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Statistical Investigation and Comparative Assessment of the Non-Performing Assets of Indian Commercial Banks

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ABSTRACT:
Non-performing assets (NPAs) have been a major cause of concern for Indian commercial banks in the recent past years. Many studies have been reported on the different aspects of NPAs in Indian banking system. However, there is a crucial lack of investigation on the comparative assessment of various types of banks such as Public sector banks, Private sector banks and foreign banks so that the trends of NPAs for each category are identified and the reasons underlying the differences among the levels of the NPAs and their trends could be highlighted and demarcated. The purpose of this study is to investigate all these crucial issues through systematic data collection and statistical testing. The outcome of this study will help in shedding more light on the correlation of NPAs with the profitability and comparative assessment of distinct classes of banks so as to identify the areas of opportunity for targeting of NPAs. Use of statistical tools would help in testing the significance of the various phenomenon associated with the NPAs.

Keywords: *Non-performing assets, Indian banking, Correlation, Hypothesis testing, ANOVA*

INTRODUCTION

It has been argued by a number of economists that a well developed financial system enables flow of savings and investments and hence, supports economic growth (King and Levine, 1993). For any nation, banking system plays a vital role in the development of its economy. India is not an exception in this regard. Bankers are the custodians and the distributors of the liquid capital of the country. The foremost function of the banking system is to mobilize the savings of the public by accepting deposits from the public. Deposit mobilization promotes the economic prosperity by controlling the monetary circulation and canalizing it for development and productive purposes.

While the primary function of banks is to lend funds as loans to various sectors such as agriculture, industry, personal loans, housing loans etc., in recent times the banks have become very cautious in extending loans. The reason being mounting non-performing assets (NPAs). NPAs beyond a certain level are indeed a cause of concern because credit is essential for economic growth and NPAs affect the smooth flow of credit. Banks raise resources not just on fresh deposits, but also by recycling the funds received from their borrowers. Thus, when a loan becomes non-performing, it affects recycling of credit and credit creation. Apart from this, NPAs affect profitability as well, as higher NPAs require more provisioning, which means that a

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large and significant part of the profits or revenue needs to e kept aside for provision against ad loans. A high level of NPA also puts strain on a bank net worth because banks are under pressure to maintain a desired level of Capital Adequacy and in the absence of comfortable profit level, banks eventually look towards their internal financial strength to fulfil the norms thereby slowly eroding the net worth.

The asset quality of banks can be assessed by monitoring the NPAs. Currently, banks and financial institutions and their customers rely on Reserve Bank of India (RBI) to publish the NPA data. This could potentially take a long time. Moreover, the relationship between the profitability of the banks and the level of the NPAs needs to be evaluated and tested for significance. There is a crucial lack of investigation on the comparative assessment of various types of banks such as Public sector banks, Private sector banks and foreign banks so that the trends of NPAs for each category are identified and the reasons underlying the differences among the levels of the NPAs and their trends could be highlighted and demarcated. The purpose of this study is to investigate all these crucial issues through systematic data collection and statistical testing. The outcome of this study will essentially be useful for providing an in depth understanding of the concept of NPA and its assessment for various categories of Indian Scheduled commercial banks (SCB's), the assessment of the correlation between the profitability of each type of SCB with the levels of NPA, the contrast of the levels of the NPAs among different types of SCBs, the contrast of the NPA ratios among various SCBs. The results obtained from the analysis of the data collected on all these aspects has also been discussed in the light of the sate of Indian economy and other variables influencing the economy such as government policies.

Meaning of NPA

Non Performing Asset means an asset or account of borrower, which has been classified by a bank or financial institution as sub-standard, doubtful or loss asset, in accordance with the directions or guidelines relating to asset classification issued by RBI.

An amount due under any credit facility is treated as "past due" when it has not been paid within 30 days from the due date. Due to the improvement in the payment and settlement systems, recovery climate, up gradation of technology in the banking system, etc., it was decided to dispense with 'past due' concept, with effect from March 31, 2001. Accordingly, with effect from March 31, 2004, a non-performing asset (NPA) shell be a loan or an advance where;

i) Interest and /or installment of principal remain overdue for a period of more than 90 days in respect of a Term Loan,

ii) The account remains 'out of order' for a period of more than 90 days, in respect of an overdraft/ cash Credit(OD/CC),

iii) The bill remains overdue for a period of more than 90 days in the case of bills purchased and discounted,

iv) Interest and/ or installment of principal remains overdue for two harvest seasons but for a period not exceeding two half years in the case of an advance granted for agricultural purpose, and

v) Any amount to be received remains overdue for a period of more than 90 days in respect of other accounts.

Literature Review

The accumulation of non-performing assets in banks has assumed great importance as it tends to reflect the asset quality as a whole (Meeker and Laura, 1987). Keeton and Morris (1987) were one of the earliest researchers to examine the causes of bad loans through a comprehensive analysis of more than 2470 insured banks in the United States from 1979-1985. They reported that the local economic conditions along with the weak performance of certain sectors contributed to the variation in the loan losses witnessed by these banks. Sinkey and Greenwalt (1991) used a simple linear regression model for loan losses in large commercial banks in the United States during 1984-1987. A significant positive relationship was observed between the loan losses and the internal factors such as high interest rates, excessive lending and external factors such as regional economical conditions. Jimenz and Saurina (2005) examined the Spanish banking sector from 1984 to 2003 and reported that in addition to GDP growth, NPLs are also determined by high real interest rates and lenient credit terms. Ranjan and Dhal (2003) employed panel regression analysis to

investigate the relation among NPAs of Indian commercial banks and favourable macroscopic conditions and financial factors such as maturity, cost and terms of credit, banks size and credit orientation.

