

**THE DETERMINANTS OF NON-PERFORMING LOANS AND ITS  
IMPACT ON MACROECONOMIC PERFORMNCE IN PAKISTAN**

**(A Panel Study)**

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*In the Name of Almighty Allah who is the most Merciful, the  
most Beneficent*

*Dedicated To my  
Grand Father  
Muhammad Abdullah (Late)*

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### *Abstract*

The study inspects the factors of Non-Performing Loans in Pakistan during the period 2000 to 2011 taking in account both of the macroeconomic as well as microeconomic variables. The study reveals that both of the macroeconomic as well as microeconomic variables are playing vital role in the evolution of NPLs in Pakistan, but the macroeconomic variables were found to have a high explanatory power as compared to microeconomic factors i.e bank specific factors. The examination of feedback using panel vector auto regressive and impulse response functions (IRF) broadly confirms strong macro-financial linkages. The results of IRF not only confirms the response of NPLs to macroeconomic conditions like inflation and real GDP, but the analysis also reveals strong impacts of banking system on the real economy, thus indicating that high level of NPLs in the country affect severely the pace of economic growth.

Keywords; Macro financial Linkages, NPLs, Impulse response functions, Panel Vector Auto Regressive.

## Abbreviations

<b>NPLs</b> .....	Non-Performing Loans
<b>OAEM</b> .....	Other Assets Especially Mentioned
<b>MFB's</b> .....	Micro Finance Banks
<b>VAR</b> .....	Vector Auto Regressive
<b>GDP</b> .....	Gross Domestic Product
<b>ARDL</b> .....	Auto Regressive Distributive Lag
<b>GCC</b> .....	Gulf Cooperation Council
<b>ROA</b> .....	Return on Assets
<b>ROE</b> .....	Return on Equity
<b>LTD</b> .....	Loan to Deposit
<b>SOLR</b> .....	Solvency Ratio
<b>INEF</b> .....	Inefficiency
<b>FEM</b> .....	Fixed Effect Model
<b>REM</b> .....	Random Effect Model
<b>GMM</b> .....	Generalized Method of Moments
<b>OLS</b> .....	Ordinary Least Square
<b>RER</b> .....	Real Exchange Rate

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## *Chapter 1:*

### **INTRODUCTION**

One of the most substantial issues for supervisory authorities concerning about the financial stability and management of banks operations is exploring the determinants of NPLs. It is widely accepted that most of the financial crises and bank failures in both developing and underdeveloped countries are due to NPLs. Since the economic growth of a country is impossible without a sound financial sector, so the best as well as the worst performance of these institutions do not hamper economic growth but also effect other parts of the world. The role of financial institutions is very important in the economy because they play a vital role in transforming deposits into productive investments. One of the main reasons of financial dis stability in both developing and underdeveloped countries is the percentage of NPLs to total assets of banks. Like, financial crisis in Sub-Saharan African countries and the current crisis which East Asia has faced. Likewise the US economy has also faced current crisis due to subprime loans or mortgages

In a nut shell we can say that low level of NPLs are boon for smooth working of economy whereas the high level of NPLs are trouble and loss for both the bank management and the economic activities. NPLs are one of the main factors that roots insolvency of financial institutions eventually hurting the entire economy (Hou, 2007). So there is a need to control these NPLs, if it is not done then economic growth as well as entire financial structure of economy is affected.

NPLs affect two main streams of banking system; which are very important for efficiency of banking system, namely liquidity and profitability. Since provisions are required in growing NPLs which reduces efficiency of income In addition due to the mismatch between assets and

liabilities there arises liquidity problems for the banks which worsen credit rating and the long run image of bank.

NPLs are the loans which are in default or closed to being in default. We can also say that if principal amount of loan and payment of interest is unpaid by 90 then those loans are considered as NPLs. There is not exact time period for considering loans as NPLs as it varies among the financial institutions. On basis of default NPLs are divided into four categories in Pakistan; OAEM (Other Assets Especially Mentioned), Substandard, Doubtful and Loss. According to the regulations of SBP the time span for recognizing loan as NPLs is 30 days for Micro Finance banks and for consumer loans by commercial banks is 90 days. The provisioning for above said loans are as 25%, 50% for substandard and doubtful and 100% for loss taking difference of principal outstanding balance and liquid assets realizable value without recourse to court of law. (Prudential Regulations for SME Financing, BPRB SBP 2011).

Like other economies banking system of Pakistan is also facing lot of problems and one of the most serious problem is enormous amount of NPLs which not only harm banking system but also the economy (Masood, 2009).

### **1.1: An overview of Banking Sector in Pakistan**

Banking sector of Pakistan perceived severe fluctuations since 1947. In the initial phase it didn't had ample resources due to prevalent political and socioeconomic conditions. In addition absence of trained staff, inadequate banking infrastructure and experts lead to poor quality of goods and services. So there was a need to have a sound and resilient banking industry in Pakistan so as a result on July 1, 1948 State Bank of Pakistan was established. In the meantime different changes were brought to outspread the operations of SBP through State Bank of Pakistan Act 1956. SBP

stimulated the private sector in the creation of financial institutions and banks in the country due to which unhealthy competition and unlawful practices took place in the country because there was a wave of bribe and corruption in the era of 50's and 60's, as a result the existing banks were taken by government sector in 1974. This nationalization not only worsened the quality of goods and services but also dejected the investors and foreign financial institutions due to government protection of employees. The poor concert of nationalized banks lead to reforms of banking sector in Pakistan in early 1990's. Presently the banking sector of Pakistan is playing a vital role in the economic growth of the country. In accord to the State Bank of Pakistan Act, the banking sector of Pakistan is a bilateral system in which the State Bank of Pakistan (SBP), commercial banks, specialized banks, Development Financial Institutions (DFI's), Microfinance banks and Islamic banks are included. At the end of June 2010, the banking sector was composed of 36 commercial banks in which all of the banks whether domestic or foreign are included with a total number of 9,087 branches across the country. Among these banks, there were 6 Islamic banks at the end of June in year 2010.

In addition, the SBP had also granted licenses to Industrial and Commercial Bank of China and Sindh Bank in December 2010. The main aim of ICBC is to explore opportunities in project and trade activities created by growing numbers of Chinese companies in Pakistan whereas Sindh Bank intended to stimulate agricultural business in Pakistan. Pakistani's banks provide clearance and cash services to residents and institutions which also include correspondent- banking. In addition banks also provide inland and cross boarder transmittal services to the people. Banks also provide services of cash deposit for accounting and security of securities. During few years, banks are giving consideration to the evolution of services provided to households and improvement of their service quality.

The financial background of the country which clearly distorted in early 70's is changed by modifications started in early 1990's into effective, healthful and resilient banking system. Due to these reforms a proficient and viable financial system came into existence. Particularly, the banking system owned by state is given in the hands of private sector. At the same time the statutory framework and State Bank of Pakistan's regulatory capacity is being improved significantly. It was due to these initiatives that the financial sector is quite sound it shows an increased flexibility to shocks. It is due to the fact that most of the banking assets are in the hand of private sector almost 80 % and a sense of professionalism & service orientation instead of bureaucracy and apathy is observed in the banking system. Banking technology which was almost non-present in Pakistan some years ago has transfigured the services rendered to customers and online banking access, internet banking, ATM's, mobile phone banking and different other kinds of delivery provided ease to customers by decreasing the transaction costs to the banks.

The difficult macroeconomic environment which Pakistan witnessed since late 2007, was not only due to world crisis but also due to a convergence factors remained infusing for a while, mainly due to the steady buildup of macroeconomic imbalances which lead to initiation of macroeconomic stabilization program started in November 2008 with support of IMF SBA. Similarly the impact of financial crisis manifested in different forms in the real sectors of economy in Pakistan became evident in 2009. But the major threat to domestic economy can be somewhat attributed to the GFC. Undeniably the drop in exports due to recession which took place in the economies which are major trading partners with Pakistan brought stress on capital flows where severe liquidity situation in global financial markets heavily obstructed foreign portfolio investment.

However, there are various other factors which played an important role in the weak economic progress in Pakistan as power shortages which lead to decline in the performance of industrial capacity subsequently rising cost of production, recent problem of circular debt, substantial decline in foreign direct investment, high inflation, security concerns, political instability, and above all, the fiscal deficit which broke all previous record in the country's economic history. The result of these issues which the country has been facing takes the form of consequent rise of NPLs on bank's balance sheets of different firms and industries since they face difficulty in compromising their loan payment capacity.

Besides, due to the worsened fiscal situation, government has been borrowing from the banks in order to support budgetary requirements, providing finance to public sector organizations, and commodity operations. Due to these there has been increase in bank's asset to credit to public sector which also include performance for top corporations, over Small and Medium Enterprises and consumer who are less resistant to economic slowdown and delicacy in operating environment. The sharp credit risk has taken the form of persistent increase in NPLs doubling over two years by year 2009.

## **1.2: Dealing with NPLs in Pakistan**

State Bank of Pakistan has been dealing the issue of NPLs in a very comprehensive manner. The various measures taken by the authorities include (a) improvement in coverage and reporting of NPLs (b) a proactive treatment of the existing stock of NPLs (c) stemming flow of new NPLs and (d) improving the policy and regulatory environment.

It is very important that even if the news loans are being serviced the NPLs will always grow over the time. It is because of principal amount and mark up. Since it is quite known that if

the principal amount and the markup is not paid by 90 days then these are recognized under the category of nonperforming loans. For example, if on January 1990 the original amount was let say Rs 1 million and the markup rate was 20 %, then it will become Rs1.2 million in January 1991, Rs 1.4 million in January 1992 and Rs 1.6 million in January 1993. So we can see that principal amounts overdue to the banking system in January 1993 will become Rs 160 billion and they will be considered as NPLs and immediately after 3 years these will be Rs 256 billion, if we assume that markup rate was 20 % per annum. Thus one can see that a 60 % rise has taken place in total volume of NPLs after a three year period, even if every single new loan is well serviced.

The second problem arises if loans are given in foreign currency which is most of the cases of NPLs about 13 %. These loans were given by foreign branches of UBL, HBL, NBP, and Allied Bank. If we assume when these loans were given we suppose the rupee-dollar exchange rate was Rs 50 to 1\$. Now if the amount of principal overdue was say \$ 1 million the book value of these loans were Rs 50 million at the time when loan was issued. Now today if the exchange rate becomes Rs 59 then the book value of same amount of loans becomes Rs 59 million i.e 18% higher than original value which was declared in 1990. The overdue markup is not included in this which also moves up an if this is include then the same amount of NPLs will be at least 40 % higher since dollar markup rate has become lower than rupee markup). So it can be observed that without bank mistake the aggregate value of NPLs (Denominated in foreign currency) has worsened by 40 %.

### **1: Improvement in Coverage and Reporting**

The SBP authorities adopted more rigorous measures for the classification of NPLs. For example in year 2002 the authorities came to know some specialized banks were only reporting the outstanding part of their NPLs in place of total outstanding loans which leads to an upward shift in the total volume of NPLs and the amount of NPLs became 47 billion Rs that was not shown

previously. At the same time SBP has also updated the methods of valuation of collaterals and brought them in line of international standards. Due to this banks today can only take minimum realizable value of assets being mortgaged in order to determine the provision. Now this realizable value must be that value that could be obtained by if pledged assets are in condition of sale As a result the banks are supposed to allocate additional provision against the collaterals which have been revised in accordance with the international practice. So we can say that the increase in the absolute amount of NPLs cannot only be accredited to only deterioration of quality of assets but also due to harder enforcement of regulations, valuation and other prudential regulations.

