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# Impact of Macro economic forces on Nonperforming loans an empirical study of commercial banks in Pakistan

Munib Badar, Atiya Yasmin Javid and Shaheed Zulfiqar  
Ali Bhutto Institute for Science and Technology (SZABIST), Islamabad.

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### ABSTRACT

The study assesses long and short run dynamics between nonperforming loans and macro economic variables covering the period from January 2002 till December 2011 belongs to commercial banks in Pakistan. Macroeconomic variables include inflation, exchange rate, interest rate, gross domestic product and money supply. A long run relationship is found among the time series of variables under studied by employing Johansen and Juselius multivariate co integration while pair wise bivariate co integration reveals pair wise long run relationship between nonperforming loans with Money supply and interest rate. Granger causality test is used to evaluate the cause and effect relationship within the sample and is found that inflation and exchange rate granger cause Nonperforming loans. Short run dynamics is explored by vector error correction model provides that weak short run relationship exist between Nonperforming loans with inflation and exchange rate. Macro economic indicators are the sizeable determinates of non performing loans is a contribution of this research also assists policy makers to keep in attention the impact of aggravating economy on non performing loans consequently hurts profitability and overall health of financial system while formulating fiscal and monetary measures.

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### Introduction

Lending and borrowing is the core business of any commercial bank works on the principal of accepting deposits of money for the purpose of lending or investment (Banking companies ordinance 1962), the role of banking industry is very versatile they utilize the depositor's funds in an efficient manner, sharing risk, play a significant role in growth of economy, are always critical to the whole financial system and remains at the centre of financial crisis (Franklin and Elena 2008). Financial institutions are responsible to operate the whole economy because they play an important role to transform deposits into productive investments (Podder and Mamun 2004).

The main cause of financial instability or crisis is the percentage of non performing loans to the total assets of the banks both in developing and developed countries like the financial crisis in sub Saharan African countries and east Asia, Similarly the current crisis in US by virtue of default in sub prime loans or mortgages (Sorge 2004). It means low level of Nonperforming Loans (NPLs) suggests a better and sound financial system where as high level of NPLs is a trouble for banks management and regulators.

NPLs is a disease for any bank which directly affects two main components of the banks responsible for overall efficiency of any bank i.e. the liquidity and profitability as increasing NPLs demands provisions which devoured income efficiency where as the mismatch of maturities in assets and liabilities causes liquidity problems for the banks which overall deteriorate the credit ratings and long run deterioration of bank image.

A loan is considered as nonperforming if default or closed to being in default. If principal and payment of interest past due by 90 days the loans may be considered as non performing loan (International Monetary Fund). There is no exact time lapse of

NPLs as it varies among different kinds of financial institutions and under different nature of loans. A loan is considered as performing if paid for principal and interest as per the terms decided at the time of loan grant. Specifically in Pakistan NPLs are classified under four categories on the basis of their default period as Other Assets Especially Mentioned (OAEM), Substandard, Doubtful and Loss. The minimum time period for considering a loan as nonperforming is 30 days for Micro Finance banks (prudential regulation no 12 for MFBs), unlike MFBs the minimum period for all consumer financing conceded by commercial banks to earmark a loan as non performing is 90 days. (Prudential Regulations for Consumer / Financings, BPRD SBP 2011). As regards, burden creates on expense side of the income statement due to provisioning made on account of above classification of these loans are 25 % for substandard, 50% for doubtful and 100 % for loss of the difference resulting from the outstanding balance of principal less the amount of liquid assets realizable without recourse to a court of law and 40% of the forced sale value of pledged stock and mortgage properties. (Prudential Regulations for Small and Medium enterprises Financing, BPRD SBP 2011).

#### Objectives of the study

- To examine the long run relationship between macro economic variables and nonperforming loans.
- To examine the short run impact of macro economic forces on nonperforming loans.
- To facilitate monetary and fiscal regulators to cover up the gaps and to make right decisions with sharing empirical results of the study.

