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Management Behaviour in Indian Commercial Banks

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Abstract: The study explores management behavior in Indian commercial banks during the post reform period. The Granger causality approach of Berger and De Young (1997) is employed to examine four hypotheses such as bad management, bad luck, moral hazard and skimping behavior of Indian commercial banks. The empirical analysis conducted for Indian banks on its three ownership groups, viz., public sector, private domestic and foreign banks, reveal the existence of characteristics of the bad management and the bad luck in Indian banking operations. The econometric analysis for sub samples of the most cost efficient banks reveal that there is no skimping behavior, while the sub sample for the least capitalized banks supports the existence of moral hazard behavior in Indian banks. The study also finds an inverse relationship between cost efficiency and capitalization. Finally, economic effects of the four hypotheses are explored.

Keywords: Non-performing loans; Capitalization; X-efficiency; Stochastic frontier approach; Granger causality; Management behaviour; Economic effects.

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1. Introduction

Over the last two decades the Indian banking system has become increasingly integrated. The two forces of deregulation and technological change led to the development of financial integration and increased competition in the banking system. As a result of the deregulatory process, there has been a remarkable stress on the role of efficiency in the banking system. That is, it has forced banks to perform closer to the efficient production frontier. On the other hand, the increase in competition reduces the market power of banks which could lead to greater risk taking behaviour in banks (Fiordelisi et al., 2011).

Principal agent problems, which imply that managers in foreign or private enterprises are supposed to be more restrained by capital market discipline, explain variations in x-efficiencies. On the contrary, lack of owner's control makes management more free to pursue a personal agenda. The principal-agent problems exist whenever there is a break between ownership and control, and this will explain differences in the performance of banks operating under different ownerships. The nexus between ownership and efficiency is determined by the amount of trading of equities and the transfer of ownership rights (William, 2004). The principal-agent problems include but are not limited to capturing board of directors, indifferent depositors, and the absence of shareholders which reflect the inadequate external discipline in banks.

This issue has attracted a considerable attention in the empirical literature, although the results are rather mixed or inconclusive. Studies such as Verbrugge and Goldstein (1981), Verbrugge and Jahera (1981), Cebenoyan et al (1993), Mester (1993), Berger and Humphrey (1997), Cummins and Zi (1998), and Altunbas et al. (2001) are recent contributors to the literature explaining variations in efficiency in terms of their ownership structure. However, the literature on ownership-performance has certain limitations. It simply describes that banks operate under one ownership structure are more or less efficient than the banks under another ownership structure. The ownership approach might provide useful information for policy and regulation. But it does not help in understanding how management behaviour could affect performance and efficiency (William, 2004).

In addition to the above, there are a considerable number of studies that differentiate bank efficiency levels between types of ownership. But the literature on the link between management behaviour and efficiency is sparse. To the best of our knowledge, even a single study does not exist with respect to Indian banks. De Young et al. (2001) examined the management structure of small US banks and found that management behaviour of most profit efficient banks is online with shareholder interests. Berger and Hannan (1998) found evidence for the structure-conduct -performance hypothesis in U.S. banks. They found that the structure of banking markets, such as concentration and its effects on bank behavior, are positively associated with cost inefficiency. In addition, Berger (1995) found a positive relationship between capitalization and earnings, supporting the expected bankruptcy

cost hypothesis, and Mester (1996) provided evidence for the moral hazard hypothesis, in U.S. banks.

In order to understand the different kinds of management behaviour, we need to explore the inter-temporal relationships between cost efficiency, non-performing loans, and capitalization. According to Berger and De Young (1997) the directions of these relationships reveal four different kinds of management behaviour, namely: (1) bad management (an exogenous decline in cost efficiency leads to an increase in non performing loans); (2) bad luck management (an exogenous increase in non-performing loans leads to a decrease in cost efficiency); (3) skimping behavior (an exogenous increase in cost efficiency leads to increases in non-performing loans); and (4) moral hazard behavior (an exogenous reduction in capital leads to an increase in non-performing loans).