Hu et al. (2006) assessed the relationship between NPLs and ownership structure of commercial banks in Taiwan with a panel dataset covering the period of 1996-1999. The study showed that the banks with higher government ownership recorded lower non-performing loans. The bank size was found to e negatively correlated to the NPLs. In the Indian context, the lending policy and credit policy have crucial impact on non performing loans (Reddy, 2002 and Karunakar et al., 2008). Many studies found the contradictory relationship between the efficiency and NPAs among all the bank groups, such as Berger et al. (1997); Indira and Vashistha (2002); Nachiket and Bhavana (2002), Gujral (2003) and Davis and Stone (2004). Several studies are based on PSBs and NPA which also confirmed the conversing effect of NPAs on the productivity of public sector banks (PSBs) such as Rajan and Dhal (2003); Prasad et al. (2004); Mohan (2005) and Tandon et al. (2009). Reddy (2004), discussed about the financial sector reforms in India which have progressed rapidly on aspects like interest rate deregulation, reduction in reserve requirements, barriers to entry, prudential norms and risk based supervision but the progress on the structural-institutional aspects has been much slower and is a cause for concern. The changes required to tackle the NPA problem were also suggested. This study also dealt with the experiences of other Asian countries in handling of NPAs and suggested mechanisms to handle the NPAs problem in India by drawing on experiences from other countries.

Nachiket (2002), attempted to highlight some major micro-level issues that are at the root of why unsustainable performance levels are being observed within Banks. The authors argued that unless the micro level issues are dealt with, even after the systemic issues are resolved, the problem of NPAs or other failures of the intermediation process may resurface with greater intensity. The manner in which banks manage the three phases in the life cycle of an asset (creation, monitoring and recovery) determines the quality of the intermediation process within a bank. Indian banking system, the current state and road ahead, the survey presented by FICCI (2010), reported that Indian banks have the capacity to absorb twice the amount of their current NPAs. However, the current crisis has exposed certain vulnerabilities and weaknesses within the system that the banks continue to be wary of. Almost 80% of the banks covered under the survey see personal loans as the greatest potential source of default followed by corporate loans and credit cards. Many banks additionally perceived a level of riskiness in farm loan and SME loan sectors.

Conceptual Framework

The NPA's have been demarcated into two basic classes:

a. GROSS NPA

Gross NPAs are the sum total of all loan assets that are classified as NPAs as per RBI guidelines as on Balance Sheet date. Gross NPA reflects the quality of the loans made by banks. It consists of all the non-standard assets like as sub-standard, doubtful and loss assets. It can be calculated with the help of following ratio:

$$Gross\ NPA\ Ratio = Gross\ NPA/Gross\ Advances \ldots\ldots\ldots(i)$$

b. NET NPA

Net NPAs are those type of NPAs in which the bank has deducted the provision regarding NPAs. Net NPA shows the actual burden of banks. Since in India, bank balance sheets contain a huge amount of NPAs and the process of recovery and write off of loans is very time consuming, the provisions the banks have to make against the NPAs according to the central bank guidelines, are quite significant. That is why the difference between gross and net NPA is quite high. It can be calculated by following:

$$Net\ NPA = \frac{Gross\ NPA - Provisions}{Gross\ Advances - Provisions} \quad \ldots\ldots\ldots(ii)$$

Indian Banking System- Vital Statistics

According to the RBI's 'Quarterly Statistics on Deposits and Credit of Scheduled Commercial Banks', September 2011, Nationalised Banks, as a group, accounted for

52.2 per cent of the aggregate deposits, while State Bank of India (SBI) and its associates accounted for 21.8 per cent. The share of new private sector banks, old private sector banks, foreign banks and regional rural banks in aggregate deposits was 13.7 per cent, 4.8 per cent, 4.6 per cent and 2.9 per cent, respectively.

With respect to gross bank credit also, nationalised banks hold the highest share of 51.6 per cent in the total bank credit, with SBI and its associates at 22.1 per cent and New Private sector banks at 13.8 per cent. Foreign banks, Old private sector banks and Regional Rural banks held a share of 5.2 per cent, 4.8 per cent and 2.5 per cent, respectively.

- ✓ Another statement released by the RBI stated that bank deposits grew 13.4 per cent to Rs 60.72 trillion (US$ 1.19 trillion) in the fiscal 2011-12 (the year to March 23, 2011), while loans and advances grew 17.08 per cent to Rs 47.54 trillion (US$ 930 billion).
- ✓ The RBI data reveals that India Inc raised US$ 2.7 billion through external commercial borrowings (ECBs) and foreign currency convertible bonds (FCCBs) in January 2012.
- ✓ Owing to a rise in core foreign currency assets (FCAs), India's foreign exchange reserves increased by US$ 862 million to US$ 294.82 billion for the week ended March 16, 2012.

In its Budget for 2012-13, the Government has earmarked a capital of Rs 15,888 crore (US$ 3.11 billion) to be infused in public sector banks, regional rural banks and other financial institutions, including NABARD (National Bank for Agriculture and Rural Development). Apart from this, the Government is also planning to set up a financial holding company that will raise funds for public sector banks.

RESEARCH METHOD

The objective of this study is to analyse the nature, extent and magnitude of NPAs of Indian SCB's as distinct groups (such as PSBs, Private sector banks and Foreign Banks) and to assess the possible correlation among the Profitability of the SCBs (as distinct groups) and the NPA levels. Further, the study is targeted at estimating the contrasts among the distinct groups of the SCBs for the levels of NPAs observed during the period selected (2001-2011). The significance of the estimated contrasts has also been assessed using statistical testing such as Analysis of Variance test, based on Fisher's ratio (F).

Research Design

Descriptive research has been used for the present study. The data regarding the NPAs has been collected from authentic sources such as RBI reports. The duration of the period selected for observing the trends of NPAs has been selected as 2001-2011, during which Indian economy witnessed many ups and downs. The data thus collected has been plotted in the form of charts and graphs and inferences have been drawn to demarcate the performance of banks in distinct groups. Also, the underlying facts and reasons for the trends observed in the data have been recognized and highlighted for better understanding of the state of Indian banking system with regard to their performance.

