NPAs in India's banks: trends and determinants

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Abstract

Purpose – This paper aims to analyse trends and determinants of NPAs in India's banks. It has empirically examined the bank-specific determinants of NPAs.

Design/methodology/approach – An FE panel estimation of a sample of 44 banks was carried out for the post-crisis time period, from 2010 to 2020 to identify the bank-specific determinants of NPAs. The sample of 44 banks includes 20 PSBs, 19 private banks and 5 foreign banks. Separate FE estimation was also carried out to identify the drivers of NPAs in PSBs.

Findings – The determinant of NPAs during the post-crisis period suggests that faulty earning management and deterioration in loan quality have resulted in high NPAs in India's banks. The result is similar for PSBs as well.

Research limitations/implications – The findings of the study suggest that the banks, especially the Public Sector Banks (PSBs) need to revisit their earning management strategies to maximise income and improve their loan quality in order to reduce the incidence of loan failure.

Originality/value – The paper contributes by empirically analysing the determinants of NPAs during the recent decade, between 2010 and 2020. Separate estimations have been carried out to understand whether the drivers of NPAs differ in the case of PSBs.

Keywords NPAs, India's banks, PSBs, Loan failure

Paper type Research paper

1. Introduction

In recent decades, India's banking sector has experienced two episodes of crisis with respect to the nonperformance of their advances or loans, one in the mid-1990s and the other which has been ongoing since 2014–2015. While there seem to be a few similarities between the two phases of the crisis, the current non-performing advances (NPA) crisis, however, is more severe in terms of the volume of failed loans turning into NPAs, thereby affecting the financial health of the banks. The growing incidence of loan failures is a major source of stress for the banking system. In terms of bank groups by ownership, it is largely the public sector banks (PSBs) that are severely affected vis-à-vis their private counterparts during both periods. However, the current phase appears to be more severe for both the PSBs and the private banks due to the higher volume of accumulated NPAs, though NPAs in the private banks are less than that of their public counterparts. The accumulation of NPAs can negatively affect

The data that support the findings of this study are collected from public domain resources. It is available at https://dbie.rbi.org.in/DBIE/dbie.rbi?site=publications [RBI publications/database on Indian economy].

the macroeconomic performance though it has negative effect on lending activities in the economy (Serrano, 2021). A significant increase in NPLs is likely to have a destabilising effect on the banking system, thereby affecting tier balance sheets and overall financial health (Park and Shin, 2021; Das and Uppal, 2021).

There can be several factors that are responsible for high NPAs during the last decade in India's banks. From the point of view of a bank, the drivers of credit risks can be internal and external. While internal factors are those which are internal to banking operations, the external factors are exogenous in nature. Major macroeconomic determinants of NPAs include adverse economic conditions, weak banking regulations and supervision, inadequate corporate governance and weak market monitoring (Keeton and Morris, 1987; Salas and Saurina, 2002; Espinoza and Prasad, 2010; Nkusu, 2011; Lokare, 2014; Samantaraya, 2016). On the other hand, bank-specific factors which drive NPAs include operational inefficiency, quality of lending, earning management and capital adequacy (Keeton and Morris, 1987; Berger and Deyoung, 1997; Kwan and Eisenbeis, 1997; Salas and Saurina, 2002; Muniappan, 2002; Arora, 2013; Dhar and Bakshi, 2015; Patra and Padhi, 2016; Bawa et al., 2019; Ozili, 2019).

The paper analyses the trends and determinants of NPAs in India's banks, with emphasis on the post-financial crisis period. There are very few studies which have analysed the bank-specific drivers of the current phase of NPAs in India's banks. Accordingly, bank-specific factors or drivers of NPAs in India's banks have been empirically estimated for the post-crisis period (2010–2020). Most of the studies that have empirically the drivers of the current phase of NPAs in banks in India have emphasised the role of macroeconomic factors in the current NPA crisis. The present paper contributes to the literature by exploring the bank-specific determinates of NPAs and explains the current NPAs crisis through the bank-specific variables or determinants.