#### Significance of the study

Profitability of commercial banks is consistently facing stagnancy for the last 5 years even in this time banks deposits

grew considerably from 3.2 trillion in 2006 to 5.4 trillion Rupees till 2010. The profitability of all banking sectors was recorded at its lower growth due to provision of NPL and written of bad debts on expense side of income statement. If we look at the first phase from 2002 till 2006 the overall profitability of commercial banks rises from 25 billion to 121 billion from 2002 to 2006 where profitability figures were almost doubled from 51 billion to 93 billion in just one year from 2004 to 2005. The main reason of profitability was a prosperous economic scenario when all the macro economic indicators specifically inflation and interest rate were under control. A hunky dory GDP growth was prevailing. Thereafter, a dark episode of macro economic instability under precarious macro economic indicator i.e. sky rocketing inflation and interest rate almost double digit for the last 5 years with a slow GDP growth and rapid depreciation of Rupee in international market faced by country. Profitability of all commercial banks reduced to almost one halve from 121 billion to 69 and 67 billion in 2008 and 2009 respectively in a shorter duration. The main cause of increasing NPLs later converted into bad debts devoured the profitability of commercial banks overnight. Expense of NPLs as being debited as provisions or directly written of bad debts becomes too high as increased from 21 billion in 2006 to 60 billion in 2007, 105 billion in 2008 and reached at 115 billion in 2009. Overall volume of NPLs belongs to commercial banks almost doubled within three years from 285 billion at start of 2009 and recorded as 572 billion till the end of 2011. On the other side banking industry employing a big labour force and stability and sustainability of commercial banks also affects their total volume as no of employees were reduced from 149,432 to 140,181 in two years from 2008 till 2010. (State bank publication overall financial position of all schedule banks). Third aspect originated by dint of non performing loans further brings mismatch in maturities liability and assets further reduce liquidity of banks and distorts credit ratings which remain a stigma while signing corporate deals until it improves up to a certain level of acceptance. It is the requirement of central bank that every commercial bank credit rate their selves after a specific period usually six month to 1 year by an authorized credit rating agency that determine likelihood of default for the debt issuers. The study of nonperforming loans and to delve the scope of precarious macro economic indicators posses greater significance for all policy makers within the commercial banks and regulators responsible for economic instability of country to take appropriate actions to get rid of this status quo as early as possible.

#### **Delimitations of the study**

There are various factors which directly or indirectly affect the performance of financial system, Macro economic indicators are the most viable cause of increasing NPLs because affects overall on all sectors of economy but Poor management, regulatory weakness, Internal factors, Political and institutional stability, corruption, force majeure, Riots, civil commotions, Wars, Asset quality and collateralization, mergers and acquisition can also be enumerated solely or collectively as significant causes of increasing NPLs of commercial banks. The study is restricted to macroeconomic indicators and growth of NPLs for a period starts from 2003 till 2011 in Pakistani commercial banking markets.

#### **Organization of the study**

After introduction the rest of the study is organized as follows section 2 covers literature review, section 3 provides

explanation of selected variables, section 4 describes methodology different components of econometric tests while the section 5 comprises of results and discussion and the last section the section 6 gives an overall conclusion.

#### **Literature Review:**

This section analyze the empirical work brought by different researchers in relation of financial crisis (generated by virtue of credit risk which ultimately transform in nonperforming loans) and macro economy, political and social factors, and internal manageability of the financial institutions.

Keeton and Morris (1987) carried out a study on 2400 US commercial banks covered the period of 1979-85 and found that economic situation with energy and agriculture sectors elaborates the variation of loan losses with liner regression methodology. Similarly in a very recent study by Sinkey and Greenwalt (1991) earmark some factors i.e. increasing interest rate, excessive lending and economic down turn has a positive relationship with the NPLs.

Caprio and Klingebiel (1996) compiled a study based on multiple episodes of banking crises among 69 countries segregated for each country for the respective time period, scope and estimated loss of crises mostly based on macro economic data, they describes that Poor management, supervision, regulations, corporate governance and unnecessary government intervention are the major causes of banking sector insolvencies during 80s to 90s.

As far as other developed economies like Europe is concerned, Salas and Saurina (2002) also provides that real growth in GDP, bank size, market power and credit expansion explains the variation in nonperforming loans after conducting a study covering the period of 1985 till 1997 in Spanish banking industry. Louzin, Vouldis and Metaxas (2010) assessed 9 largest Greek banks covering the period of 2003-9 and found that real GDP growth rate; lending and unemployment rates influence the level of NPLs.

Dimitrios Angelos and Vasilios (2011) compiled their study contains panel data of nine largest Greek banks by using generalized method of movement covering the period of 2003 to 2009 to examine the determinants of non performing loans in Greek banking system separately for each loan category (consumer loans, business loans and mortgages) they have an opinion that both macroeconomic variables i.e. Real GDP growth rate, Unemployment and lending rate possess the ability to effect the level of Non performing loans and bank specific variable i.e. performance and quality of management with risk management practices or system are also responsible for variation in NPLs.

