# Non - Performing Loans in BRICS Nations : Determinants and Macroeconomic Impact

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## Abstract

**The issue of non - performing loans is considered as a serious threat towards the banking soundness of a country. Non - performing loans are those loans which cease to generate principal and interest and create a negative impact on the performance of banks. There are a host of factors which affect non - performing loans, which include both banking and macroeconomic variables. This study attempted to study the impact of macroeconomic determinants on the non - performing loans of BRICS countries covering the period from 2000 - 2016. The BRICS bloc was considered for the study as various previous studies showed that trading blocs also get affected by inter country non - performing loans' issues. This study used dynamic panel data approach for analysis using the fully modified ordinary least square model (FMOLS) along with cointegration analysis, and for robustness checks, this model incorporated the fixed and random ordinary least square methods. The results showed that unemployment had a positive relation with non - performing loans; whereas, growth and financial soundness of a country had a negative relation with non - performing loans. Saving rate of households also had an inverse relation with non - performing loans and inflation rate also showed a negative relation with default loans.**

***Keywords:*** **non - performing assets, macroeconomic variables, fully modified ordinary least square, BRICS, banks**

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Non - performing loans are segregated into those loans which fail to pay the interest and principal for certain duration of time; different countries have different time brackets for categorizing the loan as a non - performing asset. BRICS countries follow the 90-day period, that is, if principal or interest remains unpaid consecutively for three months, then such a loan can be categorized as a non - performing loan. Non - performing loans are a major banking threat for almost every country of the world because they affect the banking structure, and thus, the profitability of banks. Banks are considered as a major driver of economy and any disturbance in banks creates ripple effects in the economy as well.

Conversely, macroeconomics variables also affect the banks and banking profitability, variables like growth rate of country, inflation, taxes, unemployment, etc. This paper tries to study the impact of selected macroeconomic variables on the non - performing loans of BRICS countries. BRICS is an important bloc of Brazil, Russia, India, China, and South Africa. This bloc gained importance after the publication of Goldman

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Sachs's report of 2003, which described this bloc as one of the emerging blocs of the world and which will contribute to a substantial part of world economy and trade by 2050 (Singh & Shrivastav, 2018).

The idea of taking BRICS countries emerges because it is a bloc of diversified developing economies controlling 1/4 $^{th}$ of world land mass, 40% of world population (Jim O'Neill), and each country has its own economic significance with estimated GDP of $16 trillion. The non - performing loan condition of BRICS countries is also quite unique - like India and Russia had a ratio of 9% of NPAs to total loans ; whereas, China, South Africa, and Brazil had a ratio of 2%, 3%, and 4%, respectively (Economic Survey, 2016). Apart from this, the economic conditions of these countries are also going through some turmoil like increasing inflation, slump in the oil markets, corruption charges, shaking leadership in certain countries, and influence of the global financial turmoil.

Although various studies have been done on non - performing loans and their relationship with macroeconomic variables (Louzis, Vouldis, & Metaxas, 2012), but this study is unique as it focuses on the BRICS bloc and covers the variables like unemployment, inflation, savings rate, and economic growth. This study is based on panel data and uses the fully modified ordinary least square technique along with fixed and random regression to check the robustness of the model.

## Non - Performing Loan Classification in BRICS Nations

This section presents a detail view of loan classification parameters which are followed by BRICS nations.

**(i) Brazil :** Financial institutions which are operating in Brazil are required to classify their loans into nine categories from AA to level H based on the risk pattern of borrower, guarantor, and operations.

- AA - no arrears at all.
- A - Arrears for 15 days & provision : 0.5%.
- B - Arrears for 15 - 30 days & provision : 1.5 %.
- C - Arrears for 31 - 60 days & provision : 3.0 %.
- D - Arrears for 61 - 90 days & provision : 10%.
- E - Arrears for 91 - 120 days & provision : 30 %.
- F - Arrears for 121 - 150 days & provision : 50%.
- G - Arrears for 151 - 180 days & provision : 70%.
- H - Arrears for 180 - 360 days & provision : 100%.

