RELATIONSHIP BETWEEN THE NON-PERFORMING ASSETS AND MACROECONOMIC VARIABLES - A PANEL DATA ANALYSIS OF INDIAN BANKING SECTOR

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Abstract

This paper empirically evaluates the relationship between accumulation of NPA in banking sector and economic growth of Indian economy. The relationships between nonperforming assets of different bank groups and annual GDP, interest rate, inflation rate, and bank wise gross advances and bank wise gross assets are analysed using panel data framework. The study finds that GDP have significant impact on accumulation of NPA and interest rate also plays a significant role in accumulation of NPA in Indian banking sector. Bank specific both factors, gross assets and gross advances, are also significant for accumulation of nonperforming assets in Indian banking industry.

Keywords: NPA, GDP, Gross Assets, Gross Advances, India.

JEL classification: C33, C87, G10, G21

1. INTRODUCTION

A credit transaction involves a contract between the borrower and the creditor subject to mutual terms of agreement. If the optimum decision differs from the borrower to that of the creditor or the mutual agreement breaks due to some unfavourable economic conditions, non-performing asset (NPA) entails (Swamy 2012). NPA is generated into account either non-payment of interest due or principal or both (Shingjergji 2013).Thus as NPA increases in the economy, amount of idle credit will increase and the active balance entering into the real sector activity will fall which creates dampening effect on growth.

The extent of NPA in the banking sector depends on the cyclical phase of the economy (Shingjergji 2013). The NPA ratio is normally observed to be low during the boom of an economy because in this phase production increases at higher proportional rate which makes loan repayment easier. On the other hand, NPA

normally tends to increase in the phase of economic downturn. If the economic activity slows down it may be difficult for economic agents, both households and firms, to repay the loans and raise the likelihood of delay in the fulfilment of their financial obligations. In addition, NPA depends on political, economic, social, technological, legal, environmental factors, and the nature of relationship varies across countries. In this study, we have looked into the relationship between NPA and real sector variables by taking bank specific factors as control variables in a panel data framework with Indian data.

Accumulation of NPA also depends on the banking sector's operational efficiency. If banks or any financial institution monitor and record project quality and depending on records of project quality give investable loans, then accumulation of NPA can reduce. In this case institutional infrastructure of the financial sector plays an important role in operational efficiency of banks and financial institutions. With the emergence of globalization and advancement in information technology structural transformation occurs in the emerging economy as well as financial sector their in. Advances in technology have facilitated rapid exchange of information across markets, creation of newer financial products, and reduction in transaction costs, thus, contributing to enhanced operational efficiency of banks and financial institutions (Ranjan and Dhal 2003). The main objective of this study is to look into the relationship between NPA and major macroeconomic variables such as: GDP, interest rate and inflation rate along with two bank specific control variables gross assets and gross advances. We found that GDP have significant impact on accumulation of NPA and interest rate plays a significant role in accumulation of NPA in the banking sector. Gross assets and gross advances also have significant impact on accumulation of NPA in Indian banking sector.

The rest of the paper is organized as follows. Section 2 gives brief description of theoretical justification along with some selected literature review. Data source and methodology used in this study are described in section 3. The empirical results are reported and discussed in section 4. Finally, section 5 summarizes and concludes.

2. THEORETICAL JUSTIFICATION AND LITERATURE REVIEW

Banking sector performs the crucial task of channelling resources from savings to investment and not need to say, the more efficient the system, the better the mobilization of resources. Therefore, banks are major suppliers of credit to finance productive investment particularly in a developing economy (Mordi 2010), and any disruption in the supply of credit is transmitted to the real economic activity. From the modern economic study many economists have explored that the quite a few recent economic crises had occurred due to the shock in the credit supply (Konecny and Kucharcukova 2013, Peetz and Genreith 2011). It is relevant to say in this connection that one of the main reasons behind the Great Depression of 1930s

was the large imbalances in credit flow in the banking sector (Crafts and Fearon 2010).