The above management behaviours are not mutually exclusive; sometimes banks show characteristics of multiple behaviours. A couple of studies have investigated this issue for developed countries. Berger and De Young (1997) is the first study in this direction. Berger and De Young (1997) investigated causality between non performing loans, cost efficiency and capitalization on a sample of US commercial banks using Granger causality tests. The study found evidence of skimping behaviour among most efficient banks, moral hazard behaviour among least capitalized banks, and also the presence of the other two, bad management and bad luck behaviour, in U.S. banks. William (2004) provides a robustness test for Berger and De Young (1997) on a sample of European savings banks. The study found a strong statistical evidence to support bad management behaviour in European savings banks and also in a sub-sample of thinly capitalized banks. At the country level, the study found evidence of both bad management and bad luck management in German banks. Podpiera and Weill (2008) extended Berger and De Young's (1997) technique to examine bad management and bad luck management behaviour in Czech banks and found evidence of bad management behaviour in the Czechs' banks. Rossi et al (2009) linked banks' management behavior to loan portfolio diversification for Austrian commercial banks and found that diversification has a negative impact on banks' cost efficiency, and reduces risk. On the other hand, it has a positive impact on banks' profit efficiency and capitalization. In addition, recently, Fiordelisi et al. (2011) for European commercial banks found that lower bank efficiency with respect to costs and revenues

Granger-causes higher bank risk. He also found that increases in bank capital precede cost efficiency improvements. More efficient banks tend to become better capitalized and these higher capital levels tend to have a positive effect on efficiency levels. These studies concentrated on developed countries. There are few studies dealing with bank management behaviour in developing countries.

The purpose of this study is to extend Berger and De Young's (1997) technique to examine the intertemporal relationships among non performing loans, cost efficiency and capitalization of Indian commercial banks to identify the different kinds of management behaviours existing in Indian banks. The explanation of the relationships of these variables is in terms of an increase in non-performing loans, because the increase in non-performing loans will reduce the asset quality of banks and push the banks to an insolvency situation. The Granger causality framework explores the intertemporal relationships between variables, and should display various types of management behaviours in banks. Studying management behaviour is a pertinent issue for bank management and policy makers in framing appropriate policies for the development of banks. This analysis focuses on the sign and the direction of lagged values of these variables.

The panel dataset consists of public, private and foreign commercial banks in India of 1,052 observations. Excluding banks with missing data the study uses a final unbalanced panel data of 87 commercial banks for the period 1995-2007. Data after year 2008 are excluded, since the global financial crisis originating in the U.S. hit almost all banking industries in the world in that year. The Indian banking industry is no exception. Inclusion of this crisis period in the analysis could have serious implications on the results of study as the whole banking industry is operating under some sort of heat and pressure created by stringent regulatory measures such as tight monetary controls and rising interest rates. To avoid any event like impact on the operations of banks, I excluded the crisis period from the sample. The necessary statistical information for empirical analysis was obtained from the Annual Accounts Data of Scheduled Commercial Banks, the Statistical Tables Relating to Banks in India, the Reports on Trend and Progress of Banking in India, published by the Reserve Bank of India, and the Prowess data base provided by Center for Monitoring Indian Economy (CMIE).

The remainder of this paper is organized as follows. Section II provides a brief

view about Indian commercial banking. Section III presents the econometric method adopted to explore the inter-temporal relationships between the variables. The results of the Granger causality tests are presented in Section IV. Section V discusses the economic effects of management behaviour. Section VI presents a summary and concluding remark for the study.

2. A brief view of Indian banking

India is one of the fastest growing countries in the world with a rich banking system history. The Indian banking industry is the largest one in South Asia and is predominantly dominated by public sector banks. After the independence, there was a perception among the policy makers that unless there is direct control of the Government over banking industry, it would be difficult to meet the financial needs for planned economic development, such as mopping up potential savings, addressing the credit gaps in agriculture, industry and retail trade, where the Government has had a leading role in every economic activity. Keeping its linkages with the economic activities in the mixed-economy framework and the economic and the social objectives of planning, the Government of India nationalized 20 banks in two phases in 1969 and 1980. The nationalization process led the Indian banking industry to grow very rapidly, in terms of branch expansion, deposit mobilization and credit allocation.

On the other hand, the bank nationalization brought several regulatory measures. Interest rates on all kinds of deposits and loans were brought under an administered mechanism; public sector banks were asked to open branches in rural and semi urban areas; and entry and operations of private and foreign banks were restricted. The Government fixed credit targets to the priority sector with subsidized interest rates. The cash reserve ratio (CRR) and the statutory liquidity ratio (SLR) were kept at very high rates in order to meet growing fiscal deficits. As a result, the Indian banking industry suffered with high costs and low quality financial intermediation. The average return on assets was about 0.15 per cent, which is extremely low as per international standards. Non- performing loans in the public sector banks accounted for nearly 24 per cent of total loan portfolio s, and thirteen public sector banks were earning losses of which eight banks made operating losses. Operating expenses were increasing and half of the public sector banks had negative worth (Sarkar, 2002). On

