Determinants of Bank Asset Quality and Profitability - An Empirical Assessment

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ABSTRACT

Determinants of default risk of banks in emerging economies have so far received inadequate attention in the literature. Using panel data techniques, this paper seeks to study the determinants bank asset quality and profitability using robust data sets for the period from 1997-2009. The findings of the study reveal some interesting inferences contrary to the established perceptions. Priority sector credit has been found to be not significant in affecting the NPAs contrary to the general perception and similar is the case with that of rural branches implying that aversion to rural credit is a falsely founded perception. Bad Debts are dependent more on the performance of the industry than other sectors of the economy. Public sector banks have shown significant performance in containing bad debts private banks have continued to be stable in containing the bad debts as they have better risk management procedures and technology, which definitely allows them to finish up with lower levels of NPAs. Further, investigating the effect of determinants on profitability it is established that while capital adequacy and investment activity significantly affect the profitability of commercial banks apart from other accepted determinants of profitability, asset size has no significant impact on profitability.

Keywords: Banks, Risk management, Ownership structure, Financial markets, Non-Performing Assets, Lending Policy, Macro-economy, Central Banks, Banking regulation, Financial system stability

JEL Classification: G21, G28, G32, E44, E58

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I. INTRODUCTION

Financial stability in an economy is largely dependent on the stability and the resilience of the banking system. To accomplish banking stability the banks are required to maintain quality bank assets that aid in achieving profitability. The failure to ensure banking stability can cause financial fragility and may lead to crisis scenarios in the event of market illiquidity and or bank contagion. The significance of banking stability can be better understood in the backdrop of the global financial crisis of 2008 that resulted in the collapse of financial markets and institutions. Moreover, output per capita is projected to slide down in countries representing three-quarters of the global economy. The consequent deterioration in the economic environment has led to a rise in the overall level of stress in the banking sectors. Commercial bank loan charge-offs in the US and Europe may exceed the levels reached during the 1991–1992 recession, even though they should remain below the levels experienced in the US during the Great Depression.

On a thorough analysis of the crisis, financial stability has once again emerged as an important area of concern in the financial systems across the globe. Financial stability is widely accepted as a situation in which financial system is capable of satisfactorily performing its three key functions simultaneously, viz; (1) efficient and smooth facilitation of the inter-temporal allocation of resources from the surplus economic units to the deficit economic units, (2) managing the forward looking financial risks with appropriate pricing and (3) to be prepared all the time to absorb the financial and real economic surprises and shocks. Counterparty risk being an important risk in the financial system more particularly in the banking system, poses a bigger challenge in order to achieve financial stability. Counter-party risk is an outcome directly related to the Non-Performing Assets[1] [NPAs] of a financial institution. Even though NPAs are

[1] Loans that the bank foresees it will have difficulty in collecting. They include nonaccrual loans, reduced rate loans, renegotiated loans, and loans past due 90 days or more. They exclude assets acquired in foreclosures and repossessed personal property. NPAs mainly arise due to the default of the borrower, which involves his inability or unwillingness in meeting the commitments to the loan. Non-performing assets (NPAs) or bad loans, as they are commonly called, have been a menace for the banking sector across the world.

permanent phenomenon in the balance sheets of the financial institutions, if not contained properly, they eventually lead to crisis, which can pose big threats of contagion that can engulf the financial health of the system.

The issue of Non-Performing Assets (NPAs) has gained growing attention in the last few decades in view of the established fact that the immediate consequence of bubbling up of NPAs in the banking system is bank failure. Many researches like; Demirguc-Kunt (1989) and Barr and Siems (1994) have established that asset quality is a statistically significant predictor of insolvency for the cause of bank failures and the failing banking institutions always have high level of non-performing loans prior to failure. Further, the problem of NPAs has become synonymous to functional efficiency of financial intermediaries and believed to be the major causes of the economic stagnation problems. As per the Global Financial Stability Report of International Monetary Fund, (IMF, 2009), identifying and dealing with distressed assets, and recapitalizing weak but viable institutions and resolving failed institutions are stated as the two of the three important priorities which directly relate to NPAs. It is obvious to note that better asset quality aids improvement in profitability. In order to improve profitability, it is imperative on the banks to manage their asset quality as well as determinants of profitability. The growing incidence of poor bank asset quality calls for a renewed look at the factors that impact on the performance of the banks in terms of both profitability and asset management.

Only few studies of citable significance have dealt on the problems of NPAs particularly in the context of developing economies like Indian banking mainly because of the the lack of sufficient published, disaggregated information on the micro-management of NPAs and the nature and type of default. Though, Indian banking has not experienced notable banking crises when compared to the other countries in the world, the issues concerning NPAs have come up particularly in view of the comparatively high levels of NPAs of Indian commercial banks vis-à-vis the other countries. These kind of economies which have not suffered banking crises but still continue face the problem of mounting NPAs offer a sound logic to undertake an empirical examination conjoining the profitability analysis as well. This study sets out specific questions such as; (i) What are the significant determinants that influence the NPAs of commercial banks

and to what extent? (ii) What factors affect bank profitability in a banking system that is quite different from that of the crises ridden advanced banking systems? (iii) What lessons (particularly in the domain of macro-economic management and prudential regulation) can be drawn from the dynamics in the banking systems like that of India particularly in the context of bank asset quality and profitability. In view of this, it is essential to identify and understand the determinants (both macro-economic and industry specific) of NPAs. Further, this study is aimed at a comprehensive empirical analysis of the determinants of bank asset quality and profitability in the context of Indian banking and contributes to the growing literature on bank asset quality management and profitability and to suggest some measures to counter the rising NPAs.

The rest of the paper is organised as follows. While Section II provides theoretical considerations drawn from an exhaustive survey of contemporary literature available on the topic, Section III and IV illustrate the macro-economic determinants and endogenous determinants of the study. Section V presents a brief discussion on the asset quality in Indian commercial banks. While empirical specification and estimation of the study is captured in Section VI, the discussion on the results is presented in Section VII. Finally, the summary and conclusion of the study is presented Section VIII.

II. THEORETICAL CONSIDERATIONS

The critical role of financial and banking development in economic growth in any economy has been established by many researchers (Levine, 2004 and Singh, 2005). In the process of providing credit assistance to the investment activities and projects in the economy, the financial institutions face inherent risks in the form of default risk that results in the form of Non-Performing Assets that have a negative effect on the profitability of the financial institutions. Typically, a credit transaction involves a contract between two parties: the borrower and the creditor (bank) subject to a mutual agreement on the '*terms of credit*'[2]. Optimising decision pertaining to the terms of credit could differ from the borrower to that of the creditor. As such, the mutual agreement between the borrower and the creditor may not necessarily imply

[2] The '*terms of credit'* are defined over five critical parameters; viz, amount of credit, interest rate, maturity of loans, frequency of loan servicing and collateral.

an optimal configuration for both. The most important reason for '*default*'[3] could be mismatch between 'borrower's terms of credit' and 'creditor's terms of credit'. However, a common perspective is that both the cases of 'defaulter' and 'non-performer' imply similar financial implications, *i.e.,* financial loss to banks. Moreover, regulatory and supervisory process does not focus on such a distinction between defaulter and non-performer as far as prudential norms are concerned.

Table-1: NPA levels and CRAR of Developing & Advanced Countries

Country	CRAR				NPA/TL			
	2002	2006	2007	2008	2002	2006	2007	2008
Developing Economies								
China	-	-	8.4	8.2	26	7.5	6.7	2.5
India	12	12.4	12.3	13	10.4	3.5	2.5	2.3
Indonesia	20.1	21.3	19.3	16.8	24	13.1	4.1	3.5
Korea	11.2	12.8	12.3	10.9	2.4	0.8	0.7	1.1
South Africa	12.6	12.3	12.8	12.5	2.8	1.2	1.4	2.6
Advanced Economies								
Australia	9.6	10.4	10.2	10.9	0.4	0.2	0.2	0.5
Canada	12.4	12.5	12.1	12.7	1.6	0.4	0.7	1.1
France	11.5	-	10.1	-	4.2	3.2	2.7	-
Germany	12.7	-	12.9	-	5	4	2.7	-
Italy	11.2	10.7	10.4	-	6.5	5.3	4.6	-
Japan	9.4	13.1	12.9	12.3	7.4	2.5	1.5	1.5
United Kingdom	13.1	12.9	12.6	-	2.6	0.9	0.9	-
United States	13	13	12.8	12.5	1.4	0.8	1.4	2.3

Source: Global Financial Stability Report, April 2009, IMF.

A synoptic review of the literature brings to the fore insights into the determinants of NPAs across countries. Quite a lot of economies have experienced such distressed debt cycles. NPA levels and Capital to Risk (Weighted) Assets Ratio (CRAR) of Developing & Advanced Countries presented in *Table-1* and Provisions to NPAs and Return on Assets (ROA) of Developing & Advanced Countries captured in *Table-2* explain us the differences in the levels as well as the approaches towards NPA management in different countries. Bank Regulatory CRAR of select countries is captured in *Figure-1*. In the USA, the non- and sub-performing loans

[3] A '*default*' entails violation of the loan contract or the agreed terms of the contract, while a non-performing loan entails that the borrower does not renege from the loan contract but fails to comply the repayment schedule due to evolving unfavourable conditions.

resolution was embedded into the savings and loans crisis from 1989 to 1994. In Japan, the NPA cycle began in 1997 and China and the rest of Asia deal with NPAs Sub Prime Loans [SPLs] since 1999. The origin of the Chinese NPAs crisis can be traced to political issues. During the centrally planned economy from 1949 onwards loans were granted by state owned banks to state-owned companies without proper credit due diligence at predetermined standardised conditions by the government. Especially, in the overheated economy of the 1990s domestic credits extended enormously and grew by 30 percent year on year between 1992 and 1995 (Chen, 2004; Sprayregen et al., 2004).

Table-2: Provisions to NPAs and ROA of Developing & Advanced Countries

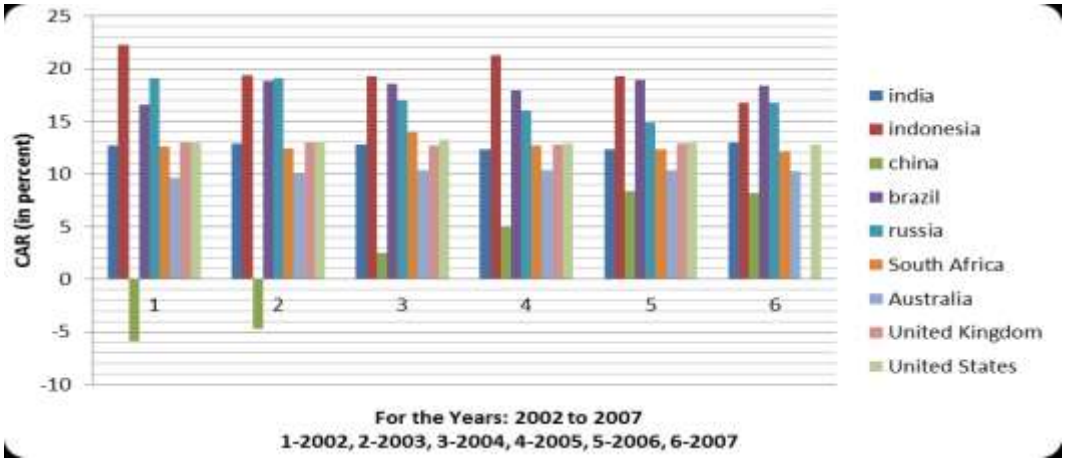
Country	PROVISIONS TO NPAs				ROA			
	2002	2006	2007	2008	2002	2006	2007	2008
Developing Economies								
China	-	-	39.2	115.3	-	0.9	1	-
India	-	58.9	56.1	52.6	0.8	0.9	0.9	1
Indonesia	130	99.7	87.7	98.5	1.4	2.6	2.8	2.6
Korea	89.6	175.2	199.1	155.4	0.6	1.1	1.1	-
South Africa	46	-	-	-	0.4	1.4	1.4	1.8
Advanced Economies								
Australia	106.2	204.5	183.7	87.2	1.4	-	1	0.9
Canada	41.1	55.3	42.1	34.7	0.4	1	0.9	1.3
France	58.4	58.7	61.4	-	0.5	-	0.4	-
Germany	-	-	77.3	-	0.1	0.5	0.2	-
Italy	-	46	49.5	-	0.5	0.8	0.8	-
Japan	-	30.3	26.4	24.9	-0.7	0.4	0.2	0.3
United Kingdom	75	-	-	-	0.4	0.5	0.4	-
United States	123.7	137.2	93.1	84.7	1.3	1.3	0.8	0.3

Source: Global Financial Stability Report, April 2009, IMF.