**(ii) Russia:** In Russia, loans are classified into five categories based on arrears and defaults :

- Quality 1 (Standard Loan): Loans which have no credit risk.
- Quality 2 (Non Standard Loan): Loans which have moderate credit risk, that is, probability of credit risk it below 20%.
- Quality 3 (Doubtful Loans): Loans with considerable risk, that is, probability of credit risk is between 21% to 50%.
- Quality 4 (Non - Performing Loans): Loans of high credit risk, that is, probability of credit risk is between 51% - 100%.
- Quality 5 (Bad Loans): No possibility of loan repayment.

**(iii) India :** In India, the first ever classification of assets was done by A. Ghosh Committee in 1985. During that time, assets were classified into eight categories - from satisfactory to bad and doubtful assets. Later on in 1991, the Narsimham Committee pointed out that our asset classification was not as per international standards and suggested to classify assets into four broad categories, that is, standard assets, sub - standard assets, doubtful assets, and loss assets.

**(iv) China :** China follows a risk-based approach for loan classifications. They have five broad categories, which are as follows :

- Pass : This includes those loans which are fully secure and chances of default are nil.
- Special Mention : These loans are although secure from a borrower's point of view, but host of other factors may affect loan repayment.
- Substandard : This category includes those loans where chances of repayments are in question, even when guarantees are executed.
- Doubtful : This includes those loans where the repayment can be done in full, even when guarantees are executed.
- Loss : In this category, chances of repayment of principal and interest is nil, and loan can be categorized as a loss asset.

**(v) South Africa :** Non - performing loans in South Africa are those loans which do not generate income for a longer period of time. As per the central banks of West African States, the lead time from a standard loan to doubtful and loss loans is much longer. Substandard loans are those loans which fail to generate principal and interest for more than 6 months. While at some places, a different definition is also being used as by the Central Bank of "Central African States". In this definition, non - performing loans are the loans for which interest and/or principal have been left unpaid for a period of at least 3 months.

Thus, although all the countries follow slight variations in their asset classification, but still, if we see the conclusive overview, we can find out that generally, all of them follow four main broad categories, which are standard, sub standard, doubtful, and loss assets. Furthermore, a 90-day period is also common among them. Thus, comparing their ratios can be justified.

## Review of Literature

A lot of research has been done in the past related to non - performing loans and their macroeconomics determinants. An analysis of some of the earlier studies is present in this section.

One of the earliest studies done on loan default was done by Keeton and Morris (1987) focusing on 2470 commercial banks of United States covering the period from 1979 - 1985. The findings showed that poor economic conditions like slow GDP and bad performance of sectors affected the loan portfolios of banks.

Keeton did a study in 1999 to study the credit growth and NPA's scenario and the findings revealed that credit growth or poor credit disbursement affected the NPA's condition, and the period of study was from 1986 - 1992.

Quagliariello (2007) estimated the macroeconomic shocks and non - performing loan relationship on a dynamic panel of Italian intermediaries covering the period from 1985 to 2002. The findings of the study revealed that economic growth and non - performing loans had a significant and an inverse relationship, suggesting an economic growth outlook for reducing the menace of non - performing loans.

Boudriga, Taktak, and Jellouli's (2009) study was based on bank specific determinants and environmental issues on loan default in Middle East and North African countries taking variables like credit growth rate, capital adequacy ratio, real GDP growth rate, ROA, loan loss reserve to total loan ratio, diversification, and private monitoring. The findings revealed that credit growth rate was negatively related to problem loans, and capital adequacy ratio was positively significant.

Louzis et al. (2012) conducted a study on Greek financial sector taking variables like return on assets, return on equity, inflation, GDP growth rate, unemployment rate, and lending rates. The findings suggested that ROA and ROE had a negative significant effect ; whereas, inflation and lending rate had a positive significant effect on NPLs.

Swamy (2012) conducted a study on the determinants focusing on the Indian banking sector's key variables, that is, GDP, inflation, saving growth rate, bank size, loan to deposit ratio, etc. The findings showed that the key variables had an insignificant effect on loan default.