In addition of all of these factors the inclusion of unrealized mark up of three years, undisclosed NPLs and currency revaluation lead to increase the overall volume of NPLs at the end of June 2002. This increase was about 47 billion Rs in last three years. This increase results because of onetime adjustment made in September 2002 due to improvement in the methodology. Apart from the nationalized commercial banks which had brought down their NPLs the most substantial change had been made in the class of specialized banks. Their NPLs swells up from 19.3 billion Rs from 67 billion Rs as a result of this onetime adjustment.

For the regulatory authorities the absolute amount of NPLs is not important but the indicators of asset quality and capital adequacy of banks is the ratio of NPLs to total advances. The two ratios namely NPLs/gross advances and NPLs/net advances are needed to monitor properly. If bank grant new loans after careful attention and concentration then these ratios tend to decline over the time and asset's quality will improve. It is also important to mention that the systematic threat to banking system is non- provisioning. The more the provisioning, lower will be the systematic risk. The ratio of NPLs/net advances dropped from 15% to 11 % as banks and

other DFIs increased holding of provisions to Rs 142 billion which covered 56 % of their both domestic and foreign loan portfolios

## **2: Proactive treatment of the stock of NPLs**

The regulators of SBP were unsatisfied with the declining trend of these NPLs since the gap between deposit and lending rate was quite high. So it adopted another approach to resolve the issue. First, they put compression on the banks and DFIs to increase the recovery process. As a result more than Rs 40 billion of outstanding loans given in 1999 recovered in cash. Second, they directed banks to distinguish between circumstantial and willful defaulters. Case of willful defaulters were sent to NAB for action. NAB assisted in the recovery of Rs 17.5 billion from those defaulters. Third, CRSU (Committee on Revival of Sick Units) was authorized the restructure NPLSS immediately to operate sick units which are economically feasible. Fourth, CIRC (Corporate and Industrial Restructuring Corporation) was created by government. . The aim of this unit was to acquire the bad loans form nationalized commercial banks at discount and auction them in public snatching away assets from the existing owners and to repay the proceeds to banks. Fifth, in order to deal with aged loans which can hardly recover SBP developed general guidelines for board of directors of banks to write off these loans to assist small and medium borrowers.

Finally, 80 % of these loans were concentrated in the major public owned banks so they were merged and some of them were privatized.

## **3: Stemming flow of new NPLs**

The reforms in the banking sector initiated in early 1990s has significantly improved asset's quality. The ratio of NPLs/total loans which was disturbed in 1990s remained about 5 % much lower than international norms. NPLs and their ratios remained much lower for both domestic and



foreign banks. As state owned banks and DFIs are liquidated or merged the new NPLs dropped significantly.

Likewise, a change in atmosphere of credit culture of NCBs has developed who now pay great attention to more severe credit evaluation, proper credit certification and monitoring. Banks management now has developed mechanism for management of risk and dropped lending on political consideration.

There has been some negative repercussions of this new credit culture, it tends to drop in private sector credit due to this risk aversion and bank credit staff. SBP has been trying to alleviate by indicating banks to expand their portfolios and extending new businesses for example consumer financing, mortgage financing, and SME lending and agriculture credit. This diversification and risk management strategy not only helped to meet credit demand of economy but also branch flow of NPLs.

#### **4: Policy and regulatory environment**

The State Bank of Pakistan Policy and regulatory framework also restored to solve this problem. Interest rate declined and low interest rate should help borrowers to repay their loans. Information of companies and groups are today available online to assist in credit advancement decisions.

An important development taken place is in the shape of recovery law made in 2001 by which bank are able reprocess collaterals without recourse of law. A new bankruptcy law also permitted orderly resolution of debtor obligation under distress.

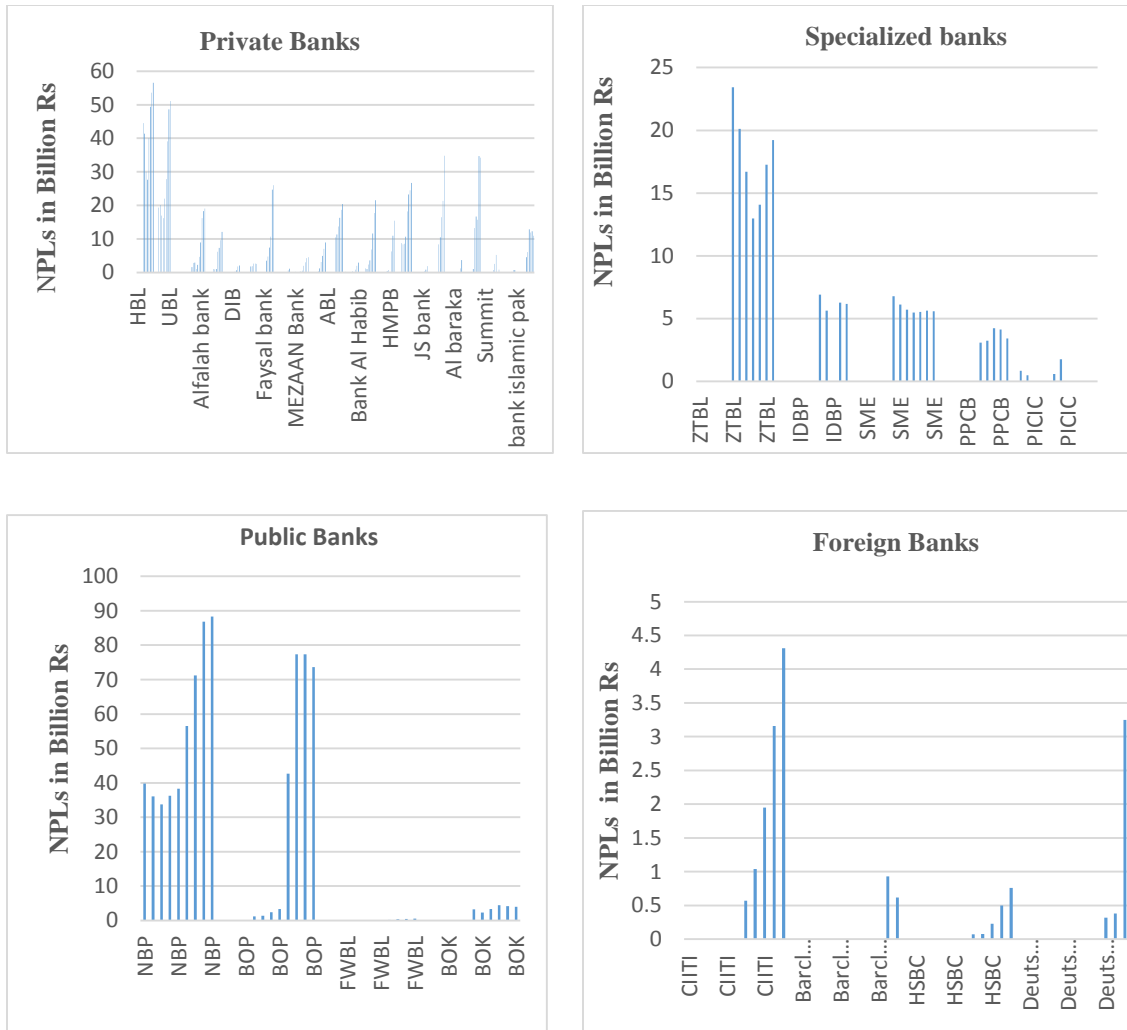
#### **1.3: Non Performing loans in Pakistan**

The total NPLs stood at Rs 613 billion for all banking sector excluding finance development institutions, as per data provided by State Bank of Pakistan on September 30, 2011.

Out of total loan 62 % comes from balance sheet of private banks; 31 % from public banks and almost 6 % from specialized and foreign banks holding a minor portion of total NPLs. NPLs are growing continuously on quarter basis, increasing 6 % growth in the first quarter of fiscal year 2011-2012. Cash recovery for first quarter reached Rs 14 billion, with major recovery by private banks of Rs 105 billion. The Net NPLs/Net loans for banking sector is 6.4 %, the ratio is higher because of high contribution 15.1 % ratio of publicly held banks and 14.7 % of specialized banks. The contribution of foreign banks and local privately held banks are 1.3 and 3.8 % respectively.

The government of Pakistan has been criticizing the private banks for not providing credit to private sector, but in reality government owns the larger share of these private lending's. About 20 % of private borrowings is done by textile sector; the amount of outstanding loans towards textile sector was Rs. 555 billion in January 2012, whereas manufacturing sector owned 51 % of total borrowings (Rs 1,464 billion). The persistent electricity shortfalls and gas shortages now become a consistent phenomenon; as a result textile and manufacturing sector are made to borrow more than their working capital requirement. The biggest example gas shortage effect on manufacturing sector is the world's biggest single train urea manufacturing plant which was not working because of irregular gas supply. The cost of this project was over \$1 billion which was mainly financed by banks. as the plant did not operate fully so there was possibility of loan default and increase NPLs. Therefore, because of such infrastructure –based uncertainty banks of Pakistan avoid lending to private sector, as it can translate growth in NPLs. Thus banks are only lending to government because of growth in demand but also to reduce riskiness of loan portfolio.

## Sector wise NPLs



### 1.4: Objectives of the study

The objective of the study is twofold as,

Firstly, the study aims to assess the factors of NPLs in Pakistan by taking in account both microeconomic data and macroeconomic data for year 2000-2011. This would be useful to evaluate relative importance of bank level vs. macroeconomic factors. Secondly the study evaluates response from banking to real economy using panel vector auto regression VAR analysis, which includes three endogenous variables namely, NPLs, Inflation, and Real GDP. This

study used 12 years panel data of 37 banks including Public banks, Privatized Banks, foreign banks, Private Banks, and Specialized banks

### **1.5: Organization of Study**

After a brief introduction the remaining part of study is structured as follows. Chapter 2 presents literature review on both macroeconomic and microeconomic determinants of NPLs and on empirical evidence related to feedback effects between NPLs and real economy. Chapter 3 discusses data and Methodology used in study, Chapter 4 evaluates response from banking sector to real economy using Panel VAR and IRFs. Chapter 5 Concludes and offer policy implication

## **LITERATURE REVIEW**

The existing literature on NPLs identify two factors, responsible for the evolution of NPLs over the time period. One group emphasizes on the macroeconomic conditions which affect borrower's capacity in paying their loans, whereas the second group looks in the variability of NPLs across the banks responsible for level of NPLs due to bank level factors. Empirical evidence shows that behind every financial crisis there is a macroeconomic factors which slowdown the aggregate economic activities. When growth slows down or becomes negative it leads to the reduction in the cash inflows of firms and households which make them unable to repay their bank loans along with principal and interest. A bank on the other hand expect that if recession occurs in economy households firms and will face liquidity shortages and therefore leads to delay in fulfilling their financial obligations. Therefore banks credit policies becomes sticer and selective ( Credit crunch), which in turns increase difficulties for firms and households, economic activity is weakened and number of problem loans accelerates.