Most of the studies conducted on developed countries but in the recent past we can find a number of papers published on developing countries too i.e. Dash and Kabra (2010) revealed that the real income variation negatively associated with NPLs and further probe that high interest rates, real effective exchange rate brought high level of NPLs a study conducted on Indian banks covers the time period of 1998-2009.

Siraj and Sudarsanan (2011) investigated the performance of Indian commercial banks from 1999 till 2011 before and after the global financial crises by using ratios and absolute figures, urged non performing assets is a major threat in credit risk management of banks in India and stability of banks depends on the performance and quality of assets they hold.

Hardi and di Pitti (2001) compiled their study with trans log functional form covering the period from 1981 till 1997 to

assess effects of financial reforms on the profitability and efficiency of Pakistani banks and identified in one of that aspects that the credit managers are directly responsible for the bank failures because their involvement were found to use substantial amount of funds for their own benefits in Pakistani banking crises.

Omar, Bellalah, Walid and Frederic (2010) Credit managers contributed a unique idea that years of service and experience of credit managers were positively correlated with non performing loans as decision making of credit managers were influenced by the external factors i.e. personal gain and political corruption. On the basis of our literature review we identified the most influential macro economic indicators remains as main causes to create nonperforming loans and the most appropriate methodology to assess their mutual relationship with nonperforming loans.

Adela and Iulia (2010) presented the idea by using Pearson correlation coefficient that how these banking elements average interest rate is connected with Non performing loans in Romanian banking system covering the period of 2006 till 2010, results of their study also suggest that there are other indirect channels which affect the non performing loans as well.

Sofolis and Eftychia (2011) used univariate regression to measure the impact on nonperforming loans in Romanian banking system and provided that Inflation, unemployment rate, external debt to gross domestic product, Money supply and investment with construction expenditure jointly with country's (Greek) crises specific variables influence the credit risk of banking system.

Solarin Sulaiman and Jauhari (2011) complied their findings on the basis of Auto regressive distributed lag (ARDL) approach on Islamic banks of Malaysia that interest rate has significant positive long run impact on Nonperforming loans where as productivity has a positive but insignificant relationship with NPLS which also lessens the stronger belief of Islamic banks operating on profit and loss mechanism because productivity has a weak impact than interest rate.

Asari et al (2011) also bring the opinion with the help of vector error correction model by using stata software covering the data of 48 months belongs to commercial banks in Malaysia during 2006 till 2010 to unearth the relationship of inflation and interest rate with non performing loans. They found a strong long run relationship between interest rate and nonperforming loans while inflation and interest rate have insignificant relationship in long run. Where as in short run both interest rate and inflation couldn't influence non performing loans. Further the casual relationship is found non directional.

Saad and Kamran (2012) concluded outcomes of their study covering the period from 1996 till 2011 by using generalized autoregressive conditional heteroskedasticity that interest rate volatility significantly but not exclusively affect on rising nonperforming loans and some other macro economic factors, political factors and credit policy of the banks require to be studied in depth to find the root cause of Non performing loans.

Results complied by European Central Bank in 2011 for a panel data of 80 countries through econometric analysis to determine the credit quality of banks by assessing the overall asset quality with association of credit risk and provided that Real GDP growth is the main driver of non performing loans during the past decade, exchange rate depreciation is also causing Non performing loans to increase in those countries with high level of foreign lending to unhedged borrowers further

equity prices in those countries where stock market is bigger relative to size of its economy and interest rate also tend to affect NPLs (ECB Financial Stability Review 2011).

## Data and Methodology

### Data

On the basis of our literature review it is assumed appropriate to choose, five macroeconomic indicators Inflation, interest rate, Gross Domestic Product, exchange rate and money supply as independent variables to examine the impact on Nonperforming Loans. A consolidated figure of NPLs belongs to 36 Pakistani commercial banks is taken for our study. The study covers the time series data on quarterly basis from January 2002 till December 2011. The data is gleaned from the published sources of State bank of Pakistan and International Financial Statistics.

