

The Impact of Macroeconomic and Bank Specific Variables on Non-Performing Loans in Pakistan (A Panel Analysis)

Muhammad Haroon¹

Muhammad Sohail²

Zahid Mehmood Akhtar³

Abstract

This study is conducted in order to explore determinants of non -performing loans for banking sector of Pakistan. In order to explore the determinants of NPLs in Pakistan this study focused both on the macroeconomic as well as microeconomics/bank specific variables. The study took bank level data in addition with macroeconomic variable for a period of 2004 to 2017 for 37 banks of Pakistani banking industry and used both static as well as dynamic approach of estimation. The results of this study reveal that macroeconomic variables including gross domestic product, exchange rate, and inflation have a significant role in the evolution of NPLs in Pakistan. Contrary among the microeconomic/bank specific variables the role of size effect hypothesis is more significant as compared to other hypothesis which includes Bad Management, Moral Hazard, Bad Management II/ Skimping hypothesis. The results of both static as well as dynamic panel suggest that NPLs in banking sector of Pakistan is more linked with the macroeconomic conditions of economy as compared to the bank specific variables. From policy perspective the study suggests that the supervisory authorities of banks must closely look into the banking performance ensuring the efficiency of banks in terms of profitability and its lending activities. The supervisory authorities must ensure banking supervisions in order to avoid future pile up of NPLs, ensure banks to avoid excessive lendings, uphold high standard for credit and prevent foreign currency lending to unhedged borrowers. The significance of macroeconomic variables as showed in the results indicates strong macro-financial linkages so the policy makers must devise sectoral growth policies of various sectors especially those closely linked with the financial sector and ensure its coordination with the financial sector of economy.

Keywords: Non-Performing Loans, NPLs, Bank Specific factors, Static Panel, Dynamic Panel

Introduction

Among the issues which the supervisory authorities show concern related to financial stability, one important issue that always remains in discussion is non-performing loans. It is indeed of vital importance for the supervisory authorities to properly examine what factors play a significant role for the pile up of NPLs over a

¹ National University of Modern Languages, Islamabad; Email: mhharon@numl.edu.pk

² National University of Modern Languages, Islamabad.

³ National University of Modern Languages, Islamabad.

period of time. There is no second opinion among researchers regarding the financial crisis and failure of banks that happen across the world or have taken earlier in the history of financial sector of both under developed as well as developing countries, seeds out of various other factors of which NPLs are the major one. Among the other sectors of economy that have their implications in the economic prosperity of a country, the role of financial sector cannot be ignored, so the performance of financial institutions either best or worst not only effects the other sectors but also hampers economic growth. Among the other causes of financial sector variations that have occurred in both developing and under developed economies, the NPL ratio is of significant importance. Examples include the financial crisis of Sub Saharan African countries and recent East Asian downturn, and the world financial crunch of 2008 of US economy, all had roots in subprime loans and mortgages.

So, we can say that appropriate level of NPLs favors the smooth working of economy, contrary high level of NPLs not only effects smooth operations of banks but also economic activities of countries. Among other factors that lead to insolvency of financial institutions NPLs are one of main factors among these factors (Hou, 2007). It can be said that for smooth working of economy there is a need to govern the magnitude of these NPLs in the economy.

NPLs mainly effect two main streams of banking sector namely profitability and liquidity. Since provisioning is required in growing NPLs, it not only reduces the efficiency of income banks but also rises problem of liquidity for banks that add to worsen their credit rating and consequently good will of bank. In addition, macroeconomic indicators also link with the level of NPLs and the economic performance reflected in terms of performance of these indicators also affects level of NPLs across banks.