The following sets of hypothesis have been formed and would be tested for the collected data.

a) H0: There is no significant correlation between profits & NPAs of Public Sector Banks for the period of the study.

H1: There is a correlation between profits & NPAs of Public Sector Banks for the period of the study.

b) H0: There is no significant correlation between profits & NPAs of Private Sector Banks for the period of the study.

H1: There is a correlation between profits & NPAs of Private Sector Banks for the period of the study.

c) H0: There is no significant correlation between profits & NPAs of Foreign Banks for the period of the study.

H1: There is a correlation between profits & NPAs of Foreign Banks for the period of the study.

Hypothesis Testing Using T-test

The t-test based on the student's t-distribution has been used for testing the above listed hypothesis.

A t-test is any statistical hypothesis test in which the test statistic follows a Student's t distribution if the null hypothesis is supported. It can be used to determine if two sets of data are significantly different from each other, and is most commonly applied when the test statistic

would follow a normal distribution if the value of the variance in the test statistic were known. When the population variance is unknown and is replaced by an estimate based on the data, the test statistic (under certain conditions) follows a Student's t distribution. In the t-test comparing the means of two independent samples, the following assumptions should be met:

1. Each of the two populations being compared should follow a normal distribution. This can be tested using a normality test, such as the Shapiro–Wilk or Kolmogorov–Smirnov test, or it can be assessed graphically using a normal quintile plot.
2. The two populations being compared should have the same variance (testable using F test, Levene's test or assessable graphically using a Q–Q plot). If the sample sizes in the two groups being compared are equal, Student's original *t*-test is highly robust to the presence of unequal variances.
3. The data used to carry out the test should be sampled independently from the two populations being compared.

The collected data on the NPAs and the profits of the SCBs (group-wise) represents the two distinct populations in this study. The variance of the two populations can be assumed to be identical, as the sample size is equal, represented by the equal number of observations for the fixed period of study. The data has been collected from the most authentic sources, thus the independence assumption is also satisfied.

Analysis of Variance Test

Analysis of Variance test is a test of significance based on F ratio, known as Fisher's ratio. ANOVA test is focused on testing the significance of an independent parameter by comparing the variability observed in the data, among the parameters with the variability within the parameter being assessed. The ANOVA test has been used in this study to test the following hypothesis:

A. To Contrast the Net NPAs of PSBs, PRBs and Foreign Banks

H_0: There is no significant difference among the net NPAs for public sector banks, private sector banks and foreign banks for the period considered (2004-2011).

H_1: There is a significant difference among the net NPAs for public sector banks, private sector banks and foreign banks for the period considered (2004-2011).

B. To Contrast the NPA Ratio of PSBs, PRBs and Foreign Banks

H_0: There is no significant difference among the net NPA to net advances ratio for public sector banks, private sector banks and foreign banks for the period considered (2004-2011).

H_1: There is a significant difference among the net NPA to net advances ratio for public sector banks, private sector banks and foreign banks for the period considered (2004-2011).

RESULTS AND DISCUSSION

Scheduled Commercial banks (SCBs) in India remained robust against the backdrop of global financial crisis. It is noteworthy that contrary to the trend in some advanced countries, the leverage ratio (Tier I capital to total assets ratio) in India has remained high reflecting the strength of the Indian banking system. However, the Indian banking sector was not completely insulated from the effects of the slowdown of the India economy.

According to the consolidated balance sheet of SCBs, as shown in table 1, the Indian banking sector performed better in 2010-11 over the previous year despite the challenging operational environment. The banking business of SCBs recorded higher growth rate in 2010-11 as compared to their performance over last few years. Credits grew at 22.9% and deposits grew at 18.3% in 2010-11 over the previous financial year. Despite the growing pressure on margins owing to higher interest rate environment, the Return on Assets of SCBs improved to 1.10% in 2010-11 from 1.05% in 2009-10. The highest growth was recorded by new private sector banks followed by public sector banks. Yet, at the end of 2011, three fourth of the total banking assets belonged to PSBs followed by NRPBs (15%). The recapitalisation of the PSBs by Indian Government and the mobilisation of the funds from the stock market were the main reasons for the growth of the capital of SCBs in 2010-11. The growth in term deposits was found to increase whereas the growth in savings deposits decelerated, mainly due to high deposit interest rates.

Table 1: Growth in balance sheet of Indian banks (March 2011)

Item	Public Sector Banks		Private Sector Banks		Old Private Sector Banks		New Private Sector Banks		Foreign Banks		All scheduled commercial banks	
	2009-10	2010-11	2009-10	2010-11	2009-10	2010-11	2009-10	2010-11	2009-10	2010-11	2009-10	2010-11
Capital	0.1	40.7	7.3	5.6	8.7	9.7	6.7	4.1	19.7	15.9	12.3	21.9
Reserves and Surplus	16.8	19.2	21.0	15.9	15.9	18.7	22.0	15.4	12.3	18.2	17.5	18.1
Deposits	18.6	18.4	11.7	21.9	15.4	14.9	10.4	24.6	8.4	3.7	16.8	18.3
-Demand Deposits	18.4	11.3	33.5	18.1	22.5	12.2	35.9	19.2	12.7	6.8	20.9	12.4
-Savings Deposits	25.8	22.1	32.8	23.0	26.2	14.0	34.9	25.8	26.5	8.8	26.9	21.8
-Term Deposits	16.2	18.2	1.3	22.5	12.0	15.5	-3.1	25.8	2.2	0.6	12.9	18.2
Borrowings	21.4	25.9	8.5	24.5	40.6	26.4	6.9	24.4	-11.9	36.0	12.2	26.8
Other Liabilities	4.2	21.4	8.5	20.9	8.4	-1.0	8.5	25.5	-29.7	16.9	-4.6	20.4
Total Liabilities/Assets	17.9	19.2	12.0	21.5	15.8	14.9	10.9	23.5	-2.2	12.9	15.0	19.2
Cash and Balances with RBI	20.8	30.1	32.0	13.5	27.7	7.4	33.3	15.2	22.1	6.3	23.1	25.4
Investments	20.0	9.3	15.5	19.2	15.3	10.9	15.6	21.7	22.2	3.9	19.3	10.8
-Govt. securities	19.0	7.4	10.6	9.1	13.4	6.2	9.7	10.1	17.5	-4.7	17.3	6.6
-Other securities	-36.8	-38.2	43.4	-71.4	56.2	-82.2	-31.7	74.8	-41.7	-57.1	-34.6	-40.2
-Non-approved securities	28.4	20.1	27.6	41	20.5	24.9	29.5	45.0	37.7	28.1	29.2	27.6
Loans and advance	19.6	22.4	9.9	26.1	19.9	19.8	7.1	28.1	-1.3	19.8	16.6	22.9
-Bills purchased	10.4	30.3	30.7	21.2	19.1	10.3	37.2	25.0	46.9	18.2	16.3	27.5
-Cash credits, overdrafts etc.	22.9	26.9	9.6	28.4	20.8	23.4	2.5	32.1	2.5	24.8	19.9	27.0
-Term loans	18.1	18.2	9.0	25.7	19.2	17.8	7.0	27.3	-13.4	14.9	14.4	19.8
Fixed Assets	2.2	4.9	3.6	26.8	8.0	6.5	2.4	32.8	2.6	2.0	2.5	9.1
Other Assets	-0.2	32.9	-11.6	21.6	7.4	12.6	-14.5	23.3	-30.1	14.0	-14.1	24.7