The paper spreads over seven sections. The introduction to the paper has been presented in Section1. The trend and composition of NPAs have been analysed in Section 2. A review of literature related to determinants of NPAs has been presented in Section 3. Data and methodology, including variables and estimation model, has been discussed in Section 4. The empirical results have been presented in Section 5. It has been followed by a discussion of results in Section 6. Finally, Section 7 provides the concluding remarks.

2. NAPs in India's banks

The current crisis in India's banking system is largely due to the unprecedented accumulation of non-performing loans. All banks, irrespective of their ownership, have registered a substantial volume of bad loans, though the incidence of NPA is prevalent in the PSBs. The widespread prevalence of bald loans came to light with the conduct of an asset quality review (AQR) in 2015 by the RBI. The ratio of nonperforming advances to total advances (GNPA ratio) of the Scheduled Commercial Banks has risen significantly to a mammoth 11.2% in 2017–18 (Table 1). The NPA figures of the PSBs increased significantly, from 2% in 2008–09 to 14.6% in 2017–2018. Similarly, the GNPA ratio of the private banks increased to 5.45% in 2019–2020. The foreign banks also recorded substantial rise in their NPA figures. However, recent data suggests that it declined in later years.

The GNPA ratio of PSBs shows considerable variation among the banks. The average GNPA ratio of different time periods has been analysed to identify banks with high exposure to bad loans (Table 2). The average GNPA ratio of most of the PSBs was moderately low, ranging from about 1.5% to about 4.5% between 2009 and 2014. The GNPA ratio is found to be significantly high for most of the banks during 2015–20. The average NPA figures during this period varied from 7.1% GNPA ratio (Indian Bank) to 20.3% (Indian Overseas Bank). Following the AQR exercise of the RBI, the NPA figures of PSBs spiked up during this period.

The average GNPA ratio of private banks as a whole does not suggest any deep crisis, though NPA figures have increased between 2015 and 2020 (Table 2). Most of the leading private banks did not experience a high GNPA ratio except for ICICI Bank. The average

Year (end March)	All SCBs		Public sector banks		Private banks		Foreign banks	
	Gross NPAs	Net NPAs	Gross NPAs	Net NPAs	Gross NPAs	Net NPAs	Gross NPAs	Net NPAs
NPAs as % of Advances								
2005–06	3.3	1.2	3.7	1.3	2.4	1	2.1	0.8
2006–07	2.5	1	2.7	1.1	2.2	1	1.9	0.7
2007–08	2.2	1	2.2	1	2.5	1.1	1.9	0.8
2008–09	2.3	1.1	2	0.9	2.9	1.3	4.4	1.8
2009–10	2.5	1.1	2.3	1.1	3	1	4.4	1.8
2010–11	2.4	1	2.3	1.1	2.5	0.6	2.6	0.7
2011–12	2.9	1.3	3.2	1.5	2.1	0.5	2.8	0.6
2012–13	3.2	1.7	3.6	2	1.8	0.5	3	1
2013–14	3.8	2.1	4.4	2.6	1.8	0.7	3.9	1.1
2014–15	4.3	2.4	5	2.9	2.1	0.9	3.2	0.5
2015–16	7.5	4.4	9.3	5.7	2.8	1.4	4.2	0.8
2016–17	9.3	5.3	11.7	6.9	4.1	2.2	4	0.6
2017–18	11.2	6	14.6	8	4.7	2.4	3.8	0.4
2018–19	9.08	3.7	11.59	4.8	5.3	2	2.99	0.5
2019–20	8.21	2.8	10.25	3.7	5.45	1.5	2.34	0.5