A similar study was done by Skarica (2014) in Central and Eastern European countries on determinants of non - performing loans by taking variables like gross domestic product, inflation, and unemployment findings. The study showed that unemployment and GDP had a negative significant relationship ; whereas, inflation had a significant relationship with NPLs.

Messai and Jouini (2013) conducted a study on three countries : Greece, Spain, and Italy on bank specific and macro financial variables' findings, which revealed that loans varied negatively with the growth rate of GDP, and the profitability of banks' assets and loans varied positively with the unemployment rate.

Viswanadham (2015) conducted a study on determinants of non - performing loans in National Bank of Commerce taking variables like interest rate, GDP, concentration of lending activities, bank's loan supervision capacity, and economic condition. Conclusive findings suggested that interest rate, GDP, bank's loan supervision capacity, and economic condition influenced the level of NPLs. However, the results did not suggest that concentration of lending activities increased the level of NPLs.

The above review gives a mix response of non - performing loans and its macroeconomic determinants. Some studies showed a positive relationship between default loans and growth rate ; whereas, some showed a negative association. The same goes with inflation and unemployment. One of the major gaps in earlier research is that there is no conclusive study done on BRICS bloc ; the period of research in earlier studies was also quite old ; whereas, this study covers the period from 2000 to 2016 to give new insights on how variables like inflation, unemployment, saving, and growth affect the non - performing loans of the selected countries and the method employed in this study, which is FMOLS, is also quite unique as compared to the methodology used in previous studies.

## Research Methodology

This study is basically based on panel data modeling taking the dependent variable as non - performing loans and independent variables as inflation, unemployment, saving rate, and gross domestic growth. The study covers the period from 2000 - 2016 and took the yearly data of all the four variables from the World Bank site. The methodology adopted for analysis was first checking whether the variables were stationary or not through unit root, then analyzing the long run co-integration among the variables, and lastly through FMOLS (fully modified ordinary least square), the magnitude of long run association was established. To check the robustness of the study, the data were also analyzed using the dynamic ordinary least square.

The analytical framework and justification of variables is as follows :

$$NPL_{i,t} = \beta_1 + \beta_2 GDP_{i,t} + \beta_3 UNR_{i,t} + \beta_4 INF_{i,t} + \beta_5 SAV_{i,t} + \ldots + \varepsilon_{i,t}$$

where,
*NPL* : non - performing loans,
*GDP*: Gross domestic product,
*UNR*: Unemployment rate,
*INF*: Inflation rate,
*SAV*: Saving Rate,
Subscript *t* corresponds to the examined period,
Subscript *i* corresponds to the examined country.

**(1) Variables Explained**

**(i) Inflation :** Inflation signifies the rise in price level. Theories says that as price level rises, it increases the cost of living and adversely affects the salaried class, thus their repaying capacity falls, and it also widens the gap between the rich and the poor, decreasing the gains from growth (Easterly & Fischer, 2001). Friedman (1977) also claimed that inflation ambiguity leads to an opposing output impact. Thus, inflation can be considered as an important determinant of non - performing loans and analyzing its effect on problem loans is quite important.

**(ii) Unemployment :** Unemployment means when there are no jobs both formal and informal and people have no employment. Unemployment and source of income are directly related, which means if a person is unemployed, then his/her source of income for that time period is nil. Thus, it becomes difficult to service his/her debt. Babouček and Jančar (2005) concluded a positive relationship between increasing unemployment and default loans. Similarly, Nkusu (2011) also confirmed that increasing unemployment is directly associated with the debt servicing problem. Thus, based on these parameters, this variable is also incorporated in the study.

**(iii) Economic Growth :** Economic growth means growth in the production of goods and services. In other words, growth can be attributed to all round development of a country like growth in industrial production, growth in employment, growth in resources, etc. Growth signifies prosperity and increasing growth helps in the overall economic development of every individual, which may be attributed to overall income equality ; thus, it can be considered that it may be beneficial for eradicating the default loan problem. Studies conducted like : Salas and Saurina (2002) and Jayaratne and Strahan (1996) confirmed a positive relationship between economic growth and non - performing loans because as economic growth increases, it helps in eradicating the problem loans to an extent.