In this connection interest rate also plays an important role in accumulation of NPA in banking sector. If the interest rate is high, people like to borrow less amount of investable credit from bank because of high interest payment. Less amount of investment credit decreases production activity. If the production decreases amount of profit return reduces this also leads to decrease amount of return on lending money. Thus, non-payment of interest and /or principal money accumulates nonperforming assets in the banking sector.

Lokare (2014) found with Indian data that growth in NPAs was low during the phases of low interest rate, while NPAs growth has increased with the increase in interest rate. The empirical estimates also corroborate the fact that growth in NPAs is likely to go up in the backdrop of elevated interest rate environment, i.e., 100 bps[1] rise in interest rate (money market rate proxy for lending rate) leads to around 0.6 percentage point rise in NPAs growth after a lag of one quarter. Thus, hardening of interest rates in the recent times might have also contributed to increase in NPAs.

Reduction in the amount of accumulated NPAs in the banking sector can occur by increase in the amount of loan advances in productive activity. Maximum amount of contribution of a financial system to growth comes from the setting up of an efficient and adaptable system of payment (King and Levine 1993).Technologically improved financial system can more efficiently internalize the savings for productive investment and thus well-functioning financial system can motivate higher economic growth (King and Levine 1993). According to Bencivenga and Smith (1991) financial intermediation through banking system can allocate resources by minimizing liquidity shock. That can again increase the amount of loan in some productive activity and decrease the amount of nonperforming loans.

Some country specific empirical study investigated the relationship between the nonperforming assets and macroeconomic variables. Shingjergji (2013) analysed the relationship between the NPL ratio and some macroeconomic variables in Albanian banking system. He captured how different macroeconomic factors accumulate different amount of nonperforming assets by taking data for the period from first quarter of 2005 until fourth quarter of 2012 by applying ordinary least square. The study observed a positive relation between NPLs ratio and foreign exchange rate and between NPLs ratio and base interest rate, but a negative

[1]The basis point (bps) is commonly used for calculating changes in interest rates. Basis point (bps) refers to a common unit of measure for interest rates and other percentages in finance. Basis point comes from the base move between two percentages, or the spread between two interest rates. One basis point is equal to 1/100th of 1%, or 0.01%, or 0.0001.

relationship between NPLs ratio and inflation. Also, the study found the existence of positive relationship between the GDP growth and NPLs ratio, which is contrary to the international evidence. Islamoglu (2015) examined the effects of public debt stock-GDP ratio and commercial loan rates on the nonperforming loans of Turkish Banking Sector from the period 2002 to 2013 by using time series data analysis and found that commercial loan interest rate and public debt stock-GDP ratio had short term as well as long term causality relationship with the ratio of non-performing loans.

Some study also empirically investigated the relationship between the nonperforming assets and macroeconomic variables in the context of Indian economy. Ranjan and Dhal (2003) explored an empirical approach of panel data analysis of public sector banks' non-performing loans (NPLs) in the Indian context. The empirical analysis evaluated as to how banks' nonperforming loans were influenced by three major sets of economic and financial factors, *i.e.,* terms of credit, bank size induced risk preferences and macroeconomic shocks. This study found that bank size had significant effect on the banks' non-performing loans, if the bank size is larger the level of gross NPAs will be lower. In regard to terms of credit variables, changes in the cost of credit in terms of expectation of higher interest rate induce rise in NPAs. Empirical results found that horizon of maturity of credit, better credit culture, favourable macroeconomic and business conditions lead to lowering of NPAs. This study also found that business cycle may have differential implications adducing to differential response of borrowers and lenders.

Das and Ghosh (2007) took both macroeconomic factors as well as microeconomic variables for examining the causes of problem loan[2] of Indian state-owned banks for the period 1994-2005. For the empirical analysis this paper used advanced panel data techniques and findings revealed that at the macro level, GDP growth and at the micro level or bank level, real loan growth, operating expenses and bank size play an important role in influencing problem loans.