Non-Performing Loans can be elaborated as those loans which are considered as default or those which are near to become default. In Pakistan, based on default NPLs are classified into four major categories, OAEM (Other Assets especially mentioned), Substandard, Doubtful, and Loss. The prudential regulations of SBP classify NPLs on the basis of time span as, 30 days for Micro Finance Banks, 90 days for consumer loans by commercial banks. Provisioning for categories of these loans are as following, 25% provisioning for substandard, 50% for doubtful and 100% for loss taking difference of outstanding principal balance and liquid assets realizable value in absence of resort to court of law (Prudential Regulations for SME Financing, BPRB SBP 2011). State bank is continuously dealing this issue in a comprehensive manner. The various measures taken by the authorities include, (a) Improving the treatment and reporting of

NPLs (b) Effective treatment of existing NPLs stock (c) Flow of new NPLs and (d) Improving policy and regulatory environment.

Quarterly statistics of Non-performing loans issued in fourth quarter of FY 2018 are given in table 1.

Table 1: *Non-Performing Loans*

Banks/DFI	June 18			Sep 18		
	NPLs	NET NPLs	Net NPLs to Net loans (%)	NPLs	NET NPLs	Net NPLs to Net loans (%)
All banks & DFIs	63,803	84,861	1.15	651,938	93,842	1.25
All Banks	623,615	80,575	1.10	636,726	89,227	1.20
All Commercial Banks	562,079	39,883	.56	581,180	56,116	.77
Public Sector Banks	187,982	11,063	.84	198,694	18,890	1.37
Local Private Banks	371,287	29,005	.50	379,674	37,411	.64
Foreign Banks	2,810	(185)	(0.33)	2,2811	(185)	(.31)
Specialized Banks	61,536	40,692	26.98	55,546	33,112	22.07
DFIs	14,688	4,286	5.46	15,212	4,615	5.90

Source: State Bank of Pakistan

⁴According to the recent statistics issue by SBP NPLs stood at Rs. 623 billion in FY18. The corporate sector remains the worst area for banks with respect to NPLs having a size of Rs. 432 billion in gross NPLs. It is followed by SME with piled up NPL value of Rs. 75 billion. The NPLs issued in the agriculture sector stand at Rs. 61 billion. NPLs under the consumer financing stand at Rs. 27 billion. NPLs under the category of others reached Rs. 19 billion by the end of June 2018.

Owing to the importance of NPLs for the smooth working for the economy, the current study adds to the existing literature of NPLs by focusing the role of both macroeconomic as well as microeconomic/bank specific variables in the evolution of level of NPLs in the banking sector of Pakistan. This is to the best of our knowledge the first attempt to model NPLs in banking sector of Pakistan using bank level data in addition to other macroeconomic variables. In addition, this study used disaggregated level data at bank level in order to test five hypothesis namely Bad management, Skimping, Moral Hazard, Size effect, and Bad management II as discussed in the novel study of Berger and De Young (1997) for banking sector of Pakistan. The use of dynamic approach apart from static panel approach will help us in understanding the

⁴ <https://propakistani.pk/2018/09/06/banking-industrys-non-performing-loans-reach-an-all-time-high/>

relative importance of these variables against macroeconomic variables. According to dynamic panel estimated over 2004 to 2017 around 37 banks ⁵in banking sector of Pakistan we found that at bank level bad management, skimping, inefficiency and size hypothesis validates for level of NPLs in banking sector of Pakistan in addition to the macroeconomic variables whereas moral hazard hypothesis using solvency ratio as indicator invalidates.

Literature Review

Two aspect of literature exists for the evolution of NPLs over the time period which include macroeconomic and individual specific/microeconomic variables. Advocates of macroeconomic factors argue that the macroeconomic condition of the economy directly affects borrower's capacity of repaying their loans. According to the empirical evidence every financial crisis that took over place in the world has its root in macroeconomic conditions of economy. When economic slump occurs it immediately reduces the availability of cash inflows for households that harden them to repay their principal and interest of loan. Turning to bank specific factors if bank anticipates recession in the economy, it will create liquidity shortages to economic agents which in turn will delay the fulfillment of the financial obligations of households, consequently credit policies of banks will become harder and selective (credit crunch). It will lead to lower incomes in households, economic activity worsens and the number of non-performing loans increases. We can explain both these factors separately as follows:

Macroeconomic factors of NPLs

A considerable literature exists in support of cyclical behavior of NPLs. The rationale for this is that an increased growth in real GDP indicates the availability of more income into the economy, enabling households and firms to improve their debt servicing capacity whereas at the trough of business cycles level of NPLs increases due to increased unemployment which affects the repayment capacities of the economic agents. The studies that explains the cyclical behavior of NPLs are as, (Salas & Saurina, 2002; Rajan & Dhal, 2003; Fofack, 2005)

Those Studies favoring the role of macroeconomic variables for credit hazard are as follows:

⁵ The list of banks include, First Women Bank Ltd, Allied Bank Ltd, National Bank of Pakistan, Bank of Khyber, Bank of Punjab, Sindh Bank, Allied Bank Ltd, Askari Bank Ltd, Bank Alfalah Ltd, Bank Al Habib, Dubai Islamic Bank Ltd, Faysal Bank Ltd, Habib Bank Ltd, Habib Metropolitan Bank Ltd, JS Bank Ltd, KASB Bank Ltd, MCB Bank Ltd, Meezan Bank Ltd, Samba Bank Ltd, NIB Bank Ltd, Silk Bank, PPC Bank Ltd, Standard Chartered Bank Ltd, Barclays Bank Ltd, United Bank Ltd, IDBP, Burj Bank Ltd, CIITI Bank Ltd, HSBC Bank Ltd, Deutsche Bank Ltd, Al Baraka Bank Ltd, Summit Bank Ltd, PICIC Bank Ltd, ZTBL, Khushali Bank Ltd, SME Bank Ltd, and Bank Islamic Pakistan Ltd.

Keeton and Morris (1987) using a panel of 2400 insured commercial banks for US economy find out variation in loan losses is explained by local economic conditions.

Quagliariello (2007) showed that business cycles affect NPLs ratio for a large panel data of Italian banks over a period of 1985-2002.

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

Cifter *et al.* (2009) in his study found that NPLs arises due to lagged industrial production in Turkish financial sector using network-based wavelet decomposition in his study.

Dimitrios, Angelos and Vasilios (2011) took their study on nine largest banks of Greece banking system to examine the level of NPLs. Their study covers the data for period of 2004 to 2009 and employed Generalized, Methods, of Moments, (GMM). The findings of study revealed that macroeconomic factors like GDP growth, unemployment rate, lending rate affect NPLs inn Greece banking system and bank related indicators are held accountable for variations in NPLs.

Fofack (2005) in a study conducted on commercial banks in Sub Saharan countries analyzed that variations in Real, Effective, Exchange, rate impact positively on level of NPLs when exchange rates are fixed. The reason for this is that most of large banks are focused for the agriculture sector which are largely export oriented and any fluctuation in the exchange rate badly effect the NPLs of those banks. Gambera (2000) while investigating determinants of NPLs on American economy taking data for span 1987-1999 found that macroeconomic variables like unemployment rates and income have impact on loan losses.

Asari *et al.* (2011) using vector error correction model on 48-month data on commercial banks in Malaysia for period 2006-2010 revealed that inflation and interest rate have a strong long run relationship whereas inflation and interest rate have insignificant relationship in long run.

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 such model and introduces probability of default. This model implies that borrowers having low income level have higher default rate due to their increased risk of facing unemployment. Consequently, bank charges higher interest rate to riskier clients.

Authors who found strong association between economic conditions and credit default are as, (Anderson & Sundaresan, 2000; Collin-Dufresne & Goldstein, 2001). For developing countries, the studies taken on the level of NPLs are as follows: Dash and Kabra (2010) studied the level of NPLs for the banking sector of Indian economy for the years between 1998 and 2009. The findings of their study reveal that any variation in real income have an inverse effect on level of NPLs, whereas interest rate and real effective exchange rate effects NPLs positively. In another study.

Rajan and Dahal (2003) showed that level of NPLs in Indian economy have a positive correlation with GDP. Khemaraj and Pasha (2009) investigates the factors responsible for NPLs in Guyana for data between 1994 to 2004 and explored that GDP negatively impact level of NPLs and RER impact NPLs positively.

