Liquid Assets to Demand Deposits	-0.0011	0.0007	-1.7076	0.0905	*
Risk Absorption Capacity	Capital Adequacy Ratio	0.0092	0.0144	0.6403	0.5233	
	Credit Ratings	0.0201	0.0077	2.6	0.0116	**
	DLI	-0.0732	0.0418	-1.749	0.0837	*
Bank Concentration	Herfindahl Index for Deposits	-0.52692	0.105737	-4.983	0.000	***
	Herfindahl Index for Loans	0.008	0.0279	0.2867	0.7748	
Interest Rate Volatility	Volatility in T Bills Yield	0.2151	1.4629	0.147	0.8835	
GDP Growth	YoY Growth in GDP	0.0056	0.0013	4.3440	0.0000	***
Financial Development Indicator	M2/GDP	0.1566	0.665	0.2354	0.8144	
	Adjusted R-squared	0.5521				
	Durbin-Watson	1.9878				

*** represent significance at 1%, ** at 5% and * at 10% respectively

Table 2.11 : Panel Regression Results (Excluding Public Sector Banks) - Interest Rate Spreads on Selected Variables

Dependent Variable: Interest Rate Spread

	Independent Variables	*Coefficient*	*Std. Error*	*t-ratio*	*p-value*	
	Constant	0.0026	0.0018	1.5004	0.1378	
Bank Size	Total Assets	0.0106	0.0038	2.7875	0.0068	***
	Network Size	0.0179	0.0052	3.4780	0.0008	***
Operational Efficiency	Loan Market Share	0.5130	0.2735	1.8760	0.0646	*
	Deposit Market Share	-0.6564	0.2236	-2.9360	0.0044	***
	Non Interest Income to Total Assets	0.1516	0.1033	1.4680	0.1464	
	Return on Assets	0.0043	0.0019	2.2710	0.0254	**
	Overheads to Total Assets	-0.0076	0.0624	-0.1220	0.9033	
	Deposits per Employee	0.0002	0.0004	0.5521	0.5826	
	Gross Loans per Employee	-0.0053	0.0018	-2.8760	0.0050	***
	Performing Loans per Employee	0.0094	0.0036	2.6070	0.0106	**
Asset Quality	Impaired Lending to Gross Advances	-0.1074	0.0507	-2.1190	0.0375	**
	Public Sector Deposits to Total Deposits	0.0632	0.0300	2.1070	0.0398	**
	Loans to Agriculture to Total Advances	-0.0215	0.0135	-1.5920	0.1148	
	Loans to Textile to Total Advances	0.0732	0.0332	2.2028	0.0307	**
	Loans to Energy to Total Advances	-0.0287	0.0285	-1.0046	0.3184	
	Loans to Consumers to Total Advances	0.0345	0.0251	1.3758	0.1731	
Liquidity	Liquid Assets to Demand Deposits	-0.0020	0.0006	-3.5610	0.0006	***
Risk Absorption Capacity	Capital Adequacy Ratio	-0.0582	0.0240	-2.4310	0.0170	**
	Credit Ratings	0.0131	0.0050	2.6448	0.0100	***
	DLI	-0.0807	0.0300	-2.6880	0.0085	***
Bank Concentration	Herfindahl Index for Deposits	-0.7284	0.3607	-2.0192	0.0471	**
	Herfindahl Index for Loans	1.3744	0.8479	1.6209	0.1093	
Interest Rate Volatility	Volatility in T Bills Yield	-0.9122	0.9548	-0.9554	0.3425	
GDP Growth	YoY Growth in GDP	0.7998	0.3703	2.1599	0.0340	**
Financial Development Indicator	M2/GDP	-0.0075	0.0142	-0.5294	0.5978	
	Adjusted R-squared	0.725261				
	Durbin-Watson	2.092401				