identifying the growing illnesses in Indian banking, the Government of India set up a committee on Financial Sector Reforms in 1991 to review the Indian financial system and suggest appropriate measures to improve its profitability and efficiency. Based on the recommendations of the committee, the Government started implementing reforms in the banking sector. These reforms include deregulation of interest rates, gradual reduction of CRR and SLR, branch delicensing, operational freedom to public sector banks, introduction of capital adequacy norms and provisioning norms, etc. Entry norms for private and foreign banks were also liberalized to induce competition in Indian banking markets. These measures were expected to improve bank profitability and enhance competition and efficiency (Kumbhakar and Sarkar, 2004).

These structural changes over the last several years in Indian banking will obviously have an impact on the bank management. This study period following major changes enables an examination of the characteristics of management behaviour in Indian commercial banks during the post reform period. Indian banking consists of public, private, and foreign banks. Since the objectives of the each group are different; it is very important to examine how the management behaviour varies across the bank groups.

3. The econometric model

Granger causality tests developed by Berger and De Young (1997) are employed to explore management behaviour existing in Indian commercial banks. The management behaviour is analyzed as an inter-temporal relationships between non performing loans, cost efficiency, and capitalization that are expected to reveal four kinds of management behaviours, namely: (1) bad management, (2) bad luck, (3) skimping, and (4) moral hazard. The Granger causality framework for the present case is as follows:

$$NPL_{i,t} = f_1 (NPL_{i,lag}, X\text{-}EFF_{i,lag}, CAP_{i,lag}, LTA_{i,lag}, Yr_t) + \varepsilon_{1i,t} \quad (1)$$

$$X\text{-}EFF_{i,t} = f_2 (NPL_{i,lag}, X\text{-}EFF_{i,lag}, CAP_{i,lag}, LTA_{i,lag}, Yr_t) + \varepsilon_{2i,t} \quad (2)$$

$$CAP_{i,t} = f_3 (NPL_{i,lag}, X\text{-}EFF_{i,lag}, CAP_{i,lag}, LTA_{i,lag}, Yr_t) + \varepsilon_{3i,t} \quad (3)$$

where

$NPL_{i,t}$ = ratio of non performing loans to total loans for i_{th} bank in t_{th} year

$X\text{-}EFF_{i,t}$ = cost efficiency for i_{th} bank in t_{th} year

$CAP_{i,t}$ = ratio of equity capital to total assets for i_{th} bank in t_{th} year

$LTA_{i,t}$= ratio of total loans to total assets for i_{th} bank in t_{th} year

Yr_t= set of time dummy variables

The ratio of non-performing loans to total loans (NPL) is an indicator of asset quality, which is defined as the ratio of loans which are either overdue for more than 90 days or non earning loans to total loans. Cost efficiency (X-EFF) is estimated by using the stochastic frontier model. The details of measuring cost efficiency and estimates are given in Appendix I. The ratio of equity capital to total assets (CAP) is a measure of bank capitalization and reflects the financial strength of the bank for absorbing loan losses resulting from mix of loan portfolio. The ratio of total loans to total assets (LTA) is a proxy for risk which is included in all the three equations in order to control risk factors[1]. Certain portfolio mixes usually produce more non performing loans and give more costs and difficulties to banks to maintain loan intensive balance sheet. This pressures banks to improve cost efficiency. Time dummy (Yr_t) for all the years, such as D1995, D1996, D1997 and so on, is included in the model to control macroeconomic changes, such as raising inflation, increasing interest rates, and regulatory changes as well as changes in technology. Each dummy variable is equal to one, if the observation refers to the correspondent year and zero, if otherwise. The D1995 variable has been dropped to avoid collinearity in the data.

Equation (1) tests the bad management hypothesis that predicts a negative relationship between non-performing loans and x-efficiency. Because, the bad management hypothesis considers low cost efficiency to be an indicator for poor managerial performance, lower efficiency would be expected to result in larger amounts of non performing loans. Poor managers may fail to control operating costs which leads to low cost efficiency. Such managers may not follow standard loan underwriting or monitoring practices; not be capable of credit scoring; not be competent in assessing the value of collateral, and may often choose a relatively high proportion of loans with negative or low net present values. Besides an immediate reduction in cost efficiency, poor underwriting and control practices should lead to

[1] The database on the ratio of risk weighted assets to total assets, suggested by Berger and De Young (1997) for measuring risk factor, is not available. Therefore, the study is constrained to use the ratio of risk weighted assets to total assets as risk controlling factor. The study considered the ratio of total loans to total assets as a proxy for risk factor.

high non-performing loans in the future. Therefore, under the bad management hypothesis, reduced cost efficiency is expected to cause higher non-performing loans.