For banking sector of Pakistan existing literature exploring the level of NPLs are as follows:

Siddiqui, Malik and Shah (2012) in the study took quarterly data from 1996 to 2011. The study applied GARCH model in examining the volatility of interest rates on NPLs and finds out positive relationship between NPLs and interest rates.

Badar and Javaid (2013) examined the role of macroeconomic forces on level of NPLs for Pakistan taking data between years 2002 to 2011. The findings of their study reveal macroeconomic variables have a positive long run correlation with level of NPLs in Pakistan and these are the key determinants of NPLs.

Ahmed and Bashir (2013) examined the power of microeconomic/Individual bank-specific factors as determinants of NPLs and used panel data for period 2006 to 2011 and reveals evidence in favor of most of bank specific factors.

Bank Specific Factors of NPLs

Apart from macroeconomic variables there are other factors like microeconomic or bank specific factors that also effects level of NPLs in the economy. The literature that analyses the role of microeconomic/Bank specific factors for the level of NPLs are as follows:

Berger and De Young (1997) conducted a seminal work in order to investigate the bidirectional causality among loan quality and bank capital for US banking system. The data taken for this study is for the period between 1985 and 1994. This study codifies four hypothesis namely Bad luck hypothesis, Bad management hypothesis, Skimping hypothesis, and moral hazard hypothesis. The findings of the study support both bad management and bad luck hypothesis showing two-way connectedness. Apart their study further find confirmation in favor of moral hazard hypothesis.

Salas and Saurina (2002) conducted their study for assessing the level of NPLs in Spanish commercial, and saving, banks taking in account both microeconomic and

macroeconomics variables. The findings of this study showed that lagged efficiency and lagged solvency has a trivial impact on level of NPLs. In addition, the study finds out that bank size negatively affects level of NPLs.

Podipiera and Weill (2008) conducted their study for Czech banking, industry, for period 1994 to 2005 and found association between cost efficiency and NPLs. Their study finds out favorable argument for bad, management, hypothesis and proposed authorities to emphasize more on managerial performance.

Data Description and Methodology

Data

Keeping a look at the books and the availability of our research data takes into account three macroeconomic variables namely Real GDP, inflation and Real Exchange rate are taken. For coping the issue of time series data, the data has been transformed into log form. In order to deal with microeconomic/bank specific variables panel of 37 banks including 5 public, 4 privatized, 19 private, 4 foreign and 5 specialized banks are taken. For testing the bank specific hypothesis bank level indicators are constructed using the data from the financial statements of banks. For macroeconomic variables details are obtained from published sources of SBP and International Financial Statistics (IFS). The construction of bank specific variable is given below in the Table 2 as,

Table 2: Definition of Bank Specific Variables

Variable Tested	Definition	Hypothesis Tested
Return on Assets	$ROA = \frac{\text{Net Profit after Tax}}{\text{Total Assets}} * 100$	“Bad Management II” (-)
Return on Equity	$ROE = \frac{\text{Net Profit after Tax}}{\text{Total Share Holder's Equity}} * 100$	“Bad Management II” (-)
Loan to Deposit	$LTD = \frac{\text{Loans}}{\text{Deposits}} * 100$	“Moral Hazard” (+)
Solvency Ratio	$SOLR = \frac{\text{Owned Capital}}{\text{Total Assets}} * 100$	“Moral Hazard” (-)
Inefficiency	$INEF = \frac{\text{Operating Exp}}{\text{Operating Inc}} * 100$	“Bad Management” (+) “Skimming” (-)
Size	$SIZE = \frac{\text{Total Assets}}{\sum \text{Total Assets}} * 100$	“Size” (-)

Methodology

Preliminary econometric Analysis

Non-Performing Loan literature relies on the use of NPL ratio which is used after transforming in logit form. The use of logit transformation of NPL ratio make it

possible to extend NPL ratio between open interval over $[-\infty \text{ to } +\infty]$ instead of bounding it between 0 and 1. The study uses a panel of 37 banks for the years between 2004 till 2017. Starting with, initially the model is estimated by incorporating macroeconomic variable and later on the model is extended including microeconomic/bank specific variables.