*** represent significance at 1%, ** at 5% and * at 10% respectively

Figure 2.1: Comparative Share of Top Six Banks (2004 and 2009)
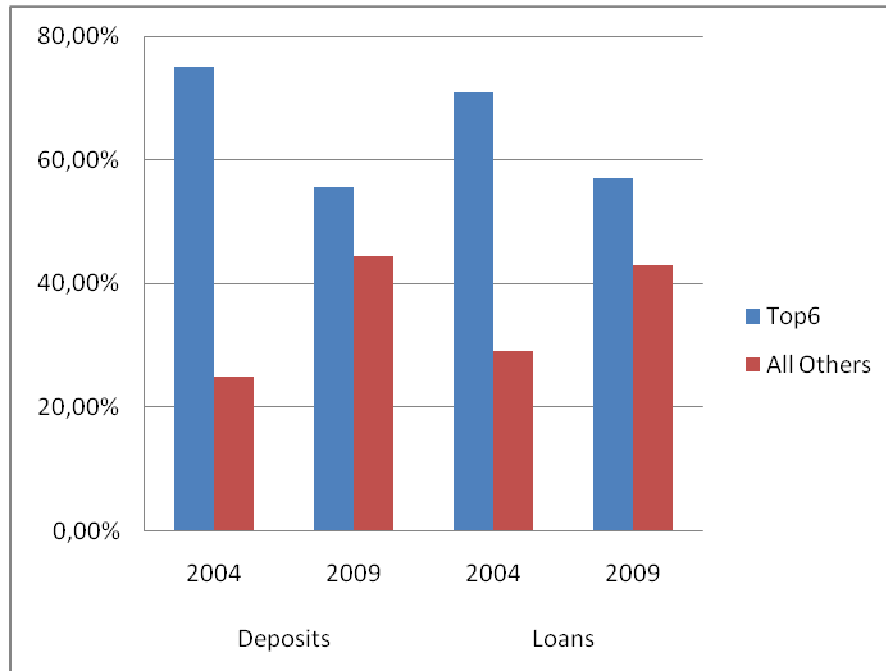
Figure 2.2: Textile Sector NPLs to Gross Loans
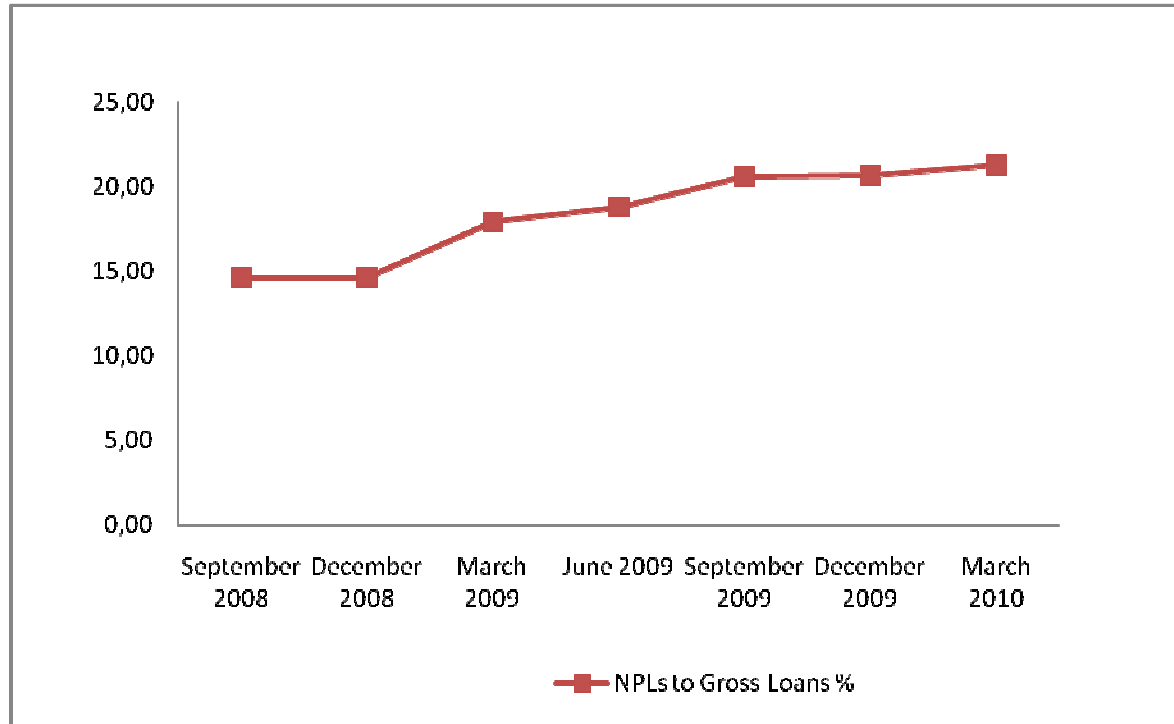
Table 3.1:

Sample Distribution 2004 – 2009

Year	2009	2008	2007	2006	2005	2004
No of Banks	25	25	25	24	21	21

Table 3.2 :Expected Signs of Coefficients

	Variables (Regressor)	Expected Signs
HH Index (Loans)	Size of Loan Portfolio Log(Total Advances)	-
	Deposits to Total Assets	-
	Capital Adequacy	+
Risks (NPL/Advances), DLI and VAR	Lagged Value of HHI	+
	Overheads to Total Assets	+
	Capital Adequacy	-

Table 3.3
Banks Descriptive Statistics

	VAR	Total Assets (Mlns)	Overheads / TA	NPLs / Advances	CAR	HIL	Deposits/TA	Advances (Mlns)	Advances / TA	DLI
2004										
Average	6.73%	121138.4	2.22%	10.55%	17.41%	0.197	81.74%	66708.3	55.07%	2.36%
Median	6.51%	67890.5	1.99%	8.32%	12.89%	0.174	80.61%	40599.3	59.80%	0.07%
Min	5.42%	3686.8	1.29%	22.09%	8.16%	0.073	56.23%	4016.6	35.23%	0.00%
Max	8.21%	549740.8	3.45%	48.22%	71.01%	0.299	86.23%	277919.1	62.74%	15.23%
2005										
Average	6.65%	161982.5	2.46%	8.81%	11.98%	0.195	76.98%	92147.5	55.51%	5.10%
Median	6.22%	91502.4	2.14%	4.00%	11.18%	0.199	77.77%	55526.0	56.41%	0.31%
Min	5.27%	9618.4	1.40%	0.01%	3.47%	0.063	57.89%	3723.7	38.71%	0.00%
Max	8.81%	577719.1	4.88%	38.89%	21.91%	0.342	89.61%	299422.8	64.73%	19.74%
2006										
Average	9.86%	172556.5	2.55%	10.43%	13.52%	0.191	74.89%	100177.5	54.81%	5.66%
Median	6.56%	113773.4	2.29%	4.39%	11.66%	0.174	75.11%	71991.5	57.66%	3.46%
Min	3.12%	8178.7	1.44%	0.01%	3.61%	0.113	58.53%	2395.0	29.28%	0.00%
Max	29.68%	635132.7	7.27%	63.00%	29.68%	0.372	86.88%	348370.5	63.38%	17.03%
2007										
Average	6.35%	204357.0	2.72%	7.13%	16.73%	0.194	74.63%	111434.5	50.00%	5.22%
Median	5.66%	141277.4	2.50%	5.22%	11.46%	0.155	75.74%	86623.4	53.41%	1.35%
Min	3.82%	14447.5	1.21%	0.03%	0.00%	0.086	61.22%	3992.2	22.63%	0.00%
Max	19.27%	762551.8	6.19%	33.93%	65.43%	0.476	83.06%	380751.2	63.70%	20.35%
2008										
Average	10.27%	212027.0	2.99%	12.61%	13.50%	0.159	74.07%	128744.7	58.76%	3.97%
Median	7.84%	157782.5	2.70%	7.84%	10.62%	0.139	74.40%	95790.4	60.76%	0.74%
Min	5.30%	16487.3	0.07%	0.85%	0.36%	0.069	58.46%	6163.0	35.03%	0.00%
Max	27.63%	817758.0	7.87%	33.64%	55.13%	0.336	88.25%	460244.7	82.42%	17.50%
2009										
Average	9.45%	251784.4	3.12%	16.74%	15.41%	0.182	73.00%	124758.0	46.59%	3.78%
Median	8.54%	180865.4	2.79%	11.68%	13.25%	0.155	75.77%	84021.4	48.47%	0.00%
Min	4.83%	23734.1	0.65%	1.95%	0.56%	0.071	45.13%	9723.4	30.50%	0.00%
Max	18.75%	944232.8	6.14%	44.06%	57.04%	0.423	84.79%	475243.4	62.26%	16.50%

Table 3.4

Descriptive Statistics - Top Six vs. Rest of the Banks (2004 - 2009)