On the other hand, a positive relationship between the two variables suggests skimping behaviour. Under the skimping behaviour hypothesis bank managers face a trade-off between short -term operating costs and long term non-performing loans and reduce the amount of resources spent on underwriting and monitoring bank loans. This affects both the quality of loans and cost efficiency. Skimping behaviour gives the misleading impression that the banks are cost efficient in the short-run, because fewer expenses are supporting the same quantity of outputs, while non performing loans are about to multiply. Therefore, I re-estimate the equation (1) for a sub sample of banks with cost efficiency above the median cost efficiency. Banks that engage in skimping behaviour should appear to be cost efficient in the short run and should have a rise in non performing loans.

Equation (1) also tests the moral hazard hypothesis and predicts a negative relationship between non performing loans and capital. I re-estimate equation (1) to test the moral hazard hypothesis only for a sub sample of banks with capital below the median capital. Because the moral hazard hypothesis assumes that managers of low capitalized banks are less opposed to take risk, since the expected return on the risk is positively related to the amount of the bank risk taken, and it is more attractive than the possibility of loss on account of default risk. This may happen when bank mangers feel that the risk is rewarding and others in the industry are resorting to the same practice. Mangers prefer to take risk to the extent their position warrants, and the support likely to be extended by their bosses in the event of an adverse outcome on account of the risk taken. Thus risk taken by a bank depends not only on the risk appetite of the managers, but also to the extent of the protective shield extended by the Central Bank/Government. Thus, under the moral hazard hypothesis, banks with relatively low capital may undertake more risky portfolios in response to moral hazard incentives, which in turn results in higher non-performing assets in the future.

Equation (2) tests the bad luck hypothesis which predicts a negative relationship between cost efficiency and non-performing loans. Under the bad luck management hypothesis exogenous events, such as, closing a local firm or economic downtrends, increase non-performing loans. Once the loans become past due, the management will put extra managerial effort and expenses to deal with the adverse effect of problem

loans, which in turn leads to a decrease in bank cost efficiency. These extra expenses result from various sources, including keeping more vigilance on delinquent borrowers and their loan collateral, the cost of seizing and disposing of collateral in cases of default, allocating extra resources to analyze and negotiate the possibility of getting back the default amount, the extra costs associated with showing the bank's records as to safety and soundness to supervisors and market participants, costs on additional precautions to protect the high quality of current loans, etc. Most of these expenses will take place well after increases in non performing loans. Hence, the bad luck hypothesis assumes that increases in non performing loans cause a decrease in cost efficiency.

Equation (3) is included to complete the model but not for testing any of the above hypotheses. However, following Berger and De Young (1997), the study wants to see whether the estimated parameters of Equation (3) make any economic sense in a Granger causality framework. The relationships among the variables may indicate different unknown behaviours or hypotheses. However, the scope of the present study is limited to the aforesaid four hypotheses.

4. Results and discussion

For the primary investigation, results of the summary statistics for the variables in the Granger causality model are presented in Table 1. The mean of the ratio of non-performing loans to total loans is around 7 per cent in Indian banks, and it is slightly lower in case of public sector banks over other groups. Indian banks on average operate at 75 per cent cost efficiency. Among the groups, public sector banks are relatively more cost efficient over the other groups. Mean values for the ratio of equity capital to assets for all banks indicate that Indian banks are adequately capitalized. Public sector banks and private banks are much less capitalized than foreign banks. The mean values for the ratio of loans to assets indicate that loans occupy a major portion in the Indian banks asset portfolios. But foreign banks are more loan intensive when compared to public sector banks in India. The mean values of the variables vary across the groups. The values of the standard deviation reveal that there is considerable variation in the dataset, and it is high in variable, such as the ratio of capital to assets and loans to assets.

Table 1
Summary statistics of mean and standard deviation for variables in the Granger causality model (after a lag)

Bank Group	N	Non Performing Loans (%)	Cost Efficiency	Capital to Assets (%)	Loans to Assets (%)
PSB	330	6.695 (4.268)	0.783 (0.113)	3.35 (5.612)	87.129 (197.691)
DPB	306	7.3374 (10.382)	0.735 (0.126)	2.841 (4.628)	65.02 (93.446)
FB	329	7.444 (10.421)	0.749 (0.123)	31.969 (96.967)	242.635 (665.544)
ALL	965	7.154 (8.827)	0.756 (0.122)	13.027 (58.587)	133.535 (417.433)

Note: Values in parenthesis are standard deviation. PSB = Public Sector Banks, DPB= Domestic Private Banks, FB = Foreign Banks, and ALL = All Banks.