Estimation Technique

The commonly used methodologies employed in the existing literature for analyzing the empirical relationship between level of NPLs and macroeconomic and microeconomic variables includes, regression analysis in panel, cross country analysis, cointegration and dynamic analysis. This study employed two commonly used methodologies. For static panel analysis the study uses Common effect Model (CEM), Fixed Effect Model (FEM) and Random Effect Model (REM) model whereas for dynamic analysis the study employed Generalized Methods of Moments (GMM).

For static panel analysis initially, the model is estimated using common effect, FEM and REM models. The choice of common effect model assumes a common intercept for all cross sections with no individual effects. The use of FEM model incorporates the individual effects of each cross section and assumes cross sectional specific intercept. The choice between common effect model and FEM is chosen using redundant F test. Null hypothesis assumes common effect model to be more appropriate whereas in the case if rejection of null hypothesis FEM is preferred. The use of REM model treats each group intercept not fixed but as a random parameter. The choice of FEM vs REM model is done using Hausman test. Under the null hypothesis REM model is preferred whereas in other case FEM model is most appropriate in static panel analysis.

Dynamic Panel Analysis

The new literature of panel analysis like (Salas & Saurina, 2002, Athanasoglou *et al.*, 2009, Merkl & Stolz, 2009). Beck and Levine (2004) suggests that in order to examine time structure in the structure of level of NPLs is very important. So, there is a need to use dynamic panel approach in addition to static panel approach. The major feature of dynamic panel is that it uses the lagged values of NPL ratio as explanatory variable in addition with other explanatory variables. The model becomes,

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

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} , δ_i are the unobserved bank specific effects and ϵ_{it} are error terms.

Major drawback in the above model is that there may arise problem of dynamic panel bias i.e. there is high probability that the lag value of the regress and will be endogenous in nature with the FEM in error term. So, in this case the use of OLS will result bias and inconsistent parameter estimates. To cope out this issue equation (1) is estimated using the method of “Generalized Methods of Moments (GMM)” suggested by Arellano and Bond (1991) which convert the model into 1st difference to avoid the FEMs and then using the lagged level NPL ratio as instruments. The transformation of model (1) takes the form as,

$$\Delta y_{it} = \alpha \Delta y_{it-1} + (L) \Delta X_{it} + \Delta \epsilon_{it} \quad (2)$$

Where Δ first difference operator, in the above equation the lagged dependent variable Δy_{it-1} is by construction correlated with error term, $\Delta \epsilon_{it}$ imposing bias in estimation. Nonetheless, Δy_{it-2} , which is expected to be correlated with Δy_{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.

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

Apart the second source bias arise from the endogeneity of explanatory variable and the correlation with error term. For the case of strict exogenous variables all past and future values of explanatory variables are uncorrelated with error term, implying the following moment condition, $E[X_{it-s} \Delta \epsilon_{it}] = 0 \text{ } t = 3 \dots T \text{ for all } s$. This assumption of strict exogeneity is restrictive and invalid if there is reverse causality i.e. when $E[X_{it-s} \Delta \epsilon_{it} = 0] \text{ for } t < s$. For the case of weakly exogenous predetermined explanatory variables, only current and lagged value s of X_{it} are used as valid instruments and following moment condition is used $E[X_{it-s} \Delta \epsilon_{it}] = 0 \text{ } t = 3 \dots T \text{ and for } s \geq 2$.

The orthogonality conditions described above form the underpinnings of one step GMM estimation which produces under the assumption of independent and homoscedastic residuals consistent parameters. The validity of instruments used in moment conditions as well as assumption of no autocorrelation of residuals is crucial for the consistency of GMM estimates. Last the validity of the instruments is validates using Sargan Test proposed by Arellano and Bond (1991), by Arellano and Bover (1995) and Blundell and Bond (1998).