### Interest Rate

Interest rate is like a service charge paid by the borrower of an asset to its owner against the usufruct of assets can also be said the return paid against the borrowed money. The risk free rate of return usually remains in access of monetary regulators to manipulate in pursuance of monetary objectives. Discount rate is set by the central bank as per requirement to offset inflationary pressures. In our study we used six month Treasury bill rate as a proxy of interest rate as being used commonly by the commercial banks for pricing of loans. Interest rate is positively associated with NPLs.

### Inflation

An increase in general price level of goods and services in an economy up to a certain extent when a unit of currency buys fewer goods and services. Some economist says increase in the amount of money in circulation referred as inflation. Consumer price index is used in our study as the proxy of inflation as a most comprehensive measure of inflation defines as a change in the price of consumer goods and services purchased by households. It reflects the movements in prices of urban workers (Feridun et al 2006). Increase in CPI compels monetary regulators to use contractionary measures by increasing the interest rates to control inflation which later increase the cost of borrowing and ultimately cause nonperforming loans to born. At times inflation surge more than expectations and discount rate couldn't be set in consonance leaves real interest rate in negative. Inflation has a positive correlation with NPLs. We use here CPI that includes prices of 12 major cities. We calculated annual inflation rate from quarterly CPI by two methods:-

Inflation is calculated by taking annualized percentage change in CPI as follows:

Equation 1

$$\pi_t = \left( \frac{P_t}{P_{t-h}} - 1 \right) \times 100$$

Where  $h = 4$ ,  $P$  and  $\pi$  stands for the price level (CPI) and inflation rate, respectively

### Gross Domestic Product (GDP)

GDP is the market value of all final goods and services produced in a country during a specified time usually one year. Growth in GDP is considered as a symbol of country's progression calculated with sum of private and public consumption with private and public investment if expenditure approach is used. A slow growth rate in developing countries referred to a stagnant economy shows that a country is suffering from recession where prices, output and employment level is not maintained up to a desired level. Market price of GDP is used as

a proxy. Growth of GDP is negatively associated with NPLs. Quarterly data is acquired from 2002 till 2003 Quarter 4 on GDP at constant Market prices at the base of 1980-81 compiled by Kemal and Arby (2004) since 1972. Then, the gap before after 2003:4 is fulfilled by taking ten year moving average of quarterly weights, which then are multiplied by the annual GDP at constant Market prices at the base of 1999-00 to get quarterly figures. However, Quarterly data set requires the seasonality adjustment that is obtained by using five quarters central moving average method.

Simple moving average formula is given as follow:

Equation 2

$$Y(t) = \frac{(Y(t-1) + Y(t-2) + \dots + Y(t-k))}{k}$$

Where, k=4

**Exchange Rate**

Exchange rate is the rate used to exchange one currency with another one. Exchange rates are determined by the continuous foreign exchange markets remained opened for 24 hours a day except weekends comprises of wide range of different types of currency traders. This exchange of currency is largely influenced by exchange of capital goods and services across border called international trade. A decrease in home currency will result in costly imported goods which put a pressure to finance letter of credits issued to trader by commercial banks and risk of default increases. Therefore an increase in exchange rate positively associated with NPLs. We took USD /PKR as a proxy of exchange rate.

**Money Supply**

Total stock of money available in any economy during a specified time is called money supply, there are different forms to calculate money, and generally it is divided into three forms Reserve Money Mo, Narrow Money M1 and Broad Money M2. In our study we took M2 as the proxy of money supply as the most detailed form of money comprise the prior two categories in it. Resave money shows the overall money available in tangible form while narrow money band includes reserve money and all demand and time deposits of schedule banks. M2 includes narrow money and all resident foreign currency deposits. Money supply is positively associated with non performing laons.

**Methodology**

The study is focused on describing the short and long run relationship of macro economic variables on nonperforming loans, the dynamic model of nonperforming loans is provided in equation 3 as

$$NPL = \beta_0 + \beta_1GDP + \beta_2M2 + \beta_3ER + \beta_4TB + \beta_5CPI + \mu t \dots\dots\dots (1)$$

Where,

- NPL = Non Performing Loans
- GDP = Gross Domestic Product
- M2 = Money Supply
- ER = Exchange Rate
- TB = interest rate
- CPI = Inflation rate
- $\mu t$  = Random Error

Co integration and causally analysis between macro economic variables and nonperforming loans are applied. As our study is meant to find the relationship between economic forces with non performing loans where convention estimation of OLS (ordinary least Square) regression model will produce spurious

results if regressed for a non stationary series with non long run relationship or co integration (Engle and Granger1987). Here, Stationary means a series fluctuates around a mean value and having a tendency to converge towards mean value while a non stationary series wander widely without convergence to mean. The best way to check stationary a unit root test is conducted. Two common methods are used to conduct a unit root test Augmented Dickey Fuller (ADF) and Phillip Perron (PP) test. ADF is an extension to Dickey Fuller test which is used for complicated set of time series. The presence of Auto regressive model in a unit root is a condition for Dickey fuller.

