Macroeconomic Vulnerabilities and Their Effect on Nonperforming Loans in Indian Commercial Banks

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Abstract

This study explored the panel data of 27 public sector banks, 21 private sector banks, 5 SBI & associate banks along with 49 foreign banks covering the period from 2000 – 2018. The main objective of this paper was to investigate the impact of macroeconomic variables on nonperforming loans by categorizing the Indian scheduled banks into four categories namely public, private, foreign, and SBI associate banks. Altogether, five macroeconomic variables were taken focusing on economic growth, unemployment, interest rates, inflation, and exchange rate vulnerabilities. Using GMM model, the findings showed that macroeconomic variables differed for all the categories of banks as for public sector banks, including State Bank of India and its associates, all the variables were significant ; whereas, for private banks, inflation, growth rate, and interest rate were significant factors. On the contrary, foreign banks were more affected by exchange rate fluctuations apart from other macroeconomic variables. The findings of the study provided insights about how this relationship between macroeconomic variables and NPAs changed among the different categories of banks on the basis of ownership, thus assisting bankers and policy makers in taking precautionary measures while drafting banking and monetary policies as ownership of the banks plays a key role in the overall banking management, which we can also see from the analysis that over the years, private and foreign banks have considerably reduced their share of nonperforming loans from the overall share of NPAs in Indian commercial banks.

Keywords : GMM model, Indian banks, macroeconomic, nonperforming loans, inflation, unemployment

JEL Classification : E32, E44,G21,F62

Paper Submission Date : September 20, 2019 ; Paper sent back for Revision : January 25, 2020 ; Paper Acceptance Date : January 28, 2020

O ver the years, different countries have gone through various financial crises like Greece financial crisis, U.S. subprime crisis, and Ukraine crisis, etc. These crises have attracted the attention of researchers to study the underlying causes of such a crisis. The main reason which can be linked with the financial crisis is banking instability. In this context, to explore the factors which affect banking instability is an important issue for maintaining a sound and responsible banking structure.

Various studies in the past have concluded that the banking crisis is the result of either banking variables or macroeconomic vulnerabilities (Louzis, Vouldis, & Metaxas, 2012 ; Nkusu, 2011). Conditions like low growth in the economy, high interest rate, high inflation, and lower employment rates create a negative pressure on the banks

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as these variables hinder the repayment capacity of the borrowers, and thus, the problem of impaired loan rises, which is why Castro (2013) emphasized one to study bank credit related issues, which ultimately turn into nonperforming loans. Reinhart and Rogoff (2010) pointed that NPA is the main trigger point for banking crisis around the world.

Although there are various factors which affect nonperforming loans, some factors are common among countries ; whereas, some are country specific. Factors are generally categorized into bank specific and macroeconomic factors. This study basically focuses on macroeconomic vulnerabilities associated with nonperforming loans in India.

India is one of the fastest developing economies of the world with a well maintained economic and banking structure. The Indian banking sector consists of 27 public sector banks, 21 private sector banks, and 49 foreign banks apart from other cooperative and regional rural banks, and the Indian banking assets are worth nearly around US$ 270 billion (Gupta & Jaiswal, 2020).

Although the Indian banking industry is quite stable in terms of capital and liquidity ; yet, it has one of the highest NPAs around the world after Russia and Ukraine. India NPAs stood at around ₹ 10 trillion (2018 figures), which was roughly 10% of the total loans and the major portion of NPAs are of the public sector banks as compared to private banks. The major reasons attributed for such high NPAs are sluggish economy, delay in project implementation, industrial sickness, and RBI norms for asset classification. As Indian banks are reeling with huge NPAs, studying the factors responsible for such mounting NPAs in an important issue.

This study is basically done to study the macroeconomic vulnerabilities or determinants which affect nonperforming loans among the scheduled banks of India. To study the macroeconomic determinants and their impact, this study has incorporated five macroeconomic variables, which are unemployment rate, gross domestic product, interest rate, inflation, and exchange rate and banks are basically divided into four categories : public banks, which include panel data of 27 public sector banks ; private banks, which include 21 banks ; foreign banks, which include 49 foreign banks' panel data ; and State Bank of India and its associates. The period of study is taken from 2000 – 2018 and the method which we have employed is GMM as it solves the problem of exogenous and endogenous variables from which our panel data set suffers. The findings show that public sector banks are highly affected by unemployment, growth, inflation, and interest rate fluctuations as compared to private and foreign banks. Foreign banks are highly affected by interest rate and exchange rate fluctuations ; whereas, for private banks, growth and inflation are the highly significant factors. The determinants affecting NPAs are different for different categories of banks due to varied reasons, which will be discussed in the subsequent sections.