Swamy (2012) also used panel data analysis to investigate the impact of macroeconomic and endogenous factors on non-performing assets during the period 1997 to 2009 in Indian banking sector. This study found that GDP growth rate and lending rates had not significant in affecting the non-performing loans. Index of industrial production, credit to deposit ratio, return on assets and cost of funds are negatively significantly associated with NPAs. This study found that large banks may have better risk management procedures and technology for which they end up with lower levels of NPAs compare to smaller banks.

Ranjan and Dhal (2003), Das and Ghosh (2007) concentrate mainly on different economic and financial factors such as GDP growth, real interest rate, credit

[2] In the banking and credit markets, a problem loan is one of two things; it can be a commercial loan that is at least 90 days past due, or a consumer loan that it at least 180 days past due. This type of loan is also referred to as a nonperforming asset (loan).

growth, bank size causing accumulation of banks' non-performing loans in Indian banking sector as a whole. But, Swamy (2012) considered different groups of banks in Indian Banking industry to analyse NPA. The present study also considers different groups of banks in Indian banking industry to re-examine the relationship between some real economic variables and accumulation of banks' non-performing assets in Indian banking sector from the time period 1996 to 2017. Swamy (2012) found that lending rates were insignificant in affecting the non-performing loans, which is contrary to the general perception. Thus, I am re-examining this relationship between real economic variables and accumulation of banks' NPA in Indian banking sector for the extended time period 1996 to 2017.

3. DATA SOURCES AND ESTIMATION METHOD

Annual data of different bank groups and the yearly data of GDP, wholesale price index, call money rates are collected from *Handbook of Statistics on Indian Economy(2013,2016)* published by the Reserve Bank of India. Annual data of different bank groups consist bank specific gross nonperforming assets, bank specific gross assets and bank specific gross advances figured in billion rupees. The bank specific gross nonperforming asset is employed as a measure for financial variable. Where, GDP is widely used to measure real economic growth. GDP at market prices is collected for the purpose of present analysis as this series is available up to current year. Here the annual aggregate data of GDP is also figured in billion rupees. Base period of 2004-05 of GDP series is changed to current base period 2011-12 for smoothing out analysis. We have collected the weighted average annual figure of call money rate as proxy of interest rate. Annual average wholesale price index data is used to calculate the annual inflation rate. We have changed the base period of wholesale price index from 1993-94 = 100 and 2004-05 =100 to the current base period 2011-12=100. All variables are converted into natural logarithmic form for smoothing out series to some extent.

We have to estimate a relationship of the following form using the *panel data*, consisting of different groups of banks in Indian banking industry (such as scheduled commercial banks, public sector banks, new private sector banks and foreign banks in India) collecting data across a period from 1996 to 2015, comprising of 80 data points. In this present study we have a balanced panel, as each type of bank has 20 observations.

For estimating the determinants of NPA, we specify the following relationship:

$$GNPA_{it} = \alpha + \beta_1 GDP_t + \beta_2 INFLA_t + \beta_3 INTRT_t + \beta_4 GASSET_{it} + \beta_5 GADV_{it} + U_{it} \quad (1)$$

Here, $GNPA_{it}$ is the gross nonperforming assets of bank group *i* in period *t*; and the explanatory variables are GDP (GDP), inflation rate (INFLA), interest rate (INTRT) and bank specific variables such as bank gross assets (GASSET) and bank

gross advances (GADV). While 'i' represents the category of bank group and 't' represents the year. The term U_{it} represents the unexplained residual and decomposed as

$$U_{it} = \vartheta_i + \varepsilon_{it} \qquad (2)$$

Panel data have more variability and exploring more issues than do cross-sectional or time-series data alone. Panel data econometric model used in this study captures bank group specific unobserved heterogeneity in estimating the relationship between NPA and GDP. The unobserved effect may either be fixed, or random effect determined by the Hausman (1978) test.