**(iv) Saving Rate :** Saving rate denotes the percent of money saved by a household as a percent of GDP in the economy in a particular year. Keynes argued that saving and investment are equal ; whereas, certain modern economists gave different views on saving and investment by incorporating the concept of consumption as saving left after consumption expenditure can be considered as investment. There are limited studies which considered saving as a determinant of non - performing loans. Muthami (2016) concluded that in the Nigerian banking sector, the saving rate had a positive relationship with non - performing loans, but this study tries to check for a negative relationship as saving promotes investment and investment helps in promoting growth and prosperity in a nation, and thus, debt servicing can be improved and hence, NPAs can be reduced.

**(2) Data Sources and Estimation :** Data from a panel of five countries over the period from 2000-2016 are used in this paper. The main sources from which data were collected are world development indicators and central banks

of the respective BRICS countries. The main variables which are used in this paper are inflation, gross domestic product, unemployment, saving rate, and non - performing assets. Descriptive analysis of country wise data is presented in the Appendix, which shows the maximum minimum mean and other related values of explanatory variables along with the non - performing loans. Now, we proceed with checking the cross section dependency among the variables using the panel unit root tests of Im, Pesaran, and Shin (2003) as well as Levin, Lin, and Chu (2002).

## Analysis and Results

The results, as depicted in Table 1, indicate that there is no cross section dependency, and all the variables are non - stationary at levels (as the *p* - value is more than 5%) and stationary at 1(1). So, now, we can proceed with the other diagnostic test. After checking cross section dependency, we proceed with checking the long run cointegration relationship among the variables.

The panel cointegration tests - both Kao and Johansen panel cointegration test results shown in Table 2 and Table 3 nullify the null hypothesis that the variables are not cointegrated as the *p* - values are less than 5%, and from the results, we can conclude that the variables have a long run association among them, which is in line with the findings of Viswanadham (2015) and Şahbaz and İnkaya (2014). Panel co-integration test only tells about the long run association among variables, but it does not provide the exact information as to the direction of influence

**Table 1. Results of Unit Root Test**

| Variable | Im et al. (2003) (*p* - value) 1(0) | Levin et al. (2002) (*p* - value) at 1(0) | Test Statistics (Im et al., 2003) | Test Statistics (Levin et al., 2002) |
|---|---|---|---|---|
| Inflation | .44 | .059 | -0.14 | -1.89 |
| Saving Rate | .63 | .12 | .33 | -1.12 |
| Unemployment | .86 | .62 | 1.09 | .32 |
| GDP | .07 | **.0008*** | -1.42 | -3.14 |
| NPA | .765 | .78 | .76 | .78 |

***Note.*** NPA: non - performing assets, GDP: gross domestic product

***Note.*** *In Hadri, ADF and Fisher PP, GDP is also non - stationary as the *p* - value is more than 5% ; so, we are taking it as non-stationary.

**Table 2. Kao Panel Cointegration Test Results**

Null Hypothesis: No cointegration

| Null Hypothesis (No Cointegration) | *p* - value | Test Statistics |
|---|---|---|
| ADF | .0002 | -3.60 |

**Table 3. Johansen Panel Cointegration Test Results**

| | Fisher Stats (Trace Test) | *p* - value | Fisher Test (Max Eigen Value) | *p* - value |
|---|---|---|---|---|
| None | 88.23 | **.0000** | 67.76 | **.0000** |
| At most 1 | 32.70 | **.0003** | 25.44 | **.0046** |
| At most 2 | 16.70 | .0812 | 14.90 | .1357 |
| At most 3 | 13.75 | .18 | 13.75 | .1845 |