Review of Literature

Previous literature has basically categorized bank credit risk on two broad parameters, that is, bank specific determinants and macroeconomic determinants. There are certain studies like Salas and Saurina (2002) which focused on both the determinants and their impact on nonperforming loans, but we will only consider macroeconomic determinants and their interrelation with nonperforming loans considering past literature.

Zribi and Boujelbène (2011) focused on macroeconomic determinants and their impact on credit risk for Tunisia using panel data approach and covering the period from 1995 – 2008. The findings suggested that the growth rate, interest rate, and inflation had a profound role in explaining nonperforming loans in Tunisian banks and they shared a mix relationship with nonperforming loans.

Similarly, Louzis et al. (2012) conducted a study focusing on macroeconomic variables and their effect on nonperforming loans in the Greek banking sector. This study particularly was focused on covering all segments of

loans covering the period from 2003 – 2009. Using dynamic panel data approach, the study concluded that the major reason for disturbance in the Greek banking sector was unstable growth rate and unemployment apart from other banking variables. A similar study was also conducted by González-Hermosillo, Pazarbaşioğlu, and Billings (1997).

Ozili (2018) explained the relationship between financial progress and non-performing loans employing regional and country data for nonperforming loans. Variables taken were private credit by banks to GDP ratio (financial intermediation), foreign banks' presence (financial liberalisation), and bank deposit to GDP ratio (size of banking sector). The findings showed that non-performing loans had a direct association with financial development measured as private credit by banks to GDP ratio, meaning banks with high financial intermediaries and ownership dependency experienced high NPAs.

A comparative study was also conducted by Ali and Daly (2010) focusing on macroeconomic determinants among United States and Australia. The study depicted that same macroeconomic variables had a different impact on the default loan structure of these countries. The study also concluded that macroeconomic shocks were more severe in the U.S. banking sector as compared to the Australian banking sector.

Festic, Kavkler, and Repina (2011) investigated the macroeconomic determinants and their impact on nonperforming loans among five European union member states (Bulgaria, Romania, Estonia, Latvia, and Lithuania). The findings suggested that economic slowdown, unemployment, and lack of banking supervision were the major reasons for increase in nonperforming loans in these countries.

Castro (2013) examined macroeconomic determinants among five European banking systems (Greece, Ireland, Portugal, Spain, and Italy, known as PIIGS) using a dynamic panel data methodology. The findings suggested that economic growth, unemployment, interest rate, and exchange rate fluctuations were the major variables which affected nonperforming loans in these countries. Similar studies which investigated credit risk are the ones conducted by Nkusu (2011) and Goodhart, Basurto, and Hofmann (2006).

Chaibi and Ftiti (2015) studied the problem loans of Tunisian firms using qualitative aspects as proxies. The study aimed to study if credit risk assessment was different through quantitative and qualitative proxies using bank level indicators and ownership. The results concluded that cost inefficiency and profitability were important determinants of credit risk ; apart from that, loan quality was directly influenced by bank capitalization, size, and ownership structure.

Nkusu (2011) further explored the relationship between macro financial vulnerabilities and nonperforming loans on a panel of 26 advanced countries using vector auto regressive approach on the panel data from 1998 – 2009. This study was based on two parameters, that is, determinants of nonperforming loans and interaction between NPL and economic performance. The findings pointed out that NPL played a significant link between credit risk disturbance and macro financial vulnerabilities. The results confirmed that slower growth was linked with debt service problem resulting in rising nonperforming loans.

Espinoza and Prasad (2010) investigated the macroeconomic determinants of nonperforming assets in the GCC banking system. They argued that lower growth rate and high interest rate increased the nonperforming loans. Using the vector autoregression model, they studied 80 banks of GCC region covering the period from 1995 – 2008. After comprehensive analysis, they found that high interest rate increased nonperforming loans, but not significantly.

Thiagarajan, Ayyappan, and Ramachandran (2011) analyzed credit risk of Indian commercial banks using the panel data of 22 public banks and 15 private banks covering the period from 2001 – 2010. The study showed that both macro and bank specific variables had a great influence on credit risk. The analysis also confirmed that credit risk and GDP growth had a negative significant relationship among both public and private banks.