### **2.1: Macroeconomic factors of NPLs**

There is noteworthy empirical evidence supporting ant cyclical behavior of NPLs. A general explanation of this is that high real GDP growth usually translates more income into the economy resulting increase the income of firm and households improving their capacity of debt servicing, on the other hand during the down turn of the business cycle the level of NPLs are likely to increase due to increase in unemployment and borrowers feel difficulty in repaying their loans (Salas and Saurina, 2002; Rajan and Dhal 2003; Fofack, 2005 and Jimenez and Saurina, 2005.

Other studies which conform macroeconomic conditions for credit risk are as follows,

Keeton and Morris (1987) showed for 2400 insured commercial banks of US banks for the period (1979-85) that local economic conditions explain variation in loan losses.

Sinkey and Green walt (1991) identifies some factors like increasing interest rate, economic downturns and excessive lending has a positive relationship with NPLs.

Authors who observed at asset price they also found a link between credit risk & hostile macroeconomic conditions are (Muller, 2000; Anderson and Sundaresan, 2000; Collin- Dufresne and Goldstein, 2001).

Quagliariello (2007) showed that business cycles affects NPL ratio for a large panel data of Italian banks over a period of 1985-2002. Cifter et al (2009), using in his study network based wavelet decomposition, found lagged impact of industrial production on number of NPLs in Turkish financial system for period of January 2001 to November 2007.

Dimitrios Angelos and Vasilios (2011) directed their panel data study of nine largest Greek banks over a period of 2004 to 2009 using GMM technique to inspect the determinants of NPLs in Greek banking system including( business, consumer and mortgages). They found that macroeconomic variables like real GDP growth rate, unemployment rate and lending rate effect NPLs and bank specific factors are also responsible for deviation in NPLs. In this regard, there is a negative impact exchange rate depreciation on asset quality, more specifically for countries who lend in foreign countries to unhedge borrowers, and interest rate affects the ability to service debt particularly in case of floating rate loans.

Solarin, Sulaiman and Jauhari (2011) compiled their findings on Islamic banks using ARDL approach in Malaysia showed that interest rate has a positive and long lasting impact on NPLs whereas productivity has an insignificant relationship with NPLs.

Asari et al (2011) using vector error correction model on 48 month data on commercial banks in Malaysia for period 2006-10 revealed that inflation and interest rate have a strong long run relationship whereas inflation and interest rate are insignificant in long run.

Saad and Kamran (2012) in their study for period over 1996- 2011 by using GARCH point out that interest rate volatility suggestively but not solely affect NPLs and other macroeconomic, political factors and policies of bank's credit are needed to study in depth to find main cause of NPLs.

Kent and D Arcy (2000) suggesting in his study on Australian banks that risk is showed during contractionary phase of business cycle and peaked at top of the cycles.

The choice of GDP, interest rate and unemployment as primary determinants of NPLs may also be justified form the theoretical literature of life cycle consumption models. Lawrence (1995) examines a model in which he included probability of default. According to model borrowers having low income level have higher default rate due to their greater chances of facing unemployment. Consequently bank charges higher interest rate to riskier clients.

There is also an evidence of positive relationship between NPLs and REER. Fofack (2005) analyzes that changes REER have a positive impact on NPLs of commercial banks in some of the Sub-Saharan countries where exchange rates are fixed. This is due to the reason that most of the large loans were concentrated to agriculture sector which are export oriented, which was badly affected increase in exchange rate of those countries.

Gambera (2000) in his study on American economy for data over 1987-99 evaluated the macroeconomic variables impact on loan losses; his findings suggest that income as well as unemployment rates are macroeconomic factors causing loan losses in America.

Kaminsky and Reinhart (1999) explain that an increase of NPLs in any country is an indication of financial crisis in that country. Although literature does not explain NPLs directly responsible for any financial crisis yet it explains the severe impact of NPLs on the economy of country (Caprio and Klingebiel, 1996; and Pazarbasioglu, 1998; Kaminsky and Reinhart, 1999).

Hoggarth, Zicchino and Sorensen (2005) having their study conducted in UK for time period 1988-2004 found that Inflation and Interest rates are positively related with NPLs.

Kalirai and Scheicher (2002) in their findings on Australian banking system after taking in account data over a period of 12 years from 1990-2001, point out that the major factors which determine the level of loan quality are lending rate, business confidence index industrial production, and stock market return respectively.

Likewise Bofondi and Ropele (2001), in one of their study conducted on Italian Banking system for time span over 1990-2010, exposes that NPLs are positively linked with the unemployment rates, lending rates and negatively linked with the GDP rate.

Similarly Rinaldi and Sanchis-Arellano (2006), in one of the study have explained the level of NPLs for group of European countries. According to their findings the major factors which effect the household NPLs are unemployment, disposable income, and monetary conditions.

Berge and Boye (2007) also highlights the factors responsible for the level of NPLs in Nordic banking system covering time span from 1993 to 2005. They suggest that NPLs are highly associated with lending rates and unemployment.



As far as developing countries are concerned there are various studies elaborating the issues of NPLs as;

Dash and Kabra (2010), examining level of NPLs in Indian banks for the period span over 1998-2009 exposed that real income variation are negatively related with NPLs and REER, and interest rates are positively associated with NPLs.

Rajan and Dahal (2003) observed in their study on Indian banking sector showed out that the level of NPLs are positively associated with GDP.

Khemraj and Pasha (2009) investigated the causes of NPLs in Guyana taking in account data from 1994-2004, they found that gross domestic product has an inverse relationship with volume of NPLs, whereas RER has a positive relationship with NPLs.

As far as Pakistan is concerned there are some of the studies which explains the level of NPLs in the country;

Siddiqui, Malik, & Shah (2012) after conducting a research in Pakistan covering a period 1996Q to 2011Q by applying GARCH model found that non-performing loans are affected by volatility in interest rates.

Badar & Javaid (2013) after conducting their research in order to assess the impact of macro-economic forces on NPLs in Pakistan for period 2002 to 2011 revealed that long relationship is found among the variables and macroeconomic variables are key determinants of non -performing loans in Pakistan.

Ahmad and Bashir (2013) in their study for assessing the power of microeconomic factors as the determinants of NPLs in Pakistan for period 2006 to 2011 using panel data found evidence for most of the bank specific variables.

## **2.2: Bank Specific Factors of NPLs**

The determinants of NPLs are not solely the macroeconomic factors but the distinctive features of banking industry and policies of each bank in respect of improving risk management and maximizing efficiency are expected to put forth essential impact on evolution of NPLs. A strand of literature has assess the link between NPLs and bank specific factors for instance,

Salas and Saurina (2002), in their study on Spanish banks revealed that the various factors responsible for level of NPLs are real GDP growth, bank size, capital ratio & market power credit Bercoff, Giovanni and Grimard (2002) also explained that asset growth, operating efficiency, and exposure to local banks also explained NPLs.

Berger and De Young (1997), in their seminal work after explaining causality between loan quality and bank's capital for US banks over a period over 1985-1994 codify four hypothesis for the flow of causation among the variables as ,

### **1. “Bad luck hypothesis”**

According to this hypothesis cost efficiency is decreased by increase in NPLs, the rational of this argument is that high numbers of NPLs give rise to operating cost dealing with them.

### **2. “Bad Management Hypothesis”**

High level of NPLs in future is positively associated with low cost efficiency. The justification of the above argument is that bad management is linked with poor skills in credit

scoring, monitoring borrowers and judgment of pledged borrowers. This hypothesis is same as bad luck hypothesis but implies opposite ordering.

### **3. “Skimping Hypothesis”**

High measured cost efficiency roots increasing number of NPLs in future. “According to this hypothesis there exists a tradeoff between allocation of resources for underwriting and monitoring loans and measured cost efficiency”. In other words those banks which are less devoted to ensure higher loan quality they are cost efficient but there will be a growing number of NPLs in long run.

### **4. “Moral hazard hypothesis”**

Lower capitalization tends to increase NPLs. This link is thought to be found in moral hazard incentives for the managers who willingly increase the portfolio risk when their banks are delicately capitalized.

Berger and De Young found support for both hypothesis (Bad Management and Bad Luck) founding bidirectional causality. They also found evidence for moral hypothesis.

Podpiera and Weil (2008) in their study conducted on Czech banking industry for period 1994-2005 examine empirical connection between cost efficiency and NPLs. Their study points strong argument in favor of bad management hypothesis and suggest authorities in emerging economies to emphasis on managerial performance.

Salas and Saurina (2002) in their study combine both microeconomic and macroeconomic variables to describe NPLs for Spanish Commercial and Saving banks or period (1985-1997). They observed statistically insignificant impact of lagged efficiency on NPLs and a negative impact of

lagged solvency ratio to NPLs. In addition they also found that bank size also affect NPLs i.e. large banks seem to have few NPLs.

Thus following hypothesis may be formulated

#### **5. “Size effect Hypothesis”**

Size of the bank is negatively related with NPLs.

The link between previous performance of bank and NPLs is ambiguous in its direction. One hypothesis favors negative relationship among past performance and future NPLs. According to this hypothesis worse performance of banks are due to lower quality skills with respect of lending activities just same as which has been observed in bad management hypothesis. Contrary to it there may be a positive relationship between past earnings and future NPLs. This can be explain in the model of Rajan (1994). According to this bank may attempt to persuade market regarding profitability of its lending by approving liberal credit policies which enhances current earnings at expense of future loans. So a new hypothesis can be formulated

#### **6. “ Bad Management II Hypothesis”**

Poorer performance of bank is positively associated with increase in future NPLs.

Furthermore, we could also analyze credit growth a cause of future NPLs according to literature of business cycle;

#### **7. “Procyclical credit Policy”**

Banks approve liberal credit policy as a negative extension of credit during boom and tight policy in contractory phase.

### **2.3: Feedback from banking system to Real economy**

The empirical literature on the linkages between NPLs and macro financial linkages relies on the VAR approach to highlight feedback between the two.

In this context an early study was done by Keeton and Morris (1999) on US data. In their study they used Vector Auto Regressive model and found strong evidence for credit growth.

Lis et al. (2000) implied simultaneous equation model to infer bank loan losses in Spain and found GDP growth, size of bank, and CAR are negatively related with loan growth whereas collateral, debt equity, regulation regime, market power net interest margin and lagged dependent had a positive impact on NPLs.

Marcuccind Quagliariello (2009) investigate the cyclical behavior of default rates in Italian banks and find default rate decline during good economic conditions and increases in downturns. The study also finds a feedback from banking sector to macroeconomic sector which operates via bank capital channel.

Episona and Parsad (2010) used group of 80 banks operating in GCC (Gulf Cooperation Council) and found that NPLs ratio worsens as economic growth weakens and interest rate increases. Their investigation of effects of increasing NPLs on growth suggests that there can be a robust, short lived adverse response from losses in balance sheets of banks on economic activity.

Jacobsen et al (2005) has used panel Vector Auto Regressive model to model macroeconomic factors and chances of default on Swedish companies and provided indication for macro feedbacks.