4. EMPIRICAL RESULT AND INTERPRETATION

The graphical depictions of gross nonperforming assets, gross advances and gross assets of each kind of bank in figure I, figure II, figure III and figure IV (Appendix) give the observances of these banks' (scheduled commercial banks, public sector banks, new private sector banks and foreign banks in India) performances over time period 1996 to 2015. It is shown from figure I and figure II that in scheduled commercial banks and public sector banks there was upward movement of gross advances and gross assets approximately from year 2005 to onwards. Upward movement of nonperforming assets of these banks (scheduled commercial banks, public sector banks) is also noticed from time period 2008 and thereafter. Some of the reasons for high NPAs especially in the public sector banks are due to prolonged period of easy fiscal and monetary conditions since 2008 resulted in easy liquidity, low interest rate which prompted public sector banks to lend aggressively. Second, infrastructure lending undertaken in 2010 and 2011with optimistic assumptions resulted in unviable projects. Some of these were stalled for lengthy periods due to unavailability of raw materials, land acquisition problems or lack of other clearances. These have morphed into stressed assets (Kumar, Krishna and Bhardwaj 2016).

Private-sector banks and foreign banks are better placed (figure III and figure IV) than the public sector banks. Their NPAs in proportion of their lending are lesser than that of the public sector banks (Sengupta and Vardhan, 2017). In post crisis period slowdown observed in the domestic economy as well as the sluggish recovery of the global market, total amount of non-performing assets (NPAs) as well as restructured advances witnessed accelerated growth during 2011-12.

Table 1: *Observed changes in Gross non-performing asset and its covariates:*

Variable names	**Year**		
	1996	**2005**	**2015**
Gross nonperforming asset	230.69	246.09	3059.74
Gross advances	1454.24	7544.01	40836.72
Gross assets	3268.31	13515.38	64931.76

GDP	31790.25	54952.37	113810
Call money rate	7.84	5.6	6.98
Inflation Rate	43.5	66.91	109.72

Note: tabulate values are average values of different variables across banks in three time points; 1996, 2005 and 2015. Gross nonperforming assets, gross advances, gross assets and GDP figures are reported in billion rupees.

Source: Author's estimation based on data from Handbook of Statistics on Indian Economy 2013 and 2016, RBI

Table 1 shows average values of gross nonperforming assets, gross advances, gross assets, GDP, call money rate and WPI across different groups of banks in Indian banking industry in three time points; 1996, 2005 and 2015. It is found that average gross nonperforming assets remain almost same from 1996 to 2005 but in 2015 it increases in large amount. To some extent the restructuring schemes introduced by the RBI helped the banks to suppress the extent of their balance sheet stress in the aftermath of the 2008 Global Financial Crisis. In April 2015, RBI introduced the Asset Quality Review (AQR), which forced the banks to recognize the stressed assets on their books and provision for them. This was applicable to private and Public sector banks alike (Sengupta and Vardhan (2017)). Reserve Bank of India, under the leadership of former Governor Raghuram Rajan, asked banks to set aside a pool of funds in the form of provisioning towards sub-standard assets in 2015(Kumar, Krishna and Bhardwaj(2016)).

It is observed that average value of gross advances increased from year 1996 to year 2005 and again it increased from year 2005 to year 2015. During the pre-crisis period, bank credit expanded at a robust pace, averaging at over 25 per cent. Several factors, such as increased financial deepening, increased competition, improvement in asset quality of banks and rapid product innovations contributed to the rapid credit expansion (Lokare (2014)).The average value of gross assets also increased in a larger amount from year 2005 to year 2015 in comparison with average value of gross assets increased from 1996 to 2005. There was significant improvement in the asset quality, particularly from the year 2000, partly as a result of expansion of loan volumes and partly on account of write-offs and recovery of past dues. Thus, rapid credit expansion from 2002-03 was encouraged by improvement in asset quality (Lokare (2014)).