Petropoulos, Siakoulis, Mylonas, and Klamargias (2018) examined the impact of fiscal measures on the nonperforming loans of 31 countries on a panel data for 15 years. The findings from the study reiterated that fiscal measures had a significant impact on the formation of nonperforming loans. Fiscal measures which assisted in the reduction of unemployment and in upliftment of economic growth also assisted in the reduction of nonperforming loans as nonperforming loans were found to have a direct relationship with macroeconomic variables.

The above review reveals that there are various studies which have investigated the relationship between macroeconomic variables and nonperforming loans in different parts of the world, but in India, there is no such composite and comprehensive study which has categorically investigated the interrelationship between macroeconomic variables and nonperforming loans on the basis of ownership structure by incorporating all the scheduled commercial banks of India, thus providing a suitable gap to further explore this above relationship ; whereas, employing the dynamic generalized method of moments technique makes the study more unique and dynamic.

Data and Econometric Issues

This study analyzes scheduled commercial banks of India segregating them into 27 public banks, 21 private banks, 49 foreign banks, and 5 SBI and associate banks. Panel data of all banks are taken covering the period from 2000 – 2018. Data were taken from 2000 onwards as banks were going through major reforms during this period. Secondly, this was the time prior to global recession when the economy was going through a turbulent time, and lastly, farm loans and other schemes were also quite active during this period. Data related to banks were collected from Reserve Bank of India website and for macroeconomic variables, the databases of The World Bank and International Monetary Fund are considered.

Variables and Bank Category Wise Description

(1) Gross Domestic Product : The studies conducted by various researchers have pointed out that banks and macroeconomic conditions are interrelated and economic conditions have a significant impact on the banking industry. As quoted by Louzis et al. (2012), Espinosa and Prasad (2010), and Ramesh and Kumar (2018), domestic growth of a country has a negative relationship with growth. As growth of a country increases, it increases the earning capacity of an individual. Similarly, this also affects the development of various industries and this helps in reducing the nonperforming loans to an extent. Nkusu's (2011) study of 26 advanced economies concluded that poor economic conditions (GDP) led to higher nonperforming loans. Similarly, Fofack (2005) also confirmed that economic growth was a significant factor which affected nonperforming loans in Sub Sahara African countries.

(2) Unemployment : Unemployment is another determinant which affects nonperforming loans as concluded by various researchers and scholars. Increase in unemployment reduces the earning capacity of an individual and it consequently affects the debt service capacity and this may lead to higher nonperforming loans. Espinoza and Prasad (2010), Messai and Jouini (2013), and Amuakwa - Mensah and Boakye - Adjei (2015) concluded in their studies that unemployment as a macroeconomic factor contributed significantly to problem loans and it had a positive relationship with default loans.

(3) Inflation : There are two different viewpoints on inflation and nonperforming loans. Authors like Klien (2013) and Ghosh (2015) argued that inflation lowers the real value of debt, thus loan repayment becomes easier which

postulates that inflation and nonperforming loans have a negative relationship and this also supports the findings of Shu (2002), Touny and Shehab (2015), and Ahmad and Bashir (2013).

Contrary to the above studies, some researchers like Fofack (2005) and Farhan, Sattar, Chaudhry, and Khalil (2012) concluded that inflation and nonperforming loans had a positive relationship as high inflation affected the real income of salaried class people, thus payment of loans became difficult. Lastly, there are certain studies which concluded that inflation was insignificant for nonperforming loans (Akinlo & Emmanuel, 2014 ; Tanasković & Jandrić, 2015).

(4) Exchange Rate : Exchange rate got a mixed response in relation to nonperforming loans. Researchers like Fofack (2005) and Khemraj and Sukrishnalall (2009) concluded that exchange rate and nonperforming loans had a positive relationship as appreciation in exchange rate increased the value to goods and services, thus reducing the competitiveness of export oriented firms and downgrading their debt service capacity. Similar studies done by Farhan, Sattar, Chaudhry, and Khalil (2012) and Jakubík and Reininger (2013) also supported the hypothesis of positive association between default loans and real exchange rate.