Summing up it can be seen that the problem of NPLs for both of the developing and developed countries is important to address for the smooth working of the country. Particularly for developing countries where these level of NPLs not only hampers growth but also affect pace of recovery and other sectors of economy. As far as this study is concerned, this study not only point outs the key factors of NPLs but also evaluates the impact of these level of NPLs on the macroeconomic performance in Pakistan for which no considerable literature has been written. More over the study takes in account both the static and dynamic impact of NPLs in country for which the previous studies have not taken so far.

## *Chapter 3*

### **DATA AND METHODOLOGY**

#### **3.1: Data**

Keeping in view the existing literature and the data availability three macroeconomic variables are taken as Real Gross Domestic Product, Inflation and Real Exchange rate. All of the macro economic variables are first transformed into log form prior to estimation. For bank specific hypothesis 37 banks including 5 public banks, 4 privatized banks, 19 private banks, 4 foreign banks, 5 specialized banks. In order to test micro economic hypothesis the bank level indicators are developed by analyzing their financial statements. The data is gleaned for published sources of SBP, International Financial Statistics and the financial statements of banks from their respective bank sites.

The significance and anticipated signs of macroeconomic variables with NPLs are as follows;

##### **3.1.1: Real GDP**

There is a major evidence of negative relationship between NPLs and gross domestic product (Louzis, Metaxas, Vouldis, 2011; Khemraj and Pasha, 2009; Salas and Saurina, 2002; Rajan and Dhal, 2003; Fofack, 2005; and Jimenez and Saurina, 2005). The underlying argument is that an increase in GDP increases the income level of the individuals which enhances the loan repayment capacity contributing lower level of NPLs.

##### **3.1.2: Inflation**

There is a mixed empirical evidence for the link between NPLs and Inflation. The studies favoring positive relationship include studies of Khemraj and Pasha, 2009, Fofack 2005. Contrary

Nukusu, 2011 has explained that the link can be either positive or negative. According to him inflation can positively or negatively affects the payment capacity of individuals, higher inflation reduces the real value of outstanding debt enhancing loan repayment capacity because it is associated with low employment as Phillips curve suggests. Whereas at the same time it can weakens loan payment capacity of borrowers because it reduces the real income of borrowers when the wages/salaries are sticky. Moreover, when loan rates are flexible , inflation is supposed to reduce borrowers loan servicing capacity because the lenders adjusts to uphold real returns or pass through increase in policy rates resulting from monetary policy actions in order to face inflation.

### **3.1.3: Real Exchange Rate**

The literature provides mixed results for exchange rate. According to Khemraj and Pasha (2009), there is a positive connection between REER and NPLs. Appreciation in exchange rates have different implications i.e.it can badly affect loan payment capacity of export oriented firms (Fofack, 2005). On the other hand it can positively effect of loan payment capacity who borrow in foreign currency.

## **3.2: Construction of Bank Specific Variables**

The bank specific variables are developed by analyzing the financial statements of the banks form their annual reports. Following micro economic variables are developed.

### **3.2.1: Performance Indicators**

The financial sector of Pakistan is the combination of institutions which are of diversified nature including Banks, Leasing Companies, Modarba companies, Insurance Companies etc., so ratios which are used to analyze performance of these institutions are different from each other but some of the ratio are in common to all. Following ratios are developed;



### 1. Return on Assets:

$$ROA = \frac{\text{Net profit after tax}}{\text{Total Assets}} * 100$$

This ratio explains the ability of earning profit by a bank using its total assets. This ratio is used to test the bad management hypothesis.

### 2. Return on Equity:

$$ROE = \frac{\text{Net profit after tax}}{\text{Total Share holders equity}} * 100$$

“Total Shareholders’ equity (Pakistani Banks) = Share capital + Reserves + Unappropriated profit/loss”

“Total Shareholders’ equity (Foreign Banks) = H.O capital account + Reserves + Unremitted profit”

This ratio measures return to shareholders by banks. This proxy is used similar as ROA to test bad management II hypothesis.

### 3. Loan to deposit ratio:

$$LTD = \frac{\text{Loans}}{\text{Deposits}} * 100$$

This ratio is the amount of banks loan divided by the total deposits at a point of time. This ratio expresses the %age of gross advances of banks by the deposits and indicates the exploitation of deposits in the core business of bank. This ratio is used to test moral hazard hypothesis.

#### 4. Solvency Ratio:

$$SOLR = \frac{\textit{Owned Capital}}{\textit{Total Assets}} * 100$$

It is the measure of the banks' ability to service its debts. A higher solvency ratio represents a healthy banking and vice versa. It is used to test moral hazard hypothesis same as loan to deposit ratio but opposite sign.

#### 5. Inefficiency Ratio:

$$INEF = \frac{\textit{Operating expense}}{\textit{Operating Income}} * 100$$

This ratio indicates total operating expense to non-interest income. It gives the %age of administrative expense experienced in earning non-interest income. It is used to test bad management/ skimping hypothesis.

#### 6. Bank Size:

$$SIZE = \frac{\textit{Total Assets}}{\sum \textit{Total Assets}} * 100$$

This ratio is used to test size effect hypothesis whether size of a banks affects NPLSS or not.

**Table 3.1: Definition of Bank Specific Variables**

<i>Variable Tested</i>	<i>Definition</i>	<i>Hypothesis Tested</i>
Return on Assets	$ROA_{it} = \frac{Profits_{it}}{Total\ Assets_{it}}$	“Bad Management II” (-)
Return on Equity	$ROE_{it} = \frac{Profits_{it}}{Total\ Equity_{it}}$	“Bad Management II” (-)
Loan to Deposit Ratio Solvency Ratio	$LtD_{it} = \frac{Loans_{it}}{Deposit_{it}}$ $SOLR = \frac{Owned\ Capital_{it}}{Total\ Assets_{it}}$	“Moral Hazard” (+) “Moral Hazard” (-)
Inefficiency	$INEF_{it} = \frac{Operating\ Exp_{it}}{operating\ Income_{it}}$	“Bad Management” (+) “Skimping” (-)
Size	$SIZE_{it} = \frac{Total\ Assets_{it}}{\sum_{i=1}^n Total\ Assets_{it}}$	“Size” (-)

### **3.3: Methodology.**

#### **3.3.1: Preliminary econometric Analysis**

In most of the literature, NPLs ratio is used in the logit transformation of (i.e.  $\log(\text{NPLs}/1-\text{NPLs})$ ) where NPLs is the NPL ratio. This alteration ensures dependent variable extends over the interval  $[-\infty \text{ to } +\infty]$  contrary to lying between 0 and 1 and is distributed symmetrically. So in our analysis we use logit transformation of NPLs ratio.

The data set consists of an unbalanced panel of 37 banks operating in Pakistan including public, private, privatized and specialized banks spanning the period from 2000 to 2011.

Baseline model is initially investigated using the macroeconomic variables, specifically the Real GDP, Inflation, and Real Exchange rate. After this the baseline model is further prolonged including the microeconomic variable i.e. banks specific variables.

#### **3.3.2: Estimation Technique**

There are various methods which have been used in the existing studies exploring the empirical relationship between NPLs and micro and macro determinants include panel regression analysis, cross country analysis, co-integration analysis, and dynamic analysis. This study uses two techniques; first for static analysis study uses fixed effect regression which allows controlling unobserved heterogeneity across banks. The validity of the fixed effect model is checked by using redundant fixed effect test. It compares the common effect model against fixed effect suggesting there is no individual effect. Before assessing the validity of FEM, we are also required to check whether fixed effect should be included in model or not. For this standard F test is applied to check FEM against CEM. If the null hypothesis is rejected then fixed effect model is used otherwise common effect is used. If we reject null hypothesis then random effect model is run and Housman

specification test is applied to check whether FEM or REM provide correct specification under  $H_0$  that individual effect are not related with other regressors in model. So if we reject  $H_0$  hypothesis then FEM is preferred otherwise REM.

### 3.3.3: Dynamic Panel Analysis

According to the recent literature in panel studies like (Salas and Saurina, 2002, Athanasoglou et al, 2009, and Merkl and Stolz, 2009 related on banking studies, Beck and Levine, 2004 Sants-Paulino and Thrlwall, 2004 andToubal, 2004 on macroeconomic studies) there is also a need to check the persistence of time in NPL structure so the study has also used dynamic approach. The main aspect of dynamic panel data specification is that it also uses dependent variable along with other regressors in the model, so

$$y_{it} = \alpha y_{it-1} + \beta(L)X_{it} + \delta_i + \varepsilon_{it}, \quad |\alpha| < 1, \quad i=1, \dots, N, t=1, \dots, N \quad (4.1)$$

“Where the subscripts  $i$  and  $t$  denotes the cross sectional and time dimension of the panel,  $y_{it}$  is the first difference of NPLs ratio,  $\beta(L)$  is the  $1 \times K$  lag polynomial vector,  $X_{it}$  is the  $k \times 1$  vector of explanatory variables other than  $y_{it-1}$ ,  $\delta_i$  are the unobserved bank specific effects and  $\varepsilon_{it}$  are error terms”

Since one of the drawbacks of fixed effect model was that it may rise an issue of dynamic panel bias which arises because of possible endogeneity of lagged dependent variable and fixed effect in error term  $\varepsilon_{it}$ . So if OLS estimation is used it will produce biased and inconsistent parameter estimates. Equation (4.1) is estimated by using GMM technique as suggested by Arellano and Bond (1991) which transforms data into first difference level in order to remove fixed effect element and then uses the lagged levels of independent variables as instruments.

“The GMM estimation proposed by Arellano and Bond (1991) is built upon on first difference transformation of equation (4.1) in order to remove fixed effect element and then use lagged levels of independent variables variables as instruments.

$$\Delta y_{it} = \alpha \Delta y_{it-1} + \beta(L) \Delta X_{it} + \Delta \epsilon_{it} \quad (4.2)$$

“Where  $\Delta$  first difference operator, in the above equation the lagged dependent variable  $\Delta y_{it-1}$  is by construction correlated with error term,  $\Delta \epsilon_{it}$  imposing bias in estimation”

“Nonetheless,  $\Delta y_{it-2}$ , which is expected to be correlated with  $\Delta y_{it-1}$  but not with  $\Delta \epsilon_{it}$  for  $t=3 \dots T$  can be used as instrument in estimation of (2) it implies that lags of order two or more of dependent variable satisfy following moment conditions”

$$E[y_{it-s} \Delta \epsilon_{it}] = 0 \text{ for } t = 3, \dots, T \text{ and } s \geq 2 \quad (4.3)$$

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

$$E[X_{it-s} \Delta \epsilon_{it}] = 0 \text{ } t = 3, \dots, T \text{ for all } s \quad (4.4)$$

“This assumption of strict exogeneity is restrictive and invalid in presence of reverse causality i.e. when  $E[X_{it-s} \Delta \epsilon_{it}] = 0$  for  $t < s$ . For set of weakly exogenous predetermined explanatory variables, only current and lagged value  $s$  of  $X_{it}$  are valid instruments and following moment condition is used”

$$E[X_{it-s} \Delta \epsilon_{it}] = 0 \text{ } t = 3, \dots, T \text{ and for } s \geq 2 \quad (4.5)$$

“The orthogonality conditions described in (3)-(5) form underpinnings of one step GMM estimation which produces under the assumption of independent and homoscedastic residuals consistent parameters”

The validity of the instruments used ion moment conditions as well as assumption of serial independence of residuals is crucial for consistency of GMM estimates. The overall validity of instruments is checked using Sargan Test proposed by Arellano and Bond (1991), by Arellano and Bover (1995) and Blundell and Bond (1998).