		Total Assets (Mlns)	Overhead to Total Assets	NPLs to Gross Loans	HIL	VAR	CAR	DLI
Top Six Banks	Average	446534.9	2.5%	8.3%	0.12	6.8%	13.2%	10.0%
	Median	408324.7	2.5%	9.1%	0.12	6.4%	12.3%	9.8%
	Min	267639.7	2.0%	3.6%	0.09	4.3%	9.4%	2.2%
	Max	701108.8	2.9%	12.3%	0.17	21.9%	17.8%	20.6%
Rest of the Banks	Average	74702.1	3.0%	11.1%	0.21	9.3%	17.0%	2.3%
	Median	53987.2	2.8%	7.1%	0.18	7.9%	11.5%	0.2%
	Min	13742.3	1.5%	0.8%	0.11	3.1%	4.2%	0.0%
	Max	195078.2	5.8%	38.5%	0.48	29.6%	42.6%	11.3%

Table 3.5: Hirschman Herfindahl Index (Loans)

Variables	Coefficient	Std. Error	t ratio	p value	
Log (Advances)	-0.021	0.007	-3.113	0.002	***
Deposits to Total Assets	-0.141	0.062	-2.285	0.025	**
Capital Adequacy	0.002	0.000	3.766	0.000	***
Constant	0.134	0.123	1.091	0.280	
Adj R - Squared	0.393				
F Stats	2.718				
P Value (F)	0.000				

*** represents significance at 99%, ** at 95% and * at 90%*

Table 3.6: Non Performing Loans to Gross Loans

Variables	Coefficient	Std. Error	t ratio	p value	
HHI Loans	0.042	0.047	0.906	0.367	
Overheads to Total Assets	0.100	0.028	3.558	0.001	***
Capital Adequacy	0.000	0.000	-5.294	0.000	***
GDP growth	-0.115	0.055	-2.101	0.036	**
Constant	0.022	0.042	0.523	0.601	
Adj R - Squared	0.249				
F Stats	7.309				
P Value (F)	0.000				

*** represents significance at 99%, ** at 95% and * at 90%*

Table 3.7: Default Likelihood Indicator

Variables	Coefficient	Std. Error	t ratio	p value	
HHI Loans	0.002	0.000	11.353	0.000	***
Overheads to Total Assets	0.106	0.044	2.412	0.016	**
Capital Adequacy	0.000	0.000	-2.670	0.008	***
GDP growth	-0.073	0.264	-0.276	0.783	
Constant	0.082	0.139	0.587	0.558	
Adj R - Squared	0.177				
F Stats	5.228				
P Value (F)	0.000				

*** represents significance at 99%, ** at 95% and * at 90%

Table 3.8: Value at Risk

Variables	Coefficient	Std. Error	t ratio	p value	
HHI Loans	0.132	0.045	2.896	0.005	***
Overheads to Total Assets	0.152	0.013	11.326	0.000	***
Capital Adequacy	-0.076	0.027	-2.791	0.005	***
GDP growth	-0.069	0.057	-1.202	0.229	
Constant	0.154	0.123	1.249	0.215	
Adj R - Squared	0.182				
F Stats	8.251				
P Value (F)	0.000				

*** represents significance at 99%, ** at 95% and * at 90%

Table 4.1. Karachi Stock Exchange at a Glance

	2006	2007	2008	2009	2010
Equities					
Listed Companies	651	654	653	651	644
Listed Capital (Rs in million)	515,029.54	671,269.47	750,477.55	814,478.74	919,161.26
Market Capitalization (million)	2,766,583.84	4,329,909.79	1,858,698.90	2,705,879.83	3,268,948.59
New Companies Listed	9	14	10	4	6
Listed Capital (in million)	14,789.76	57,239.93	15,312.12	8,755.74	33,438.45
Debt Instruments					
New Debt Instruments Listed	3	3	7	1	4
Amount Listed (in million)	3,400.00	6,500.00	25,256.97	3,000.00	5,650.18
KSE – 100 INDEX					
High	12273.77	14814.85	15676.34	9845.74	12031.46
Low	8766.98	10066.32	5865.01	4815.34	9229.6
Year End	10040.5	14075.83	5865.01	9386.92	12022.46
KSE – 30 INDEX					
High	14020.56	18083.15	18996.33	10508.35	11588.97
Low	12248.93	12550.26	5485.33	4428.1	9104.25
Year End	12521.54	16717.1	5485.33	9849.92	11588.24
Turnover of Shares					
Total Shares (in million)	63,046.52	65,956.89	36,527.96	44,446.88	33,529.72
Average Daily Turnover (in mlns)	260.69	268.23	146.55	179.88	132.64