On the contrary, certain studies concluded that change in exchange rate affects those countries who have taken high amount of foreign loans. In such a situation, currency depreciations increase the debt servicing costs in local currency terms for borrowers who have loans denominated in foreign currency (Touny & Shehab, 2015).

(5) Real Interest Rate : Interest rates are considered as a source of income for banks. When banks increase their interest rates, debt servicing becomes tougher as borrowers have to pay more interest on their outstanding loans. This hypothesis was supported by various researchers and academicians (Chandra & Awasthi, 2019 ; Nkusu, 2011 ; Syed & Tripathi, 2019 ; Viswanadham & Nahid, 2015), who conducted their studies on different advanced economies and concluded that interest rates and nonperforming loans had a positive association, and banks which charged higher interest rates tended to have a higher amount of nonperforming loans.

Studies done by Cifter, Yilmazer, and Cifter (2009) ; Adebola, Yusoff, and Dahalan (2011) ; and Espinoza and Prasad (2010) also concluded that higher interest rates were detrimental to default loans and had a direct relationship with nonperforming loans in the selected countries.

(6) Bank Classification : The Indian banking system is basically categorized into public banks, private banks, foreign banks, and cooperative & regional rural banks. However in this study, four major categories of banks are included, that is, public banks, private banks, foreign banks, and SBI & its associates. The brief description of banks is discussed below focusing on their ownership structure, banking business, and nonperforming loan percentage.

✤ **Public Banks Including SBI & its Associates :** Public sector banks are characterized by their stakeholder ownership, that is, 50% and more equity shareholding in such banks is owned by the Government of India. There are 27 public sector banks representing the major portion of the Indian banking industry and State Bank of India along with its five associates has emerged as the largest public sector bank of India. Recent studies have shown that the maximum default loan problem is with public sector banks as compared to earlier times when private banks used to have the highest NPAs. Apart from this, public sector banks also have the highest share in the Indian banking industry in terms of deposits, business, accounts, and employment. As per the Reserve Bank of India report, public sector banks held two - thirds of total deposits, that is, ₹ 114 lakh crores. Nonperforming loans of public sector banks stood at ₹ 8,64,433 crores.

↭ **Private Banks:** Private sector banks are those banks where government ownership does not exist. There are around 21 private banks, both old and new ones. The Reserve Bank of India report stated that private banks held 25.4% of the total deposits ; whereas, the credit distribution of private banks was 29.3%. In terms of total NPAs, the private sector's share was considerably less (4.7% of total NPAs of ₹ 10.39 trillion) as compared to its public sector counterparts.

↭ **Foreign Banks :** Foreign banks are those banks which are not governed by the Government of India although they adhere to the rules and regulations of the Indian government. There are 49 foreign banks in India and the NPAs of foreign banks is less than 1% out of the total NPAs of the Indian banking industry. The foreign banks also hold the least amount of deposit percentage in terms of total deposits.

So, these are the details of the banks which are analyzed keeping in mind the macroeconomic factors and the nonperforming loan interrelationship.

Econometric Method Used

Using the data of the above dependent and independent variables, we have employed GMM model to check the below drafted hypotheses :

↭ **H01 :** Economic growth has a negative and significant association with nonperforming loans.

↭ **Ha1 :** Economic growth has an insignificant association with nonperforming loans.

↭ **H02 :** Unemployment has a positive and significant association with nonperforming loans.

↭ **Ha2 :** Unemployment has an insignificant association with nonperforming loans.

↭ **H03 :** Inflation has a positive and significant association with nonperforming loans.

↭ **Ha3 :** Inflation has an insignificant association with nonperforming loans.

↭ **H04 :** Exchange rate has a positive and significant association with nonperforming loans.

↭ **Ha4 :** Exchange rate has an insignificant relationship with nonperforming loans.

↭ **H05 :** Interest rate has a positive and significant association with nonperforming loans.

↭ **Ha5 :** Interest rate has an insignificant association with nonperforming loans.