A typically high leverage in the country shown by a Debt/Gross Domestic Product (GDP) ratio of 146 percent may be an indicator for the problem of NPAs (see Ernst & Young, 2001). High leverage was experienced in the real estate sector, particularly during the rise of the Japanese real estate bubble in the 1980s. With the burst of the bubble in the 1991 and the dramatic economic slowdown, real estate values waned tremendously in the case of Japan. As an aftermath, borrowers defaulted on the debt service and lenders had to sign big losses. Lacking

regulations[4] and tax incentives by the Japanese Government as well as insufficient equity reserves of the banks to compensate write-offs of distressed debt, banks tried to deal with the problem by a wait-and-see approach. Barseghyan (2004) identifies a link between the Japanese government's reluctance to solve the bad loan problem and the economic slowdown. He opines that the Governments behaviour deteriorated the economic situation of Japan and affirms this hypothesis by a normative study.

Figure-1: Bank Regulatory Capital to Risk-Weighted Assets



Source: Global Financial Stability Report, April 2009, IMF.

In the case of Thailand, the causes for NPAs include factors like liberalized capital and current account, a legal system that made credit recovery time consuming and difficult, real estate speculations, steep rise in interest rates and inability of the banks to assess the credit risk. To overcome the problem the Financial Sector Restructuring Plan (1998) focused on capital support facilities for bank recapitalization and setting up of Asset Management Corporations (Devakula, Pridiyathorn, 2001). Korean causes for distressed loans were like directed credit (Kang, Moon-Soo, 2001), the "compressed growth policy" which backfired when slowing demand and rising input costs placed severe stress on their profitability, lack of monitoring and contagion effects. These issues were attempted to be countered with measures like; Creation of the Korea Asset Management Corporation (KAMCO) and a NPA fund to finance the purchase of NPAs (Bama, 2002) and Corporate Restructuring Vehicles (CRVs) and Debt/Equity Swaps were used to facilitate the resolution of bad loans.

[4] The inconsistent regulatory policies and shortsighted macro-economic policies were a prelude to the banking crises in most of the Latin American countries. Further, the rapid and uncontrolled expansion of bank lending was found to be the key cause for the Scandinavian banking crisis.

III. MACRO-ECONOMIC DETERMINANTS OF ASSET QUALITY

Most of the empirical evidence suggests that banks' NPAs closely linked to the economic activity. In other words, macroeconomic factors such as; downturns / slowdowns in the economy, recessions, low rate of savings, weak markets, depressions in industrial production, reduction in per capita income levels and most importantly the inflation levels in the economy. A fair amount of the academic literature has dealt with determinants of banking crisis, which is the most severe of the consequences of bad loans in a banking system that is of valuable understanding as a backdrop for the study of NPAs[5]. Dermiguc-Kunt and Detragiache (2000) employed a Multivariate Logit Framework to develop an early warning system for banking crisis and a ratings system for bank fragility. Beck, Demirguc-Kunt, and Levine (2005) examined the inter-linkage between bank concentration and banking system fragility where they have established that higher bank concentration is associated with lower profitability. Lis, *et.al.,*(2000) have found that Gross Domestic Product growth, bank size and Capital had negative effect on NPAs while Loan growth, collateral, net interest margin, debt-equity, market power and regulation regime had a positive impact on NPAs.

Resti and Sironi (2001) examined corporate bond recovery rate abducing to bond default rate, macroeconomic variables such as GDP and growth rate, amount of bonds outstanding, amount of default, return on default bonds, and stock return wherein it was established that default rate, amount of bonds, default bonds, and economic recession had negative effect, while the GDP growth rate, and stock return had positive effect on corporate recovery rate. Lis, *et.al.,*(2000) used a simultaneous equation model in which they explained bank loan losses in Spain using a host of indicators, which included GDP growth rate, debt-equity ratios of firms, regulation regime, loan growth, bank branch growth rates, bank size (assets over total size), collateral loans, net interest margin, capital-asset ratio (CAR) and market power of default companies. They found that GDP growth (contemporaneous, as well as one period lag term), bank size, and CAR, had negative effect while loan growth, collateral, net-interest margin, debt-equity, market power, regulation regime and lagged dependent variable had positive effect on

[5] Non-performing assets is used interchangeably with non-performing loans in this Comment. NPAs are measured on either gross basis or on net basis (net of provisions). While the gross NPAs reflects the quality of loans made by the banks, net NPAs shows the actual burden of the banks.

problem loans. Sergio (1996) in a study of non-performing loans in Italy found evidence that, an increase in the riskiness of loan assets is rooted in a bank's lending policy adducing to relatively unselective and inadequate assessment of sectoral prospects. Interestingly, this study refuted that business cycle could be a primary reason for banks' NPAs. The study emphasised that increase in bad debts as a consequence of recession alone is not empirically demonstrated. However, according to Bloem and Gorter (2001) NPAs may be caused by wrong economic decision or by plain bad luck.

Das and Ghosh (2003) established relationship between Non Performing Loans of India's public sector banks in terms of various indicators such as; asset size, credit growth and macroeconomic condition and operating efficiency indicators. Bercoff, Giovanniz and Grimardx (2002) in their study of Argentinean banks tried to measure NPAs by using the various bank related parameters as well as macroeconomic parameters. Bank specific parameters in their study were Ratio of Networth to Net Assets, Banks exposure to peso loans, and type of banks such as foreign, private or public. Macroeconomic factors in this study were credit growth, reserves adequacy, foreign interest rate and monetary expansion. They have established that variables such as operating cost, exposure to peso loans, credit growth, and foreign interest rate had a negative effect on NPAs. The macroeconomic variables such as money multiplier and reserve adequacy had a positive impact on NPAs. Chen *et al.* (1998) study the relationship between the risks and the ownership structure, and it appears that a negative correlation exists between the managers' shareholdings and the risks faced by the financial institution. That means that if the managers' shareholding percentage increases, the financial institution will reduce its own risk behavior. While Berger and De Young (1995) mention that a management team with poor operating capability is unable to correctly appraise the value of collateral, which means that it is difficult for it to follow up on its supervision of the borrower, its poor credit-rating technology will result in management being unable to control and supervise the operating expenses efficiently, thus leading to a significant increase in NPLs. Wahlen (1994) also points out that unexpected changes in the NPL Ratio may indicate that expected future loan losses are relatively non-discretionary and negatively related to bank stock returns. Therefore, we have considered the various bank groups in Indian Banking based on their ownership structures for the analysis.

Ownership pattern can also affect the bad loan levels significantly. In times of downturn, the government would often turn to banks for financial resources through policy loans for the State Owned Enterprises (SOEs). Projects financed by these policy loans gave rise to growing default rates (Huang, 1999). The biased lending behavior of the banks to SOEs is supported by other research findings as well (Lu et al., 2001). In case of Taiwanese banks the rate of non-performing loans decreases as the government, shareholding in bank goes higher up to 63.51 percent, while thereafter it increases (Hu et al., 2002). Few studies have also indicated a relationship between the size of the bank and the level of bad loans. Bank's sizes are often found negatively related to the rate of non-performing loan (Hu et al., 2002). Bodla and Verma (2006) have emphasised that financial sector reforms have brought in greater competition among the banks and have brought their profitability under pressure. Accordingly, banks are facing a number of challenges such as frequent changes in technology required for modern banking, stringent prudential norms, increasing competition, worrying level of NPA's, rising customer expectations, increasing pressure on profitability, assets-liability management, liquidity and credit risk management, rising operating expenditure, shrinking size of spread and so on. However, Singh (2005) argues that globalization of operations and development of new technologies are taking place at a rapid pace and this has led to the increase in resource productivity, increasing level of deposits, credits and profitability and decrease in NPAs.

IV. ENDOGENOUS DETERMINANTS OF ASSET QUALITY

The literature on these issues identifies determinants of banks risk taking that can be translated into a tractable empirical specification by measuring the effect of observable variables like; capital adequacy, credit growth, operational efficiency, branch spread and others. Rajaraman, Bhaumik and Bhatia (1999) have explained the variations in NPAs across the Indian banks through differences in operating efficiency, solvency and regional concentration. Again, Rajaraman and Vasishstha (2002) in their empirical study have proved that significant bivariate relationship exists between NPAs of the public sector banks and the inefficiency problems. Das (1999) has contrasted the different efficiency measures of public sector banks by applying data envelopment analysis model and concluded that the level of NPAs has significant negative relationship with efficiency parameters. Kwan and Eisenbis (1997) have examined the relationship between problem loans and bank efficiency by employing Granger-causality

technique and found that high level of problem loans cause banks to increase spending on monitoring working out and / or selling off these loans and possibly become more diligent in administering the portion of their existing loan portfolio that is currently performing.

Ranjan and Dhal (2003) attempted an empirical analysis of the NPAs of Public Sector banks in India and probed the response of NPAs to terms of credit, bank size, and macroeconomic condition and found that terms of credit have significant effect on the banks' Non Performing Assets in the presence of bank size and macroeconomic shocks. They also found that alternative measures of bank size could give rise to differential impact on NPAs. In the ensuing section, we present the discussion on asset quality in Indian Banking in order to provide a setting for the empirical analysis of this study.

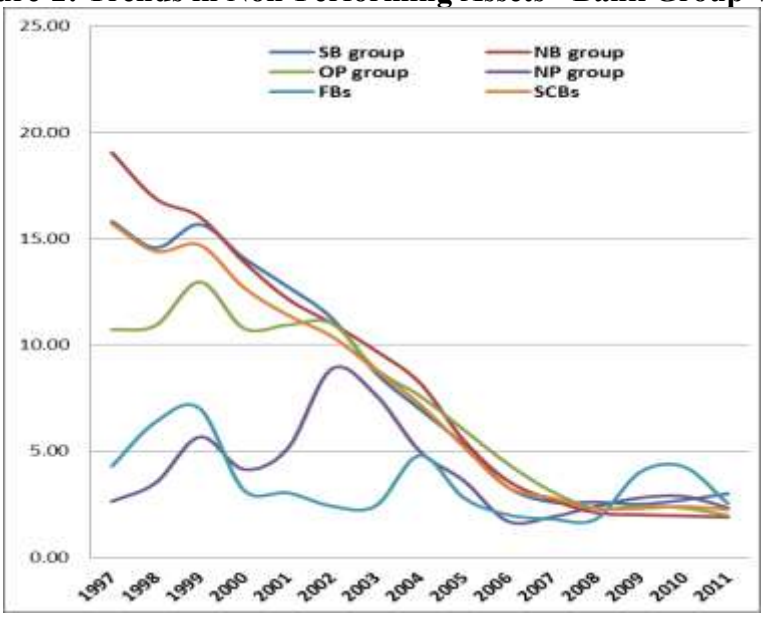
V. ASSET QUALITY IN INDIAN BANKING

The raising levels of defaults in Indian banking particularly after the incidence of global financial crisis has become a matter of concern for the bankers as well as the policy makers and researchers. However, the Indian banking system has endured the stress of global financial crisis (largely because of its partial integration with global banking) as reflected in the improvement in the Capital to Risk-Weighted Assets Ratio (CRAR). The overall CRAR of all SCBs improved to 13.2 per cent at end-March 2009, remaining considerably above the stipulated minimum of 9.0 per cent. The gross NPAs to gross advances ratio remained unchanged at 2.3 per cent as at end-March 2009 from its level as at end-March 2008. The ROA also remained unchanged at 1.0 per cent at end-March 2009 over its level at end-March 2008 indicating no deterioration in efficiency with which banks deployed their assets. The Return on Equity (ROE) increased to 13.3 per cent as at end-March 2009 from 12.5 per cent at end-March 2008, indicating increased efficiency with which capital was used by banks. In India, as in most other countries, NPAs[6] are only an indicator of loan performance. The degree to which it measures actual performance of banks depends on the quality of accounting, auditing, regulation and supervision and the amount of

[6] Non-Performing Asset (NPA) has been defined as a loan or an advance in respect of which payment of interest or principal or both has remained unpaid as per agreed terms of the loan contract for more than 90 days. The official definition of NPA in the Indian context is largely based on the loan repayment status. The distinguishing features of reporting of NPAs are in the terminology of Gross NPA (GNPA) and Net NPA (NNPA). Banks hold the bad loans even after making provisions in their books and continue to report as gross NPA. NNPA is the net value of the bad loan after deducting the available/marketable security and the appropriate provision from the gross NPA.