Using the sample of 87 commercial banks, the study estimated the Granger causality Equations (1) to (3) for the period 1995-2007. A Breusch-Pagan test found the presence of heteroskedasticity in the model. Using a weighted least square technique, heteroskedasticity is corrected and the corrected results are reported.[2] Specifying an optimum lag for the model, I followed an F-test procedure, which supported a single lag for each equation. I tested the results by increasing the lags from one to two, two to three. This exhibited the collinearity problem among the estimated lagged coefficients. The coefficients were becoming statistically insignificant, and the F-test value was declining. The usage of one over two, and two over three lagged terms in the model statistically weakens the presence of several important relationships among the variables. Hence, I included a single lag considering it as appropriate for the model. Subsequently, the three equations were re-estimated for each of the three bank groups.[3]

The OLS estimates of Granger causality tests for Equation (1) are displayed in Table 2. The lagged coefficient of cost efficiency is negative in all banks, i.e. public sector banks and private domestic banks. However, it is statistically significant only in

[2] First an OLS regression is run and the residuals are taken. The logs of the squares of these residuals then become the dependent variable in second regression and the original independent variables plus their squares are included in the right-hand side. The fitted values from the second regression are then used to construct a weight series, and the original model is re-estimated using weighted least squares, and the final results are reported.

[3] Coefficients of time dummy variables are not displayed in the tables.

public sector banks. It reveals that public sector banks are characterized with bad management behaviour. It indicates that a decrease in the estimated cost efficiency tends to lead to increases in non-performing loans in public sector banks on account of poor loan management thereby affecting the asset quality. The relationship between the ratio of non-performing loans and loans to assets is positive, and it is statistically significant only in all banks group. This supports the argument that banks with more loan-intensive balance sheets will eventually yield higher non-performing loans, which exhibit deteriorating asset quality. For instance, banks may not have up-to-date information about the whereabouts of loan customers, and the status of loan accounts, is such loan accounts may become non performing assets.

Table 2
OLS estimates of Granger Causality tests in non performing loans equation (1)

Variable	All Indian banks	Public sector banks	Private banks	Foreign banks
Constant	0.328***	0.664*	0.666**	0.266
	(1.766)	(3.67)	(1.975)	(0.513)
NPL-1	0.275*	0.201*	0.151*	0.278*
	(7.816)	(4.098)	(3.062)	(4.538)
X-EFF-1	-0.088	-0.389*	-0.121	0.017
	(-0.413)	(-3.922)	(-0.547)	(0.038)
CAP-1	-0.033***	0.005	0.003	-0.014
	(-1.671)	(0.161)	(0.054)	(-0.477)
LTA-1	0.054***	0.002	0.057	0.038
	(1.879)	(0.056)	(0.972)	(1.075)
R^2 (adj)	0.170	0.441	0.229	0.150
N	965	330	306	329

Note: * indicates significant at one per cent, ** indicates significant at five per cent, and *** indicates significant at ten per cent. t- values are in parenthesis.

In general, it is observed that skimping behaviour is dominated by bad management behaviour for the overall sample, but this may not prevent the possibility of skimping behaviour in individual banks. In order to check the possibility of skimping behaviour in Indian commercial banks, a sub sample of the most cost efficient banks, whose efficiencies are higher than the median cost efficiency in ever year, are constructed. We may expect the skimping behaviour among the most efficient banks because such banks face a trade-off between loan quality and cost reductions and wait for the non -performing loans to multiply in future. Therefore, the study re-estimates Equation (1) for the sub- samples of the most cost efficient banks,

and the results are presented in Table 3. The results do not find any statistical evidence for skimping behaviour in the most efficient Indian banks. The relationship between non-performing loans and the lagged coefficient of loans to assets is positive and statistically significant which indicates that even in most cost efficient banks a higher loan proportion tends to cause a greater volume of non-performing loans.

Table 3
OLS estimates of Granger Causality tests in non performing loans equation (1) for sub samples of the data

Variable	Skimping behaviour (in most cost efficient banks)	Moral hazard hypothesis
Constant	0.235 (1.064)	0.525** (2.040)
NPL-1	0.196* (3.816)	0.037 (0.847)
X-EFF-1	-0.012 (-0.315)	-0.739 (-1.572)
CAP-1	-0.065** (-2.207)	-0.036*** (-1.931)
LTA-1	0.084** (2.055)	-0.008 (-0.193)
R^2 (adj)	0.203	0.118
N	481	492

Note: * indicates significant at one per cent, ** indicates significant at five per cent, and *** indicates significant at ten per cent. t- values are in parenthesis.