Econometric Model Specification

Equation (1) of the original model is as follows,

$$\Delta \ln NPL_{i,t} = \alpha \Delta \ln NPL_{i,t-1} + \sum_{j=1}^2 \beta_j \Delta \ln GDP_{t-j} + \sum_{j=1}^2 \delta_j \Delta \ln RER_{t-j} + \sum_{j=1}^2 \beta_j \Delta \ln GDP_{t-j} \cdot \sum_{j=1}^2 \varphi_j \Delta \ln INF_{t-j} + \gamma_i + \epsilon_{i,t} \quad (3)$$

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

ΔNPL_{sit} represents first difference of NPL ratio”, ΔGDP is the real growth rate, ΔRER_{it} is exchange rate 1st difference, ΔINF_{it} is the inflation 1st difference, γ_i is an unobserved individual bank related factors which do not vary with time and ϵ_{it} is vector residuals.

Results and Discussions

This section discusses estimation results as,

Static Panel results

Initially static model is estimated. Pooled OLS is employed to analyze the behavior of NPLs. The results of Pooled OLS are reported in Table 3.

Table 3: *Pooled OLS Regression results*

Variable	Coefficient	St Error	t-stat	Prob
C	-19.76	18.09	-1.09	.2759
LRGDP	-1.22 ***	.63	-1.92	.0554
LRER	2.67	3.21	.83	.4057
LINF	3.54 **	.76	4.64	.0000
$R^2 = .16$			F Statistic	13.23
Adjusted $R^2 = .15$			Prob (F Stat)	.000
***, **, and * denote significance at 1 %, 5 %, and 10 % respectively				

The results show that the impact of real GDP growth on the level of NPLs are negative and significant. In addition, real effective exchange rate affects NPLs positively but is insignificant. At last inflation affects NPLs positively as well as significantly. The results indicate that level of NPLs are sensitive to macroeconomic conditions in case of banking sector of Pakistan and are in line with the empirical findings of existing studies (Khemraj & Pasha, 2009, Fofack, 2005).

The validity of the model is checked through redundant F test. The results are depicted in Table 4 as,

Table 4: *Redundant Fixed Effects Test*

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

High P value rejects null hypothesis in favor of alternative, therefore suggesting the presence of cross-sectional randomness across banks supporting the use of FEM model in static analysis.

The rejection of common effect model using F test support the use of FEM model while considering individual FEMs. The results of FEM model are shown in Table 5 as,

Table 5: *Fixed Effect Regression Results*

Variable	Coefficient	St Error	t-stat	Prob
C	-37.96	11.86	-3.21	.2759
LRGDP	-1.06 **	.43	-2.49	.0554
LRER	6.18 **	3.21	2.97	.4057
LINF	4.11**	.76	8.42	.0000
$R^2 = .72$				F Statistic 12.15
Adjusted $R^2 = .66$				Prob(F Stat) .0000
***, **, and * denote significance at 1 %, 5 %, and 10 % respectively				

The above results of Table 5 show that all variables showed the expected signs in line with economic model. Real GDP growth showed adverse and significant relationship with level of NPLs indicating the any increase in growth tends to decline the level of NPLs in the economy. Also, inflation and exchange rate showed significant impact on level of NPLs validating previous studies. The coefficient of effective exchange rate in this model is significant as compare to common effect model where it was insignificant. Last in static analysis the results of REM model are reported in Table 6 as,

Table 6: *Random Effect Regression Results*

Variable	Coefficient	St Error	t-stat	Prob
C	-35.77	11.76	-3.04	.0027
LRGDP	-1.08 **	.43	-2.55	.0113
LRER	-5.75 **	2.07	2.78	.0060
LINF	4.03 **	.48	8.28	.0000
$R^2 = .32$				F Statistic 31.6
Adjusted $R^2 = .31$				Prob(F Stat) .0000
***, **, and * denote significance at 1 %, 5 %, and 10 % respectively				

All variables are showing significant relationship with level of NPLs. Real GDP, inflation and exchange rate are highly significant at 5% significance level. The choice between FEM and REM model id taken on the basis of “Hausman Test”. Table 7 reports the results of Hausman Test as,

. Table 7: *Correlated Random Effects- Hausman Test*

Test Summary	Chi-sq. statistic	Chi-sq. df	Prob.
Cross-section random	4.55	3	.207

High P value of Hausman Test clearly rejects null hypothesis suggesting FEM model to be more appropriate in static analysis.