**Table 4. Results of Fully Modified Ordinary Least Square (FMOLS)**

| | Prob. | *t* - statistics | Std. Error | Coefficient |
|---|---|---|---|---|
| Inflation | .0000 | -4.81 | .111004 | -0.5339 |
| Unemployment | .0000 | 4.78 | .09642 | 0.4611 |
| GDP | .0024 | -3.14 | .0954 | -0.3000 |
| Saving Rate | .0028 | -3.09 | .23 | -.71 |

**Table 5. Fixed and Random Effect OLS**

| Variable | Coefficient | Std. Error | *t* - statistics | Prob |
|---|---|---|---|---|
| *C* | 4.21 | 1.24 | 3.40 | .0011 |
| *X*1 | -0.19 | .078 | -2.49 | .0148 |
| *X*2 | .39 | .123 | 3.22 | .0019 |
| *X*3 | -.27 | .073 | -3.72 | 0.0004 |
| *X*4 | -.26 | .078 | -3.79 | .0004 |
| **Random Effect OLS** | | | | |
| **Variable** | **Coefficient** | **Std. Error** | ***t* - statistics** | **Prob** |
| *C* | 9.89 | 1.79 | 5.52 | .0000 |
| *X*1 | -0.306 | .139 | -2.20 | .0306 |
| *X*2 | -0.17 | .05 | -3.258 | .0016 |
| *X*3 | -0.12 | .15 | -.80 | .42 |
| *X*4 | .14 | .17 | .84 | .46 |

among the dependent and independent variables. To be more specific, cointegration analysis does not tell anything about the hypothesized signs and magnitudes of the coefficients. This is the reason why fully modified ordinary least square (FMOLS) proposed by Pedroni (2000) is used to get these estimates.

The results from fully modified ordinary least square as depicted in Table 4 shows that all the four variables : inflation, unemployment, saving rate, and gross domestic product are highly significant to explain the non - performing assets of the BRICS blocs. The results show that unemployment has a positive relationship with non - performing assets, which means when unemployment increases, non - performing loans also increase. This supports the findings of previous studies of Castro (2012) and Nkusu (2011) as reducing unemployment of a country can help in resolving the non - performing loan issue ; whereas, inflation, saving rate, and gross domestic product have a negative relationship with non - performing loans, which means that with an increase in gross domestic product, saving rate, and inflation, the non - performing loans decrease, which also supports the findings of Alshubiri (2017) and Moinescu (2012), which were conducted on CEE countries and suggested that growth of a country is an important determinant for reducing non - performing loans, and improving the growth prospects of a country can help in solving the issue of non - performing loans.

The coefficient shows that with a 1% increase in inflation, NPA decreases by 5.3% ; with a 1% increase in GDP, the non - performing assets decrease by 3% ; with a 1% increase in saving rate, the non - performing loans decrease by 7.1% percent ; whereas, with a 1% increase in unemployment, NPA increases by 4.6 %. To check the consistency and robustness of the results, fixed and random ordinary least square are also used, as shown in Table 5, which also confirm the results of FMOLS. The Housman test confirms that the results of the fixed model are more appropriate, which also supports the findings of fully modified ordinary least square.

The objective of using mathematical and econometric models in the study are first to check the interdependency among the variables, whether they are related on not ; secondly to see that by what quantum the independent variable affects the dependent variables, that is, how non - performing assets get affected by economic growth, rising unemployment, saving rate of households, and high inflation. Mathematical models are more appropriate in finding out the exact percentage rise and fall between independent and dependent variables, which help policy makers in framing appropriate policies to overcome any unforeseen situations and crisis. These models are also helpful in hypothesis rejection and acceptance as they give an appropriate base for acceptance and rejection. The models used in this study assist us in understanding the percentage relation among the explanatory variables and will help the banking sector in safeguarding their financial soundness by studying the percentage rise and fall in economic growth, saving rate, inflation, and unemployment.

## Discussion

The study shows that macroeconomic determinants have a significant role in determining the non - performing assets of BRICS nations. Inflation, unemployment, saving rate, and growth rate are the key determinants which can help in explaining the non - performing loans to an extent, which also supports the findings of previous studies. If these variables can be controlled, then the problem loans can be avoided. The banks, apart from focusing on banking variables, should also keep a close watch on the macroeconomic variables, and accordingly, they should adjust their strategies for loan disbursement and loan collection. While analyzing the non - performing loans of BRICS nations, certain other issues related to default loans emerged, which are also summarized as country specific findings.