Source(s): Calculation based on RBI data

Table 1.
Bank group-wise
NPAs in India's banks:
2005–2020

Name of the bank	Category	2005–09	2009–14	2015–20
Allahabad Bank	PSB	3.23	2.81	14.69
Andhra Bank	PSB	1.54	2.37	14
Bank of Baroda	PSB	3.35	1.96	10.34
Bank of India	PSB	3	2.79	14.7
Bank of Maharashtra	PSB	4.18	2.44	14.99
Canara Bank	PSB	2.1	1.9	9.55
Central Bank of India	PSB	5.4	3.78	17.89
Corporation Bank	PSB	2.13	1.58	13.64
Dena Bank	PSB	4.95	2.42	13.87
Indian Bank	PSB	2.21	1.93	7.1
Indian Overseas Bank	PSB	3.04	3.63	20.36
Oriental Bank of Commerce	PSB	4.41	2.6	13.25
Punjab and Sind Bank	PSB	6.16	1.88	10.83
Punjab National Bank	PSB	3.61	2.99	14.7
Syndicate Bank	PSB	3.35	2.4	10.03
UCO Bank	PSB	3.32	3.52	19.92
Union Bank of India	PSB	3.19	2.8	12.94
United Bank of India	PSB	3.99	4.45	16.55
Vijay Bank	PSB	2.39	2.4	5.23
State Bank of India	PSB	3.31	3.71	8.01
IDBI Ltd	PSB	1.91	2.57	16.41
All PSBs	*PSB*	*3.13*	*2.63*	*11.49*
HDFC Bank Ltd	Private	1.57	1.2	1.17
ICICI Bank Ltd	Private	3.1	4.62	7.58
IndusInd Bank Ltd	Private	2.82	1.16	1.8
Kotak Mahindra Bank Ltd	Private	2.22	2.51	2.31
Yes Bank Ltd	Private	0.16	0.32	4.72
Axis Bank	Private	1.44	1.24	4.71
All Private Banks	*Private*	*2.76*	*2.34*	*4.44*

Note(s): *In 2018, Vijay Bank and Dena Bank were merged with the Bank of Baroda
Source(s): Calculation based on RBI data

Table 2.
Average GNPA ratio of
PSBs and leading
private banks (%)

GNPA ratio of the ICICI Bank between 2015 and 2020 stood at 7.6%, which is the highest among leading private banks. The Axis Bank averaged a GNPA ratio of 4.7% between 2015 and 2020, which is higher than that of several private banks. It is interesting to note that another leading private bank, the HDFC Bank, did not record a rise in its GNPA ratio. On the contrary, it saw a decline in its average GNPA ratio during the same time period.

3. Determinants of NPAs: review of literature

Broadly, from the perspective of banks, the determinants of NPAs can be classified into two categories – internal and external factors. The internal factors are those which are internal to banking operation. On the other hand, the external factors are those that are exogenous to bank's operation, however, can influence the loan outcome. It includes macroeconomic factors, industry-specific factors and regulatory factors. Major determinants of NPAs that have been pointed out in literature include adverse economic conditions, weak banking regulations and supervision, inadequate corporate governance and weak market monitoring. Several studies have concluded the critical role of macroeconomic factors in driving NPAs (Keeton and Morris, 1987; Salas and Saurina, 2002; Espinoza and Prasad, 2010; Nkusu, 2011; Lokare, 2014; Samantaraya, 2016). Along with macroeconomic and bank-level factors, financial development and structure of the financial sector have been taken into consideration while explaining NPLs. A study by Ozili (2019) looks into the role of financial development in the persistence of NPLs. His cross-country analysis suggests that NPL increases with an increase in financial development, due to weak supervision in the process of financial intermediation (Ozili, 2019). However, the present study restricts its analysis with a focus on the bank-specific determinants of NPAs.