The result of dynamic panel analysis is reported in Table 7 and Table 8. This specification helps us in testing five hypothesis concerning individual/bank specific causes of NPLs.

Dynamic Panel results

One step AB GMM results are shown in Table 8 and 9. The explanation of the results are as follows,

Table 8: *GMM Estimation Results*

Model Specification	Macroeconomic Variables			
	AB GMM (1-Step)		AB GMM (1-step)	
ln (NPL/1 - NPL)₋₁	.57**		.55**	
	[5.71]		[5.15]	
ln(RGDP)	-.61**		-.61**	
	[-2.82]		[-2.52]	
ln(RGDP)₋₁	-.33		-.23	
	[-1.03]		[-.73]	
ln(RER)	3.67**		4.11***	
	[2.76]		[1.73]	
ln(RER)₋₁	.53		.19	
	[.25]		[.07]	
ln(INF)	2.71		2.35	
	[1.29]		[1.72]	
	J Stat	46.9	J Stat	37.8
	Prob	.15	Prob	.47
	Obs	106	Obs	127
	No of Banks	27	No of Banks	32
	Instruments	10	Instruments	09

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

Results of Table 8 shows that the lagged NPLs has positive as well as significant impact with level of NPL ratio of banking system. It means if level of NPLs of banks are higher in the past then it will add to future NPLs that banks may incur. The estimate of lag value of NPL ratio is possible to be negative as it was reported in the work of (Sorge & Virolanien, 2006) who argues that NPL ratio have a tendency to decline when it becomes efficient in past due to write offs. Lastly, all macroeconomic variables showed results supporting the economic intuition in dynamic model apart from static analysis.

Table 9: *GMM Estimation Results*

Model Specification	Microeconomic Variables			
	AB GMM(1-Step)	AB GMM (1-step)		
ROA	-.0015** [-2.62]	-.0001 [-.88]		
(ROA)₋₁	-.0002* [-5.91]	-.0002* [-5.68]		
ROE	-.0002*** [1.69]	.0003 [1.23]		
(ROE)₋₁	.0005 [1.46]	.0007 [1.42]		
LTD	.0008*** [3.19]	.0003 [0.56]		
(LTD)₋₁	-.0001** [-4.89]	5.44E - 05 [-.96]		
SIZE	-2.84** [-2.44]	-3.93** [-2.92]		
(SIZE)₋₁	1.80 [1.60]	1.98 [1.44]		
INEF	.5* [-1.99]	-.93** [-2.22]		
(INEF)₋₁	-1.11*** [-3.18]	-1.16*** [2.97]		
SOLR	-.57 [-.008]			
(SOLR)₋₁	-2.92 [-.24]			
	J Stat	46.96	J Stat	37.8
	Prob	.15	Prob	.47
	Obs	106	Obs	127
	No of Banks	27	No of Banks	32
	Instruments	10	Instruments	09

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

Results in Table 9 reports the relationship of NPLs with microeconomic variables/bank specific variables. To test Bad Management Hypothesis the study uses two variables as ROA and ROE. The anticipated values of these variables can either be positive or negative. The results show ROA and level of NPLs have negative and significant relationship. The coefficient of ROA although is very weak but is significant, therefore confirming Bad Management II hypothesis which means that the reason of poor performance of banks may be due to lower banking skills in lending activities due to which past and future earnings of banks are negatively related with level of future NPLs. For testing bad management hypothesis as used in the model of

Rajan (1994) the study uses ROE as indicator. The results show that bank performance and level of NPLs are favorably linked with each other. It is due to the reason that bank motivates market regarding its profitability using “Liberal credit policies” that results in increasing earnings of current time period on the cost of future loans and resultantly positively associated with level of NPLs. Summing up we can argue, that performance indicators used in the study namely ROA and ROE validate bad management hypothesis for banking sector of Pakistan, though explanatory power is weak.