The purpose of co integration analysis is to test the presence of equilibrium relationship between the variables because an economic time series may wander with time and a chance that a linear combination of variables converges to an equilibrium which is called variables are co integrated. The Johansen (1988, 1991), Johansen and Juselius (JJ) (1990) test are used to find the maximum likelihood ratios while Engle-Granger (1987) test is used to evaluate the residual based long run relationship between variable. JJ test is used to find the no of co integration relationship between the variables. This is measured with the help of Eigen values which explores that the null hypothesis of co integration vector in comparison with alternate hypothesis by using E views software. It means that the maximum Eigen value than the critical value shows that co integration exists. JJ co integration used to select lag length for Vector Auto Regression to further determine long run relationship. Granger Causality test is used to find the relationship and direction between or among the variables. It is used to determine whether one time series is useful to forecasting another which confirms causation behaviors between two variables.

Before used Vector Error Correction Model (VECM) we have already employed bivariate, multivariate co integration, Granger causality but VECM is one of the authenticated model is used to assess co integration vector, Maximum likelihood ratio and information absorption model to yield. A vector error correction model (VECM) adds error correction features to a multi-factor model such as a vector auto regression model (VAR) in VAR each variable has an equation explaining its evolution based on its own lags and the lags of all the other variables in the model. VECM is allowed to consider overall co integration without normality and specification of endogenous and exogenous variables and to determine the misspecification to discover the short run relation.

**Discussion of Results**

**Table 1. Unit Root Test**

Variables	Augmented Dickey Fuller		Phillips Parron	
	Level	First Difference	Level	First Difference
CPI	-2.81	-5.46*	-1.89	-3.42*
ER	-0.15	-3.36*	.43	-3.36*
GDP	-1.14	-2.39**	-3.40	-38.32*
TB	-1.47	-2.68**	-.84	-2.80*
NPL	-0.28	-2.56**	1.80	-2.56**
M2	-2.43	-12.33*	-2.94	-11.04*

Note: The \* indicates significance at 1%, \*\* at 5% and \*\*\* at 10%

From the results of both the Augmented Dickey Fuller and the Phillips Parron test for all variables, it can be seen that all variables are not stationary in their levels but become stationary when they are first differenced. Once it has been established that all variables are integrated of the same order, move on to the next step, that is, to find a co-integrating relationship between the variables.

The Johansen co-integration test is carried out to test the long run relationship with in Nonperforming Loans and the macro economic indicators of our study which are Consumer Price Index (CPI), Exchange Rate (ER), Gross Domestic Product (GDP), Money Supply (M2) and Treasury Bill Rate (TB). The co-integrating properties are examined using two test statistics i.e. trace statistics and maximum Eigen value. Multivariate co integration analysis of trace statistics is used to evaluate the null hypothesis of  $r$  vector of co integration against the  $r$  or other vectors of co integration proposed by maximum likelihood.

**Table 2. Multivariate Co integration Analysis Trace Statistics**

Hypothesis	Eigen value	Trace Statistic	Critical Value 5%	
$r = 0^*$	0.980793	333.8737	117.7082	Vectors  (CPI, ER, GDP, M2 and TB)
$r \leq 1^*$	0.891192	191.5839	88.8038	
$r \leq 2^*$	0.678374	111.7297	63.8761	
$r \leq 3^*$	0.631633	70.89251	42.91525	
$r \leq 4^*$	0.519791	34.94021	25.87211	
$r \leq 5$	0.211031	8.533019	12.51798	

**Table 3. Multivariate Co integration Analysis Maximum Eigen Value**

Hypothesis	Eigen value	Max-Eigen	Critical Value 5%	
$r = 0^*$	0.980793	142.2898	44.4972	Vectors  (CPI, ER, GDP, M2 and TB)
$r \leq 1^*$	0.891192	79.85419	38.33101	
$r \leq 2^*$	0.678374	40.83723	32.11832	
$r \leq 3^*$	0.631633	35.9523	25.82321	
$r \leq 4^*$	0.519791	26.40719	19.38704	
$r \leq 5$	0.211031	8.533019	12.51798	

Table 2 provides Five co integration vectors are found which means the trace statistics is greater than critical value at 5% level of significance. This confirms that long run relationship exists between Nonperforming loans and macro economic variables. For further explanation of these results another Table 3 is also provided describing the long run relationship on the basis of maximum Eigen values also confirms that a long run relationship exists with the presence of five co integration vectors where maximum Eigen values are greater than the critical values at 5% level of significance.