Source- RBI report

Net NPAS of Indian SCBs

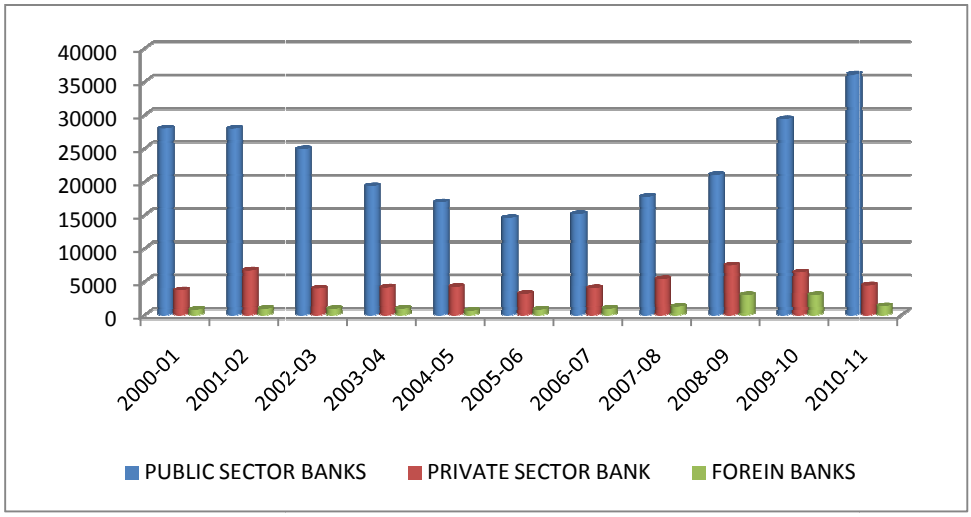
Figure 1 shows the variation of the Net NPAs of Indian SCBs for the period of the study (year 2001-2011). The interpretation of the figure 1 reveals that-

i. It is observed that net NPA of public sector banks has a declining trend up to year 2005-06 and after that it has a rising trend till 2010-11. The same trend has been observed in both Private and Foreign Sector Banks. The declining trend from 2003 to 2006 of NPA was due to the implementation of Securitization Act (2002).

ii. The net NPAs of private sector banks has a rising trend after 2006 but it again started declining after 2008-2009 because of improved bank policies and a better Way of collection of loans and other funds. The same trend has been observed in net NPAs of foreign sector banks like the NPAs of private sector banks but after 2008-09 NPAs declined at very slow rate 0.13% and had a great fall of 55.9% in 2010-11.

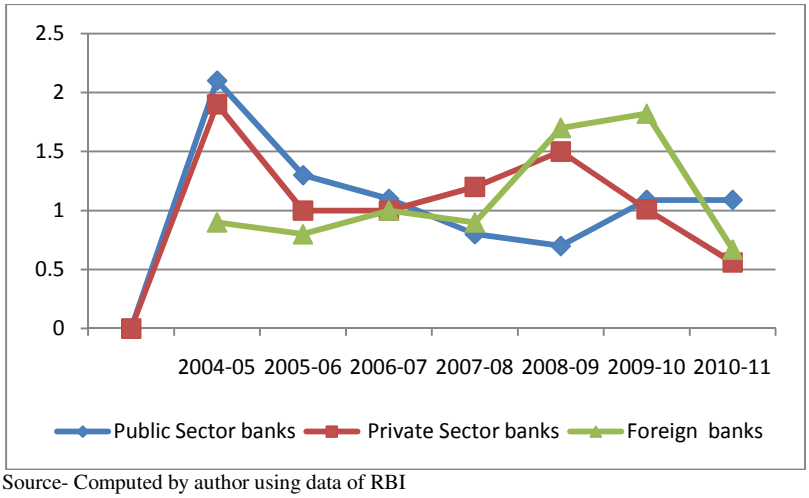
iii. The NPAs of PSBs have been much higher than the other two banks (PRBs and foreign banks). This could be attributed to the stagnation in specific industries with large share of loans. As on March 31, 2001, industry shared 43.58% of the outstanding credit of the PSBs. It was observed that textiles, paper, pig iron, steel and castings had high risks throughout the period. With liberalization and globalization and state emphasis on infrastructure building, the industries made heavy investments for capacity building, however, because of recession in the global economy, they could neither raise exports nor face adequate growth of domestic demand. This led to realization of higher NPAs by PSBs as PSBs had most of the exposure in such industries.

iv. The net NPAs of foreign banks have been on the lower side as compared to PSBs and PRBs. This may be partly because the foreign banks are already accustomed to NPA norms in their parent country. Further, various credit related welfare programs are carried out through public sector banks.