To test Moral Hazard Hypothesis the study uses Loan to Deposit ratio (LTD) as indicator. The coefficient of LTD ratio is positive and significant both at level and lagged terms which mean that higher LTD ratio increases future NPLs of banks. The size effect is seen more significant and clearer in the study. The negative value of size specifies that large banks have low level of NPLs due to diversifying portfolio in banking sector and vice versa confirming bank size hypothesis. The coefficient of size is more in magnitude than all other variables showing dominant size hypothesis for banking sector.

To test Skimping/Bad Management Hypothesis indicator Inef is used. The coefficient of Inef showed negative and significant impact on both level and lagged values favoring skimping/bad management hypothesis. Last, the coefficient of SOLR used to validate moral hazard hypothesis is both to be insignificant both at current and lagged level so we dropped this variable and again estimated the model.

Results shows that dropping SOLR showed no significant change in the estimated results yet some changes are observed. The effect of macroeconomics indicators on level of NPLs remained same in both models. Looking into bank specific variables Performance indicators such as ROA are now insignificant at the current level, but significant at the previous level. ROE still is insignificant for its level as well as past values. LTD ratio became insignificant now. Size effect became extra significant and influential compare to model 1 as the coefficient of it increases from 2.48 to 3.43. The estimate of Inef remained negative and significant in two models with increase in the value of coefficient in both current and lagged levels.

Conclusion and Policy Recommendations

Conclusion

This study is conducted in order to analyze various factors that are held responsible for evolution of NPLs in banking sector of Pakistan taking in consideration both macroeconomic as well as bank specific/microeconomic variables. For determining macroeconomic factors liable for level of NPLs the study uses three macroeconomic factors as Real Gross Domestic Product (RGDP), Real Exchange Rate (RER) and Inflation (INF). Whereas for bank level variables of NPLs the following

indicators are constructed as Return on Assets (ROA), Return on Equity (ROE), Loan to Deposit Ratio (LTD), Bank Size, Solvency Ratio (SOLR), and Inefficiency Ratio (Inef). Two econometric methodologies are used in the study. For static panel analysis the study used Common Effect, Fixed Effect Model (FEM) and Random Effect Model (REM) whereas for dynamic panel analysis study used the method of Generalized Methods of Moments i.e. GMM.

The results showed that both macroeconomic indicators and microeconomic indicators played their role in the evolution of NPLs in the banking sector of Pakistan. The explanatory power of macroeconomic variables is found to be stronger and more significant as compared to microeconomic variables both in static and dynamic model setting. In addition, by including bank level variables to original model pose additional explanatory power. The results of GMM indicate that in the banking sector of Pakistan Bad management, Skimping, Bad management II, inefficiency and size effect validates whereas moral hazard hypothesis using SOLR as indicator invalidates for the banking sector of Pakistan.

The findings of the study also show that Bank status of NPLs is very sensitive to specific factors / microeconomic variables. High quality of bank management measured using profits indicators lowers the level of NPLs, whereas moral hazard hypothesis worsens NPLs.

Policy Recommendations

The study suggests some policy recommendations for the supervisory authorities/policy makers of banks. Since the findings of the study reveal that the bank specific factors in addition of macroeconomic factors are also main determinants of NPLs in Pakistan. So the supervisory authorities which include both State Bank of Pakistan and bank management needs to supervise bank in terms of their performance which includes liquidity, profitability, and solvency. The findings of the study also emphasize the supervisory authorities to strengthen process of banking supervisions to avoid future pile up of NPLs. Supervisory authorities must ensure banks to avoid excess lendings, uphold high standards for credit and prevent any lending in foreign currency to unhedged borrowers. The significance of macroeconomic variables as shown in the results indicates strong macro-financial linkages so the policy makers must devise sectoral growth policies of various sectors especially those closely linked with the financial sector and ensure its coordination with the financial sector of economy.

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