Source: Karachi Stock Exchange

Table 4.2. Sector wise Turn Over Contribution
(5 Years Average)

Sector Name	Turnover Contribution
Banks	45.99%
Chemicals	24.88%
Oil and Gas	4.70%
Equity Investment Instruments	3.05%
Construction and Materials	2.42%
Others (29 Sectors)	18.96%
Total	**100%**

Source: Karachi Stock Exchange

Table 4.3: Sample Distribution 2004 – 2009

Year	2009	2008	2007	2006	2005	2004
No of Banks	25	25	25	24	21	21

Table 4.4: Dependent Variable Cost of Deposits/Borrowings

Variables	Coefficient	Std. Error	t ratio	p value	
CAR	-0.1203	0.0549	-2.1923	0.0312	**
NPL/GL	0.0149	0.0048	3.1019	0.0027	***
REV/INV	-0.0116	0.0033	-3.5270	0.0007	***
OH/TA	0.3284	0.1944	1.6890	0.0951	*
ROA	-0.0023	0.0105	-0.2223	0.8247	
LIQ	-0.0295	0.0067	-4.4330	0.0000	***
Log(TA)	-0.0147	0.0151	-0.9741	0.3323	
GDP	-0.2032	0.0817	-2.4874	0.0149	**
const	0.0034	0.0205	0.1656	0.8689	

R - Squared	0.7530	
Adj R - Squared	0.6585	
F Stats	7.9673	
P Value (F)	0.0000	

*** represents significance at 99%, ** at 95% and * at 90%*

Table4.5 : Average Descriptive Statistics for Dependent and Independent Variables

	2004	2005	2006	2007	2008	2009
Cost of Funds	4.550%	3.262%	4.924%	5.465%	6.468%	6.833%
Beta (Bank Index)	0.912	0.871	0.903	0.815	1.239	1.513
Beta (KSE 100)	0.610	0.638	0.766	0.734	1.027	1.130
VAR	8.220%	5.957%	9.698%	6.382%	9.687%	9.378%
DLI	0.070%	0.810%	1.950%	1.350%	0.990%	0.890%
B/M	0.852	1.103	0.717	0.624	0.615	1.199
ΔP	0.140%	0.290%	0.016%	0.116%	-0.602%	-0.007%

Table 4.6 : Regression Results
Dependent Variable : Cost of Deposits/Borrowings

Variables	Coefficient	Std. Error	t ratio	p value	
Beta (Systematic Risk) with KSE 100	0.0094	0.0055	1.7067	0.0914	*
Value at Risk	0.0685	0.0336	2.0349	0.0447	**
Book to Market (Value)	0.0096	0.0050	1.9097	0.0606	*
Size (MV of Equity)	-0.0061	0.0023	-2.6424	0.0097	***
DLI (KMV, Merton)	0.0982	0.0477	2.0574	0.0426	**
Price	-0.0045	0.0045	-0.9991	0.3204	
Growth in GDP	-0.0763	0.0274	-2.7874	0.0065	***
Constant	-0.0056	0.0062	-0.8953	0.3730	
R – Squared	0.5613				
Adj R – Squared	0.5280				
F Stats	16.8181				
P Value (F)	0.0000				

*** *represents significance at 99%, ** at 95% and * at 90%*

Table 4.7: Regression Results
Dependent Variable: Cost of Deposits/Borrowings

Variables	Coefficient	Std. Error	t ratio	p value	
Beta (Systematic Risk) with Bank Index	0.14956	0.01834	8.1533	0.0000	***
Value at Risk	0.0094	0.0055	1.7067	0.0914	*
Book to Market (Value)	0.08907	0.04634	1.922	0.0577	*
Size (MV of Equity)	-0.0694	0.0344	-2.0182	0.0466	***
DLI (KMV, Merton)	0.08579	0.04383	1.9572	0.05699	*
Price	-0.0056	0.0062	-0.8953	0.3730	
Growth in GDP	-0.0083	0.0016	-5.1309	0.0000	***
Constant	-0.0011	0.0025	-0.4374	0.6628	
R – Squared	0.5844				
Adj R – Squared	0.5527				
F Stats	18.4785				
P Value (F)	0.0000				