Data consists of 27 public banks, 21 private banks, 49 foreign banks, and 5 SBI & associate banks covering the period from 2000 – 2018, that is, 19 years data. As the data suffers from heterogeneity issues which we cannot control like individual bank practices, regulations, etc., thus we have employed panel data technique for analysis. As heterogeneity gives biased results, we have used fixed and random effect approach to check the suitability. Hausman test is also employed, under which the p - value is .0034. This statistic rejects the null hypothesis that random model is appropriate, and thus, we go with the fixed effect model results. However, the independent variable includes lagged dependent variable such as lag of NNPA and lag of GDP. This creates the problem of endogeneity as owing to lagged dependent and explanatory variable, the regressor exogeneity does not hold. To overcome this endogeneity issue, we consider another model that covers such issues and provides a more

appropriate result. Hence, we apply the two stage least square generalized method of moments (GMM) that resolves the endogeneity issue, the results of which are summarised in Table 1. Before applying the GMM method, we have also checked the unit root of all the data which is presented in the Appendix as all the variables are of 1(0) and 1(1) level on integration, and we can further proceed with our analysis.

(1) Fixed - Effect Model : To estimate fixed effect panel regression on explanatory and dependent variables, we have employed the following model presented as equation 1 (Wooldridge, 2010) :

$$Y_{i,t} = C + X_{i,t}\beta + \eta_i + \varepsilon_{i,t} \qquad (1)$$

where,
$Y_{i,t}$ is $NNPA_{i,t}$ for i^{th} bank, where i = bank panel and t^{th} year, where $t = 1,\ldots19$. C is the common intercept, $X_{i,t}$ is the bank financial ratios for i^{th} bank and t^{th} year, where $t = 1,\ldots19$.
η_i is the fixed-effect for the ith bank ; i = bank panel also referred to as the unobserved effect.
$\varepsilon_{i,t}$ is the error term for i^{th} bank and t^{th} year ; also referred to as the idiosyncratic error, β is a vector of model parameters. C is common intercept and i and t are cross section and time period, respectively.

Under this model, we control heterogeneity of banks and assume bank heterogeneity remains constant overtime.

(2) Random - Effect Model : The generalized equation used in analyzing the random effect model is stated below in equation 2 (Wooldridge, 2010) :

$$Y_{i,t} = C + X_{i,t}\beta + (\eta_i + \varepsilon_{i,t}) \qquad (2)$$

$Y_{i,t}$ is $NNPA_{i,t}$ for i bank and t^{th} year, where $t = 1,\ldots19$. C is the common intercept.
$X_{i,t}$ is explanatory variables for i^{th} bank and t^{th} year, where $t = 1,\ldots19$.
η_i is the random-effect for i^{th} bank ; $\varepsilon_{i,t}$ is within entity error term for i^{th} bank and t^{th} year, where $t = 1,\ldots19$. β is a vector of model parameters.

This method selects banks randomly from the bank samples. This is the reason this method is denoted as the random effect method. This method does not consider the correlation among the variables and is thus considered as inappropriate. This method is helpful as it inferences the population on the basis of the sample and also studies the effect of explanatory variables on the dependent variable.

(3) Generalized Method of Moment : Lagged independent and dependent variables create the exogeneity problem and to deal with this issue, we have incorporated the Arellano - Bond (1991) two-step generalized method of moments. Time constraints and large number of panel and with assumption of no correlation exist in idiosyncratic errors ($\varepsilon_{i,t}$). This GMM estimator conducts first difference of the regression equation to eliminate panel specific heterogeneity. Robust standard errors are calculated using serial correlation (Arellano, 1987; White, 1980). For coefficient covariance method, white period is used. It uses exogenous variable at first difference and endogenous variable lags as instruments.
Equation 3 represents the model specification of the GMM model :

$$Y_{i,t} = \gamma y_{i,t-1} + \beta' X_{it} + \rho' z_i + \alpha_i + \varepsilon_{i,t} \qquad .....(3)$$

where, i = bank panel and t = 1.....19.

$Y_{i,t}$ is the net NPA to net advances ratio $NNPA_{i,t}$ for i^{th} bank where i = bank panel and t^{th} year, where t = 1...19.

α_i = the unobserved individual bank effect for the ith bank = bank panel.

X_{it} are the macroeconomic variables for the ith bank, where i = Bank panel and across t, t = 1... 19.

z_i is a vector of K_2 time-invariant explanatory variables, ε is error term with $E(\varepsilon_{it}) = 0$ and $E(\varepsilon_{it}\varepsilon_{js}) = \sigma2\varepsilon$ if $j = s$, $t = s$, and $E = (\varepsilon_{it}\varepsilon_{js}) = 0$ otherwise.

We assume that $E(\alpha_i) = 0$ $E(\alpha_i x_{it}) = 0$.