'ever greening' of weak loans, through restructuring, which is an incessant problem[7] in India to judge from the numerous circulars against the practice which the Reserve Bank of India (RBI) has issued against it over the last decade. Although NPAs have been substantially reduced since regulation was tightened in 1993, especially in the Public Sector Banks (PSBs), the momentum has recently slowed down and the levels of NPAs remain high compared to international standards (Refer *Figure-2*). He further argues that the problems of NPAs have a sizeable overhang component, arising from infirmities in the existing practices of debt recovery, inadequate legal provisions for foreclosure and bankruptcy and difficulties in the execution of court decrees. The problem is exacerbated by the regulatory provisions for loan classification vis-à-vis international best practices.

Figure-2: Trends in Non-Performing Assets - Bank Group-wise



Source: Compiled by Author based on data from RBI publications

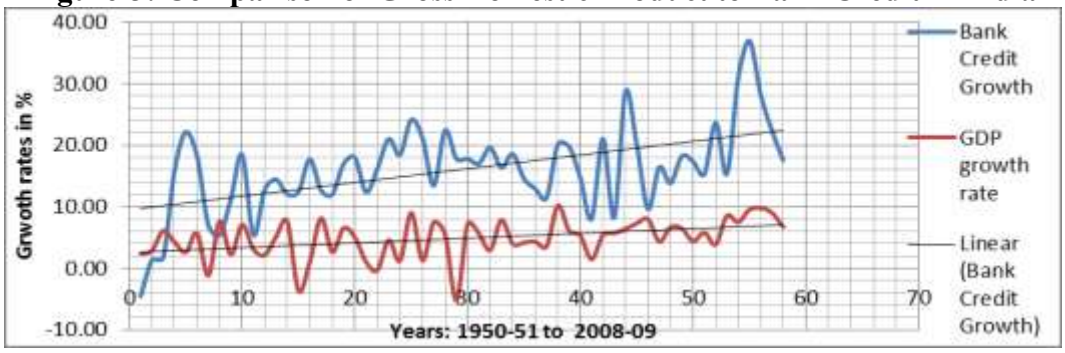
Although public sector banks have recorded improvements in profitability, efficiency (in terms of intermediation costs) and asset quality in the 1990s, they continue to have higher interest rate spreads but at the same time earn lower rates of return, reflecting higher operating costs. Bhattacharya (2001) rightly points to the fact that in an increasing rate regime, quality borrowers would switch over to other avenues such as capital markets, internal accruals for their

[7] It is widely claimed in news reports that the figures of NPAs reported by different banks might be underestimated and might not reflect the true picture mostly due to the weak accounting practices, laxity and bias leading to improper classification with a motive to recognise higher revenue though not received, and disclosure measures, etc.

requirement of funds. Under such circumstances, banks would have no option but to dilute the quality of borrowers thereby increasing the probability of generation of NPAs.

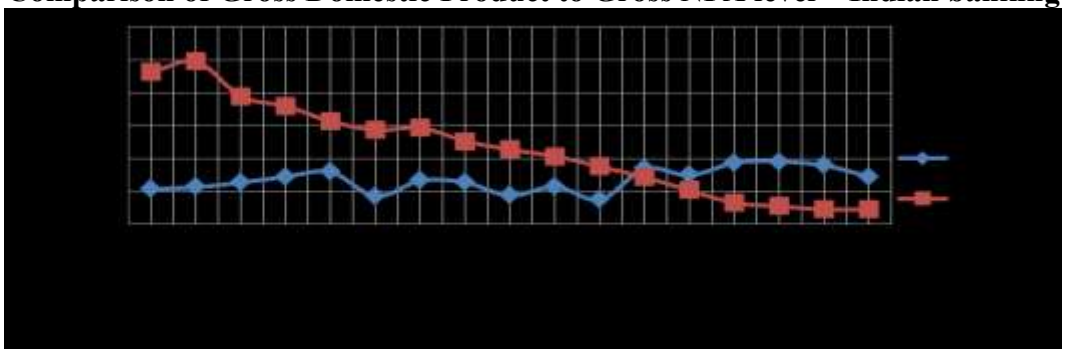
There are many internal and external factors affecting NPAs in India. While the internal factors might be taking up new projects, promoting associate concerns, time to cost overruns during the project implementation stage, business failure, inefficient management, strained labour relations, inappropriate technology/technical problems, product obsolescence etc., the external factors include GDP growth, default in other countries, high inflation, accidents and natural calamities. Further, it is observed that while there is a positive correlation between the factors such as GDP growth induce the bank credit, Procyclicality is observed in the case of comparison of Gross Domestic Product growth to NPA levels (*Figure-3 and Figure-4*).

Figure-3: Comparison of Gross Domestic Product to Bank Credit in India



Source: Compiled by Author based on data from RBI publications

Figure-4: Procyclicality of NPAs:
Comparison of Gross Domestic Product to Gross NPA level – Indian banking



Source: Compiled by Author based on data from RBI publications

Bank Profitability

Determinants of profitability in the banking sector have been a subject research quite often in the recent past. The importance of bank profitability can be assessed at the micro and

macro levels of the economy. The stability of the banking sector is closely related to the profitability of the sector, which is significant for a sound capital structure. The 2008 global financial crisis has shown that a banking sector having problems with profitability and capital structure may have a devastating effect to the economy as such a banking sector will not be able to generate credit for the economy. In this section, an investigation into the bank specific and macroeconomic determinants of profitability for participation banks in Turkish banking sector. Although the determinants of profitability in commercial banks has been a subject of research in a number of papers there is a need for research regarding the profitability of banking system that are distinct from those which have experienced crisis quite often..

At the micro level, profit is the essential prerequisite of a competitive banking institution and the cheapest source of funds. It is not merely a result, but also a necessity for successful banking in a period of growing competition on financial markets. Therefore, the basic object of a bank's management is to achieve a profit, as the essential requirement for conducting any business. At the macro level, a sound and profitable banking sector is better able to withstand negative shocks and contribute to the stability of the financial system. The importance of bank profitability at both the micro and macro levels has made researchers, academics, bank managements and bank regulatory authorities to develop considerable interest on the factors that determine bank profitability (Athanasoglou *et al*., 2005: 5). Bourke (1989) examined the internal and external determinants of profitability for the banks of twelve countries from Europe, North America, and Australia and observed that banks with a high degree of market power tend to exhibit risk avoidance behavior. Several studies demonstrate the existence of a significant relation between the business cycle and bank profitability. Demirgüç-Kunt and Huizinga (1999) were among the first to relate bank profits to macro-economic indicators such as real GDP per capita. Based on aggregate data of the banking sector in a number of OECD countries, Bikker and Hu (2002) estimate the relation between bank profitability and real GDP growth. More recently, Albertazzi and Gambacorta (2009) report a significant relation between real GDP growth and bank profitability. Athanasoglou et al. (2008) find a positive relation between the output gap and the profitability of a panel of Greek banks.

Moulyneux and Thornton (1992) investigate the determinants of profitability in the banking sector for eighteen European countries and find no evidence of risk avoidance hypothesis. Berger (1995) observes that there is a positive relationship between higher capital and higher earnings for U.S. banks in the 1980s but this structure had turned to negative 1990s. Demirgüç-Kunt and Huizinga (1998) investigate the determinants of commercial bank interest margins and profitability for 80 countries during the period 1988-1995. Athanasoglou, Brissimis and Delis (2005) analyze the determinants of profitability for Greek banks for the 1985-2001 period. They observe that increased exposure to credit risk has a negative impact on profitability whereas labor productivity growth has a positive effect on bank profits. They also observed that business cycle has a positive but asymmetric effect on profits. Flamini, McDonald and Schumacher (2009) investigate the determinants of commercial bank profitability in Sub-Saharan Africa. They observe that larger bank size, activity diversification, and private ownership are associated with higher profitability. In terms of macroeconomic variables, low inflation and stable output growth improve profitability indicators.

Berger and DeYoung (1997) investigate the intersection of the problem loan literature and the cost efficiency literature in order to understand loan quality and efficiency. They note that, at first glance, there would appear to be little or no relationship since operations and lending are conducted in different areas of the bank by different personnel. However, the quality of senior management provides one link because banks that are poorly managed may be both cost inefficient and have higher levels of problem loans than other banks. Cole, et al (2004) and others found that small banks focus on different types of customers than large firms and evaluate credit in different ways. Carter, McNulty, and Verbrugge (2004) and Carter and McNulty (2005) suggest that monitoring may contribute positively to small bank financial performance because risk-adjusted loan yields and spreads are greater for small banks. They point out that one explanation for the positive relation between monitoring and performance is the ability of small banks to find economically valuable information about a firm's financial condition by monitoring the firm's demand deposit account. There is not a large empirical literature on the relationship between bank profit efficiency and market value. One study (Aggarwal, Akhigbe, & McNulty, 2006) that deals only with banks involved in mergers finds that these two measures are positively related. Kaya (2002) investigating the determinants of profitability for Turkish

banking sector for the 1997-2000 period observes that capital, liquidity, personnel expenditures, loans, non-performing loans and deposits are the bank specific determinants of profitability. NPAs assume significance in determining the level of profitability, as we are well aware of the relationship between loan losses and loss of income.

VI. EMPIRICAL SPECIFICATION AND ESTIMATION

In this section, we would introduce the methodology and the data source adopted for the empirical analysis. Accordingly, there is a need to estimate a relationship of the following form using the panel data consisting of different groups of banks in Indian Banking industry[8] (such as State Bank Group, Nationalised Banks, Old Private Banks, New Private Banks and Foreign Banks) data across a period from March 1997 to March 2009. The choice of the period is dictated by several considerations. The first is the availability of published data on the variables considered in the study. Secondly, the year 1996-97 marks the rigorous regime of the prudential norms as a result of the 'first generation' reforms programme initiated in 1991, so that it would be useful to examine the impact of various determinants and the behaviour of different banking sector in terms of NPAs through the initiation of the reform process. Further, the said period covers the significant period of post-liberalisation in Indian banking. The period chosen is upto March 2009 and not beyond in order to avoid the sudden devastating effect of the global financial crisis and is not before March 1997 as the effect of liberalisation and various financial sector reforms could well establish by this year (financial sector reforms were initiated in 1991-92).