In 2004-05, several policy initiatives were taken to increase agricultural productivity, expand the industrial base especially through greater investment in infrastructure, were strengthen the momentum of economic growth. In the context of globalisation of production systems, several initiatives were aimed at promoting exports, rationalising trade duties and preparing the economy for the commitments that may emerge from the Doha Round of the World Trade Organisation (WTO) (The Annual Report on the Working of the Reserve Bank of India, (July 2004 to June 2005)). Thus, increases the GDP of Indian economy in 2005.Again the upward revision in India's GDP growth rate for 2015 may be due to a significant increase in growth estimates for industrial and services sectors in current years.

In case of call money rate, which is the proxy of interest rate, it is found that interest rate decreased from 1996 to 2005 and then it again increased in 2015 but rate of interest remain lesser in 2015 than it was in 1996. Calculated inflation rate from WPI, increased from 1996 to 2005 then again increased from 2005 to 2015.Year-on-year inflation accelerated to 6.0 per cent by April, 2005 due to hardening of prices of fruits and vegetables under seasonal pressures and some upward adjustment in the prices of aviation turbine fuel, naphtha, furnace oil and iron and steel. In view of the persistently rising international crude oil prices, domestic prices of petrol and diesel were increased by about 7-8 per cent on June 2005. Electricity prices were also raised by 5.1 per cent in early June 2005 (The Annual Report on the Working of the Reserve Bank of India, (July 2004 to June 2005)). In current years faster rising in cost of food and housing may be the reasons behind the increase in inflation rate in 2015 in Indian economy.

Table 2 shows the estimated result of panel regression of random effect model. In case of analysing panel data, we can use random effect model or fixed effect model. But for knowing which model will be the appropriate model we apply Hausman Test. The table 3 (Appendix) reports the result of Hausman test. In our model, calculated value of χ^2 is less than the tabulated value of χ^2 (Table 3).Therefore we reject the alternative hypothesis and we select the random effect model.

Table 2: *Estimated relation between Gross non-performing asset and GDP*

Dependent variable	**Gross non-performing asset**		
Independent variable	**Coefficient value**	**Z-statistics**	**p-value**
GDP	-1.33	-8.18	0.00
Call money rate	0.53	3.99	0.00
Inflation	-9.51	-7.59	0.00
Gross advances	-1.29	-3.83	0.00
Gross assets	2.61	7.19	0.00
Constant	6.32	3.96	0.00
Sigma _u	0.11		
Sigma _e	0.30		
Rho	0.11		

Source: Author's estimation based on data from Handbook of Statistics on Indian Economy 2013 and 2016, RBI

Table 2 shows the random effect model's estimated relation between nonperforming assets of different bank groups and annual GDP, interest rate, inflation rate, and bank wise gross advances and bank wise gross assets. This result shows that effect of GDP is significant for the accumulation of bank's nonperforming assets in a developing country like India. 1% increase in GDP decreases accumulation of nonperforming assets by 1.33%. Therefore, increase in real output have significant impact for the decrease in the amount of nonperforming assets in the Indian banking sector. But there is a significant positive relation exits between the call money rate, which is used as proxy of interest rate, and bank specific

nonperforming assets. 1% increase in call money rate increases nonperforming assets by 0.53 %. As the interest rate increases then non-payment of interest due or principal or both increases, thus accumulation of nonperforming assets in the banking sector also increases. Role of inflation rate is also significant for the accumulation of bank's nonperforming assets in Indian banking sector. Thus, bank's nonperforming asset is negatively influenced by the inflation rate also. But the bank specific both the factors gross advances and gross assets are significantly influencing the amount of accumulation of bank's nonperforming asset. There exits significant inverse relationship between accumulation of bank's nonperforming asset and amount of bank's gross advances. If the amount of bank loan in some productive activity increases, nonperforming loan decreases and if the amount of bank loan decreases, nonperforming asset increases. Thus 1% increase in bank's gross advances decreases bank's nonperforming assets by 1.29 %. This is large in magnitude. There exits significant positive relationship between accumulation of bank's nonperforming asset and amount of bank's gross assets. 1% increase in bank's gross assets increases bank's nonperforming assets by 2.61 %. This implies as the amount of bank asset or bank size increases the amount of nonperforming loan also increases and vice versa.