Using Equation (1) the study also tested the moral hazard hypothesis for another sub-sample of Indian banks, which consists of those banks with a ratio of equity capital to assets below the sample median in every year. The Moral hazard hypothesis predicts negative relationships between low capitalized banks and non-performing loans. The results of this model are presented in the last column of Table 3. The coefficient of the lagged capitalization is negative, and it is statistically significant supporting the presence of moral hazard behaviour in thinly capitalized Indian banks. Because thinly capitalized banks may take more risk by responding to moral hazard incentives, such as negligence in business, favouritism, and nepotism in sanctioning loans, etc., this appears to result in higher non-performing loans in the future.

Equation (2) tests the bad luck hypothesis, which predicts an increase in non-performing loans will Granger cause a decrease in cost efficiency. Therefore,

Equation (2) is estimated, and the results are displayed in Table 4. The coefficient of the ratio of non performing loans is negative and statistically significant in all the groups except in foreign banks, suggesting that Indian commercial banks are characterized by bad luck management behaviour, indicating that once loans become overdue, banks keep extra effort and spend more amount of money for recovery which in turn lowers cost efficiency. Interestingly, the results indicate a positive relationship between the coefficients of the lagged loans to assets ratio and cost efficiency. However, this is statistically significant only in foreign banks. This suggests that an exogenous increasing loans to assets ratio Granger causes a rise in cost efficiency.

Table 4
OLS estimates of Granger causality tests in X-efficiency equation (2)

Variable	All Banks	PSB	DPB	FB
Constant	-0.058* (-4.797)	0.129* (4.759)	-0.067** (-2.203)	-0.186* (-6.144)
NPL-1	-0.038** (2.383)	-0.173** (-2.570)	-0.022* (-3.63)	0.007 (0.945)
X-EFF-1	0.969* (56.94)	1.613* (59.898)	0.897* (21.418)	0.689* (11.848)
CAP-1	-0.0024 (-1.041)	-0.009** (-2.155)	0.051*** (1.73)	-0.014** (-2.005)
LTA-1	0.0024 (0.908)	0.005 (0.793)	-0.002 (-0.301)	0.016* (3.104)
R^2 (adj)	0.77	0.907	0.608	0.362
N	965	330	306	329

Note: * indicates significant at one per cent, ** indicates significant at five per cent, and *** indicates significant at ten per cent. t- values are in parenthesis.

The Capitalization Equation (3) is estimated to complete the Granger causality test, and the results are presented in Table 5. The results indicate a negative and statistically significant relationship between capitalization and the lagged coefficient of cost efficiency in public sector banks and in private domestic banks. This suggests that a decrease in cost efficiency Granger causes an increase in capitalization. This may be because banks as a defensive measure respond to the problems and difficulties of reductions in cost efficiency by strengthening their capital in order to get attention of market participants, regulators, and customers. Positive but weak statistical evidence is found between capitalization and the lagged coefficient of cost efficiency in the all banks group, suggesting that increases in cost efficiency pushup

bank earnings, which Granger causes increases in bank capital. This possibly happens when a part of banks' earnings are used to improve bank capitalization.

Table 5
OLS estimates of Granger causality tests in capitalisation equation (3)

Variable	All Banks	PSB	DPB	FB
Constant	0.199 (0.861)	-0.882* (-2.765)	-0.963** (-2.163)	1.426* (3.101)
NPL-1	-0.022 (-1.053)	-0.001 (0.020)	0.009 (0.187)	-0.073 (-1.549)
X-EFF-1	0.387 (1.526)	-1.179* (-3.738)	-0.679*** (-1.659)	-0.035 (-0.069)
CAP-1	0.497* (16.201)	0.654* (14.113)	0.0442* (8.771)	0.323* (5.93)
LTA-1	-0.083* (-2.886)	-0.038 (-0.615)	0.101*** (1.821)	-0.049 (-1.171)
R^2 (adj)	0.391	0.598	0.362	0.246
N	965	330	306	329

Note: * indicates significant at one per cent, ** indicates significant at five per cent, and *** indicates significant at ten per cent. t- values are in parenthesis.