The data for the empirical analysis has been sourced from the robust database of RBI and from the various publications of RBI (more particularly the annual reports on Trend and Progress of Banking in India and Statistical tables relating to banks in India) and also from the published annual audited accounts of individual banks. Several appropriate and relevant variables were identified in the backdrop of the theoretical considerations deliberated in the earlier section of this paper. The description of the variables and the related explanation is captured in Appendix-

[8] State Bank group (SB) includes the prominent State Bank of India and its subsidiary banks, Nationalised Banks group includes all other public sector banks excluding SB group. SB group and NB group adding together constitute the public sector banks in Indian banking. Private sector banks are grouped as Old Private banks (OP) which have been in existence for a long time well before the financial sector reforms and New Private banks (NP) are the new generation banks that have emerged after the reforms and are technology savvy coupled with professional modern managements. The last group constitutes the Foreign Banks (FB) that has a very feeble presence in the entire economies and is found only in metros scheming the creamy business of the economy.

1. The descriptive statistics of the variables employed in the econometric analysis are presented in Appendix-2. Further, correlation statistics for the variables employed in the analysis are presented in Appendix-3 with significance levels at 1% and 5% (two-tailed). The movement of determinant variables in panels of analyses are presented in Appendix-4a to 4d.

Econometric approach

Two models of analysis were designed (Model 1 and 2) in order to capture the effect of variables in different dimensions. Model 1a and 2a involve GDPGR as the control variable for macro-economic activity whereas IIPGR, INFLA, MCAP and LR replace the GDPGR in Model 1b and 2b. Model 1a and 1b are studied employing the panel least squares method with a first difference estimator for the data with robust standard errors (Wooldridge example 10.6, p. 282). Following Baltagi and Chang (1994) (also described in Baltagi, 2005), a fixed effects GLS specification has been estimated assuming the presence of cross-section heteroskedasticity in model 1a and 1b. Coef covariance method among the robust methods has been used to compute the coefficient standard errors. The covariance calculations are chosen to be robust under the assumption perhaps that of cross-section heteroskedasticity and the calculations are performed without the leading degree of freedom correction term. The observed R-squared and *F*-statistics are based on the difference between the residuals sums of squares from the estimated model, and the sums of squares from a *single* constant-only specification, not from a fixed-effect-only specification. Further, the observed Durbin-Watson stat is formed simply by computing the first-order residual correlation on the stacked set of residuals. Variance Inflation Factors (VIF) for the explanatory variables were found to be on the expected lines. *F*-test of the joint significance of variables that are presently omitted from a panel or pool equation has been performed with the null hypothesis that the variables are are jointly irrelevant. Further, redundant variables test has been performed to ascertain the joint significance of the variables that are presently included in the panel equation and irrelevant variables are removed from from the model. Balanced panel data is employed for estimation by employing the EViews tools for detailed analysis.

Model specification

The primer model that can be estimated using panel techniques can be written as

$$Y_{it} = f(X_{it}, \beta) + \delta_i + \gamma_t + \epsilon_{it} \quad \text{----------} \rightarrow (1)$$

With assumption of a linear conditional mean specification, we can write the specification as;

$$Y_{it} = \alpha + X_{it}\beta + \delta_i + \gamma_t + \epsilon_{it} \quad \text{----------} \rightarrow (2)$$

Where Y_{it} is the dependent variable, and X_{it} is a k-vector of regressors, and ϵ_{it} are the error terms for $i = 1, 2, \ldots\ldots, M$ cross-sectional units observed for dated periods $t = 1, 2, \ldots, T$. The α parameter represents the overall constant in the model, while the δ_i and γ_t represent cross-section or period specific effects (random or fixed).

Determinants of NPAs

The objective here is to identify and analyse the determinants of NPAs. The following specification is designed for a panel regression method.

Then, the equation would be;

$$GNPA_{it} = \alpha + \beta_1 GDPGR_t + \beta_2 ER_t + \beta_3 MCAP_t + \beta_4 LR_t + + \beta_5 IIPGR_t + \\ + \beta_6 INFLA_t + \beta_7 SVGR_t + \beta_8 ASSET_{it} + \beta_9 CAR_{it} + \beta_{10} CDR_{it} + \beta_{11} COF_{it} + \\ + \beta_{12} ROA_{it} + \beta_{13} RUSUBRA_{it} + \beta_{14} CREDGR_{it} + \beta_{15} PSC_{it} + \beta_{16} OER_{it} \\ + \beta_{17} ROI_{it} + \delta_i + \gamma_t + \epsilon_{it} \quad \text{----------} \rightarrow (3)$$

The vector of regressors include both the macroeconomic and the endogenous (industry specific) variables that are assumed to determine the level of NPAs.

The explanatory variables are represented by the macro-economic variables such as Gross Domestic Product Growth Rate (GDPGR), Exchange Rates (ER), Market Capitalisation Growth Rate (MCAP), Bank Lending Rates (LR), Index of Industrial Production (IIPGR), Inflation rate (INFLA), Savings Growth Rate (SVGR). The endogenous variables among the explanatory variables are represented by bank assets (natural log) (ASSET), Capital Adequacy Ratio (CAR), Credit to Deposit Ratio (CDR), Cost of Funds (COF), Return on Assets (ROA),

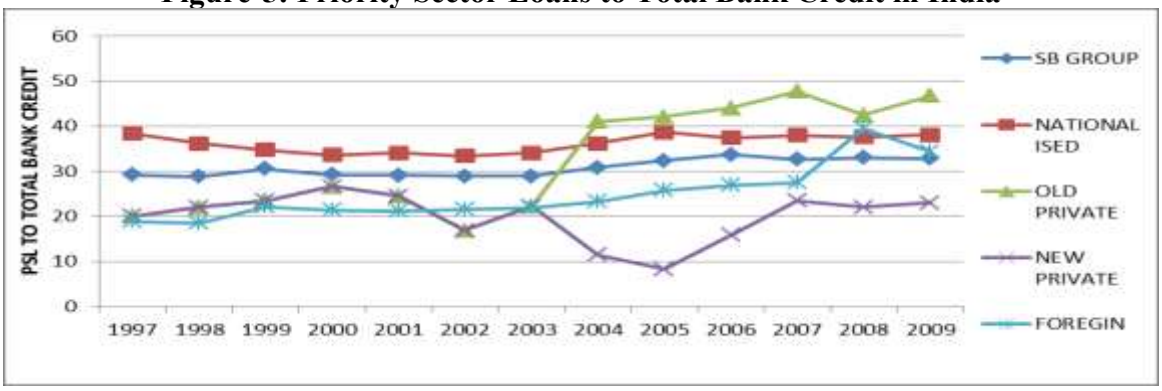
Ratio of Rural and Semi Urban Branches to total bank branches (RUSUBRA), Bank Credit growth (CREDGR), Ratio of Priority Sector Credit to total loans (PSC), Operating Expenses to total assets (OER), and Return on Investments (ROI) that are supposed to determine the NPAs in the Indian context. While 'i' represents the category of bank group, 't' represents the year and $\in_{it}$ represents the unexplained residual. This equation is estimated using panel regression analysis considering Gross NPA (GNPA), which is calculated as the ratio of Gross Non Performing Assets to Total Advances and as regressand.

GDPGR is involved as a determinant in view of its all-pervading effect in the economy that may have a say in causing the NPAs. It controls for the macroeconomic conditions that owing to the business cycles in the economy have a significant role to play in causing defaults in loan repayments. It is also because of the reasoning that as the GDP increases the amount of NPAs decrease. INFLA is considered as a macroeconomic determinant as it is one of the aspects related to Indian economy which affects the banks overall performance especially the level of NPAs in the banking system. This is because when RBI takes some steps related to interest rates to control inflation, the defaulters list also grows for the banks with the rising interest rates. Further, savings levels in an economy explain the savings propensity as well as the economic surpluses available which has a relation to the repayment capacity of the borrowers of the banking sector in general. In view of this, SVGR is considered as a determinant. Also, in a growing economy like India, capital markets attract a whole lot of investors as well stimulate the capital formation in the country which has a bearing on the performance of the organised industrial sector. In view of this logic, Bombay Stock Exchange Market Capitalisation Growth Rate (MCAP) is considered as a determinant.

It is argued that Non Priority Sector is the prime contributor to the NPAs. To include this viewpoint in the study, bank assets (ASSET) is taken as control for whether the bigger banks are more vulnerable to the problem of NPAs than their smaller counterparts are. CAR was also considered as a determinant in view of the logic that the higher the capital of the banks the lower is the level of NPAs. It was also due to the fact that as capital base of the banks increases confidence of the bank also increases and gets reflected in their performance thus leading to effective recovery of bank loans and bringing down the level of NPAs. ROA is considered as an

endogenous determinant because of the fact that profitability of banks would have a close relation with its NPAs. It is obvious in general that the more profitable banks would have less NPAs. In order to capture the aggressiveness in lending activity of the banks that can lead to NPAs, CDR is considered as an endogenous variable. Cost of Funds for the banks cause significant strategic decisions in the area of bank lending. In order to account this argument, COF is also considered as a determinant. Growth in Bank Credit is also one of the factors that can determine the emergence of NPAs. In view of this, CREDGR is considered as one of the determinants. In the area of bank lending the lending rates play a significant part. The cheaper the rates the more is the recovery rate, the higher the rates the higher the defaults. In order to account this argument, LR is considered. Much of the operating expenses in the bank are believed to be towards employing the work force and related resources for credit deployment and recovery. Accordingly, OER is also considered as a variable. Proportion of rural and semi-urban bank branches (RUSUBRA) has been considered as a determinant to examine whether the location of banks i.e, rural and semi-urban areas matter in causing NPAs in banking. The more aggressive are the banks in their lending they may end up in pushing riskier loans and thereby end up in higher level of NPAs. However, there is a contention that as banks concentrates on credit management they may have developed expertise in managing the credit risk and hence may sometimes exhibit lower level of NPAs. Therefore, the role of lending aggressiveness in causing increase in NPAs is still hazy. Ratio of Priority Sector Credit to total bank lending (PSC) was included as a determinant in order to account for the argument that the Priority Sector Loans are responsible for the most number of defaults (Refer Figure-5).

Figure-5: Priority Sector Loans to Total Bank Credit in India



Source: Compiled by Author based on data from RBI publications

Panel regression estimation for analysing the determinants of asset quality is made with GNPA as dependent variable (proxy for asset quality). Models 1a and 1b are analysed with Panel Least Squares and model 2a and 2b are analysed by employing Panel Least Squares with Cross-section weights (PCSE) standard errors & covariance. Residuals of the specification are presented in Appendix-5.

Bank profitability

The objective here is to identify and analyse the determinants of bank profitability of foregoing analysis of NPAs. The following specification is designed for a panel regression method.
Then, the specification for analysis would be;

$$ROA_{it} = \alpha + \beta_1 GDPGR_t + \beta_2 ASSET_{it} + \beta_3 CAR_{it} + \beta_4 CDR_{it} + \beta_5 COF_{it} + \beta_6 GNPA_{it} + \beta_7 RUSUBRA_{it} + \beta_8 ROADV_{it} + \beta_9 PSC_{it} + \beta_{10} OER_{it} + \beta_{11} ROI_{it} + \beta_{12} IDR_{it} + \in_{it} \quad (4)$$

Where, vector of regressors include both the macroeconomic and the endogenous (industry specific) variables that are assumed to determine the level of profitability.