From table 2 we are also getting the value of sigma u equal to 0.11, which is the value of standard deviation of individual specific effect. This value is very small in magnitude. Thus, cross section effect is not significant. Bank specific individuality factor has no influential impact on accumulation of non-performing assets. Therefore, we are not rejecting the null hypothesis that institutional characteristics have no differential impact on accumulation of banks' non-performing assets of different groups of banks in Indian banking industry.

Empirical results suggest that there is significant relationship exists between the GDP growth and accumulation of nonperforming assets in emerging economy like India. Swamy (2012) study found that GDP growth rate has no significance on accumulation of NPAs. Whereas Das and Ghosh (2007) study found significant role of GDP leads to a decline in problem loans. In this present study interest rate is also positively significantly influencing the accumulation of nonperforming assets (Shingjergji 2013). Upward movement of interest rate makes accumulation of nonperforming assets. Whereas Swamy (2012) and Das and Ghosh (2007) study found the opposite result that real interest rates did not seem to exert any significant influence on problem loans. Bank specific factor gross advances have significance negative influence on the accumulation of nonperforming loans. If the amount of bank loan increases, then it will decrease the accumulation of NPAs **(**Ranjan and Dhal 2003). Again, Bank specific factor gross assets have significance positive influence on the accumulation of nonperforming loans. If the bank size increases in terms of bank assets, then it also increases bank's nonperforming assets **(**Ranjan and Dhal 2003).Present study also found that the individual bank specific character have no differential effect on the amount of accumulation of nonperforming assets. Swamy (2012) study found the opposite result that some banks had advantages in

terms of their efficiencies in better credit management that contains non-performing assets.

5. CONCLUSION

From the result of this study we can conclude that real GDP have significant effect on the accumulation of nonperforming assets in the banking sector. In general theory we get that there must be a negative relation between GDP growth and accumulation of NPA. If the GDP growth of a country decreases, then accumulation of NPA increases in the banking sector and vice versa. In previous thoughts accumulation of NPA occurred because of mainly loan default in the priority sector; such as loan in the agriculture sector, loan in subsidize sector. We are getting significant relation between GDP and NPA. Thus, the accumulation of banks' NPA is not mainly due to the priority sector lending in Indian economy. There may be some big corporate industry's loan default for which accumulation of NPA occurred in the Indian banking sector. Thus, if GDP growth of Indian economy decrease it have significant impact for accumulation of banks' NPAs. In a developing country like India real growth play significant role in reduction of nonperforming assets in Indian banking sector. Thus, null hypothesis is accepted of this study that GDP growth influence accumulation of banks' non-performing assets.

Financial variable interest rate has significant influence on the accumulation of nonperforming assets. Speculation is present in the Indian financial sector. If the present rate of interest increases people do not like to deposit the interest payment or the principle money or both, in expectation of decrease in future interest rate and this will lead to accumulation of nonperforming loans in the Indian banking sector.

Bank specific both factors are significant for accumulation of nonperforming assets in Indian banking industry. Increase in the amount of bank advances for investment, increases the amount of productive activity, this accumulates more profit returns and re-payment of debt, this reduces the amount of nonperforming assets accumulation in a developing country India. Thus, bank's credit flow can influence accumulation of banks' non-performing assets. Bank size increase in terms of bank assets, increases the amount of loans, this also increases the amount of debt payment and accumulates nonperforming assets in banking sector of Indian economy.

Finally, we are not getting any significant differences in accumulation of nonperforming assets in different banking sector. Thus, institutional characteristics have no differential impact on accumulation of banks' non-performing assets of different groups of banks of developing country India.