### 3.3.4: Econometric Specification

The equation 4.1 takes form in the base line model;

$$\Delta \ln NPL_{it} = \alpha \Delta \ln NPL_{it-1} + \sum_{j=1}^2 \beta_1 \Delta \ln GDP_{t-j} + \sum_{j=1}^2 \beta_4 \Delta \ln RER_{t-j} + \sum_{j=1}^2 \beta_5 \Delta \ln INF_{t-j} + \gamma_i + \varepsilon_{it} \quad (4.6)$$

With  $|\alpha| < 1, i = 1, \dots, 39$  and  $t = 1, \dots, 11$  where

$\Delta NPL_{it}$  represents first difference of NPL ratio,  $\Delta GDP_t$  is the real GDP growth rate,  $\Delta RER_t$  is the b first difference of exchange rate,  $\Delta INF_t$  is the first difference of inflation,  $\gamma_i$  is a time invariant unobserved bank specific effect and  $\varepsilon_{it}$  is vector of disturbances.

### 3.3.5: Dynamics of NPLs and their Macroeconomic effects

This section explores the response from banking sector to the real economy. This is being carried out by Panel Vector Auto Regressive methodology which serves as a useful tool to evaluate the magnitude and duration of effects. This technique combines the traditional Vector Auto Regressive methodology with the panel Vector Auto Regressive methodology which allows for unobserved individual heterogeneity. Panel VAR is based on the following model

$$Y_{it} = \epsilon_0 + \sum_{s=1}^n \epsilon_s Y_{i,t-s} + \epsilon_{it} \quad (4.7)$$

Where  $Y_{it} = (npl_{it}, \Delta rgdp_t, \Delta cpi_t)$  is a vector of three endogenous variables  $npl_{it}$  is the ratio of NPLSS to total loans of banking sector in bank I and year t;  $\Delta rgdp_t$  is the real GDP,  $\Delta cpi_t$  is the inflation rate.

The dynamic of model is assessed using impulse response which explains the response of one variable in system as a result of innovation in other while keeping all other shocks at zero. The innovations in VAR were orthogonalized by using Cholesky decomposition which explains that variables appearing in earlier order are taken as more exogenous while others as endogenous. So the study follows the presumption that the GDP growth, unemployment and inflation affect NPLSS only with a lag, while NPLs have a contemporaneous effect on economic activity through credit. So NPLs appear first in ordering and the, GDP, and CPI appear later.



## Chapter 4

### DISCUSSION OF RESULTS

This section concerns the discussion of estimation results.

#### 4.1: Static Panel results

As a starting point initially the model is estimated in static form. Initially traditional OLS method is adopted to see the behavior of macroeconomic variables on NPLs. The common constant model is also called pooled OLS method which assumes a common constant  $\alpha$  for all cross sections i.e common constant for all banks. CEM suggests no difference among estimated cross sections and is gainful under the null hypothesis that the data is homogenous i.e data contains samples of homogenous banks in respects of their profitability, size, efficiency etc., but practically this is restrictive and there are more cases of interest involve which are the addition of Fixed Effect and Random Effect methods of estimation.

Results of pooled OLS regression is depicted in Table 4.1.1. It can be seen from the above results that the Real GDP growth has a negative effect on NPLs ratio implying an increase in Real GDP growth tends to decrease NPL ratio, moreover the results are significant at 10 % level of significance. Similarly the effect of REER is positive on NPL ratio and supporting the hypothesis according to economic theory implying an increase in exchange rate tends to increase NPL ratio supporting the findings of Khemraj and Pasha (2009), examined a positive relationship between REER and NPL that it can positively effect of loan payment capacity who borrow in foreign currency but the results are insignificant at all levels of significance.

Similarly we can see the results of inflation on NPL ratio supporting a positive relationship between inflation and NPL ratio. The findings are according to the economic theory and according

to the findings of Khemraj and Pasha, 2009, Fofack 2005. Contrary Nukusu, 2011 who explained that the link can be positive or negative. They suggest that there can be a positive as well as negative impact of inflation on the payment capacity of borrowers. Higher inflation reduces the real value of outstanding debt enhancing loan repayment capacity because it is associated with low employment as Phillips curve suggests. Whereas at the same time it can weakens loan payment capacity of borrowers because it reduces the real income of borrowers when the wages/salaries are sticky. Moreover, when loan rates are flexible , inflation is supposed to reduce borrowers loan servicing capacity because the lenders adjusts to uphold real returns or pass through increase in policy rates resulting from monetary policy actions in order to face inflation. More over the results are significant at all levels of significance

**Table: 4.1.1 Pooled OLS Regression results.**

<b>Variable</b>	<b>Coefficient</b>	<b>St Error</b>	<b>t-statistic</b>	<b>Prob</b>
<b>C</b>	<b>-19.76</b>	<b>18.09</b>	<b>-1.09</b>	<b>0.2759</b>
<b>LRGDP</b>	<b>-1.22*</b>	<b>0.63</b>	<b>-1.92</b>	<b>0.0554</b>
<b>LRER</b>	<b>2.67</b>	<b>3.21</b>	<b>0.83</b>	<b>0.4057</b>
<b>LINF</b>	<b>3.54***</b>	<b>0.76</b>	<b>4.64</b>	<b>0.0000</b>
<b>R Squared 0.16</b>		<b>F Statistic 13.23</b>		
<b>Adjusted R Squared 0.15</b>		<b>Prob( F Stat) 0.0000</b>		
<b>***, **, and * denote significance at 1 %, 5 %, and 10 % respectively</b>				

In order to check the validity of the model standard F test is applied to test the H0 that all the constants are same (homogenous) against the alternative hypothesis that there is no common constant across the cross section implying heterogeneity across the cross sections.

**Table: 4.1.2 Redundant Fixed Effects Test**

<b>Effect Test</b>	<b>Statistic</b>	<b>d.f</b>	<b>Prob.</b>
Cross Section F	1.204	(35, 193)	0.2145

Since the F test rejects the common constant for each cross section, so we use the FE method which allows a different constant for each group. The results for FE regressions are depicted in Table 4.1.3 as,

**Table: 4.1.3 Fixed Effect Regression Results.**

<b>Variable</b>	<b>Coefficient</b>	<b>St Error</b>	<b>t-statistic</b>	<b>Prob</b>
<b>C</b>	<b>-37.96</b>	<b>11.86</b>	<b>-3.21</b>	<b>0.2759</b>
<b>LRGDP</b>	<b>-1.06**</b>	<b>0.43</b>	<b>-2.49</b>	<b>0.0554</b>
<b>LRER</b>	<b>6.18***</b>	<b>3.21</b>	<b>2.97</b>	<b>0.4057</b>
<b>LINF</b>	<b>4.11***</b>	<b>0.76</b>	<b>8.42</b>	<b>0.0000</b>
R Squared 0.72		F Statistic 12.15		
Adjusted R Squared 0.66		Prob( F Stat) 0.0000		
***,**, and * denote significance at 1 %, 5 %, and 10 % respectively				

It can be seen from the above table that all the variables show expected signs according to the economic theory. Real GDP growth has a negative relationship with NPL ratio and the coefficient is significant at 5 % level of significance. Comparing this result with pooled OLS method it can be seen that the magnitude as well as significance of results has been improved in FE regression results. Apart from the real GDP growth it can be seen that both the inflation and exchange rate have a significant and positive impact on the NPL ratio and results are according to the economic theory. It can be seen clearly in the FE regressions that the impact of exchange rate on NPL ratio is now highly significant and positive as compared to the common OLS results. Moreover, the impact of exchange rate on NPL is also positive and significant in both of regression

results. Similarly it can be seen in the results of FE regression that value of R squared has been significantly increased in FE regression results as compare to common OLS results.

After estimating FE model we also run random model which handles constant not fixed, but a random as parameters. The results of Random Effect regressions are depicted in Table 4.1.4 as,

**Table: 4.1.4 Random Effect Regression Results**

Variable	Coefficient	St Error	t-statistic	Prob
<b>C</b>	<b>-35.77</b>	<b>11.76</b>	<b>-3.04</b>	<b>0.0027</b>
<b>LRGDP</b>	<b>-1.08**</b>	<b>0.43</b>	<b>-2.55</b>	<b>0.0113</b>
<b>LRER</b>	<b>5.75***</b>	<b>2.07</b>	<b>2.78</b>	<b>0.0060</b>
<b>LINF</b>	<b>4.03***</b>	<b>0.48</b>	<b>8.28</b>	<b>0.0000</b>
<b>R Squared 0.32</b>		<b>F Statistic 31.6</b>		
<b>Adjusted R Squared 0.31</b>		<b>Prob( F Stat) 0.0000</b>		
<b>***, **, and * denote significance at 1 %, 5 %, and 10 % respectively</b>				

It can be seen in the above table that all of the macroeconomic determinants are showing expected and significant coefficients in line of economic theory.

After estimating equation with random effects, the Hausman test is applied to choose the most suitable method comparing the fixed effect and random effect estimators. The following Hypothesis are tested,

**$H_0$** : FEM is the most appropriate model

**$H_A$** : REM is the most appropriate model

The results of the tests are reported in Table 4.1.5 and it can be seen in this case that chi square statistic is 4.549, which is greater than critical 1% level of significance so we reject hull hypothesis.

**Table: 4.1.5 Correlated Random Effects- Hausman Test**

<b>Test Summary</b>	<b>Chi-sq. statistic</b>	<b>df</b>	<b>Prob.</b>
Cross section random	4.5	3	0.207

So according to chi-sq. statistic the most appropriate model in static panel estimation is the random effect model.

Apart from static panel estimation it is expected that there may arise some degree of persistence in the evolution of NPLs, so the above analysis is further extended to dynamic setting. Subsequently the dynamic specification is also suitable in testing hypothesis regarding micro determinants of NPLs.

#### **4.2: Dynamic Panel results**

The results of the one step AB GMM estimators are depicted in Table 4.2.1, the analysis takes in account both of the banks specific as well as macroeconomic variables. It can be seen in the above table that the lags of NPL in t-1 period has a positive and major impact on current NPL ratio in banking system, means the higher the loans in the last period has a positive impact on current NPLs level in the economy, moreover the explanatory power of this coefficient is also strong and significant at 5% level of significance. Likewise the coefficient of lagged dependent variable can also be negative as it was shown in the work of Sorge and Virolanien (2006) who reported negative value of this coefficient, they say that the NPL ratio tends to decrease when it has got better in the previous year due to write offs. Similarly the impact of other individual micro economic variables can be seen in detail as,

First investigating the bad management II hypothesis, for which two measures of the bank specific variables were taken namely ROA and ROE. The performance indicators such as ROA

and ROE were expected to be negatively and positively related to NPLs. It can be seen that there is a negative relationship between Return on assets and NPLs and also significant. Although the explanatory power of the variable is quite weak but still it confirms the bad management II hypothesis, indicating that the bank worse performance may be due to lower quality skills within respect of lending activities of banks indicating a negative relationship between past earnings and future NPLs. The results support the above hypothesis both in the current as well as lagged levels and results are significant although the explanatory power is quite weak.