Similar specification is employed as furnished here below for determining explanatory factors for ROE as the dependent variable for profitability analysis.

$$ROE_{it} = \alpha + \beta_1 GDPGR_t + \beta_2 ASSET_{it} + \beta_3 CAR_{it} + \beta_4 CDR_{it} + \beta_5 COF_{it} + \beta_6 GNPA_{it} + \beta_7 RUSUBRA_{it} + \beta_8 ROADV_{it} + \beta_9 PSC_{it} + \beta_{10} OER_{it} + \beta_{11} ROI_{it} + \beta_{12} IDR_{it} + \in_{it} \quad (5)$$

The explanatory variables include GDPGR, ASSET, CAR, CDR, COF, GNPA, RUSUBRA, ROADV, PSC, OER, ROI and IDR that are supposed to determine the profitability in a broader perspective in the Indian context. While 'i' represents the category of bank group, 't' represents the year and $\in_{it}$ represents the unexplained residual. This equation is estimated using panel regression analysis considering ROA and ROE as regressand.

GDPGR is involved as a determinant in view of its all-pervading effect in the economy that may have a say in affecting the profitability. It controls for the macroeconomic conditions that owing to the business cycles in the economy have a significant role to play in causing defaults in loan repayments and revenues. It is also because of the reasoning that as the GDP increases the profitability also increases. As size of the banking firm matters in profitability, bank asset (ASSET) is taken as control for whether the bigger banks have advantages in terms profitability than their smaller counterparts. CAR was also considered as a determinant in view of the logic that the higher the capital of the banks the higher would be the profitability. It was also due to the fact that as capital base of the banks increases confidence of the bank also increases and gets reflected in their performance thus leading to effective recovery of bank loans and bringing down the level of NPAs. In order to capture the aggressiveness in lending activity of the banks that can lead to boosting of interest income, CDR is considered as an endogenous variable. COF for the banks causes significant strategic decisions in the area of bank lending and affects the profitability.

As the NPAs rise, there would be a dampening effect on the profitability and in order to understand the impact of NPAs, GNPA is included as a predictor variable. Much of the operating expenses in the bank are believed to be towards employing the work force and related resources for credit deployment and recovery. Accordingly, OER is also considered as a variable. Proportion of rural and semi-urban bank branches (RUSUBRA) has been considered as a determinant to examine whether the location of banks i.e, rural and semi-urban areas matter in causing NPAs in banking. The more aggressive are the banks in their lending they may end up in pushing riskier loans and thereby end up in higher level of NPAs. However, there is a contention that as banks concentrates on credit management they may have developed expertise in managing the credit risk and hence may sometimes exhibit lower level of NPAs. Therefore, the role of lending aggressiveness in causing increase in NPAs is still hazy. Ratio of Priority Sector Credit to total bank lending (PSC) was included as a determinant in order to account for the argument that the Priority Sector Loans are responsible for the most number of defaults. As the return on investments (excluding the loans and advances) increases, the profitability gets positively affected and as such, ROI is considered as a variable. Lastly, investment to deposit ratio (IDR) is also considered in order to control for the impact of deposit vis-à-vis investment

activity on bank profitability. Panel regression estimation for analysing the determinants of profitability is made with ROA and ROE as dependent variables as proxy for profitability. Model 1 is analysed with Panel Least Squares and model 2 is analysed by employing Panel Least Squares with Cross-section weights (PCSE) standard errors & covariance. Residuals of the analysis are presented in appendix-6.

VII. RESULTS AND DISCUSSION

The results of the analysis for determinants of asset quality is presented in Table-5 and the nature and strength of the impact of macroeconomic and endogenous determinants on NPAs are furnished in Table-6 for ready comprehension. Under both models, GDPGR is found to be negatively significant at 5 % and 1% levels respectively. COF is found to have a significant negative relationship at 1% significance level. The coefficient of CREDGR has turned out to be negative and significant at 5% level indicating that banks with higher credit growth may have better risk management procedures and technology, which definitely allows them to end up with lower levels of NPAs. It was also observed that CDR is negatively associated with bad loans signifying that higher the CDR the lower tends to be the level of NPAs. As an alternative macro-economic variable, we employed the Index of Industrial Production (IIPGR) instead of GDPGR in Model-1b. The results indicate that the coefficient on this variable is negatively significant as conjectured at 1% level of significance. Further, as another variant of the aforesaid specification, we introduce the market capitalisation ratio (MCAP) in Model-1b with a view to capture the transition from a bank based to market based financial system. The result shows that the coefficient is positively significant at 1% level implying that transition to market orientation has impinged on the problem loans, as the surpluses tend to move into the booming markets as investments and thereby affecting the repayments of bank loans.

Table-5: Results of Panel Least Squares Regression for Determinants of NPAs

Explanatory Variables	Model-1a	Model-1b	Model-2a	Model-2b
Method	Panel Least Squares		Panel Least Squares with Cross-section weights (PCSE) standard errors & covariance	
Constant	0.06 9.53	0.41 -10.0	0.02 9.23**	0.49 -6.11
COF	0.02 -2.82**	0.001 -6.85***	0.005 -2.82***	0.0001 -6.85***
CREDGR	0.29 -0.33	0.04 -1.56**	0.17 -0.33	0.02 -1.56**
ER	--	0.66 -0.20	--	0.58 -0.20
GDPGR	0.015 -1.61**	--	0.006 -1.6***	--
IIPGR	--	0.0003 -3.78***	--	0.0000 -3.7***
INFLA	--	0.048 4.02**	--	0.01 4.02**
LR	--	0.12 7.55	--	0.03 7.55**
MCAP	--	0.03 0.77**	--	0.004 0.77***
OER	0.000 3.48***	0.0006 3.49***	0.0000 3.48***	0.0000 3.49***
PSC	0.30 0.69	0.76 0.22	0.14 0.69	0.68 0.22
ROI	0.005 4.88***	0.0006 6.37***	0.0008 4.88***	0.0001 6.37***
RUSUBRA	0.053 1.03	0.98 -0.01	0.019 1.03**	0.97 -0.01
SVGR	0.48 -0.19	--	0.42 -0.19	--
SBdummy	0.39 0.73	0.03 6.57**	0.82 0.42	0.01 2.68**
NBdummy	0.95 0.05	0.03 6.18**	0.88 -0.24	0.02 2.29**
OPdummy	0.57 -1.23	0.13 4.19	0.49 -1.23	0.04 4.19**
NPdummy	0.86 -0.30	0.09 3.89	0.10 -0.93	0.02 -3.89**
FBdummy	0.86 0.30	0.096 3.89	0.83 -0.30	0.22 3.8
R Square	0.84	0.88	0.84	0.88

Adjusted R Square	0.80	0.80	0.80	0.80

Note: 1. Dependent variable: GNPA
2. *** at 1% level of significance * * at less than 5% level of significance
3. Coefficient values are marked with significance levels and the first row of results indicates the probability values.

Though LR under model-1b is found to be insignificant but is found to significant at 5 % level in model 2-b. While OER and ROI are found to be significant at 1% level in both the variants of models 1 and 2, interestingly, PSC and SVGR are found to be insignificant in both the models of analysis. As is theoretically well established when the ROI has increased, it is resulting in lesser amount of problem loans. Accordingly, the analysis has found that ROA is strongly associated with the NPAs negatively. Cost of Funds (COF) was found to be significantly associated with the NPAs negatively to evidence our viewpoint that as the cost of funds increase the banks tend to be very cautious and choosy in their lending thus leading to decrease in NPAs. Lending Rates have been found to be not so significant in affecting the NPAs contrary to the general perception. The rest of the explanatory variables exhibit theoretically expected relationships with NPAs and are self-explanatory as detailed in the columns 1 and 2 of Table-6 which explains the nature and strength of the impact of endogenous determinants on NPAs.

Table-6: Nature and Strength of the Impact of determinants on NPAs

Explanatory Variable	Model-1	Model-2
COF	Negative and Significant	Negative and Significant
CREDGR	Not Significant	Negative and Significant
ER	Not Significant	Not Significant
GDPGR	Negative and Significant	Negative and Significant
IIPGR	Negative and Significant	Negative and Significant
INFLA	Positive and Significant	Positive and Significant
LR	Not Significant	Positive and Significant
MCAP	Positive and Significant	Positive and Significant
OER	Positive and Significant	Positive and Significant
PSC	Not Significant	Not Significant
ROI	Positive and Significant	Positive and Significant
RUSUBRA	Not Significant	Positive and Significant
SVGR	Not Significant	Not Significant
SBdummy	Significant	Positive and Significant
NBdummy	Significant	Positive and Significant
OPdummy	Not Significant	Positive and Significant
NPdummy	Not Significant	Negative and Significant
FBdummy	Not Significant	Not Significant

Note: Significance levels for the analysis is assumed at 1% and 5% considering the dynamics of the impacting variables
Source: Compiled from the results of the analysis by author

The last focus of interest in this study was whether the NPAs are in any way affected by the ownership styles of the banks. This issue was investigated by introducing the ownership dummies (SBdummy for State Bank Group of banks, NBdummy for Nationalised Banks, OPdummy for Old Private Banks, NPdummy for New Private Banks and FBdummy for Foreign Banks. The results summarized in Table-5 indicate that Private Banks (both Old and New) and Foreign Banks appear to manage their NPAs efficiently. State Bank Group and Nationalised Banks appear to lag behind their private counter parts in NPA management.

The results of the analysis for determinants of profitability are presented in Table-7 and the nature and strength of the impact of macroeconomic and endogenous determinants on NPAs are furnished in Table-8 for ready comprehension.

Table-7: Results of panel regression analysis of determinants of profitability

Explanatory Variables	**ROA**	**ROE**	**ROA**	**ROE**
	Panel Least Squares		Panel Least Squares with Cross-section weights (PCSE) standard errors & covariance	
Constant	0.79 -3.15	0.32 -3.71	0.96 -0.44	0.007 -4.94
ASSET	0.26 0.34	0.24 0.09	0.17 0.34	0.14 0.09
CAR	0.005 2.44**	0.0003 1.25***	0.006 2.44***	0.0000 1.26***
CDR	0.39 -1.41	0.69 -0.20	0.29 -1.41	--
COF	0.07 -1.43*	0.18 -0.29	0.02 -1.43**	0.06 -0.31*
GDPGR	0.47 -.027	0.89 -0.01	0.40 -0.27	0.97 -0.003
GNPA	0.07 -0.14*	0.16 -0.03	0.012 -0.14**	0.06 -0.03*
IDR	0.03 2.13**	0.91 0.03	0.02 2.13**	0.75 0.05
OER	0.72 -0.21	0.01 -0.47**	0.59 -0.21	0.008 -0.44***
PSC	0.29 -0.40	0.30 -0.12	0.22 -0.40	0.17 -0.12
ROADV	0.30 0.74	0.02 0.28**	0.11 0.74	0.07 0.30*

ROI	0.02 2.63**	0.09 0.59*	0.02 2.63**	0.01 0.65***
RUSUBRA	0.79 -0.08	0.65 -0.03	0.67 -0.08	--
SBdummy	0.002 2.18***	0.15 0.30	0.53 -0.52	0.04 0.31**
NBdummy	0.02 1.77**	0.73 0.08	0.26 -0.93	0.52 0.11
OPdummy	0.11 -2.24	0.43 0.15	0.03 -2.24	0.05 0.18**
NPdummy	0.01 -2.70**	0.86 -0.30	0.0002 -2.70***	0.02 0.18**
FBdummy	0.01 2.7**	0.74 -0.08	0.41 0.45	0.99 -0.0001
R Square	0.84	0.66	0.84	0.66
Adjusted R Square	0.77	0.54	0.77	0.55

Note: 1. Dependent variables: ROA and ROE
2. *** at 1% level of significance * * at less than 5% level of significance * at less than 10% level of significance
3. Coefficient values are marked with significance levels and the first row of results indicates the probability values.
Source: Compiled from the results of the analysis by author

Under both models, COF is found to have a significant negative relationship at 1% significance level. Similar is the case with CAR, which is positively significant at 1% level in both the models of analysis. IDR is also observed to be negatively significant at 5% level. OER is found to be negatively significant at 5% and 1% levels of significance. ROI is significant at 5% and 1% levels in both the models of analysis. Asset size, CDR, GDPGR, PSC, RUSUBRA are found not to have insignificant impact on profitability.