Source- Computed by author using data of RBI

Figure 1: Net NPA of Indian SCBs (in Rs. Crore)



Source- Computed by author using data of RBI

Figure 2: Net NPAs as percentage of net advances of SCBs

Net NPAS as Percentage of Net Advances of SCBs

Figure 2 represents the Net NPAs as percentage of net advances for Indian SCBs. Following inferences may be drawn from this figure-

i. From the above it is clearly observed that only public sector banks have succeeded in reducing net NPA against net advances made over the period of time. Public sector banks have been able to reduce this ratio by 66.7% from 2005 to 2009, due to stringent checks and control exercised by them. Whereas, in case of

private sector banks, it has exhibited a different type of trend, which is not continuous and unidirectional.

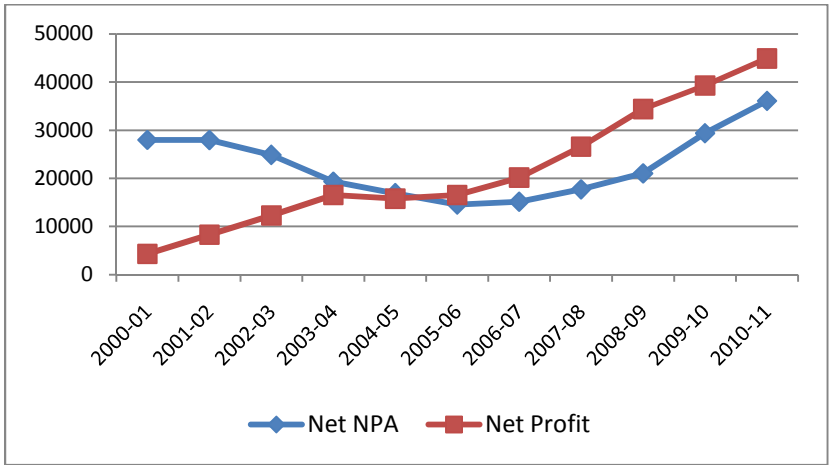
ii. In case of foreign banks the trend is fluctuating over the years. In the year 2008-09, the ratio increased by 89% where the foreign banks were badly affected by the global meltdown. Even for private sector banks, the ratio increased by 25% in 2009 due to financial crises.

Net Profit and Net NPA of PSBs

Following inferences may be drawn from figure 3.

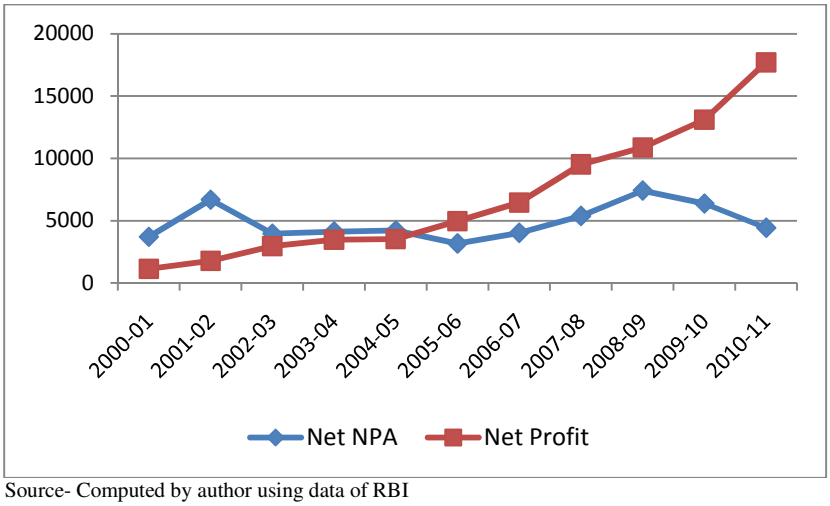
i. It is observed that there exists no particular relationship between net profit and net NPA of public sector banks. There is constant increase in net profit from 2000-01 to 2003-04 and from 2005-06 to 2010-11. The average of percentage increase in net profit YOY basis comes to 30%.

ii. On the contrary, public sector banks have managed to reduce net NPA constantly from 2001-02 to 2005-06, after which it has been continuously increasing. The average of percentage decrease in net NPA on YOY basis comes to 4%.



Source- Computed by author using data of RBI

Figure 3: Net profit and net NPA for Public Sector Banks (Rs. Crore)



Source- Computed by author using data of RBI

Figure 4: Net profit and net NPA for Private Sector Banks (Rs. Crore)

Net Profit and Net NPA of PRBs

It is clearly observed from figure 4 that there is continuous rise in net profit of private sector banks over the years. The average of percentage increase in net profits of private sector banks comes to approximately 50%. On the contrary, there is no continuous rise/fall in net NPA. Overall, there is no rise in net NPA from 2000-01 to 2010-11. The average of percentage rise in net NPA comes to almost 6%.

Net Profit and Net NPA of Foreign Banks

It can be seen from figure 5 that the Net profit of the foreign banks continuously increased from year 2000-01 to 2008-09 after which it witnessed a sharp fall in year 2009-10, but anyway managed to increase again in year 2010-11. Net NPA levels of the foreign banks went on increasing till 2008-09, afterwards the foreign banks have successfully managed to first stabilize and then reduce the NPA levels. A positive correlation appears to exist between the Net NPA and Net profit for foreign banks.

Discussion on Statistical Testing

The test of co-relation is used to identify the co-relation between two variables. The variables investigated in the current study are Net NPA and Net Profit. Here, the test is being applied to evaluate the magnitude of the correlation between Net NPA and Net Profit of Public, Private and Foreign sector banks.

Public Sector Banks

H_0: There is no significant correlation between profits and NPAs of Public Sector Banks for the period of the study.