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APPENDIX

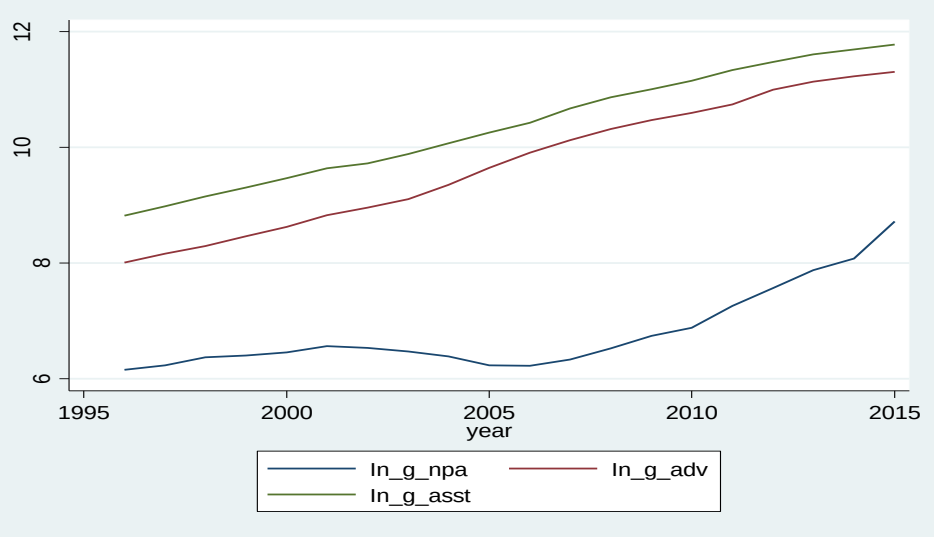

Figure 1: *Scheduled Commercial Banks' gross NPA, gross advances and gross assets*
Source: Handbook of Statistics on Indian Economy 2013and 2016, RBI.

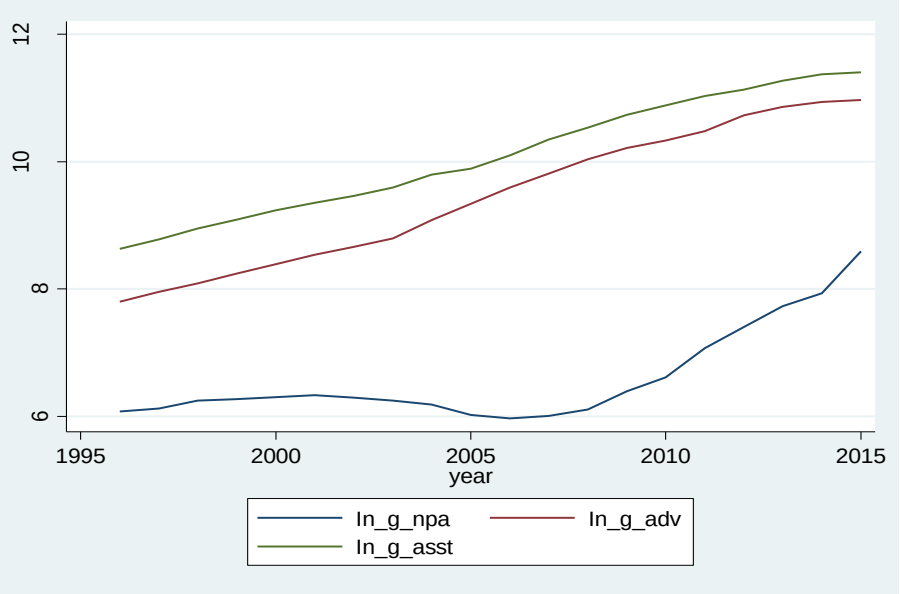

Figure 2: *Public Sector Banks' gross NPA, gross advances and gross assets*
Source: Handbook of Statistics on Indian Economy2013and 2016, RBI.