Table-6: Nature and strength of the impact of determinants of profitability

Explanatory Variable	ROA	ROE
ASSET	Not Significant	Not Significant
CAR	Positive and Significant	Positive and Significant
CDR	Not Significant	Not Significant
COF	Negative and Significant	Negative and Significant
GDPGR	Not Significant	Not Significant
GNPA	Negative and Significant	Negative and Significant
IDR	Positive and Significant	Positive and Significant
OER	Negative and Significant	Negative and Significant
PSC	Not Significant	Not Significant
ROADV	Positive and Significant	Positive and Significant

ROI	Positive and Significant	Positive and Significant
RUSUBRA	Not Significant	Not Significant
SVGR	Not Significant	Not Significant
SBdummy	Positive and Significant	Positive and Significant
NBdummy	Positive and Significant	Positive
OPdummy	Not Significant	Positive and Significant
NPdummy	Not Significant	Negative and Significant
FBdummy	Significant	Not Significant

Note: Significance levels for the analysis is assumed at 1% and 5% considering the dynamics of the impacting vbariables

Source: Compiled from the results of the analysis by author

Finally, one of the corollary objectives of this study was whether the profitability is in any way affected by the ownership styles of the banks. This issue was investigated by introducing the ownership dummies (SBdummy for State Bank Group of banks, NBdummy for Nationalised Banks, OPdummy for Old Private Banks, NPdummy for New Private Banks and FBdummy for Foreign Banks. The results summarized in Table-7 indicate that Private Banks (both Old and New) appear to manage their profitability efficiently. State Bank Group and Nationalised Banks appear to lag behind their private counter parts in profitability management.

Robustness Checks

In order to ascertain whether or not the empirical results presented above are robust, two routes were explored. Firstly, the robustness of the results with respect to the presence of outliers was investigated and the main results were not found to be driven by outliers. Secondly, the robustness of the above results to various specifications was investigated by various iterations of regression analysis. Variables included in the above specifications were excluded one by one and combinations of them and the final results presented are found robust to those modifications after duly considering the potential biases resulting from the omitted variables. Further in order to ensure the non-stationarity of the data panel-based unit roots were estimated as the rrecent literature suggests that panel-based unit root tests have higher power than unit root tests based on individual time series.

VIII. SUMMARY AND CONCLUSION

Several policy implications can be garnered from this analysis. Favourable macroeconomic conditions facilitate in NPA management leading to better asset quality. First, as the banks grow in size, they tend to control the NPA owing to efficiency in their management. In this background, there is a case for consolidation of banks in the public sector to reap this potential of efficiency in scale of operations. Larger banks have exhibited better credit risk management with lower NPA levels. Secondly, Priority Sector lending by banks is found to be not much significant in contributing for NPAs in contrast to the perception of some urban bankers that PSL cause NPAs. This supports the contention that branch expansion in rural and semi urban areas for extending priority sector credit is a viable proposition and there need not be aversion on this by the policy makers as well as the industry heads. Thirdly, Ownership of banks is an interesting issue that has been quite often debated. This study has established that private banks and foreign banks have advantages in terms of their efficiencies in better credit management in containing the NPAs, which indicates that bank privatization can lead to better management of default risk. These findings infer that better credit risk management practices need to be taken up for bank lending. Adequate attention should be paid to those banks with low operating efficiency and low capitalisation as also to macroeconomic cycles that appear to be playing some role in NPA management. The state owned banks need to be toned up with adequate measures to sharpen their NPA management practices. These findings assume crucial importance in view of the significance. It is summarised that Private Banks (both Old and New) and Foreign Banks appear to manage their NPAs efficiently. State Bank Group and Nationalised Banks appear to lag behind their private counter parts in NPA management.

Investigating the industry specific and macroeconomic determinants of profitability for commercial banks in India, it is observed that capital adequacy is positively influencing the profitability. It can be inferred that capital infusion though comes with a cost, on other hand, is beneficial in improving the profitability. It is interesting to note that since majority of the banks being domestic oriented banks, return on advances has a positive causative relationship on profitability. Similar is the case with investment activity. On the impact of ownership styles, it is observed that Private Banks (both Old and New) appear to manage their profitability efficiently. State Bank Group and Nationalised Banks appear to lag behind their private counter parts in

profitability management. These results contribute to the existing literature particularly in the context of emerging economies by providing new understanding about the determinants of quality of assets and profitability of banks.

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Appendix-1: Description of Variables

Variable	Empirical Definition and explanation
ASSET	Size of the bank is represented by the total asset of the bank (natural log) and is expected to have a positive effect on profitability.
CAR	Capital Adequacy Ratio (also called CRAR) is the ratio of the capital of the bank against its risk weighted assets. It is expected to have a positive effect on profitability.
CDR	Credit Deposit Ratio represents the ratio of the loans outstanding vis-à-vis deposits outstanding in a bank. Very high CDR indicates the aggressive lending activity of the bank and is predicted to have a positive effect on the NPA levels and negative effect on the profitability as increasing NPA levels lead to non-realisation of income by the bank.
COF	Cost of Funds in percentage is the cost incurred by the bank in raising its funds for banking business in which cost of deposits constitutes a major chunk. It is expected to negatively affect the NPAs as the rising cost of funds compels the bank to selectively go for quality credit deployment and hectic recovery measures. Further, it would negatively on the profitability, as the increase in cost of funds would drain away the margin for the bank.
CREDGR	Bank Credit Growth Rate (Growth in real advances) is measured in percentage and is expected to negatively affect the NPAs and positively influence the income of the bank.
ER	Exchange rate levels are expressed by the trend in the exchange of domestic currency vis-à-vis US Dollar widely considered as the global anchor currency. It is expected that as the exchange rate for Dollar increases, the domestic currency depreciates leading the unhealthy scenario on many fronts in the economy and hence it is predicted to impact on the banking industry too.
GDPGR	Growth Rate of real Gross Domestic Product (measured in percentage growth) is the variable that controls for the impact of macroeconomic activity on the banking industry. It is expected to have a negative effect of the NPAs and on the other hand positively affect the profitability of the bank.
GNPA	Gross NPA to Total Advances is a broad measure of non-performing bank assets. The higher the ratio the higher is the loss of profitability for the bank and speaks low about the bank's efficiency in credit management. It is expected to have a significant negative impact on the profitability.
IDR	Investment to Deposit Ratio explains the level of Investments as against the Deposit levels of the bank and is expected to have a positive impact on profitability and negative impact on the NPA levels.
IIPGR	Index of Industrial Production (IIP), measured in percentage annual growth of industrial production in the economy is expected to have a significant effect on the NPAs.
INFLA	Inflation levels measured in annual growth of whole sale price index in the economy is expected to have a positive and significant impact on the NPAs
LR	Bank Lending Rates measured in percentage are expected to positively affect the NPA levels as the rising loan rates would lead to defaults thereby causing NPAs.
MCAP	Market capitalisation of Bombay Stock Exchange (BSE) is considered as a proxy for the market activity and its sentiments in the Indian industry. For the purpose of this analysis, the annual growth in the market capitalisation is considered and is expected to positively affect the profitability and negatively impact on the NPA levels.

OER	Operating Expenses to Total Assets is expressed in ratio and is predicted to negatively impact the profitability of the banks as the reduction in operating costs would lead to rise in net profit.
PSC	Priority Sector Credit to Total Loans is measured in ratio and is expected to positively impact on the NPA levels as per popular perception of the banking industry and negatively impact on the profitability.
ROA	Return On Assets of banks is measured in ratio and is considered an accounting measure of the profitability of a firm. It is expected to have negative relationship with NPA levels.
ROADV	Return On Advances is an accounting ratio measured with the amount of income generated by the lending activity of the bank (income by loans). Obviously it is expected to have a positive effect on profitability
ROE	Return On Equity of banks is measured in ratio and is considered an accounting measure of profitability of a firm. Similar to ROA it is also expected to have negative relationship with profitability of the bank.
ROI	Return on Investment is measured as the percentage of income earned by the bank out of its investment (mostly in market and off-market investment portfolios) other than loans and advances. Higher the ROI, the higher is the positive impact on profitability.
RUSUBRA	Ratio of number of Rural and Semi-Urban branches to total bank branches is expressed in ratio. It is generally believed that increase in this ratio would positively affect the NPA levels and negatively affect the profitability.
SVGR	Savings Growth Rate is expressed in ratio and represents the level of savings activity in the economy. The role of this variable in this analysis is to control for the effects of savings activity in the economy on the banking industry.

Source: Compiled from the results of the analysis by author

Appendix-2: Descriptive Statistics of Variables

	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
ASSET	25000.00	2314102.00	429639.83	466356.88	2.01	4.55
CAR	10.10	15.20	12.49	1.27	0.04	-0.17
CDR	45.24	87.18	65.28	13.00	-0.07	-1.47
COF	0.01	0.05	0.02	0.01	1.35	1.88
CREDGR	0.74	71.04	20.78	10.96	1.57	5.79
ER	0.09	0.43	0.28	0.09	-0.20	-0.76
GDPGR	3.80	9.60	6.98	1.90	-0.29	-1.15
GNPA	1.70	19.05	6.80	4.71	0.82	-0.46
IDR	33.29	60.42	45.06	7.25	0.42	-0.51
IIPGR	2.80	11.50	6.81	2.16	0.19	0.16
INFLA	3.70	9.30	5.76	1.50	0.56	0.26
LR	10.75	18.00	14.23	1.81	-0.08	-0.64
MCAP	-0.37	1.10	0.29	0.40	0.37	-0.48
OER	0.01	0.05	0.02	0.01	1.35	1.88
PSC	8.31	47.69	28.80	8.52	0.09	-0.41
ROA	0.10	8.20	1.11	0.99	5.98	42.49
ROADV	3.65	17.12	10.62	2.72	0.26	0.26
ROE	6.25	23.20	14.80	3.50	-0.26	0.49
ROI	5.70	12.66	9.40	2.23	-0.02	-1.55
RUSUBRA	0.00	0.74	0.39	0.27	-0.27	-1.53
SAVGR	0.03	0.27	0.16	0.07	-0.39	-1.13

Source: Author's calculations for this study
Note: ASSET that describes the bank assets is denominated in INR crores.
All other variables are presented in ratios

Appendix-3: Correlations of Variables

	GDPGR	INFLA	CREDGR	PSC	ASSET	CDR	ROA	RUSUBRA	GNPA	CAR	OER	COF	LR	ROA	ROADV	ROI	IDR	ROE	FXGR	IIPGR	SAVGR	MCAP	SVGR
GDPGR	1.0																						
INFLA	.08	1.0																					
CREDGR	.2*	-0.1	1.0																				
PSC	.2*	0.0	-0.1	1.0																			
ASSET	.3*	-0.0	0.2	.4**	1.0																		
CDR	.3**	-.02	.4**	-.2*	0.0	1.0																	
ROA	0.1	.06	-0.1	0.1	0.0	0.2	1.0																
RUSUBRA	-.07	0.1	-0.2	.4**	.2*	-.7**	-.2*	1.0															
GNPA	-.4**	0.2	-.3**	.04	-.2	-.8**	-0.1	.5**	1.0														
CAR	0.1	-0.1	-.02	.07	-.01	.3**	.2*	-0.1	-.3**	1.0													
OER	-0.1	0.2	-.3**	.05	-0.1	-.3**	0.1	.03	.5**	-.4**	1.0												
COF	-.4**	.5**	-.3**	-0.2	-.3**	-.4**	-0.2	0.2	.5**	-.2*	0.2	1.0											
LR	0.1	.5**	-.09	-0.2	-.3**	.4**	0.1	-.3**	-.2*	0.1	-0.1	0.2	1.0										