Several studies analyzing bank-specific determinants of NPAs or credit risks have been undertaken in different countries, including India (Keeton and Morris, 1987; Berger and Deyoung, 1997; Kwan and Eisenbeis, 1997; Salas and Saurina, 2002; Muniappan, 2002; Arora, 2013; Dhar and Bakshi, 2015; Patra and Padhi, 2016; Bawa et al., 2019). Berger and Deyoung (1997) in their study of commercial banks in the USA, between 1985 and 1994 found that operational inefficiency as reflected in low credit appraisal skills and practices leads to high NPAs. Low-cost efficiency is a sign of poor management practices which could happen if managers do not efficiently monitor and control their operating expenses. If they do not practice adequate loan underwriting, monitoring and control, it can result in higher NPAs (Berger and Young, 1997). Kwan and Eisenbeis (1997) found that banks with higher capital usually achieve greater operational efficiency and are likely to take less credit risks vis-à-vis banks with lower capital. Therefore, banks with higher capital are likely to have lower NPAs. Salas and Saurina (2002) found that when a bank enters a new geographical market, it could face adverse selection problems. It is because as the banks do not have past experience in a sector or geographical region in which it enters, then the problem of adverse selection problem may lead to a higher probability of NPA. They found the degree of competition among banks is another factor that can increase problem loans. Higher competition increases manager's incentive to take risks by deteriorating bank's interest margin and so they would be tempted to lend to customers with lower credit quality, which could translate into higher problem loans. Therefore, higher competition could lead to higher NPAs (Salas and Saurina, 2002).

Several studies have been undertaken in recent decades to explain credit risks in Indian banks. A study of PSBs by Ranjan and Dhal (2003) suggests that credit terms and macroeconomic conditions did influence credit risks among the PSBs. Similarly, a study by Das and Ghosh (2007), while analysing credit risks, concluded that pro-cyclicality and deteriorating capital adequacy ratio are responsible for credit risks among banks in India. A study of PSBs by Dhar and Bakshi (2015) for the period, from 2001 to 2005 reported that bank-specific factors like interest income (net interest margin) and ROA did significantly influence loan failures. A study by Patra and Padhi (2016) found a significant association

between capital adequacy ratio and ROA. Similarly, low quality of credit has been attributed as a major reason behind high credit risks in banks in India (Gaur and Mohapatra, 2020; Arora, 2013). A study by Muniappan (2002) suggests that negligent supervision following the detection and prevention of diversion of funds post credit disbursal is a major factor leading to higher NPAs.

4. Data and methodology

4.1 Data
A sample of 44 Indian commercial banks have been drawn for the purpose of estimation of determinants of NPAs. The sample of 44 banks includes 20 PSBs, 19 private banks and 5 foreign banks. The estimation has been done for the post-crisis time period, from 2010 to 2020. Data for the sample of 44 banks has been collected from the publications of the Reserve Bank of India – Statistical Tables Relating Banks in India and Handbook of Statistics on Indian Economy.

4.2 Variables
The focus of this paper is to analyse the drivers of NPAs which are internal to the banks and their operation. In the estimation, NPA is the dependent variable which is determined by a set of regressors. The independent variables include Operational (in)Efficiency (OC), Non-Interest Income (NII), Interest Income (II), Profitability (ROA), Capital Adequacy (CAR), Loan to sensitive sectors (LSS) and Secured Lending (SL).

4.2.1 NPAs. In this study, the net NPAs have been used a measure of NPAs. The net NPAs have been chosen as they reflect the actual burden on the banks (Prasanna *et al.*, 2014). The NNPA rate is a ratio of net NPA to total advances by the banks in percentage term. A similar measure has been employed in studies by Das and Uppal (2021), Bawa *et al.* (2019) and Prasanna *et al.* (2014).

4.2.2 Operating efficiency. Operational efficiency which reflects the management quality can significantly determine the failure or success of a loan. Poor or inadequate management will result in higher NPAs owing to poor management practices (Berger and Deyoung, 1997; Ghosh, 2014). In this study, operational efficiency has been measured as the ratio of operational income to total interest income in percentage terms. This measure was followed in a study by Das and Uppal (2021).

4.2.3 Non-interest income. Non-interest income reflects the diversification of income (Ghosh, 2014). It is the income of the banks that does not arise from lending activities. The major sources of non-interest income include profit originating from the sale of investment securities, foreign exchanges, service charges, commissions and fees. In this study, it is measured as non-interest income as a ratio of total income in percentage terms. Literature suggests that diversification of earning and NPA is likely to be exhibit negative association as banks are unlikely to undertake risky lending (Bawa *et al.*, 2019; Ghosh, 2014; Ozili, 2019). On the other hand, they can also exhibit positive associations due to the fact that with diversified income, banks tend to compromise with credit standards in terms of assessment of loan proposals, thereby resulting in higher NPAs.