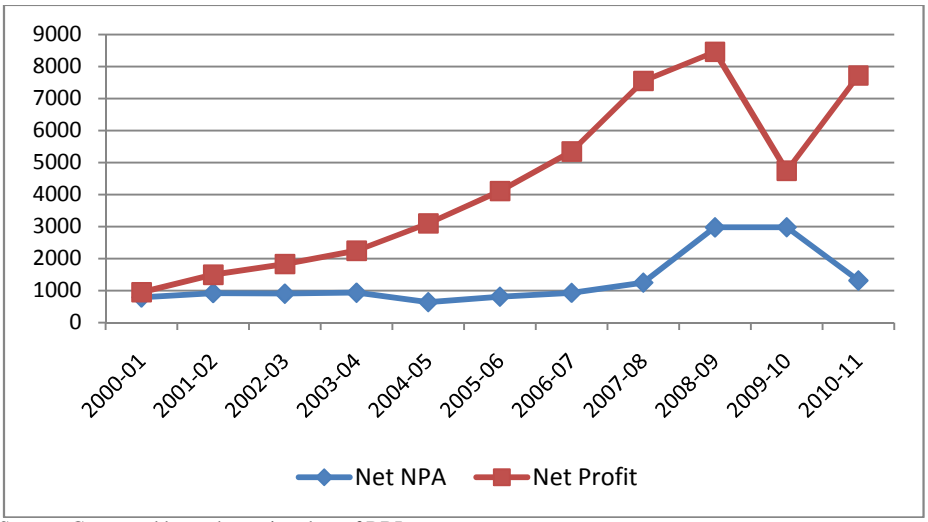
H_1: There is a correlation between profits & NPAs of Public Sector Banks for the period of the study.

The correlation coefficient (r) has been assessed first as indicated in table 2.

The correlation coefficient, r has been evaluated as:

$$r = \frac{\Sigma\{(X-\bar{X})*(Y-\bar{Y})\}}{\{\Sigma[(X-\bar{X})^2*(Y-\bar{Y})^2]\}^{1/2}} \ldots\ldots\ldots (iii)$$

Using the data tabulated in table 2.



Source- Computed by author using data of RBI

Figure 5: Net profit and net NPA for foreign banks (Rs. Crore)

Table 2: Assessing correlation between Net NPA and net Profit for PSBs (all figures in Rs Crore)

Year	Net NPA	Net Profit	$\bar{X}$	$\bar{Y}$	X-$\bar{X}$	Y-$\bar{Y}$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	$(X-\bar{X})*(Y-\bar{Y})$
2000-01	27977	4317	22815	21734	5162	-17417	26646244	303351889	-89906554
2001-02	27958	8301	22815	21734	5143	-13433	26450449	180445489	-69085919
2002-03	24877	12295	22815	21734	2062	-9439	4251844	89094721	-19463218
2003-04	19335	16546	22815	21734	-3480	-5188	12110400	26915344	18054240
2004-05	16904	15784	22815	21734	-5911	-5950	34939921	35402500	35170450
2005-06	14566	16539	22815	21734	-8249	-5195	68046001	26988025	42853555
2006-07	15145	20152	22815	21734	-7670	-1582	58828900	2502724	12133940
2007-08	17726	26592	22815	21734	-5089	4858	25897921	23600164	-24722362
2008-09	21033	34394	22815	21734	-1782	12660	3175524	160275600	-22560120
2009-10	29375	39257	22815	21734	6560	17523	43033600	307055529	114950880
2010-11	36071	44901	22815	21734	13256	23167	175721536	536709889	307101752
Total	250967	239079					479102340	1692341874	304526644
Mean	22815	21734							

Source- Computed by author using data of RBI

r =0.338
Where,
X- population 1 (Net NPA),
Y- population 2 (Net profit)

The test statistic (t0) for t-test has been computed as,

$$t_0 = \frac{r\times(n-2)^{0.5}}{(1-r^2)^{0.5}} \ldots\ldots (iv)$$

$$= \frac{\mathbf{0}.33819*(11-2)^{0.5}}{[1-(0.33819)^2]^{0.5}}$$

= 1.08
$t_{critical}$ = 1.81 (for α- 0.05, ŋ-10)
as $t_0 < t_{critical,}$

the observed value of t_0 will not fall inside the rejection region (shaded area of the t-distribution curve) corresponding to the significance level of 0.05 (as α=0.05) or critical value of t (1.81) as shown in figure 6. Hence, at 95% confidence level, the null hypothesis is accepted. In other words, there is no significant correlation between Net NPA and Net Profit of Public Sector banks for the selected period, at 95% confidence level.

The acceptance of null hypothesis and therefore, the conclusion of the no significant relation between the NPAs of the PSBs and the profits of PSBs seem to be unusual as the profitability of a banking system is expected to be strongly (negatively) correlated with the NPAs. However, it reflects another picture of Indian PSBs, that Indian banks have expanded their revenues and hence the profits by adopting prudent operating systems and an enlarged customer base. This has eventually nullified the impact of NPAs on the profits and for this reason, the relationship among the NPAs and the profits has been evaluated as non-significant and the profits have witnessed an increasing trend throughout the period of study.

Private Sector Banks

H_0: There is no significant correlation between profits and NPAs of Private Sector banks for the period of the study.

H_1: There is a correlation between profits and NPAs of Private Sector banks for the period of the study.