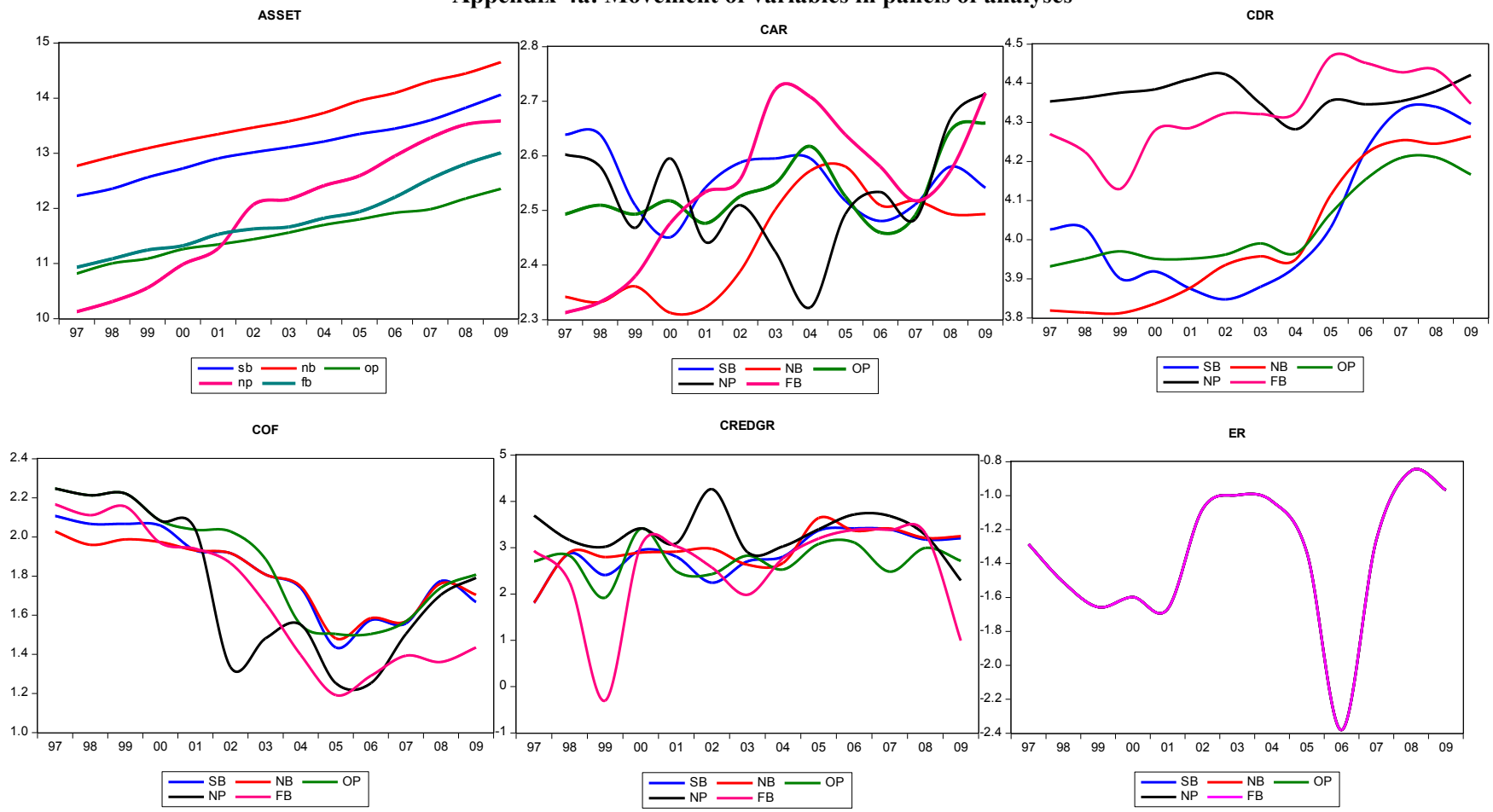
Note: *. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Appendix-3 .. continued: Correlations of Variables

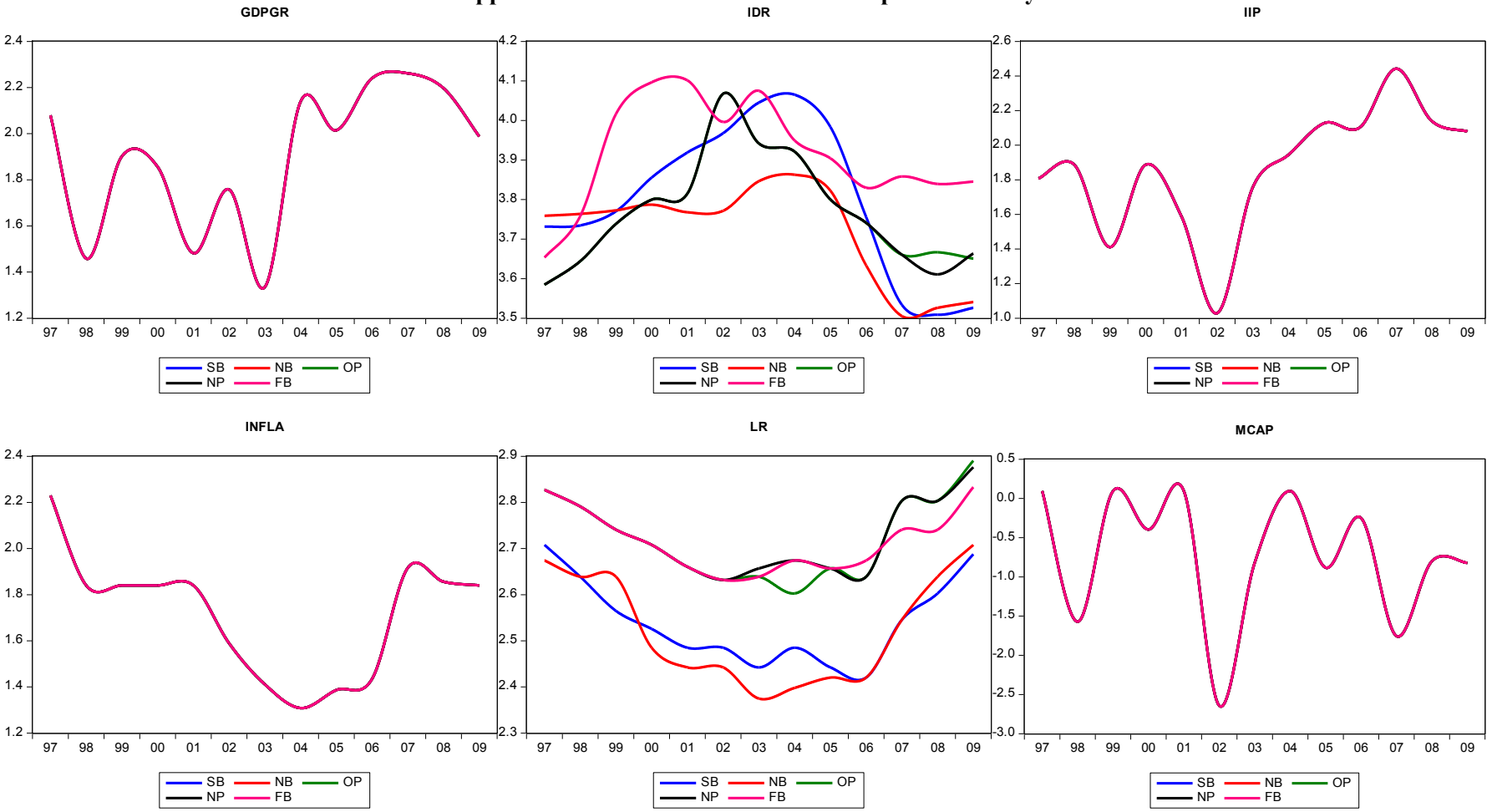
	GDPGR	INFLA	CREDGR	PSC	ASSET	CDR	ROA	RUSUBRA	GNPA	CAR	OER	COF	LR	ROA	ROADV	ROI	ID R	ROE	FXGR	IIPGR	SAVGR	MCAP	SVGR
ROA	.07	.00	.03	.08	.3**	0.2	.3*	-.1	-.2*	0.1	-.1	-.1	0.1	1.0									
ROADV	-.3**	.6**	-.3**	-.3**	-.5**	-.1	.04	-.1	.3**	-.2	.3**	.7**	.4**	.0	1.0								
ROI	-.5**	.4**	-.2*	-.3*	-.4**	-.4**	-.1	0.1	.6**	-.3**	.4**	.8**	-.03	-.2	.7**	1.0							
ID R	-.4**	-.4**	-.1	-.3*	-.4**	-.1	.09	-.2*	0.1	.08	0.1	-0.1	-.3*	-.06	0.0	0.1	1.0						
ROE	.05	-.2	0.1	-.01	0.1	0.0	.09	.1	-.1	.4**	-.5**	-.07	-0.2	0.2	-0.2	-.09	.04	1.0					
FXGR	.04	-.04	-.1	0.1	.2*	0.1	0.2	.06	-.21	.3**	-.2*	-.2	0.1	0.2	-.2	-.4**	.02	.2*	1.0				
IIPGR	.6**	.03	.2*	.3**	.3**	.3**	0.1	-0.0	-.5**	0.2	-.2*	-.5**	0.1	0.1	-.4**	-.6**	-.4**	0.1	.09	1.0			
SAVGR	.3**	-.5**	0.1	0.1	0.1	0.1	.06	-0.0	-.3**	.2*	-0.2	-.5**	-.1	0.1	-.4**	-.4**	0.0	.3**	0.1	.5**	1.0		
MCAP	.5**	-.4**	0.1	0.1	0.2	0.1	.09	-.07	-.3*	0.2	-.2	-.4**	-.1	.13	-.4**	-.4**	-.01	.2*	.06	.4**	.8**	1.0	
SVGR	.3**	-.5**	0.1	0.1	0.1	0.1	.06	-.08	-.3**	.2*	-.2	-.5**	-.1	0.2	-.4**	-.4**	.05	.3**	0.1	.5**	1.0**	.8**	1.0