4.2.4 Interest income. Interest income which reflects the earning quality of banks is the net interest margin. Literature suggests a negative association between interest income and NPAs. This is owing to the fact that with falling interest income, banks may undertake risky lending in order to compensate their income by earning more interest from their lending. This is likely to result in an increase in NPAs (Dhar and Bakshi, 2015; Salas and Saurina, 2002).

4.2.5 ROA. Return on Assets (ROA) reflects on the earning management of the banks. It is expected that ROA and NPA are likely to exhibit a negative relationship (Dimitrios *et al.*, 2016; Godlewski, 2004; Salas and Saurina, 2002). Falling profitability (ROA) due to declining

interest earning might result in higher NPAs, as the banks are very likely to undertake risky lending.

4.2.6 Capital adequacy. Capital adequacy ratio reflects the risk-absorbing capacity of a bank. A well-capitalised bank with a higher capital adequacy ratio is likely to absorb the risks better. Hence, capital adequacy ratio and NPA exhibit a negative relationship, which suggests that the higher the capital adequacy ratio lower the NPA rate (Makri *et al.*, 2014; Bardhan and Mukherjee, 2013; Ozili, 2019).

4.2.7 Loan to sensitive sectors. The composition of the loan portfolio of the banks is likely to affect the rate of NPA (Ghosh, 2014). Literature suggests that both these variables exhibit a positive relationship with NPA (Dhar and Bakshi, 2015). It implies higher the share of lending to sensitive sectors in a bank's lending portfolio higher be NPA.

4.2.8 Secured loans. A higher proportion of loans backed by collaterals in bank's lending portfolio can affect NPAs in both ways. Some studies suggest that the higher the proportion of secured loans, the lower the NPA rate (Salas and Saurina, 2002; Bawa *et al.*, 2019; Boot and Thakor, 1994). On the other hand, another set of studies suggest that the higher the proportion of secured loans backed by collaterals, the higher will be NPAs due to higher credit risks. This is because banks tend to compromise with their credit standards in the presence of collateral, leading to higher credit risks (Berger and Udell, 1990, 1995; Lis *et al.*, 2000; Jiménez and Saurina, 2003).

4.3 Estimation model

The panel data estimation has been carried out to examine the bank-specific determinants of NPAs in banks during the post-financial crisis period. The determinants of NPAs have been estimated by using the following functional form.

$$
\begin{aligned}
Net\ Non-Performing\ Asset_{i,t} = {} & \beta_0 + \beta_1 Operating\ Cost_{i,t} + \beta_2 Interest\ Income_{i,t} \\
& + \beta_3 Non-Interest\ Income_{i,t} + \beta_4 Capital\ Adequacy_{i,t} \\
& + \beta_5 Loans\ to\ Sensitive\ Sectors_{i,t} + \beta_6 Return\ on\ Assets_{i,t} \\
& + \beta_7 Secured\ Loans_{i,t} + \varepsilon_{i,t}
\end{aligned}
$$

$$(1)$$

where, i = bank, 1, ...n, and t = time, 1, ...,n and $\varepsilon_{i,t}$ is the error term.

In equation (1), seven bank-specific determinants of NPAs have been presented that reflect their operational efficiency, earning management, loan quality and capital adequacy. The present study will employ both the Fixed and Random approach to empirically estimate the determinants of NPAs in India's banks.

The FE model that has been employed to estimate the determinants of NPAs is as per the following:

$$
NNPA_{i,t} = C + \beta_1 OC_{i,t} + \beta_2 II_{i,t} + \beta_3 NII_{i,t} + \beta_4 CRA_{i,t} + \beta_5 LSS_{i,t} + \beta_6 ROA_{i,t} + \beta_7 SL_{i,t} + \mu_i + u_{i,t}
$$

$$(2)$$

where i = bank, 1, ...45, and t = time, 1, ...,10.