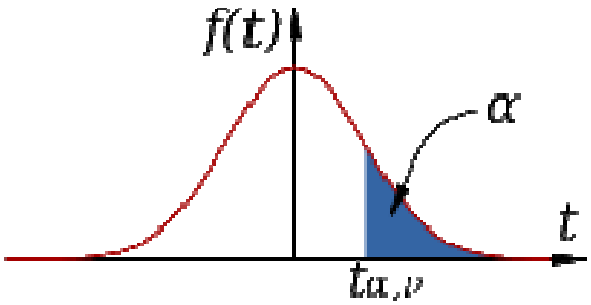


Figure 6: T-distribution curve and rejection region

Table 3: Assessing correlation between Net NPA and Net profit for Private Sector Banks (all figures in Rs. Crore)

Year	Net NPA	Net Profit	$\bar{X}$	$\bar{Y}$	$X-\bar{X}$	$Y-\bar{Y}$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	$(X-\bar{X})*(Y-\bar{Y})$
2000-01	3700	1142	4862	6868	-1162	-5726	1350244	32787076	6653612
2001-02	6676	1779	4862	6868	1814	-5089	3290596	25897921	-9231446
2002-03	3963	2958	4862	6868	-899	-3910	808201	15288100	3515090
2003-04	4128	3481	4862	6868	-734	-3387	538756	11471769	2486058
2004-05	4212	3533	4862	6868	-650	-3335	422500	11122225	2167750
2005-06	3171	4975	4862	6868	-1691	-1893	2859481	3583449	3201063
2006-07	4028	6465	4862	6868	-834	-403	695556	162409	336102
2007-08	5380	9522	4862	6868	518	2654	268324	7043716	1374772
2008-09	7418	10868	4862	6868	2556	4000	6533136	16000000	10224000
2009-10	6371	13111	4862	6868	1509	6243	2277081	38975049	9420687
2010-11	4430	17712	4862	6868	-432	10844	186624	117592336	-4684608
Total	53477	75546					19230499	279924050	25463080
Mean	4862	6868							

Source- Computed by author using data of RBI

Table 3 shows the computations involved in estimation of correlation between net NPA and net profit for private sector banks.

Following the same procedure as for PSBs (section 6.1),

$$t_0 = \frac{r\times(n-2)^{0.5}}{(1-r^2)^{0.5}} \ldots\ldots(v)$$

$$= 1.11$$

$t_{critical}$ is 1.81 (for α- 0.05, ŋ-10)

as $t_0 < t_{critical,}$

the observed value of t_0 will not fall inside the rejection region of the t-curve. Hence, at 95% confidence level, the null hypothesis is accepted. In other words, there is no significant correlation between Net NPA and Net Profit of Private Sector banks for the selected period, at 95% confidence level. This is in consistent with the previous finding for the PSBs.

Foreign Banks

H_0: There is no significant correlation between profits & NPAs of foreign banks for the period of the study.

H_1: There is a correlation between profits & NPAs of foreign banks for the period of the study.

The correlation coefficient (r) has been assessed first as indicated in table 4.

Table 4: Assessing correlation between net NPA and net Profit for Foreign Banks (all figures in Rs Crore)

Year	Net NPA	Net Profit	$\bar{X}$	$\bar{Y}$	X-$\bar{X}$	Y-$\bar{Y}$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	$(X-\bar{X})*(Y-\bar{Y})$
2000-01	785	945	1311	4320	-526	-3375	276676	11390625	1775250
2001-02	920	1492	1311	4320	-391	-2828	152881	7997584	1105748
2002-03	903	1824	1311	4320	-408	-2496	166464	6230016	1018368
2003-04	933	2243	1311	4320	-378	-2077	142884	4313929	785106
2004-05	639	3098	1311	4320	-672	-1222	451584	1493284	821184
2005-06	808	4109	1311	4320	-503	-211	253009	44521	106133
2006-07	927	5343	1311	4320	-384	1023	147456	1046529	-392832
2007-08	1247	7544	1311	4320	-64	3224	4096	10394176	-206336
2008-09	2973	8459	1311	4320	1662	4139	2762244	17131321	6879018
2009-10	2977	4741	1311	4320	1666	421	2775556	177241	701386
2010-11	1312	7719	1311	4320	1	3399	1	11553201	3399
Total	14424	47517					7132851	71772427	12802760
Mean	1311	4320							

Source- computed by author using data of RBI

Table 4 shows the computations involved in estimation of correlation between net NPA and net profit for foreign banks.

$$t_0 = \frac{r\times(n-2)^{0.5}}{(1-r^2)^{0.5}} \ldots\ldots(vi)$$

= 2.01

as $t_0 > t_{critical,}$

the observed value of t_0 will fall inside the rejection region of the t-curve. Hence, at 95% confidence level, the null hypothesis is rejected. In other words, there is a significant correlation between Net NPA and Net Profit of foreign banks for the selected period, at 95% confidence level. This is in contrast with the previous finding for the PSBs as well for the PRBs. Therefore, it could be concluded that unlike PSBs and PRBs, the foreign banks have exhibited a positive relationship between the NPAs and the profits. However, it could also be observed (table 4) that the increment in the NPAs from 2001 to 2002 and in subsequent years has not resulted in a reduction in the profits, which are increasing throughout the period of study (2001-2011). On the other hand, if the banks could control their NPAs to lower levels, the profits realized could have been more.

Analysis of Variance

Case 1: To contrast the net NPA to net advances ratio of public sector banks, private sector banks and foreign banks for the period of the study.

Hypothesis Formulation

H_0: There is no significant difference among the net NPA to net advances ratio for public sector banks, private sector banks and foreign banks for the period considered (2004-2011).

H_1: There is a significant difference among the net NPA to net advances ratio for public sector banks, private sector banks and foreign banks for the period considered (2004-2011).

Table 5 shows the net NPAs to net advances of Indian commercial banks from table 6, it is evident that the obtained F value (0.003) is much lower than the standard tabulated F value of 3.55 (for α-0.05, ŋ- 2, 18). Hence, the null hypothesis in this case could not be rejected.

In other words, it is to be concluded that there is no significant difference among the net NPA to net advances ratio for public sector banks, private sector banks and foreign banks for the period considered (2004-2011). The performance of the banks thus has been similar as far as the NPA ratio is concerned.