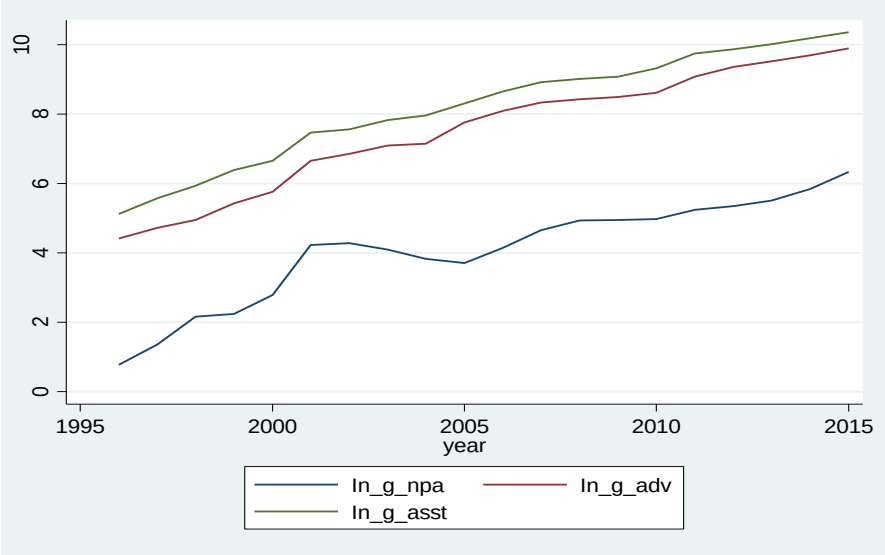

Figure 3: *New Private Sector Banks' gross NPA, gross advances and gross assets*
Source: Handbook of Statistics on Indian Economy2013 and 2016, RBI.

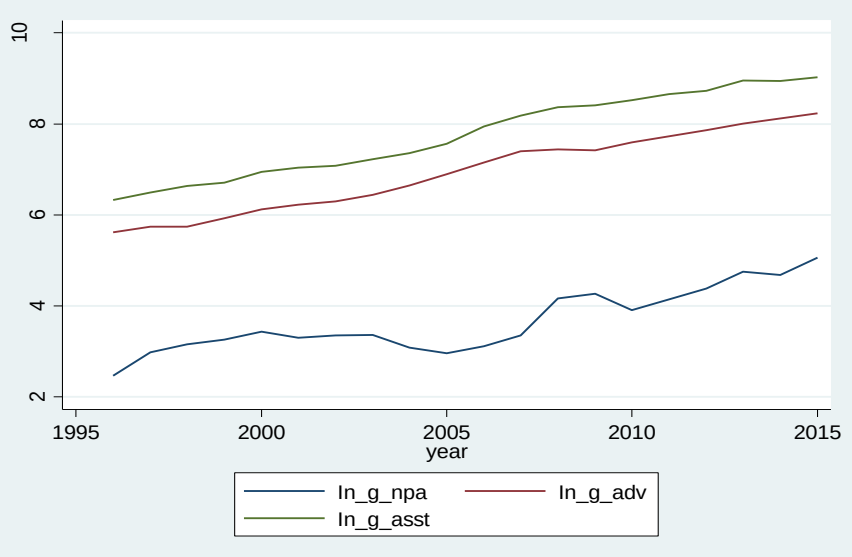

Figure 4: *Foreign Banks' gross NPA, gross advances and gross assets*
Source: Handbook of Statistics on Indian Economy 2013 and 2016, RBI.

Table 3. *Result of Hausman test*

χ^2 (5)
0.67

Note: χ^2 (5) denotes chi-square distribution with 5 degrees of freedom.

Source: Author's estimation based on data from Handbook of Statistics on Indian Economy2013 and 2016, RBI

Note: The Reserve Bank of India defines **Net NPA** as **Net NPA** = **Gross NPA** – (Balance in Interest Suspense account + DICGC/ECGC claims received and held pending adjustment + Part payment received and kept in suspense account + Total provisions held).