Likewise the lagged measures of performance and NPLs can be positively associated with each other as possible in the model of Rajan (1994). According to him that the bank convince market about the profitability of its lending for which they adopt free credit policy so a result they swell current earnings at the cost of future loans, similarly it can also use loan losses provisions in order to increase its earnings, as a result it has a positive link to future NPLs. One of the performance indicators in our study support this hypothesis as can be seen in the table that ROE and Future NPLs are positively associated with each other and quite significant at 1 % level of significance. The explanatory power of this is also quite weak like ROA. Similarly the lagged value of ROE is affecting positively current level of NPLs but the results are not significant. On the whole we can say that the performance indicators as measures of NPLs are quite significant in the case of Pakistan but the magnitude of these effects on NPLs are quite low.

Similarly we can see the coefficient of loan to deposit ratio which is used as a proxy to check moral hazard hypothesis, the coefficient of LTD is positive in both current as well as lagged value indicating the higher LTD ratio tends to increase NPLs in the subsequent years, moreover the results are also significant at 1% level of significance in both current as well as lagged levels.

It can be seen that the explanatory power of this variable is also quite low in determining yet it is playing important role in the evolution of NPLs in subsequent years.

The bank size has a negative and a significant relationship with NPLs, moreover the explanatory power of this variable is more than all of the other variables thereby confirming size hypothesis that is the more the bigger size of bank it lead to decrease the NPLs due to more diversification opportunities. It can be seen clearly in the table that in contrast to all other micro economic variables the bank size coefficient is one of the main driver in the evolution of NPLs.

Similarly the coefficient of Inef as a measure of skimping/ bad management hypothesis is negative and significant in both current and lagged levels supporting the skimping hypothesis. The explanatory power of this variable is more in the lagged level as compare to the current level and significant at 1% level of significance. Lastly the SOLR ratio in both of its level (Current and lagged) is in significant.

Similarly the results of macroeconomic variable are also supporting the economic intuition. The real GDP has a negative and significant impact on NPLs, likewise the impact of inflation and real exchange rate are positive and significant as according to economic theory.

Since the coefficient of SOLR is insignificant so drop this variable and again estimate our model, the results are given in column 2 of table as,

It can be seen in the most of the coefficients show similar signs as shown in table 1. Out of the three macroeconomic variables coefficient of inflation becomes now insignificant both in the current as well as lagged levels. Out of the performance indicators ROA becomes insignificant at level but becomes significant in its lagged level at 1% level of significance. Likewise ROE remains insignificant both in current and lagged levels in model 2. Similarly loan to deposit ratio is

insignificant in model 2 due to the exclusion of solvency ratio in both levels. Size effect is more significant and powerful in model 2 as compared to model 1 as its explanatory power increased from 2.84 to 3.43. Lastly coefficient of inefficiency is negative and significant in both of the models but the explanatory power has been increased in model 2 both in current as well as lagged levels.

**Table: 4.2.1 GMM Estimation Results**

Model Specification	AB GMM( 1-Step)	AB GMM (1-step)
$\ln(NPL/1 - NPL)_{-1}$	<b>0.57***</b> [5.71]	<b>0.55***</b> [5.15]
$\ln(RGDP)$	<b>-0.61***</b> [-2.82]	<b>-0.61***</b> [-2.52]
$\ln(RGDP)_{-1}$	-0.33 [-1.03]	-0.23 [-0.73]
$\ln(RER)$	<b>3.67***</b> [2.76]	<b>4.11***</b> [1.73]
$\ln(RER)_{-1}$	0.53 [0.25]	0.19 [0.07]
$\ln(INF)$	<b>2.71</b> [1.29]	2.35 [1.72]
$\ln(INF)_{-1}$	-0.12 -0.08	0.74 [0.36]
$ROA$	<b>-0.000315***</b> [-2.62]	-0.0001 [-0.88]
$(ROA)_{-1}$	<b>-0.000231***</b> [-5.91]	<b>0.000218***</b> [-5.68]
$ROE$	<b>0.000293***</b> [1.69]	0.0003 [1.23]
$(ROE)_{-1}$	0.000529 [1.46]	0.000785 [1.42]
$LTD$	<b>0.000836***</b> [3.19]	0.0003 [0.56]
$(LTD)_{-1}$	<b>-0.0001***</b> [-4.89]	$5.44E - 05$ [-0.96]
$SIZE$	<b>-2.84**</b> [-2.44]	<b>-3.93***</b> [-2.92]



$(SIZE)_{-1}$	1.80 [1.60]	1.98 [1.44]	
<i>INEF</i>	<b>0.5**</b> [-1.99]	<b>-0.93***</b> [-2.22]	
$(INEF)_{-1}$	<b>-1.11***</b> [-3.18]	<b>-1.16***</b> [2.97]	
<i>SOLR</i>	-0.57 [-0.008]		
$(SOLR)_{-1}$	-2.92 [-0.24]		
J statistic	46.96	J statistic	37.86
Prob (J stat.)	0.15	Prob (J stat.)	0.47
No of Observations	106	No of Observations	127
No of Banks	27	No of Banks	32
Instrument Rank	57	Instrument Rank	55
No of Observations	106	No of Observations	127
No of Instruments	10	No of Instruments	9
AR(1)	-0.21	AR(1)	-0.22
AR(2)	0.19	AR(2)	0.20
***,**, and * denote significance at 1 %, 5 %, and 10 % respectively t statistic are reported in parenthesis			

In the line of dynamic literature, in order to test the overall validity of instruments used in the model we employ Sargan specification test given by Arellano and Bond (1991), Arellano and Bover(1995) and Blundell and Bond(1998). The test is based on the sample similarity of moment condition used in estimation process in order to assess suitability of instruments. As J statistic is the Sargan Statistic so it is employed to construct the Sargan test of over identifying restrictions.

The p value reported in the table accepts the null hypothesis so the moment conditions are valid and instruments used are valid in both model.

#### 4.3: Feedback from Banking System to Real Economy

The dynamic behavior of the model is judged using IRF (impulse response functions), which describes the response in one variable due to innovation in other in system keeping all other shocks zero. Shocks in the VAR are orthogonized after the use of cholesky decomposition which

implies that the variables which appear in earlier order they are considered more exogenous, whereas later are considered endogenous, so in this regard we follow the presumption the real GDP, inflation effect NPLs only with lag whereas NPLs have a contemporaneous effect on economic activity so NPLs appears first in ordering and, GDP and Inflation latter.

#### **4.4: Impulse Response Functions Results**

The results of IRF are depicted in Table 4.3.1. The table shows the response of one variable as a result of shock or innovation in the other variable in future years. It can be seen in that when one positive shock or one positive standard deviation is given to NPLs it leads to the decline in the NPLs in the next ten years but it never becomes negative.

Similarly it can be see that when a positive shock is given to real GDP then initially for first next two years the NPLs remains constant at 0.01 %age points , but after the NPLs increases from 0.01 to 0.16 %age points till 4 years. After four years then NPLs start decline from 0.16 %age points to 0.01 %age points for next 4 years or in other words in the next eight years NPLs come to their previous level and after 8 years it becomes negative. Similarly when a positive shock is given to inflation then NPLs remain constant for the next ten years at their initial levels.

Likewise we can also see that how real GDP respond to a shock in NPLs. It can be seen in the table when a positive shock is given to NPLs then in the next first year real GDP starts declining after first year and in the second year it becomes negative and it remains negative in the next nine years and never becomes positive.

Similarly we can also see how real GDP respond to one positive shock to it. It can be seen that when a positive shock is given to real GDP then real GDP starts declining form 0.077 %age points to 0.005%age points in the initial 4 years. After 4 years then it becomes constant at

0.004%age points for next 6 years. Similarly the response of real GDP to one standard shock to inflation is not so much appreciable in future years. Initially in start it is negative but very low and after it becomes positive.

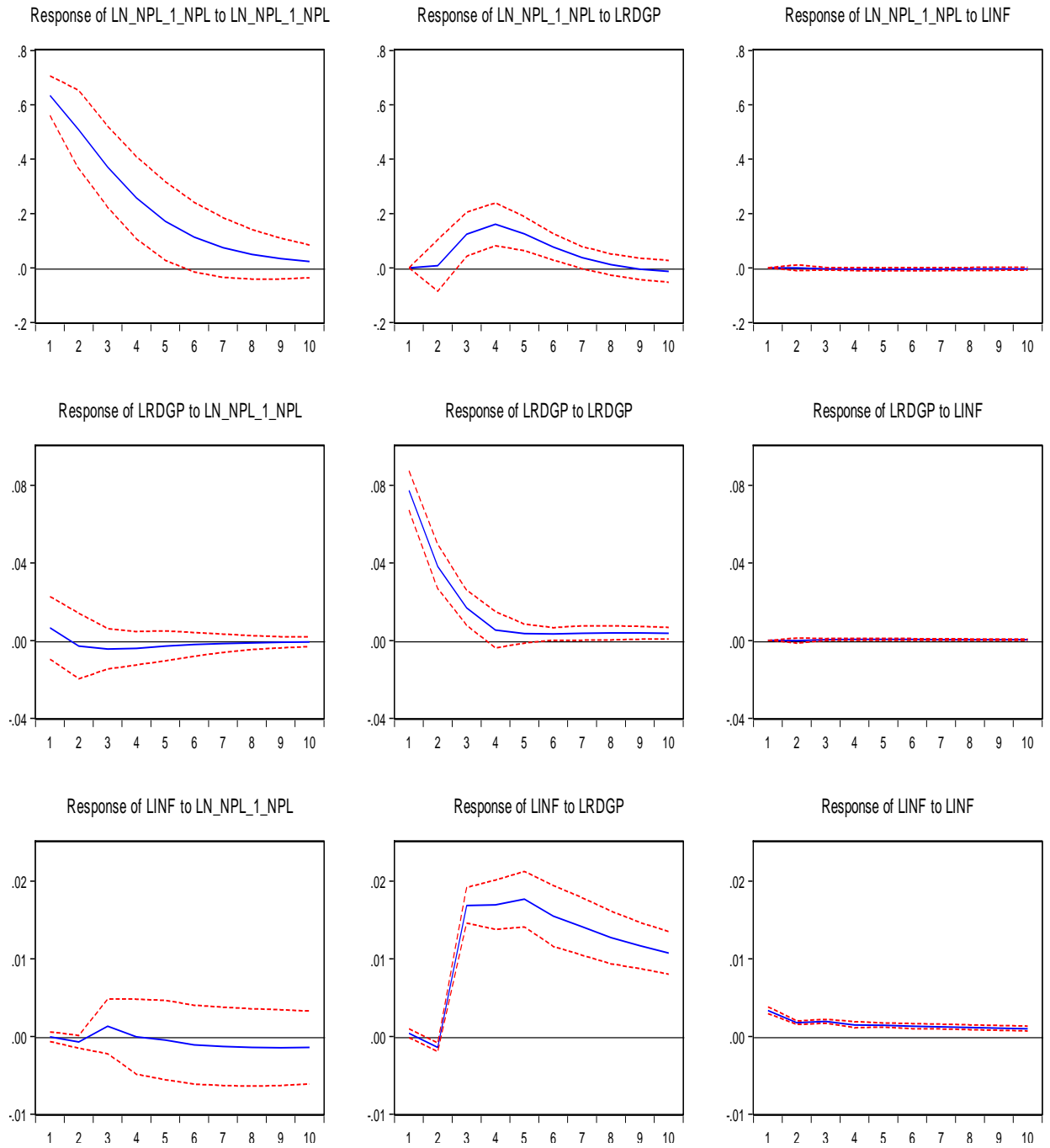
Similarly it can be seen that when a positive shock is given to NPLs then in first two years inflation is negative. After 2 years it becomes positive and reaches to 0.0013 %age points in year third. After 3 years it again starts declining and after 4 years it becomes permanent negative till next 6 years.