Table 6
OLS estimates of Granger causality tests in capitalization equation (3) for subsamples of the data

Variable	Thinly capitalized banks	Highly capitalized banks
Constant	-0.686** (-2.538)	0.789*** (1.718)
NPL-1	-0.066 (-1.582)	-0.125 (-1.544)
X-EFF-1	0.254 (0.574)	-0.386*** (-1.77)
CAP-1	0.0857** (2.355)	0.325* (6.885)
LTA-1	0.032 (0.834)	-0.218* (-4.067)
R^2 (adj)	0.231	0.231
N	492	486

Note: * indicates significant at one per cent, ** indicates significant at five per cent, and *** indicates significant at ten per cent. t- values are in parenthesis.

Equation (3) is re-estimated for the two sub-samples to test whether highly capitalized banks and low capitalized banks respond differently to changes in non-performing loans. The sample is divided into two sub-samples of low capitalized and highly capitalized banks based on annual sample medians. The results are

reported in Table 6. The results seem to be consistent with the results of the overall sample. For highly capitalized banks, the study found negative and statistically significant relationships between bank capitalization and the lagged coefficient of cost efficiency. This suggests that decrease in cost efficiency Granger causes an increases in bank capitalization.

5. The economic effects of management behaviour

Further, the study examines the economic effects of the aforementioned four hypotheses, and the results are presented in Table 7. The economic effects are calculated based on how a one standard deviation increase or decrease in a variable leads to the cumulative decrease or increase in another variable. The economic effects of bad management behaviour in Indian banks are measured in terms of a one standard deviation reduction in cost efficiency (from 0.756 to 0.634) that predicts a cumulative increase in the non performing loan ratio over a year from 7.154 to 8.308 or a rise of 16.14 per cent. The economic effects of bad management in public sector banks are measured in a similar way. In this case also a one standard deviation reduction in measured cost efficiency (from 0.783 to 0.670) predicts a cumulative increase in the non performing loan ratio over a year from 6.695 to 7.662 or a rise of 14.44 per cent. Similarly, for private domestic banks it is a rise of 17.11 per cent, and for foreign banks the reduction in the non-performing loan ratio is 16.36 per cent.

The economic impact of bad luck is measured in terms of the impact of one standard deviation increase in non performing loans to cost efficiency. One standard deviation increase in non performing loans (from 7.154 to 15.98) predicts a cumulative decrease in cost efficiency over a year is 123.9 per cent in Indian banks, which is much higher. This impact is also evident in Equation 2. This provides strong evidence for bad luck management behaviour in Indian banks. Similarly, the economic effect of bad luck behaviour for the different bank groups is measured. For public sector banks, bad luck predicts a cumulative decrease in cost efficiency of 63.74 per cent; for private domestic banks it is 141 per cent; and for foreign banks it is 140 per cent.

Table 7
Economic effects of management behaviour

Economic effects of bad management

	Sign &sig	Mean X-EFF	1std.dev	↓ NPL	NPL↑	% change
All	-&ns	0.756	0.634	7.154	8.308	16.14
PSB	-&sig	0.783	0.67	6.695	7.662	14.44
DPB	-&ns	0.735	0.609	7.337	8.593	17.11
FB	+&ns	0.749	0.627	7.444	6.226	-16.36

Economic effects of skimping behaviour

		Mean X-EFF	1std dev↑	NPL	NPL↑	% change
Cost eff		-&ns	0.8396	0.8567	7.126	6.981

Economic effects of moral hazard behaviour

		Mean CAP	1std dev↓	NPL	NPL↑	% change
Low-CAP	-&sig	0.9334	0.6651	7.517	9.678	28.78

Economic effects of bad luck

	Mean	Mean NPL	1std dev↑	XEFF	XEFF¯	% change
ALL	-&sig	7.154	15.98	0.756	0.177	-123.9
PSB	-&sig	6.695	10.963	0.783	0.284	-63.74
DPB	-&sig	7.337	17.719	0.735	0.305	-141.49
FB	+&ns	7.444	17.865	0.749	1.798	140

Notes: 1. The economic effects of bad management are measured as one standard deviation reduction in cost efficiency tends to cause to increase in non performance loans.
2. The economic effects of skimping behaviour are measured as one standard deviation increase in cost efficiency tends to cause to increase in non performing loans. This is measured based on the two sub samples of most cost and profit efficient banks.
3. The economic effects of moral hazard behaviour are measured as one standard deviation decrease in bank capitalization tends to cause to increase in non performing loans. This is done using a sub sample of the low capital banks.
4. The economic effects of bad luck are measured as one standard deviation reduction in non performing loans tends to cause to decrease in x-eff. #sig = significant, ns = not significant, sign= direction of the coefficient. And, values in parenthesis indicate a percentage reduction in the specified variable. PSB = Public Sector Banks, DPB= Domestic Private Banks, FB = Foreign Banks, and ALL = All Banks.