In the above equation (2), the dependent variable $NNPA_{i,t}$ is determined by a set of explanatory variables. The unobserved individual bank effect is μ_i, and the random error is, $u_{i,t}$. It is assumes that the above explanatory variables are uncorrelated with the error term

$u_{i,t}$, which is normally distributed, $u_{i,t} \sim N(0, \sigma_u^2)$, where σ_u^2 is > 0. The benefit of using FE model is that it analyses the impact of time-variant variables (Das and Uppal, 2021). At the same time, it also controls for all time-invariant heterogeneity among the sample banks' characteristics (Torres-Reyna, 2007).

Along with the above FE model, the following RE model (3) has been employed to estimate the factors that affect NPAs in India's banks.

$$NNPA_{i,t} = C + \beta_1 OC_{i,t} + \beta_2 II_{i,t} + \beta_3 NII_{i,t} + \beta_4 CAR_{i,t} + \beta_5 LSS_{i,t} + \beta_6 ROA_{i,t} + \beta_7 SL_{i,t} + \mu + u_{i,t}$$
$$+ \varepsilon_{i,t}$$

(3)

In the above equation (3), it is assumed that the error term is uncorrelated with the explanatory variables. The benefit of estimating the RE model is that we can generalise the inferences beyond the drawn sample (Torres-Reyna, 2007).

5. Results

5.1 All banks

The summary statistics of the variables which have been used in estimating the determinants of NPAs of a sample of 44 banks are presented in Table 3. The descriptive statistics of the dependent and independent variables have been presented for the period, from 2010 to 2020. The results show that the dependent variable NNPA ranges from 0.10 (min) to 16.7 (max) with a mean value of NNPA of 2.85. The minimum and maximum values of the explanatory variables demonstrate variability, ranging from low to high. The mean and standard deviation values suggest variation between the two.

The correlation coefficients of the variables that have been used in the regression analysis is presented in Table 4. The result shows that it is free from the problem of multicollinearity.

Equation 2 and 3 have been estimated to identify the drivers of NPAs in banks in India. The determinants of NPAs have been estimated for the time period from 2010 to 2020 for 44 commercial banks. The estimated results of the FE model suggest that NPA is negatively associated with operating cost (OC) for the sample of banks (Table 5). However, their association is not statistically significant. A negative association suggests that operating cost did not drive NPAs. Interest income (II) is also negatively associated with NPAs. The non-interest income (NII) is found to be positively associated with NPAs and the relationship is statistically significant. Return on Assets (ROA) which reflects the earning management of the banks exhibit an inverse relationship with NPAs and the association is found to be statistically significant. Secured loans (SL) exhibit a positive association with NPAs and it is found to be statistically significant. Similarly, the estimates of the RE model suggest that

Variable	Obs	Mean	SD	Min	Max
NNPA	472	2.85	2.99	0.10	16.70
OC	472	0.25	0.08	0.10	0.60
II	472	2.75	0.81	0.10	6.30
NII	472	1.18	0.52	0.20	3.40
LSS	472	19.73	10.76	4.70	72.10
CAR	472	13.51	3.34	1.10	56.40
ROA	472	0.54	1.16	−5.50	3.00
SL	472	82.76	14.62	18.20	99.80
Source(s): Author's calculation					

Table 3.
All banks: summary
statistics of the
dependent and
explanatory variables

operating cost and ROA are negatively associated with NPAs and their associations are statistically significant. NII exhibit a positive relationship with NPAs and their association is statistically significant. The result of the Hausman test suggests that the FE estimate is appropriate for the drawn sample as the estimated "p" value is greater than 0.05 (Table 5).

5.2 PSBs

The incidence of loan failures is rampant in PSBs. To explore the drivers of bad loans in PSBs, the determinants of NPAs in PSBs have been estimated with a set of variables for the time period, from 2010 to 2020. The summary statistics of the dependent and independent variables are presented in Table 6. The descriptive statistics suggest variability, with minimum and maximum numbers ranging from low to high. Also, the mean and standard deviation suggest variability of the data. The correlation coefficient of the variables used in the regression analysis has been estimated to check the presence of multicollinearity. The estimated result suggests that it is free from the problem of multicollinearity (Table 7).