We can also assess the response of inflation to one standard deviation shock in real GDP. It can be seen in the table that initially in the first two years inflation is negative at -0-0014 %age points. After second year in the third year it becomes positive and starts increasing and becomes maximum at 0.00169 %age points. After 3 years inflation becomes constant for the next two years. After 5 years then it again start declining but remains positive till last year.

At last we can see the response of inflation to its own shock. It can be seen in table that when one standard deviation shock is given to inflation then initially for 2 years it starts declining from 0.0033 %age points to 0.0017%age points, but after 2 years then for the next eight years it remains positive and constant.

### **Table 4.3.1 Impulse Response Functions**

Response to Cholesky One S.D. Innovations  $\pm 2$  S.E.



## **CONCLUSION AND POLICY RECOMMENDATION**

### **5.1: Conclusion**

The study aims to explore the causes of NPLs taking both in account the micro as well as macro-economic factors of Pakistan. Moreover the study also analyses the feedback effects from banking to real sector and vice versa using panel VAR and IRFs. Three macro-economic variables namely Real Gross Domestic Product, Real Exchange rate and Inflation are used whereas for micro economic factors different performance indicators namely, ROA( Return on Assets), ROE( Return on Equity),LTD( Loan to Deposit Ratio), Bank Size, SOLR( Solvency Ratio), INEF( Inefficiency Ratio), are used. The study uses Fixed Effect Model and Random Effect Model for static analysis, whereas for dynamic analysis the GMM estimation technique is used.

The results reveal that both of the macroeconomic as well as micro economic variables are playing an important role in the evolution of NPLs with the prior one having a greater explanatory power as compared to the latter one. It is found that both in static as well as in dynamic form the macroeconomic variables namely Real GDP, Real Exchange rate, and Inflation have a vital role in the evolution of NPLs in Pakistan. In addition the inclusion of bank specific variables in base line model poses additional explanatory power, thus supporting bad management hypothesis which links these factors to the quality of management.

The study reveals that the level of NPLs are sensitive to the bank specific factors as well. Higher quality of bank management which is measured by using bank's profitability tends to lower the NPLs, likewise moral hazard hypothesis tends to worsen the NPLs.

The examination of response between banking system and economic activity confirms the strong macro financial linkages in Pakistan. From one side the NPLs were found to respond the macro economic conditions, such as Real GDP and Inflation, results of IRF also confirms that there are also feedback effects from banking system to the real economy, thus suggesting that a one standard deviation shock to NPLs tends to have a significant impact on Real GDP and Inflation in the periods ahead thus supporting the argument that for a sustainable economic growth in an economy a sound and resilient banking system is needed.

## **5.2: Policy Recommendations**

The empirical findings of the study has some repercussions in terms of policy and regulations. Since the empirical findings suggest that the performance in addition with the bank's efficiency measures are the chief indicators of future NPLs, this suggest that the supervisory authorities could use these measures to those banks whose potential NPLs increases. The adverse effect of NPLs on the economy and also the significant contribution of bank specific factors to NPLs emphasizes the supervisors to strengthen the supervision to avoid sharp building of NPLs in future, ensuring the banks to avoid extreme lending, upholding high credit standards and preventive foreign currency lending to unhedged borrowers.

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## Appendix

**Table A1. Summary Statistics**

<i>Variable</i>	<i>Mean</i>	<i>Median</i>	<i>S.D</i>	<i>Max</i>	<i>Min</i>
<i>ln(NPL/1 – NPL))</i>	-2.28	-2.29	0.26	5.31	4.38
<i>LRGDP</i>	8.93	9.05	0.25	9.11	8.19
<i>LRER</i>	4.02	4.01	0.26	4.24	3.89
<i>LINF</i>	4.92	4.94	0.26	5.31	4.38
<i>ROA</i>	64.77	1.11	620.35	7908.612	-7.14
<i>ROE</i>	-9.06	11.27	123.47	85.62	-1114.94
<i>LTD</i>	239.66	68.32	1307.31	16777.78	0.559
<i>INEFF</i>	1.66	1.64	0.15	1.22	1.98
<i>SOLR</i>	0.012	0.0042	0.0194	0.09	-0.01
<i>SIZE</i>	0.47	0.27	0.532	2.51	0.02

**Table A2. Cross Correlations between Variables**

	<b>LINF</b>	<b>LRER</b>	<b>LRDGP</b>	<b>ROA</b>	<b>ROE</b>	<b>SIZE</b>	<b>SOLR</b>	<b>INEF</b>	<b>LN_NPLs_1 _NPLs</b>	<b>LTD</b>
<b>LINF</b>	1	-0.88	0.77	-0.06	-0.16	0.3	0.11	0.28	0.3	0.01
<b>LRER</b>	-0.88	1	-0.80	0.03	0.09	-	-0.13	-0.20	-0.29	0.00
<b>LRDGP</b>	0.77	-0.80	1	0.01	-0.13	0.07	0.108	0.19	0.24	0.038
<b>ROA</b>	-0.06	0.031	0.016	1	0.009	0.08	-0.06	0.083	-0.018	-0.01
<b>ROE</b>	-0.16	0.09	-0.13	0.009	1	0.11	0.042	-0.18	-0.35	0.00
<b>SIZE</b>	0.13	-0.15	0.071	-0.08	0.11	1	0.805	-0.17	0.09	-0.102
<b>SOLR</b>	0.11	-0.13	0.108	-0.06	0.042	0.80	1	-0.13	0.04	-0.08
<b>INEF</b>	0.28	-0.20	0.19	0.08	-0.18	-	-0.13	1	0.25	-0.17
<b>LN_NPLs_1_ NPLs</b>	0.37	-0.29	0.24	-	-	0.09	0.041	0.25	1	-0.04
<b>LTD</b>	0.01	0.01	0.035	-	-	0.10	-0.08	-0.17	-0.046	1

**Table A3. Definition of Bank specific variables**

<i>Variable Tested</i>	<i>Definition</i>	<i>Hypothesis Tested</i>
Return on Assets	$ROA_{it} = \frac{Profits_{it}}{Total\ Assets_{it}}$	“Bad Management II” (-)
Return on Equity	$ROE_{it} = \frac{Profits_{it}}{Total\ Equity_{it}}$	“Bad Management II” (-)
Loan to Deposit Ratio	$LtD_{it} = \frac{Loans_{it}}{Deposit_{it}}$	“Moral Hazard” (+)
Inefficiency	$INEF_{it} = \frac{Operating\ Exp_{it}}{operating\ Income_{it}}$	“Bad Management” (+) “Skimping” (-)
Size	$SIZE_{it} = \frac{Total\ Assets_{it}}{\sum_{i=1}^n Total\ Assets_{it}}$	“Size” (-)

**Table A4. Pooled OLS regression results**

Variable	Coefficient	St Error	t-statistic	Prob
C	-19.76	18.09	-1.09	0.2759
LRGDP	-1.22*	0.63	-1.92	0.0554
LRER	2.67	3.21	0.83	0.4057
LINF	3.54***	0.76	4.64	0.0000
R Squared 0.167 Adjusted R Squared 0.154 F Statistic 13.23 Prob( F Stat) 0.000 ***, **, and * denote significance at 1 %, 5 %, and 10 % respectively				

**Table A5. Fixed Effect Regression Results.**

Variable	Coefficient	St Error	t-statistic	Prob
C	-37.96	11.86	-3.21	0.2759
LRGDP	-1.06**	0.43	-2.49	0.0554
LRER	6.18***	3.21	2.97	0.4057
LINF	4.11***	0.76	8.42	0.0000
R Squared 0.72		F Statistic 12.1		
Adjusted R Squared 0.66		Prob( F Stat) 0.000		
***, **, and * denote significance at 1 %, 5 %, and 10 % respectively				

**Table A6: Random Effect Regression Results.**

Variable	Coefficient	St Error	t-statistic	Prob
C	-35.77	11.76	-3.04	0.0027
LRDGP	-1.08**	0.43	-2.55	0.0113
LRER	5.75***	2.07	2.78	0.0060
LINF	4.03***	0.48	8.28	0.0000
R Squared 0.33		F Statistic 31.6		
Adjusted R Squared 0.32		Prob( F Stat) 0.0000		
***, **, and * denote significance at 1 %, 5 %, and 10 % respectively				