Under the GMM estimation, we consider the two-stage least square model with cross section weights. GMM estimation begins with the assumption that there are set of L moment conditions that the K dimensional parameters of interest, β should satisfy. These moment conditions are usually quite general. However, a particular model may have more specified moment conditions than parameters to be estimated. Thus, the vector of $L > K$ moment conditions may be written as: $E(m(y_t, \beta)) = 0$. We confine our attention to the moment conditions that are written as an orthogonality condition between the residuals of the equation $u_t \beta = u(y_t, X_t \beta)$ and a set of K instruments Z_t. $E(Z_t u_t(\beta)) = 0$. (β), which in the linear case are the regressors. $u_t(b)$ = the residuals from a linear specification so that, $u_t(\beta) = y_t - X'_t \beta$.

β is the GMM estimate that minimizes the sample moment $m_t(\beta)$ is as close to zero where the moment conditions are greater than the parameters. The equation for the estimate is defined using a quadratic form : $J(\beta, W_t) Tm_t(\beta)' W_T^{-1} m_t(\beta) = \frac{1}{T} u(\beta)' ZW_t^{-1}Z'u(\beta)$ as a measure of distance. W_T is the weighting matrix since it acts to weight the various moment conditions in constructing the distance measure. The GMM estimate is b that minimizes the measure of distance.

Under GMM, $u_t(\beta)$ are residuals from a linear specification $u_t(\beta) = y_t - X'_t \beta$. The objective function of the GMM is given by $J(\beta, W_t) = 1/T(y - X\beta)' ZW_t^{-1}Z'(y - X\beta)$. The GMM estimator provides a unique solution $\theta = (X'ZW_T^{-1}Z'X)^{-1}X'Zw_T^{-1}Z'y$. The two-stage least squares objective is simply the GMM objective function multiplied by ∂^2 using weighting matrix $W_T = (\partial^2 Z'Z)/T$. Ordinary least squares is equivalent to two-stage least squares objective with the instruments set equal to the derivatives of ut. The details about GMM estimates and objective function are available on the Internet and the E-views website.

Under cross-section weights, feasible generalized least squares (FGLS) are specified assuming the presence of cross-section heteroscedasticity. Please refer to E-views website for more details. The GMM deals with the endogeneity issue in the data. We present the results for the model using the GMM estimates obtained under two-stage least squares (2SLS) in the subsequent section.

Comparative Assessment and Results

The dataset represents five independent variables covering 27 public banks, 21 private banks, 49 foreign banks, and 5 SBI & associate banks covering the period from 2000 – 2018, that is, 19 years data. Chow test is conducted to study the structural break through F- statistics. The results of Chow test confirm that there are no structural breaks (Chow, 1960).

The main objective of this paper is to study the macroeconomic determinants of nonperforming loans using the approach of Geng, Bose, and Chen (2015). The GMM approach allows some regressors to be correlated with the unobserved effect and the disturbance terms, but instruments are strictly exogenous with respect to the disturbances and the unobserved effect. The GMM model under the two-stage least square with cross-section weighting matrix provides the best results and shows an improvement in the explanatory power, reduction in the

sum of residual squares, and standard errors.

Category wise results of each type of banks are summarized as follows. The p - value denotes the significant and insignificant variables at the 5% level of significance and the coefficient determines the magnitude of relationship among the dependent and independent variables. Through R - square, the explanatory power of the variables is shown. The results in Table 1 show that for public sector banks, the significant variables which affect nonperforming loans are growth rate, unemployment, inflation, and interest rate as the p - value is less than the 5%, meaning we have to accept H01, H02, H03, and H05 in case of public sector banks. Public sector banks are more prone to political influence, social development programs, and government schemes, which not only affect their lending policies but also their loan structures. Over the years, we can see that the default loan portfolio of public sector banks has been increasing, the reason being farms loan waivers, industrial sickness, inadequate implementation of government schemes, and uses of banks for political motives apart from improper bank management. The public sector loan disbursement is more influenced by powers and politics rather than the credit worth of the borrowers which can be seen from the case of Kingfisher Airlines, Firestar Diamond, etc.