Table 5: Net NPAs to net Advances of SCBs

Year	Public Sector banks	Private Sector banks	Foreign banks
2004-05	2.1	1.9	0.9
2005-06	1.3	1	0.8
2006-07	1.1	1	1
2007-08	0.8	1.2	0.9
2008-09	0.7	1.5	1.7
2009-10	1.1	1.0	1.8
2010-11	1.1	0.6	0.7
Total	8.2	8.2	7.8

Table 6: ANOVA test summary

Source of Variation	Degrees of freedom	Sum of Squares	Mean Square	F-Ratio	F_{tab}
Factor (banks)	2	0.01	0.005	0.0003	3.55
error	18	283.13	15.73		
Total	20	283.14	14.15		

Case 2: To contrast the net NPAs of public sector banks, private sector banks and foreign banks for the period of the study.

Hypothesis Formulation

H_0: There is no significant difference among the net NPAs for public sector banks, private sector banks and foreign banks for the period considered (2004-2011).

H_1: There is a significant difference among the net NPAs for public sector banks, private sector banks and foreign banks for the period considered (2004-2011).

Table 7 shows the net NPAs of Indian commercial banks. From table 8, it is evident that the obtained F value (8.6) is much larger than the standard tabulated F value of 3.32 (for α-0.05, ŋ- 2, 18). Hence, the null hypothesis in this case could be rejected. In other words, it is to be concluded that there is a significant difference among the net NPAs for public sector banks, private sector banks and foreign banks for the period considered (2004-2011). The NPAs of foreign banks and private sector banks have been much lower than that of public sector banks.

This could be attributed to the tendency of the PSBs to lend more to more risky ventures in search of higher profits. The crux of the problem, not highlighted in the literature, is the non-existence or malfunctioning of the asset market that enables generation of NPAs through conventional routes of asymmetric information, adverse selection and improper monitoring. Apart from this, the malfunctioning of institutional environment, use of the bank as an instrument of the policy, incompatibility of the bank's interest with the policy instruments and the change in economic regime and default friendly legal system have been identified as the potential factors contributing to higher NPAs for PSBs. Table 9 gives an overview of the statistical testing performed in this research.

Table 7: Net NPAs of Scheduled Commercial Banks (SCBS)

Year	Public Sector Banks	Private Sector Banks	Foreign Banks
2000-01	27977	3700	785
2001-02	27958	6676	920
2002-03	24877	3963	903
2003-04	19335	4128	933
2004-05	16904	4212	639
2005-06	14566	3171	808
2006-07	15145	4028	927
2007-08	17726	5380	1247
2008-09	21033	7418	2973
2009-10	29375	6371	2977
2010-11	36071	4430	1312
Total	250967	53477	14424

Source- Computed by author using data of RBI

Table 8: ANOVA test summary

Source of Variation	Degrees of freedom	Sum of Squares	Mean Square	F-Ratio	F_{tab}
Factor (banks)	2	2923637204	1461818602	8.6	3.32
Error	30	5048399484	168279982		
Total	32	6510218086	203444315		

Table 9: Overview of the statistical testing of the data

S. No.	Objective of the test	Test used	Outcome of the test
1.	To test the correlation between the Net NPAs and profits of Indian SCBs		There is no significant correlation between the Net NPAs and profits for public sector banks and private sector banks. There is a significant correlation between the Net NPAs and profits for foreign banks.
2.	To contrast the net NPA to net advances ratio of public sector banks, private sector banks and foreign banks		There is no significant difference among the net NPA to net advances ratio for public sector banks, private sector banks and foreign banks
3.	To contrast the net NPAs of public sector banks, private sector banks and foreign banks		There is a significant difference among the net NPAs for public sector banks, private sector banks and foreign banks

CONCLUSION

Following conclusions could be drawn from this study:

1. Despite the growing pressure on margins owing to higher interest rate environment, the Return on Assets (ROA) of Indian SCBs improved to 1.10% in 2010-11 from 1.05% in 2009-10. The gross NPAs to gross advances ratio declined to 2.25% in 2010-11 from 2.39% in 2009-10, displaying the improvement in asset quality of SCBs.

2. The gross NPAs to gross advances of foreign banks and private sector banks reduced significantly over the year (2010-11), while that of public sector banks increased marginally. While net NPAs to net advances ratio of all the banks decreased over the previous year except that of nationalized banks, for which it stood constant.

3. The increase in gross NPAs was more noticeable in respect of new private sector and foreign banks, which have been more active in the real estate and housing loans segments. Net NPA were higher for public sector banks during the entire period (2011-2011) due to investment in welfare programs, lending to risky ventures, recession in few sectors that represented a larger chunk of the loans and use of banks as an instrument of policy.

4. There is no significant correlation between the Net NPAs and profits for public sector banks and private sector banks during the period of study. However, there is a significant correlation between the Net NPAs and profits for foreign banks, at 95% confidence level.

5. There is no significant difference among the net NPA to net advances ratio for public sector banks, private sector banks and foreign banks, at 95% confidence level. However, there is a significant difference among the net NPAs for public sector banks, private sector banks and foreign banks for the period of study.

Non-performing assets epitomize the non-performing loans, which misallocate credit investments from needful projects. Though total elimination of NPAs is not feasible in banking business as banks have to lend credit to risky ventures in search of higher capital gains, but by effective management, its magnitude may be controlled to a manageable level.

RECOMMENDATION

1. New body like Debt recovery tribunal (DRT) should be established and the capacity of DRT should be expanded so that the NPA generation is restricted.

2. All banks must keep a stagnant check on the advance being made to real estate and housing sector as these segments have contributed most towards NPAs after year 2008-09. The aviation sector has also brought troubles in year 2011-12 as far as NPA is concerned.

3. Uneven scale of repayment schedule with higher repayment in initial years normally should be preferred and implemented by the SCBs.

4. Public sector banks must find appropriate means to improve their non-interest income, as rise in NPA due to default in interest income may affect the net profits drastically.

5. Categorization of standard accounts into A, B, C based on actual recovery of interest and installments due may help in focussed and strengthened monitoring.

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