### Country Specific Findings

**(i) Brazil :** The findings that emerge are that major NPAs of banks in Brazil are due to political turmoil, corporate bankruptcy, exchange rate fluctuations, petroleum scam, and slow demand from Chinese market. The measures they have taken for reducing NPAs are : hefty fees for banking transactions, which help in reducing losses ; huge provisions for NPAs ; selling of distressed loans to private entities ; heavy investment in technology to make online banking a success so that branch cost can be minimized ; and lastly, a good capital adequacy ratio and charging higher interest rate to generate income.

**(ii) Russia :** Russia's NPAs have a long history. Major events which depict and conclude NPAs are Soviet Union collapse, high fiscal deficit, recession, blow of Asian financial crisis and currency pegged with U.S.$, falling crude oil prices, declining foreign - currency reserves, falling rubble, geopolitical reasons like the cut from Western fund sanctions and loan loss from Ukraine. To overcome the financial constraints of NPAs, the Russian central bank is more concerned with capitalization of banks with funds at reduced rates, focusing on small banks to generate funds, closing of undercapitalized banks, and lastly, undertaking conservative lending and state bank sponsored loan underwriting schemes.

**(iii) India :** India's increasing NPAs reveal that the problem emerged firstly after the nationalization of banks as political parties started using them for their political vendetta ; secondly, from banking reforms like income recognition and asset classification norms ; thirdly, from slow growth in the world market ; fourthly, from policy paralysis, which effected timely completion of different projects. According to Jayachandran and Nagananthi (2008) and Suresh (2010), apart from this, in today's time, one of the major reasons for increasing NPAs is the

agriculture sector and farm loans as 60% - 70% income of the Indian economy is agriculture based, which is reducing day by day because of droughts and faulty farming techniques. The measures taken to reduce NPAs are : setting of legal system for recovery of loans, Securitization Act, formation of assets management companies, bankruptcy code, and Mission Indradhanush for banks.

**(iv) China :** China's non - performing loan story is quite motivating as during 2000, it had NPAs amounting to 22.4% of the total loans. The reasons for such high NPAs were distressed state owned banks, high bad loans, undercapitalization of banks, and also a sluggish economy, but the Chinese economy made a U turn and reduced its NPAs to 1.4% in 2015 by taking various measures like strengthening banks and state owned enterprises through various reforms ; setting of asset management companies ; debt equity swaps ; and various incentives like tax discount, discount in administration fees, and transparent structure.

**(v) South Africa :** Lastly, going through South Africa, it can be concluded that the South African banking structure is well layered with stable profitability and a stable buffer stock to meet any financial crisis.

India can also learn certain preventive measures from these countries like quick completion of big projects, focusing on big defaulters and stopping them from further loans like China does - it debars defaulters from travel, from further loans, and also from credit cards, etc. Apart from this, major focus has to be given towards securitization and valuation of credit worthiness of borrowers because this will help in tackling this issue in the best possible way. So, this study, apart from studying the macroeconomic determinants of NPAs, also gives an insight into the emergence of the default loan situation in the BRICS countries. As certain banking and macroeconomic variables are ignored in this study, these will serve as a research gap for future studies.

## Implications and Conclusion

This study includes those variables which have a crucial impact on the earning of individuals like unemployment, which is a major issue which reduces the earning capacity of an individual ; economic growth, which makes an individual prosper ; saving rate, which generates investment ; and inflation, which helps in stabilizing the purchasing power of individuals.