Table 4 represents whether pair wise co integration exists or not between endogenous variable NPL and the exogenous variables on pair basis within specified period of study. 5% level of significance is used to explore the pair wise long run association where as  $r$  is taken as co integration vector to ascertain the null and alternative hypothesis. On the basis of results sought by bivariate co integration we analyze that Nonperforming loans has pair wise co integration with money supply and interest rate, NPLs has an equilibrium with M2 and TB due to greater trace statistics than critical values at  $\alpha = 0.05$ . Where as, no bivariate co integration is found between NPLs and exchange rate, Consumer price index and Gross domestic product.

**Table 5. Granger Causality Test**

VAR Granger Causality Tests	Chi-Sq	Prob	Conclusion
Null Hypothesis (Ho)			
CPI does not Granger Cause NPLACB	4.21058	0.01340	Reject Ho
ER does not Granger Cause NPLACB	7.37030	0.00077	Reject Ho
GDP does not Granger Cause NPLACB	2.38691	0.08867	Accept Ho
M2 does not Granger Cause NPLACB	2.40636	0.08682	Accept Ho
TB does not Granger Cause NPLACB	2.67787	0.06483	Accept Ho

Granger causality is used to detect the cause effect relationship within the sample where the  $\chi^2$ -Statistics and probability values in table 5 show the presence of two unidirectional causality in NPL with inflation and exchange rate which means that non performing loans can be predicted with exchange rate and inflation. However, since Granger causality test can only be used to test causality within the sample period, therefore, to draw conclusions about causality beyond the period of study, the variance decomposition analysis is applied. Results of the analysis are tabulated below.

Columns two to seven explains how much of an NPL's own shock is described by the movements of its own variance and other variable's variance over the forecast horizon that is 10 quarters.

Table 6 shows the result of error correction vector suggests that there is weak relationship exist between nonperforming loans with inflation and exchange rate which leads to long run relationship. The short run dynamics is explained by the matrix of short run relationship.

### Conclusion

Rapid Growth of non performing loans in the last decade specifically in the second half of the last decade when Pakistan is fallen pray of economic upheavals where skyrocketing double digit inflation, slow and declining economic growth, substantial depreciation of exchange rate, high budget and Balance of payment deficit influenced the banking sector with increasing interest rate and money supply which curtailed the repayment capacity of borrowers as term of debts issuance is agreed with a change of lending rate periodically usually 6 months to 1 year irrespective of tenor of the loan.

High borrowing cost restricts the borrowers to pay in due course becomes the cause to originate and multiply the existing pile of non performing loans which require provisioning on expense side of bank reduced overall profitability into one halve of the bank. Our empirical results showed that a long run relationship exists between macroeconomic forces and nonperforming loans as Johansen multivariate co integration test confirms long run relationship exist, similarly pair wise bi variate co integration confirms long run relationship exists between nonperforming loans with money supply and interest rates. Weak short run dynamics is found between nonperforming loans with inflation and exchange rate by vector error correction model.

These aspects must be seen by the regulators and they should take fiscal and monetary measures in such a way that macro economic variables may be recovered back and couldn't hurt banks profitability and liquidity up to a greater extent. On the basis of empirical results produced by the dint of this study may further guide the direction of nonperforming loans and ongoing financial crises.

Besides Macro economic forces, there are some other factors piling up non performing loans can be ascertained in the future research. This paper further allows researchers to address the problem loan defaults in context of other aspects i.e. Poor management, regulatory weakness, Internal factors, Political and institutional stability, corruption, force majeure, Riots, civil commotions, Wars, Asset quality and collateralization, mergers and acquisition.