Note: *. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

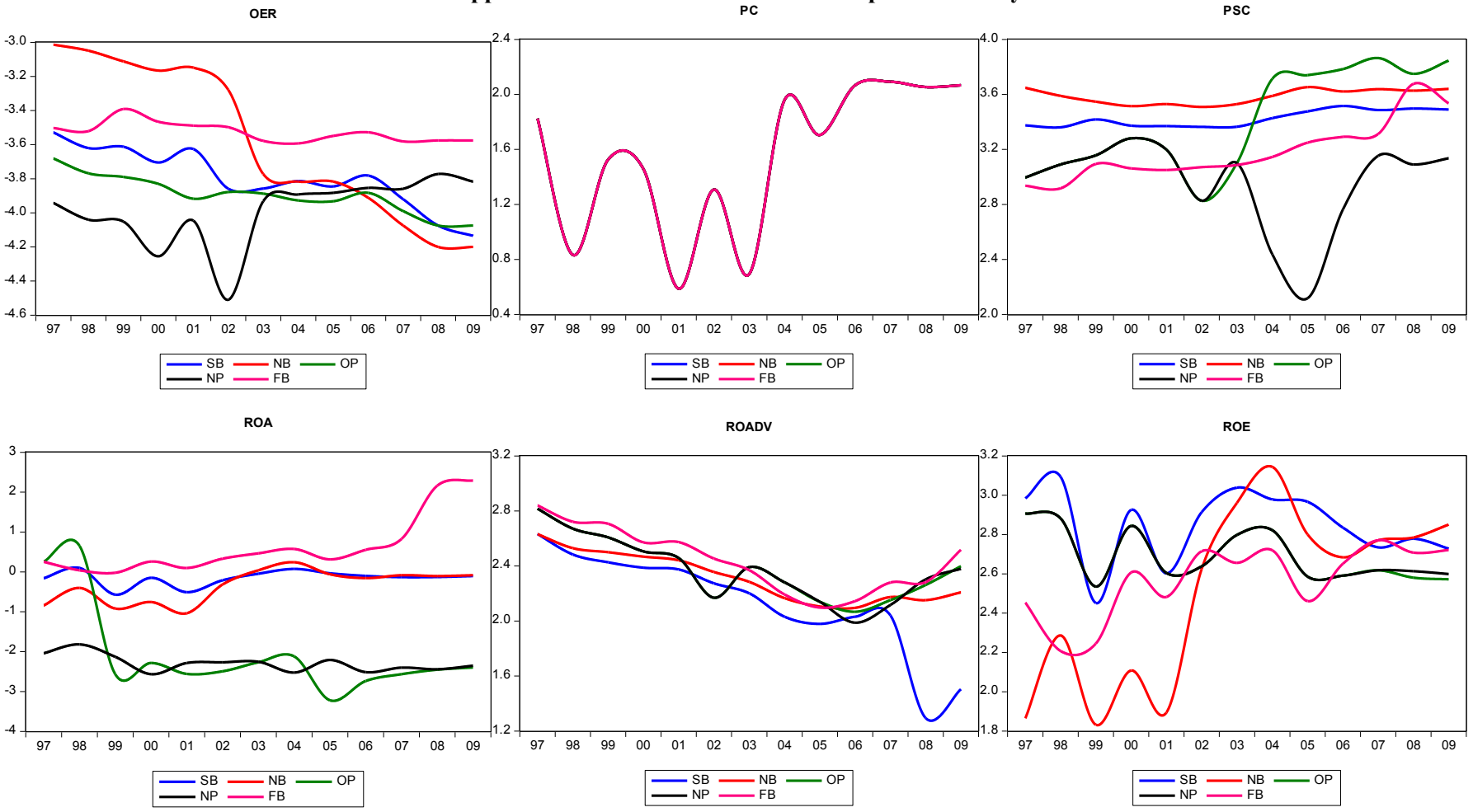
Appendix-4a: Movement of variables in panels of analyses



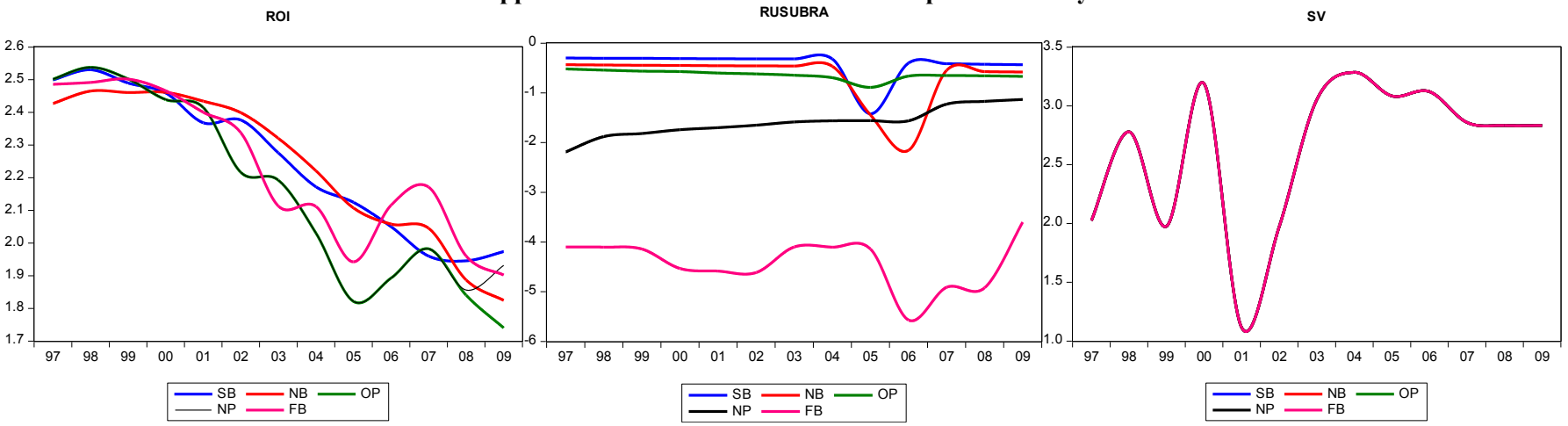
Appendix-4b: Movement of variables in panels of analyses



Appendix-4c: Movement of variables in panels of analyses

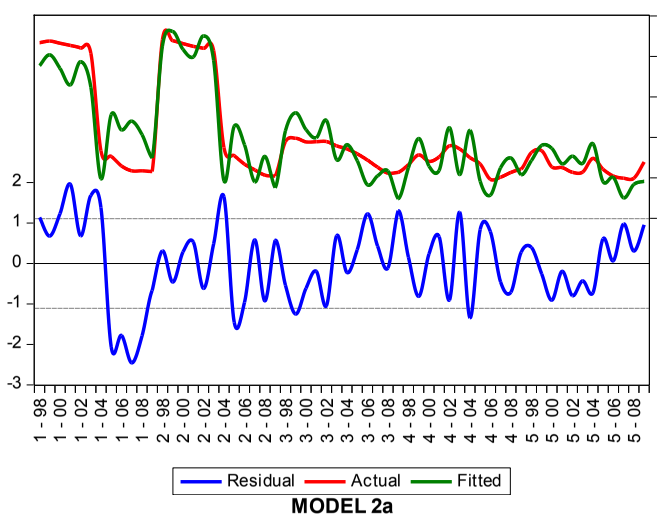


Appendix-4d: Movement of variables in panels of analyses

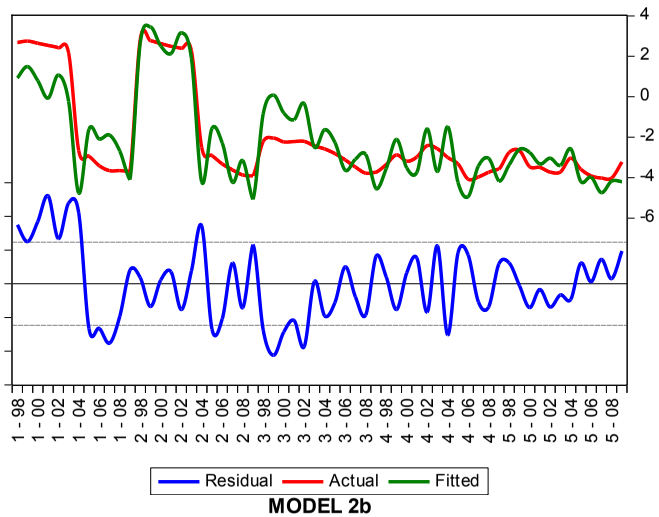


Appendix-5: Chart of residuals - Analyses for determinants of bank asset quality

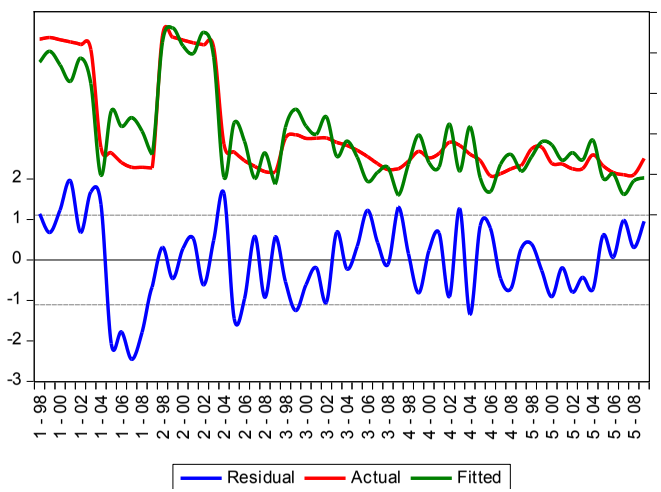
MODEL 1a



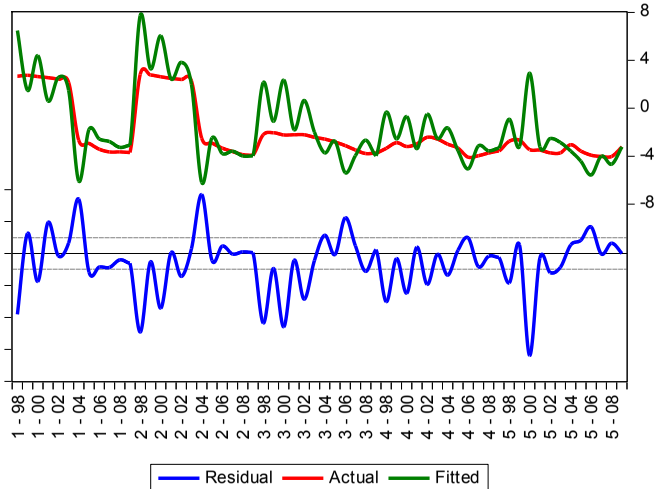
MODEL 1b



MODEL 2a



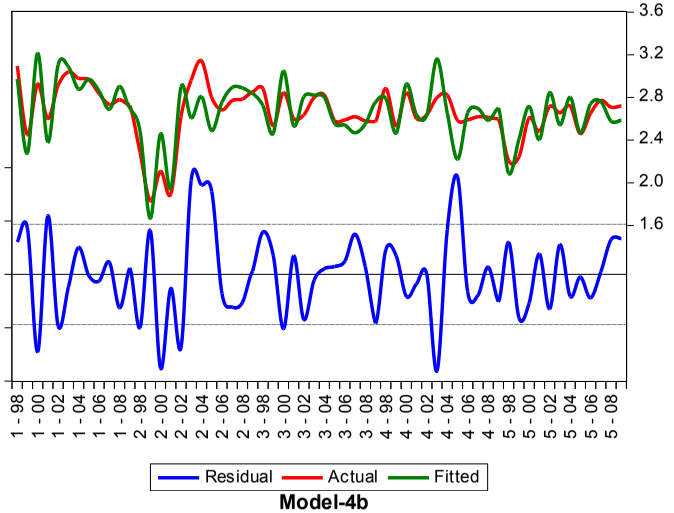
MODEL 2b



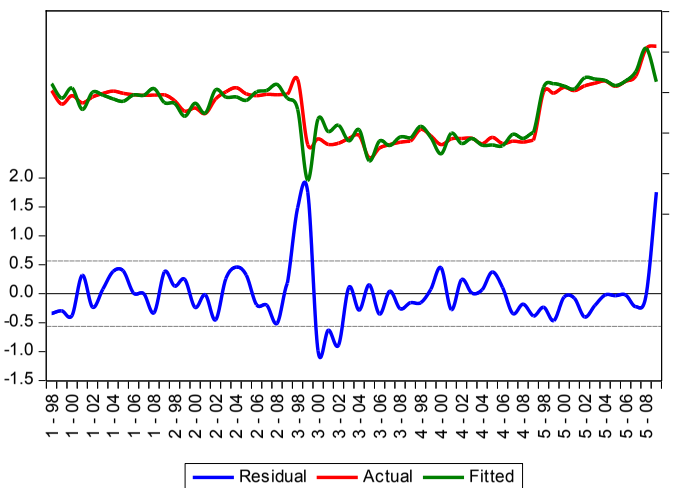
Appendix-6: Chart of residuals - Analyses for determinants of Profitability

Model-3a

Model-4a



Model-3b



Model-4b