	NNPA	OC	II	NII	LSS	CAR	ROA	SL
NNPA	1							
OC	−0.1412	1						
II	−0.5189	0.4305	1					
NII	−0.2302	0.5038	0.6002	1				
LSS	−0.0757	0.3818	0.347	0.4912	1			
CAR	−0.4228	0.3064	0.4522	0.2945	0.1993	1		
ROA	−0.6433	0.0429	0.6421	0.4376	0.1552	0.4666	1	
SL	0.3042	−0.4729	−0.4553	−0.4164	−0.4792	−0.2796	−0.3807	1

Table 4.
Correlation matrix

Source(s): Author's calculation

Independent variable = NNPA	FE model	RE model
OC	−4.197	−5.946**
	(3.098)	(2.533)
II	−0.5817	−0.511
	(0.401)	(0.346)
NII	1.975*	1.416*
	(0.391)	(0.387)
LSS	−0.0436	−0.008
	(0.030)	(0.014)
CAR	0.027	−0.002
	(0.044)	(0.045)
ROA	−1.335*	−1.567*
	(0.187)	(0.200)
SL	0.0806*	0.009
	(0.017)	(0.010)
Constant	−3.513**	3.182*
	(1.410)	(1.154)
Observations	472	472
R^2	0.667	
Hausman statistics	81.41 (0.00)	

Tables 5.
Determinants of NPAs: all banks, 2010–2020

Note(s): Standard errors in parentheses
$^*p < 0.01$, $^{**}p < 0.05$, $^{***}p < 0.001$
Source(s): Author's calculation

The determinants of NPAs in PSBs have been estimated to explore the drivers of loan failures. Both the FE and RE models have been estimated to identify the drivers of NPAs in PSBs (Table 8). The estimates of the FE model suggest that II and ROA exhibit a negative relationship with NPAs. And their association is found to be statistically significant. SL is found to be positively associated with NPAs. On the other hand, the RE estimates suggest that while II exhibit a negative relationship with NPAs, SL exhibits a positive relationship. Their association is statistically significant. With respect to the appropriateness of the estimate, the Hausman test result suggests that the FE model is appropriate for the drawn sample.

6. Discussion

The regression results of all banks suggest that three key factors that have affected NPAs in banks – Non-Interest Income (NII), earning management (ROA) and loan quality (SL). NII is found to be positively associated with NPAs, which suggests that with an increase in non-interest income, banks have undertaken risky lending. And, higher risky lending has resulted in high NPAs. The estimated results exhibit an inverse relationship between ROA and NPAs. Their negative association suggests that deteriorating interest income resulted in risky lending by banks in order to maximise income which in turn resulted in high NPAs. A study by Prasanna *et al.* (2014) in their study on determinants of NPAs in India's banking system between 2000 and 2012 suggests a similar relationship. Secured loans as a percentage of total lending are found to be positively associated with NPAs. Literature suggests that usually secured loans are likely to result in low credit risks and, therefore, low NPAs (Boot and Thakor, 1994). However, a positive relationship suggests that in the presence of mortgages, banks have compromised with the project assessment which has led to high NPAs.

Variable	Obs	Mean	SD	Min	Max
NNPA	219	4.25	3.28	0.20	16.50
OC	219	0.21	0.05	0.10	0.60
II	219	2.31	0.42	1.00	3.60
NII	219	0.91	0.25	0.40	1.70
LSS	219	16.46	4.18	7.50	27.00
CAR	219	11.98	1.54	2.00	15.40
ROA	219	0.05	1.07	−5.50	1.70
SL	219	85.86	6.25	64.90	97.10
Source(s): Author's calculation					