Table 4. Bi Variate co integration test

Pair wise co integration	Hypothesis	Eigen value	Trace Statistic	Critical Value (5%)	Remarks
NPL - CPI	$r = 0^*$	0.352425	21.15465	25.87211	No Co integration
	$r \leq 1^*$	0.141963	5.511895	12.51798	
NPL - ER	$r = 0$	0.300982	17.68883	25.87211	No Co integration
	$r \leq 1^*$	0.124777	4.797966	12.51798	
NPL-GDP	$r = 0^*$	0.311675	15.58761	25.87211	No Co integration
	$r \leq 1^*$	0.05776	2.14182	12.51798	
NPL-M2	$r = 0$	0.447437	29.33098	25.87211	Co integration
	$r \leq 1^*$	0.198733	7.976206	12.51798	
NPL-TB	$r = 0$	0.44602	26.72828	25.87211	Co integration
	$r \leq 1^*$	0.140862	5.465745	12.51798	

Table 6. Vector Error Correction Model

Error Correction:	D(NPLACB)	D(CPI)	D(ER)	D(GDP)	D(M2)	D(TB)
CoinEq1	0.000729	6.91E-07	-4.74E-07	0.003665	-0.007642	-8.69E-09
	-0.00219	-3.90E-07	-2.60E-07	-0.00331	-0.01715	-1.40E-07
	[ 0.33313]	[ 1.75322]	[-1.84792]	[ 1.10660]	[-0.44554]	[-0.06195]
D(NPLACB(-1))	0.648875	-5.19E-05	-3.55E-05	-0.551304	1.526207	-1.41E-05
	-0.29967	-5.40E-05	-3.50E-05	-0.45372	-2.34985	-1.90E-05
	[ 2.16530]	[-0.96173]	[-1.00997]	[-1.21508]	[ 0.64949]	[-0.73160]
D(NPLACB(-2))	-0.157808	2.50E-05	1.12E-06	0.126326	2.24913	-7.37E-06
	-0.34024	-6.10E-05	-4.00E-05	-0.51515	-2.668	-2.20E-05
	[-0.46381]	[ 0.40852]	[ 0.02799]	[ 0.24522]	[ 0.84300]	[-0.33768]
D(NPLACB(-3))	0.280663	4.63E-05	4.37E-05	-0.823996	-0.774173	6.57E-06
	-0.27518	-5.00E-05	-3.20E-05	-0.41664	-2.1578	-1.80E-05
	[ 1.01993]	[ 0.93466]	[ 1.35626]	[-1.97774]	[-0.35878]	[ 0.37226]
D(CPI(-1))	1010.899	0.792772	0.205863	-352.783	-10815.17	0.132936
	-1988.34	-0.35805	-0.23302	-3010.46	-15591.5	-0.12753
	[ 0.50841]	[ 2.21412]	[ 0.88344]	[-0.11719]	[-0.69366]	[ 1.04240]
D(CPI(-2))	2072.295	-0.203698	-0.404852	905.2215	10035.84	-0.125795
	-1535.06	-0.27643	-0.1799	-2324.17	-12037.1	-0.09846
	[ 1.34997]	[-0.73689]	[-2.25041]	[ 0.38948]	[ 0.83374]	[-1.27767]
D(CPI(-3))	382.5149	0.831027	-0.057767	-1049.304	-14796.31	0.109958
	-2434.52	-0.4384	-0.28531	-3686	-19090.2	-0.15615
	[ 0.15712]	[ 1.89559]	[-0.20247]	[-0.28467]	[-0.77507]	[ 0.70420]
D(ER(-1))	-629.5626	1.102081	-0.109305	1280.936	-19158.35	0.183837
	-2904.72	-0.52307	-0.34042	-4397.91	-22777.2	-0.1863
	[-0.21674]	[ 2.10694]	[-0.32109]	[ 0.29126]	[-0.84112]	[ 0.98676]
D(ER(-2))	4795.33	-0.1055	-0.308011	2181.479	-28696.85	-0.232528
	-1941.21	-0.34957	-0.2275	-2939.1	-15221.9	-0.12451
	[ 2.47028]	[-0.30180]	[-1.35390]	[ 0.74223]	[-1.88523]	[-1.86761]
D(ER(-3))	-989.9177	0.017506	-0.224801	8443.985	3469.758	0.181221
	-2744.41	-0.4942	-0.32163	-4155.18	-21520.1	-0.17602
	[-0.36070]	[ 0.03542]	[-0.69895]	[ 2.03216]	[ 0.16123]	[ 1.02954]
D(GDP(-1))	0.010074	-2.66E-05	8.31E-06	-1.035819	0.061395	-6.55E-07
	-0.06417	-1.20E-05	-7.50E-06	-0.09716	-0.50319	-4.10E-06
	[ 0.15699]	[-2.30181]	[ 1.10487]	[-10.6612]	[ 0.12201]	[-0.15906]
D(GDP(-2))	0.013511	-2.11E-05	2.62E-06	-1.044775	0.405052	-1.92E-07