*** *represents significance at 99%, ** at 95% and * at 90%*

Table 4.8: Dependent Variable : Deposit Switching

Variables	Coefficient	Std. Error	t ratio	p value	
CAR	-0.0123	0.0055	-2.2110	0.0299	**
NPL/GL	0.0938	0.0272	3.4520	0.0008	***
REV/INV	0.0164	1.4207	0.0116	0.9908	
OH/TA	0.0184	0.2457	0.0750	0.9404	
ROA	-0.7201	0.9131	-0.7887	0.4327	
LIQ	-0.9422	2.4661	-0.3821	0.7034	
Log(TA)	0.1305	0.2218	0.5882	0.5581	
GDP	-0.0128	0.0047	-2.7150	0.0082	***
Const	0.0317	0.0234	1.3566	0.1787	
R - Squared		*0.5558*			
Adj R - Squared		*0.3814*			
F Stats		*3.1881*			
P Value (F)		*0.0000*			

*** represents significance at 99%, ** at 95% and * at 90%

Table 4.9: Regression Results
Dependent Variable: Deposit Switching

Variables	Coefficient	Std. Error	t ratio	p value	
Beta (Systematic Risk) with Bank Index	0.185645	0.690797	0.2687	0.78875	
Value at Risk	0.0316	0.3132	0.1010	0.9198	
Book to Market (Value)	0.0116	0.0072	1.6130	0.1101	
Size (MV of Equity)	-0.08076	0.0333293	-2.4231	0.01741	**
DLI (KMV, Merton)	0.0272	0.1215	0.2239	0.8236	
Price	-0.043947	0.0903355	-0.4865	0.62782	
Growth in GDP	-0.078147	0.0273829	-2.8539	0.00532	***
Constant	0.0277	0.0471	0.5883	0.5583	
R – Squared	0.343375				
Adj R – Squared	0.293414				
F Stats	6.872901				
P Value (F)	*0.0000*				

*** represents significance at 99%, ** at 95% and * at 90%

Table 4.10: Regression Results
Dependent Variable: Deposit Switching

Variables	Coefficient	Std. Error	t ratio	p value	
Cost of Deposits	-0.0633	0.0192	-3.2995	0.0014	***
Beta (Systematic Risk) with Bank Index	0.3640	0.3563	1.0220	0.3096	
Value at Risk	0.0817	0.0805	1.0150	0.3139	
Book to Market (Value)	0.0510	0.1468	0.3470	0.7297	
Size (MV of Equity)	-0.0961	0.0320	-2.9990	0.0035	***
DLI (KMV, Merton)	0.0276	0.7860	0.0351	0.9721	
Price	-0.0577	0.1493	-0.3862	0.7044	
Growth in GDP	-0.0629	0.0195	-3.2320	0.0017	***
Constant	0.0391	0.0819	0.4773	0.6343	
R – Squared	*0.3575*				
Adj R – Squared	*0.3010*				
F Stats	*6.3284*				
P Value (F)	*0.0000*				

*** represents significance at 99%, ** at 95% and * at 90%*

Exhibit 4.1: Expected Sign

	Variables	Expected Signs
Market for Uninsured Liabilities *Cost of Deposits* c_{it} *Variation in Deposits* $\dfrac{\Delta D_{it}}{D_{it-1}}$	Capital Adequacy	-
	Impaired Lending to Gross Advances	-
	Revaluation Surplus to Total Investments	-
	Non Interest Expenses to Total Assets	+
	Return on Assets	-
	Liquid Assets to Demand Deposits	-
	Total Assets (Control Variable)	+
	YoY Growth in GDP	-
Market for Bank Equity *Cost of Deposits* c_{it} *Variation in Deposits* $\dfrac{\Delta D_{it}}{D_{it-1}}$	Systematic Risk	+
	Default Likelihood Indicator	+
	Book to Market	+
	Size (Market Cap)	-
	Stock Returns/Price Relatives	-
	YoY Growth in GDP	-