Table 6.
PSBs: summary statistics of the dependent and explanatory variables

	NNPA	OC	II	NII	LSS	CAR	ROA	SL
NNPA	1							
OC	0.2872	1						
II	−0.4832	−0.0523	1					
NII	0.2558	0.3955	0.0139	1				
LSS	0.3512	0.4367	−0.0908	0.3277	1			
CAR	−0.4738	−0.3249	0.3244	0.0085	−0.1166	1		
ROA	−0.6095	−0.5305	0.4088	−0.1541	−0.4542	0.6082	1	
SL	0.4838	0.076	−0.1163	−0.0458	0.0634	−0.4372	−0.3646	1
Source(s): Author's calculation								

Table 7.
Correlation matrix

Independent variable = NNPA	FE model	RE model
OC	−5.253	−5.460
	(3.948)	(4.020)
II	−1.148**	−1.199**
	(0.515)	(0.494)
NII	1.433	1.749
	(1.379)	(1.228)
LSS	0.043	0.032
	(0.070)	(0.039)
CAR	−0.081	−0.717
	(0.137)	(0.254)
ROA	−0.491**	−0.101
	(0.227)	(0.138)
SL	0.080**	0.096*
	(0.037)	(0.034)
Constant	−2.409	−3.179
	(3.388)	(3.234)
Observations	219	219
R^2	0.85	
Hausman statistics	30.44	
	(0.023)	

Note(s): Standard errors in parentheses
$^{*}p < 0.01$, $^{**}p < 0.05$, $^{***}p < 0.001$
Source(s): Author's calculation

Tables 8.
Determinants of NPAs:
PSBs, 2010–2020

The results of the FE model for all banks suggest that earning management and loan quality are two key drivers of loan failure in India's banks.

A separate estimation has been done in order to identify the drivers of NPAs in PSBs as these bank groups constitute more than two-third of NPAs in the banking system. The estimated result shows that ROA is negatively associated with NPAs and SL is positively associated with NPAs. Interest income (II) is found to be negatively associated with NPAs. The results indicate that banks have undertaken risky lending and credit appraisal standards have been compromised while disbursing loans. A study by Gaur and Mohapatra (2020) found that compromise in the quality of lending has resulted in high NPAs India's PSBs. Another study by Dhar and Bakshi (2015), while analysing NPAs in PSBs, suggested that II and ROA play a critical role in the accumulation of NPAs. In the case of private banks, ROA is found to be negatively associated with NPAs as banks have undertaken risky lending to maximise returns. Patra and Padhi (2016) in their study on drivers of NPAs in different categories of banks in terms of ownership found that ROA was negatively associated with NPAs in the case of Nationalised, SBI & Associates and Private banks. Operating cost which measures operational efficiency is found to be negatively associated with NPAs. NII is positively associated with NPAs. It suggests that in a scenario of high income in the form of non-interest income, banks tend to compromise on credit appraisal standards.

7. Conclusion
The paper has analysed the trends and determinants of the NPA crisis in India's banking sector, with a focus on understanding the drivers of the current phase of the crisis. We found that the PSBs have been badly affected. The NPA problem is not prevalent in private banks as a group, though their volume of loan defaults has increased. The results suggest that diversification of income, earning management or strategy and loan quality have

significantly affected NPAs during the post-crisis period. Non-Interest Income (NII) which is a proxy for diversification of income is found to be positively associated with NPAs. It suggests that with an increase in non-interest income, banks have undertaken risky lending, thereby resulting in high NPAs. The relationship between ROA and NPAs was found to be negative suggesting, that declining interest income pushed the banks to undertake risky lending in order to maximise their earning. This has resulted in high NPAs. Secured loans as a percentage of total lending exhibited a positive relationship with NPAs, though literature suggests that usually secured loans are likely to result in low NPAs due to low credit risks. The above result suggests that in the presence of collaterals, the banks did not follow prescribed loan assessment standards which resulted in high credit risks, thus high NPAs. The result is almost similar in the case of PSBs. The findings suggest that banks should focus on improving scores on earning management and quality lending.

In the empirical analysis, three key bank-specific drivers of NPAs, namely, operational management (efficiency), earning management (efficiency) and lending quality have been taken into consideration while explaining high NPAs in India's banks. In addition to the above factors, the governance aspects of the banks can be another potential significant factor in explaining the drivers of the current phase of NPAs in banks in India.

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