**Table A6: Redundant Fixed Effects Test**

Effect Test	Statistic	d.f	Prob.
Cross Section F	1.204	(35,193)	0.2145

**Table A7. Correlated Random Effects- Hausman Test**

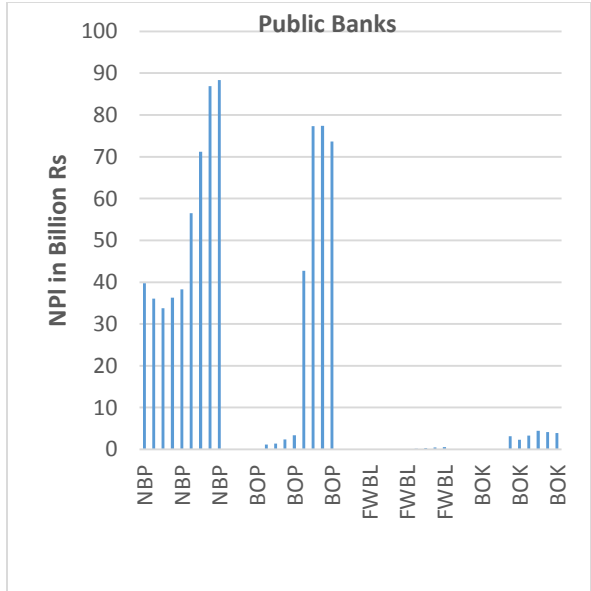
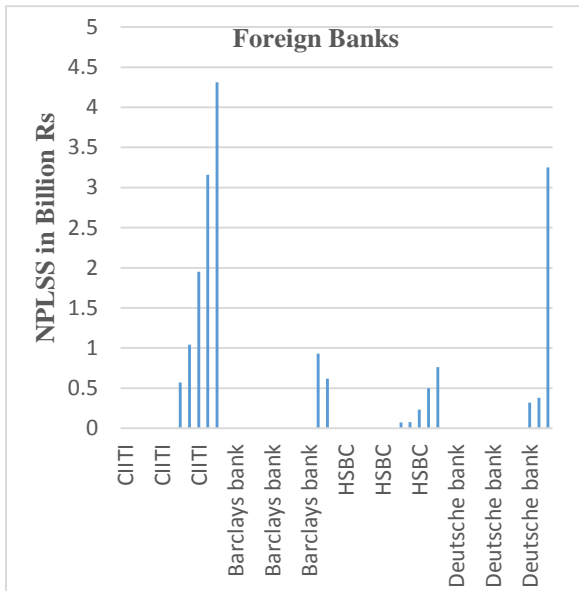
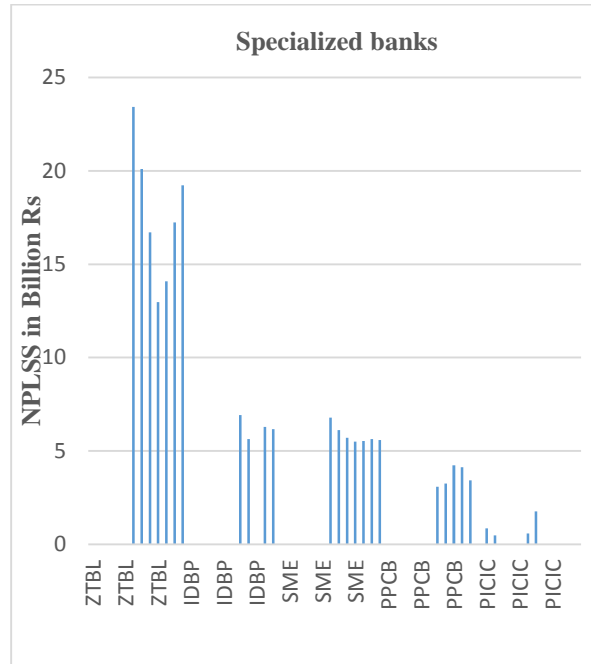
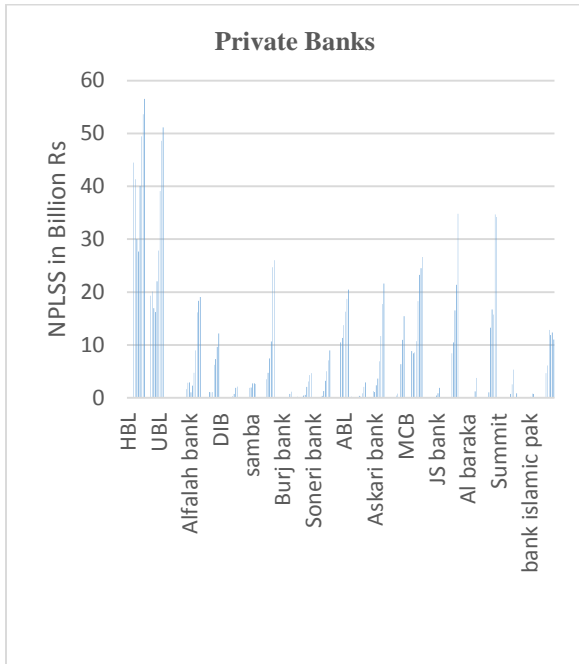
Test Summary	Chi-sq. statistic	Chi-sq. df	Prob.
Cross Section random	4.55	3	0.207

**Table A8. GMM Estimation Results**

Model Specification	Difference GMM	
	AB GMM( 1-Step)	AB GMM (1-step)
$\ln(NPL/1 - NPL)_{-1}$	<b>0.57***</b> [5.71]	<b>0.55***</b> [5.15]
$\ln(RGDP)$	<b>0.61***</b> [2.82]	<b>0.61***</b> [2.52]
$\ln(RGDP)_{-1}$	0.33 [1.03]	-0.23 [0.73]
$\ln(RER)$	<b>3.67***</b> [2.76]	<b>4.11***</b> [1.73]
$\ln(RER)_{-1}$	0.53 [0.25]	0.19 [0.07]
$\ln(INF)$	<b>2.71*</b> [1.29]	
$\ln(INF)_{-1}$	-0.12 -0.08	0.74 [0.36]
$ROA$	- <b>0.000315***</b> [-2.62]	-0.0001 [-0.88]
$(ROA)_{-1}$	- <b>0.000231***</b> [-5.91]	<b>0.000218***</b> [-5.68]
$ROE$	<b>0.000293***</b> [1.69]	0.0003 [1.23]
$(ROE)_{-1}$	0.000529 [1.46]	0.000785 [1.42]
$LTD$	<b>0.000836***</b> [3.19]	0.0003 [0.56]
$(LTD)_{-1}$	- <b>0.0001***</b> [-4.89]	$5.44E - 05$ [-0.96]
$SIZE$	- <b>2.84**</b> [-2.44]	- <b>3.93***</b> [-2.92]
$(SIZE)_{-1}$	1.80 [1.60]	1.98 [1.44]
$INEF$	<b>0.5**</b> [-1.99]	- <b>0.93***</b> [-2.22]
$(INEF)_{-1}$	- <b>1.11***</b> [-3.18]	- <b>1.16***</b> [2.97]
$SOLR$	-0.57 [-0.008]	
$(SOLR)_{-1}$	-2.92 [-0.24]	
J statistic 46.96		J statistic 37.86
Prob (J stat.) 0.15		Prob (J stat.) 0.47
No of Observations 106		No of Observations 127

\*\*\*,\*\*, and \* denote significance at 1 %, 5 %, and 10 % respectively  
t statistic are reported in parenthesis

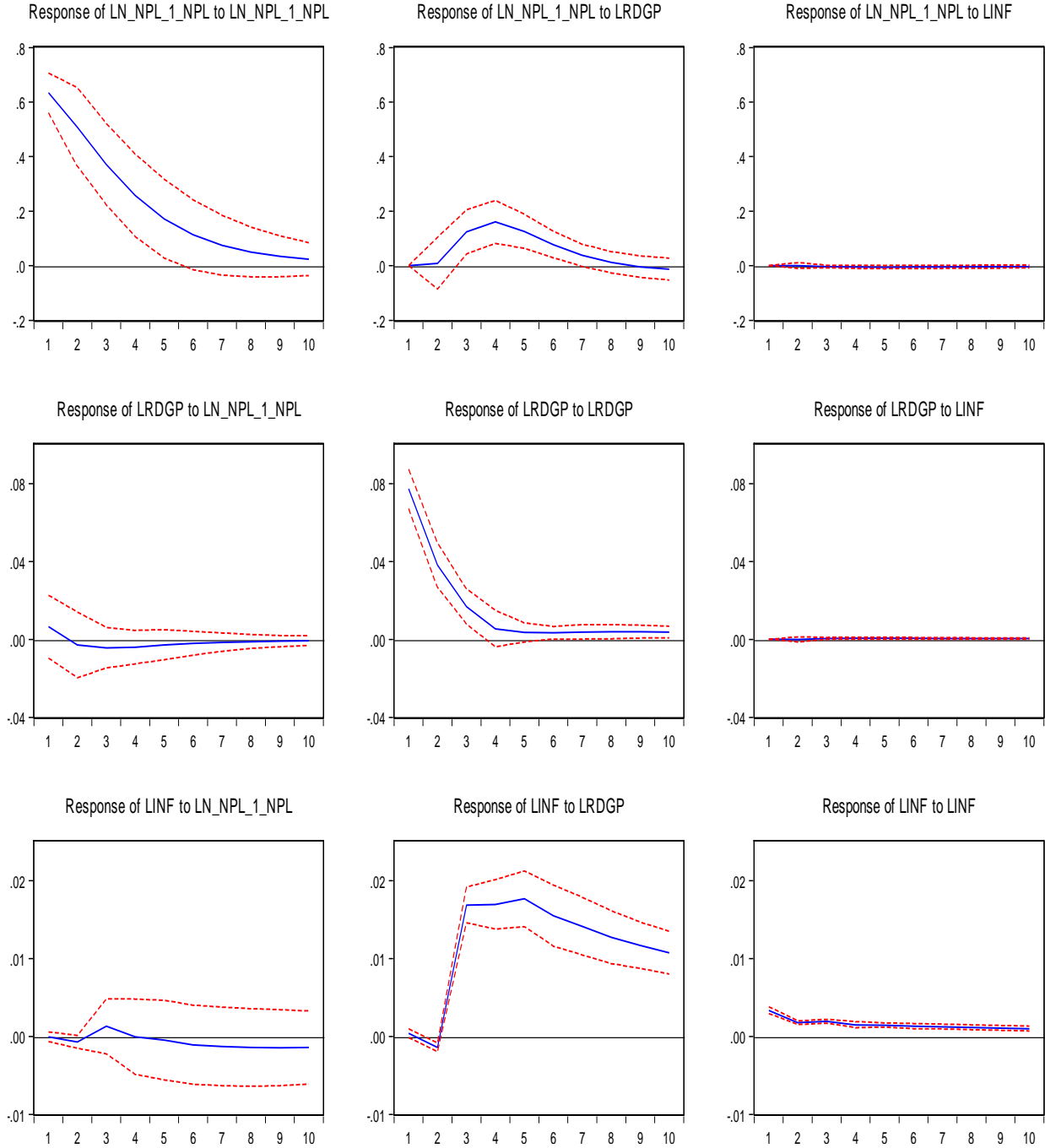
**Table A9: Sector Wise NPLs**





**Table A10. Impulse Response Function**

Response to Cholesky One S.D. Innovations  $\pm 2$  S.E.



### **Table A11: List of Banks**

- 1.** First women Bank Ltd.
- 2.** National bank of Pakistan.
- 3.** The Bank of Khyber
- 4.** The Bank of Punjab
- 5.** Sindh Bank
- 6.** Allied Bank Ltd.
- 7.** Askari Bank Ltd.
- 8.** Bak Al- Falah Ltd.
- 9.** Bank Al- Habib
- 10.** Dubai Islamic Bank Ltd.
- 11.** Faysal Bank Ltd.
- 12.** Habib Bank Ltd.
- 13.** Habib Metropolitan Bank Ltd.
- 14.** JS Bank Ltd.
- 15.** KASB Bank Ltd.
- 16.** MCB Bank Ltd.
- 17.** Meezan Bank Ltd.
- 18.** Samba Bank Ltd.
- 19.** NIB Bank Ltd.
- 20.** Silk Bank Ltd.
- 21.** PPCB Ltd.
- 22.** Standard Chartered Bank Ltd.
- 23.** Barclays Bank Ltd.
- 24.** SME Bank Ltd
- 25.** ZTBL
- 26.** United Bank Ltd.
- 27.** Khushali Bank
- 28.** IDBP
- 29.** Samba Bank Ltd.
- 30.** Burj Bank Ltd.
- 31.** CIITI Bank Ltd.
- 32.** HSBC Bank Ltd.
- 33.** Deutsche Bank Ltd.
- 34.** Al- Baraka Bank Ltd.
- 35.** Summit Bank Ltd.
- 36.** PICIC Bank Ltd.
- 37.** Bank Islamic Pakistan Ltd.