	-0.05581	-1.00E-05	-6.50E-06	-0.0845	-0.43762	-3.60E-06
	[ 0.24210]	[-2.09705]	[ 0.40014]	[-12.3645]	[ 0.92557]	[-0.05355]
D(GDP(-3))	-0.006656	-7.50E-06	4.66E-07	-1.050224	0.13919	3.00E-07
	-0.03291	-5.90E-06	-3.90E-06	-0.04983	-0.2581	-2.10E-06
	[-0.20221]	[-1.26523]	[ 0.12081]	[-21.0744]	[ 0.53929]	[ 0.14212]
D(M2(-1))	0.06124	-3.18E-06	-2.26E-06	0.009186	-0.413063	1.82E-06
	-0.04145	-7.50E-06	-4.90E-06	-0.06275	-0.325	-2.70E-06
	[ 1.47759]	[-0.42595]	[-0.46532]	[ 0.14639]	[-1.27098]	[ 0.68487]
D(M2(-2))	-0.005866	-7.69E-08	-1.91E-06	0.058364	0.163313	5.99E-07
	-0.04333	-7.80E-06	-5.10E-06	-0.06561	-0.33979	-2.80E-06
	[-0.13538]	[-0.00986]	[-0.37669]	[ 0.88958]	[ 0.48062]	[ 0.21550]
D(M2(-3))	-0.031013	9.21E-06	6.45E-06	-0.06389	0.182819	-1.51E-06
	-0.02858	-5.10E-06	-3.30E-06	-0.04327	-0.22408	-1.80E-06
	[-1.08525]	[ 1.79048]	[ 1.92498]	[-1.47666]	[ 0.81586]	[-0.82250]
D(TB(-1))	-1229.632	1.10484	-0.746628	12598.47	-2036.035	0.738438
	-5181.61	-0.93308	-0.60726	-7845.24	-40631.3	-0.33234
	[-0.23731]	[ 1.18407]	[-1.22951]	[ 1.60587]	[-0.05011]	[ 2.22194]
D(TB(-2))	3351.441	0.44282	0.264133	1620.557	1972.385	-0.098921
	-4431.27	-0.79797	-0.51932	-6709.18	-34747.5	-0.28421
	[ 0.75632]	[ 0.55494]	[ 0.50861]	[ 0.24154]	[ 0.05676]	[-0.34805]
D(TB(-3))	-2353.57	-0.243016	-0.523198	3672.98	-3080.96	-0.172588
	-4042.85	-0.72802	-0.4738	-6121.1	-31701.8	-0.2593
	[-0.58216]	[-0.33380]	[-1.10426]	[ 0.60005]	[-0.09719]	[-0.66559]
C	-3915.512	-1.239945	1.098221	61546.01	141165.1	0.021691
	-9377.23	-1.68862	-1.09896	-14197.6	-73531	-0.60144
	[-0.41756]	[-0.73430]	[ 0.99933]	[ 4.33495]	[ 1.91980]	[ 0.03607]
R-squared	0.821175	0.717915	0.79014	0.995908	0.778336	0.705286
Adj. R-squared	0.60882	0.38294	0.540932	0.991048	0.515109	0.355314
Sum sq. resids	1.89E+09	61.2105	25.92553	4.33E+09	1.16E+11	7.765126
S.E. equation	10861.67	1.955928	1.272928	16445.17	85171.21	0.696649
F-statistic	3.866996	2.143189	3.170598	204.9445	2.956907	2.015261
Log likelihood	-371.0329	-60.63618	-45.17255	-385.9654	-445.1721	-23.47201
Akaike AIC	21.72405	4.479788	3.620697	22.55363	25.8429	2.415112
Schwarz SC	22.60378	5.359521	4.50043	23.43336	26.72263	3.294845
Mean dependent	11308.67	0.263889	0.863056	14846.28	137369.2	0.187778
S.D. dependent	17366.34	2.489942	1.878733	173815.9	122312.5	0.867641

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