The BRICS bloc is a combination of two categories of economies - those that took advantage of globalization's march to integrate themselves into global supply chains (primarily China and India) and those that took advantage of globalization to sell their abundant natural resources (primarily Brazil, Russia, and South Africa). Still being the powerful bloc, few countries of these economies are having a very low growth rate like Brazil, Russia, and South Africa (2.3%, 1.7%, and 1.5%, respectively) ; similarly, unemployment rates of few countries like Brazil and South Africa are the highest (11.8% and 26.8%, respectively). Hence, these are the key issues which need to be addressed with the help of this study, as this study shows that unemployment and growth rate have a direct and significant effect on the non - performing loans.

Similarly, when we study the other two variables like inflation and saving rate, we find that inflation is very high in few countries like Brazil, Russia, and South Africa (8.7%, 7.05%, and 6.32%, respectively) and saving rate is also low in Brazil, Russia, and South Africa (13.88%, 25.37%, and 16.12%, respectively) ; so, these two variables also need consideration if the issue of non - performing loans has to be addressed as non - performing loans are directly linked with these variables as concluded in this study and also in various previous literatures.

There are a host of other variables which too impact the non - performing loans like corruption, which is very rampant in South Africa, Brazil, and Russia ; slow implementation of projects in India ; and fall in the working-age

population in China apart from others, which also need a careful examination if the banking structures need to remove their mounting NPAs.

Policies have to be framed keeping in mind these variables and how these variables can be controlled in the best possible manner. The BRICS bloc has to work in such a way that it inculcates the progress of each country as this is a diversified bloc with great potential whether we take the manpower resources or the endowed factors of each and every country separately. If the problem of unemployment, corruption, high inflation, and slow growth can be controlled, then the NPA issue can be resolved positively in these nations.

## Limitations of the Study and Scope for Further Research

This research study is based on selected key variables which affect the level of NPAs at a significant level. However, there are certain other variables which also contribute towards the increasing level of NPAs of the BRICS nations which are not incorporated in this paper due to its focus towards significant macroeconomic factors. This study also does not consider the qualitative determinant of NPAs, which can also be incorporated by researchers in further research. A point of caution is that the relationship between the determinants and level of NPAs is identified by applying statistical tests on the hypothesis framed.

This study has only incorporated macroeconomic determinants ; whereas, non - performing loans are prone to many other key variables like banking earnings, know your customers' norms, capital adequacy, pattern of loan disbursements, and alike. Thus, in future studies, these variables can also be incorporated to get a better view of non - performing loans and their determinants. Also, there are various other economic blocs which can be studied and a comparative analysis can also be done among different blocs.

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# APPENDIX

**Descriptive Statistics ($y$ = NPA, $x_1$ = Inflation, $x_2$ = Unemployment, $x_3$ = GDP, $x_4$ = Savings Rate)**

**Appendix Table A1. Brazil**

| $y$ | | $x_1$ | | $x_2$ | | $x_3$ | | $x_4$ | |
|---|---|---|---|---|---|---|---|---|---|
| Mean | 3.86 | Mean | 6.83 | Mean | 10.47 | Mean | 2.55 | Mean | 15.99 |
| Median | 3.46 | Median | 6.6 | Median | 10.86 | Median | 3.05 | Median | 16.82 |
| S. Dev | 1.34 | S.Dev | 2.52 | S. Dev | 2.47 | S. Dev | 3.08 | S.Dev | 2.06 |
| Range | 5.45 | Range | 11.1 | Range | 7.17 | Range | 11.23 | Range | 6.22 |
| Minimum | 2.85 | Minimum | 3.6 | Minimum | 6.81 | Minimum | -3.7 | Minimum | 12.35 |
| Maximum | 8.3 | Maximum | 14.7 | Maximum | 13.98 | Maximum | 7.53 | Maximum | 18.57 |
| Count | 17 | Count | 17 | Count | 17 | Count | 17 | Count | 17 |