The public sector banks and SBI & associate banks represent the same kind of relationship among dependent and independent banks as both the categories show that the growth rate has a negative relationship with nonperforming loans, meaning that when the growth rate improves, the NPAs fall. Unemployment has a positive relationship with NPAs, rising unemployment levels also increase the chances of default loans ; similarly, inflation and interest rates also have a positive relationship with nonperforming loans, that is, when inflation and interest

Table 1. Analysis of Explanatory and Dependent Variables

Banks	Macro Variables	GMM (2SLS) p - value (t-stats)	Coefficient
Public Banks (27 banks)	Gross Domestic Product	.0013(–4.6)*	–.15
	Unemployment	.023(1.66)*	.44
	Inflation	.004(3.84)*	.92
	Exchange Rate	.056(4.67)	.25
R - square : .84	Interest Rate	.04(1.99)*	1.65
Private Banks (21 banks)	Gross Domestic Product	.035(–.65)*	–.07
	Unemployment	.12((1.71)	.22
	Inflation	.016(1.52)*	.31
	Exchange Rate	.81(–.24)	–.006
R - square : .50	Interest Rate	.033(1.02)*	.66
Foreign Banks (49 banks)	Gross Domestic Product	.03(–2.24)*	–.22
	Unemployment	.14(.98)	.14
	Inflation	.80(–.25)	–.05
	Exchange Rate	.04(2.05)*	.05
R - square : .64	Interest Rate	.049(.71)*	.31
SBI & Ass. (5 banks)	Gross Domestic Product	.02(–2.59)*	–.17
	Unemployment	.019(1.39)*	.07
	Inflation	.04(2.33)*	.26
	Exchange Rate	.0001(6.39)*	.09
R - square:.89	Interest Rate	.0001(7.39)*	1.66

Note. * 5% level of significance.
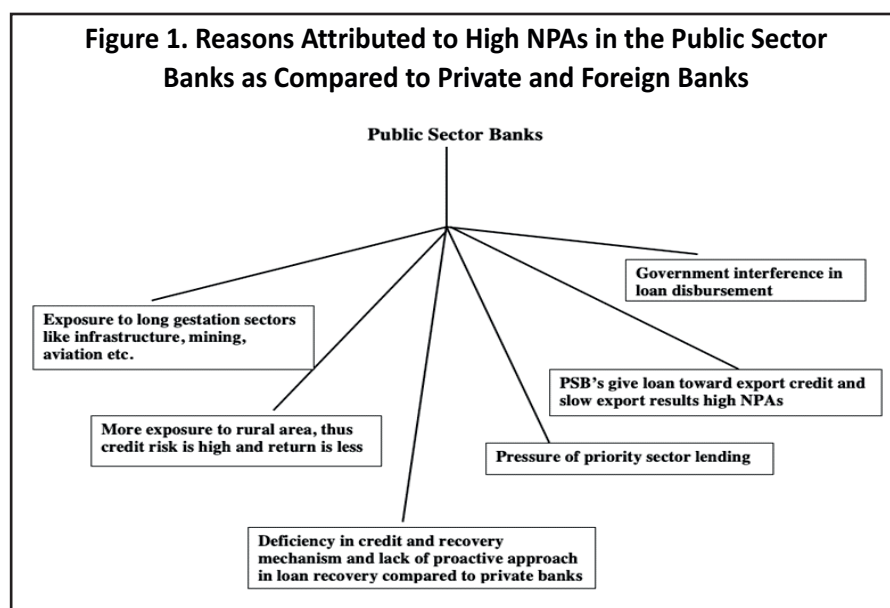
Calculation done by using E-views 10.

rates increase, the nonperforming loans also increase as both the variables create pressure on the borrowers and thus hamper the paying capacity of the borrowers. The R - square value shows that for public sector banks (84%) and for SBI & associates, 89% variation is explained by the explanatory variables. These results also support the findings of Espinoza and Prasad (2010).

The analysis of private and foreign banks shows that both the categories of banks are least affected by unemployment rate as the p - values are more than 5% ; whereas, both the segments of banks are affected by growth, inflation, and interest rates, meaning that for private banks, H01, H03, and H05 are accepted ; whereas, for foreign banks, H01, H04, and H05 are accepted. Foreign banks are more affected by exchange rate fluctuations as compared to private banks, which we can see from the coefficient value in Table 1. Over the years, we can see that the default loan ratio of private and foreign banks has been decreasing. The main reasons which we can relate with decreasing trend of default loans are their effective bank management and credit appraisal techniques. The R - square values of foreign and private banks show that the explanatory variables significantly explain the dependent variable. The result analysis also supports the previous findings of Nkusu (2011) and Touny and Shehab (2015).

Discussion

Although there are various studies which have explored the determinants of nonperforming loans, but this study is unique as it focuses on all major categories of banks in India, that is, private, public, and foreign banks. As India is reeling under huge nonperforming loans of which major portion is contributed by public sector banks, thus drawing a comparative study between private, public, and foreign banks is important, as we can see from Figure 1 that over the years, private and foreign banks have considerably reduced their share of nonperforming loans through their effective bank management and credit review mechanism (Kotishwar, 2018 ; Uppal, 2011).

This study also highlights whether public banks should be made in line with private banks so that they can be

Figure 1. Reasons Attributed to High NPAs in the Public Sector Banks as Compared to Private and Foreign Banks

Public Sector Banks

Exposure to long gestation sectors like infrastructure, mining, aviation etc.

More exposure to rural area, thus credit risk is high and return is less

Deficiency in credit and recovery mechanism and lack of proactive approach in loan recovery compared to private banks

Pressure of priority sector lending

PSB's give loan toward export credit and slow export results high NPAs

Government interference in loan disbursement

made free from political influence and government interferences. This study shows that how unemployment and government macroeconomic policies affect nonperforming loans, which depicts the necessity in making a better structure of macroeconomic policies, that is, how the macroeconomic environment can be used in a more constructive way rather than a destructive way. Comparative studies are always helpful in getting a better insight of the situation and devising ways to resolve the issues, and thus, this study is more beneficial and unique in this context too. On the basis of review and analysis, Figure 2 provides in detail the various reasons which are responsible for the huge nonperforming loans in public sector banks as compared to private and foreign banks.

Policy Implications

This study will be helpful for bankers and government officials to understand the impact of macroeconomic variables on nonperforming loans in the Indian commercial banks on the basis of ownership, that is, public, private, and foreign banks. Ownership plays a key role in the functioning of an organization, which we can also see from the performance of private and foreign banks in comparison to public banks both in terms of profitability and nonperforming loans' percentages ; thus, policy makers need to consider ownership structure before drafting monetary and banking policies for Indian banks. This study will also help researchers to understand the reasons for differences in the performance of public, private, and foreign banks on the basis of ownership structure, thus motivating them to further explore the above topic by taking new variables and research methodology.

Conclusion

This study evaluates the impact of macroeconomic variables on nonperforming loans of scheduled commercial banks of India covering the period from 2000 – 2018. This study includes five independent variables, and to make the study robust, this study segregates scheduled commercial banks into four segments namely public banks, private banks, foreign banks, and SBI & associate banks. Using GMM (2SLS) method, this study shows that macroeconomic variables have a profound impact on nonperforming loans. Growth rate, unemployment, inflation, and interest rate significantly affect nonperforming loans and these have to be monitored if banking conditions need some improvement ; whereas, for foreign banks, the exchange rate is considered as a significant variable for explaining the nonperforming loans. This study explains that over the years, private and foreign banks have considerably reduced their NPAs through their sound banking practices, effective banking management techniques, and low involvement of political influences at the time of loan disbursement. This study is unique, firstly, as this study, unlike other studies, categorizes the Indian commercial banks on the basis of ownership structure ; secondly, this study incorporates all the scheduled commercial banks of India, thus providing better comparative and comprehensive results ; and lastly, by employing the generalized method of moments technique, this study provides more robust results. As all the variables are not incorporated, this study provides scope for future research in this area.

Authors' Contribution

Dr. Aamir Aijaz Syed conceived the idea and developed the quantitative framework for conducting this research. Dr. Ravindra Tripathi verified the econometric model and helped in conceptualizing this work apart from writing the Review of Literature. The same was further transcripted and converted into this complete research paper with the help of both the authors.

Conflict of Interest

Funding Acknowledgement

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Appendix

Table A1. Panel Unit Root Test Results

Variables	At Intercept Level p - value	At Trends Levels p - value	At Intercept First Difference p - value	At Trends First Difference p - value
Growth Rate	.004	.0000	.023	.0000
NPLs	.043	.0001	.002	.0000
Unemployment	.065	.0000	.054	.0000
Inflation	.032	.0000	.001	.0000
Exchange Rate	.014	.0000	.024	.0000
Interest Rate	.064	.0000	.054	.0000

Note. * 5% level of significance.

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