**Appendix Table A2. Russia**

| $y$ | | $x_1$ | | $x_2$ | | $x_3$ | | $x_4$ | |
|---|---|---|---|---|---|---|---|---|---|
| Mean | 5.88 | Mean | 11.59 | Mean | 7 | Mean | 3.88 | Mean | 28.52 |
| Median | 6.03 | Median | 10.9 | Median | 7.05 | Median | 4.74 | Median | 28.72 |
| S. Dev | 2.35 | S. Dev | 4.79 | S. Dev | 1.49 | S. Dev | 4.51 | S. Dev | 3.648 |
| Range | 7.13 | Range | 16.4 | Range | 5.42 | Range | 17.82 | Range | 13.48 |
| Minimum | 2.4 | Minimum | 5.1 | Minimum | 5.16 | Minimum | -7.82 | Minimum | 22.67 |
| Maximum | 9.53 | Maximum | 21.5 | Maximum | 10.58 | Maximum | 10 | Maximum | 36.15 |
| Count | 17 | Count | 17 | Count | 17 | Count | 17 | Count | 17 |

**Appendix Table A3. India**

| $y$ | | $x_1$ | | $x_2$ | | $x_3$ | | $x_4$ | |
|---|---|---|---|---|---|---|---|---|---|
| Mean | 5.37 | Mean | 6.828 | Mean | 3.827 | Mean | 7.28 | Mean | 16.31 |
| Median | 4.19 | Median | 6.25 | Median | 3.75 | Median | 7.685 | Median | 16.07 |
| Standard Deviation | 3.12 | Standard Deviation | 2.849 | Standard Deviation | 0.32 | Standard Deviation | 2.002 | Standard Deviation | 1.026 |
| Range | 9.19 | Range | 8.3 | Range | 0.91 | Range | 6.46 | Range | 3.18 |
| Minimum | 2.21 | Minimum | 3.7 | Minimum | 3.49 | Minimum | 3.8 | Minimum | 14.84 |
| Maximum | 11.4 | Maximum | 12 | Maximum | 4.4 | Maximum | 10.26 | Maximum | 18.02 |
| Count | 17 | Count | 17 | Count | 17 | Count | 17 | Count | 17 |

**Appendix Table A4. China**

| *y* | | $x_1$ | | $x_2$ | | $x_3$ | | $x_4$ | |
|---|---|---|---|---|---|---|---|---|---|
| Mean | 8.6 | Mean | 2.231 | Mean | 4.244 | Mean | 9.432 | Mean | 32.99 |
| Median | 2.4 | Median | 2 | Median | 4.34 | Median | 9.4 | Median | 33.66 |
| Standard Deviation | 9.94 | Standard Deviation | 1.948 | Standard Deviation | 0.343 | Standard Deviation | 2.027 | Standard Deviation | 4.458 |
| Range | 28.9 | Range | 6.7 | Range | 1.09 | Range | 7.63 | Range | 15.99 |
| Minimum | 0.95 | Minimum | -0.8 | Minimum | 3.5 | Minimum | 6.6 | Minimum | 25 |
| Maximum | 29.8 | Maximum | 5.9 | Maximum | 4.59 | Maximum | 14.23 | Maximum | 40.99 |
| Count | 17 | Count | 17 | Count | 17 | Count | 17 | Count | 17 |

**Appendix Table A5. South Africa**

| *y* | | $x_1$ | | $x_2$ | | $x_3$ | | $x_4$ | |
|---|---|---|---|---|---|---|---|---|---|
| Mean | 3.82 | Mean | 5.382 | Mean | 23.73 | Mean | 2.993 | Mean | 45.12 |
| Median | 3.12 | Median | 5.7 | Median | 24.69 | Median | 3.04 | Median | 48.39 |
| Standard Deviation | 2.7 | Standard Deviation | 1.71 | Standard Deviation | 5.186 | Standard Deviation | 1.873 | Standard Deviation | 8.791 |
| Range | 11.7 | Range | 7.8 | Range | 22.83 | Range | 7.14 | Range | 35.73 |
| Minimum | 1.1 | Minimum | 1.4 | Minimum | 4.31 | Minimum | -1.54 | Minimum | 16.24 |
| Maximum | 12.8 | Maximum | 9.2 | Maximum | 27.14 | Maximum | 5.6 | Maximum | 51.97 |
| Count | 17 | Count | 17 | Count | 17 | Count | 17 | Count | 17 |

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