Using sub samples of the most cost efficient banks the economic effects of skimping behaviour in Indian commercial banks is measured. It was observed in the previous section that the study has not found any statistically significant evidence for the presence of skimping behaviour in Indian banks. Therefore, the economic impact of skimping behavior measured in terms of a one standard deviation increase in

estimated cost efficiency (from 0.8396 to 0.8567) predicts a cumulative reduction in the non performing loan ratio over a year of 2.03 percent.

Using sub-sample of low capital banks, the economic effects of moral hazard behaviour is measured in low capitalized Indian commercial banks. It revealed that a one standard deviation reduction in capitalization (from 0.9334 to 0.6651) results in a cumulative change in the ratio of non-per forming loans over a year from 7.517 to 9.678 or a rise of 28.78 per cent.

6. Summary and conclusions

Using the Granger causality framework of Berger and De Young (1997), I examine four kinds of management behaviours, namely, bad management, bad luck, skimping, and moral hazard in Indian commercial banks during the post reform period. They are derived based on the intertemporal relationships between non performing loans, efficiency and capitalization. The results of the Granger causality technique are as follows. There is strong statistical evidence for bad management behaviour (which implies that a decrease in cost efficiency tends to increase non-performing loans) in public sector banks. The skimping behaviour (which implies that increasing cost efficiency leads to increase non performing loans) is tested on the sub-sample of the most cost efficient banks. However, the study has not found any strong statistical evidence for the presence of skimping behaviour in Indian banks. Using another sub sample of low capitalized banks, the study tested moral hazard (low capital tends to cause an increase in non performing loans) behaviour in Indian banks. There is strong statistical evidence to support that Indian banks are characterized by moral hazard behaviour. Further, the results found strong statistical evidence for bad luck management behaviour (increasing non performing loans tend to cause decrease in cost efficiency) in all bank groups, like public sector banks and private domestic banks. It also found strong statistical evidence for banks response to the consequences of decreasing cost efficiency by boosting their capital to attract the attention of market participants and regulators.

In addition, the study also explored the economic effects of bad management, bad luck, skimping and moral hazard behaviours in Indian commercial banks. The results indicate that the intensity of the economic effects of bad management

behaviour and bad luck are higher in private domestic banks than in other banks.

The findings of the present study have several policy implications for banks. The findings of bad management in Indian banks, particularly public sector banks, suggest that regulators and supervisors should focus on improving cost efficiency, such as through a better recruitment process, finding and assessing high expense areas, better training of managers, and increasing competition, and foreign ownership (particularly for transferring of technology know-how). The findings of bad luck behaviour suggest that banks should concentrate on diversified loan portfolios and reduce loan concentrations. Bank supervisors should also limit individual banks' high risk exposures. The findings of skimping behaviour, though they are not statistically significant, suggest that as precautionary measure banks' supervisors and researchers should pay attention towards the review of loan portfolio and its performance in order to curb the likely rise in non-performing loans, in addition to focusing on improving efficiency. The findings of moral hazard behaviour in Indian banks suggest that regulators and supervisors as a recovery mechanism should pay special attention on monitoring bank capital ratios and ensuring an increase in the ratios whenever they become low. This means that banks should maintain minimum capital ratios as per statutory capital requirement norms, because undercapitalization is the first reason for deteriorating asset quality, which in turn leads to bank failures. Supervisors should also pay due attention to the attitude and performance of banks' managers, and try to motivate them to increase their efficacy and efficiency. Future studies can well focus on comparing these behaviours in the Indian banking sector with those in other emerging economies and also with developed economies in order to explore factors that similarly and differently affect management behavior in banks, thus examining reasons for why this is so.

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Appendix 1

Estimating cost efficiency

Variables such as loans, assets, capital and non performing loans can directly be culled from banks' financial statements, but cost efficiency is required to be estimated. Cost efficiency measures how the costs of a bank in relation to an ideal/model bank adopting best practices when both the banks produce the same output under similar conditions (William, 2004). More specifically, cost efficiency is the ratio between the minimum cost C*, at which a firm can produce a given vector of output, and actual cost C. Thus, cost efficiency CE = C* /C implies that it would be possible to produce the same vector of outputs with a saving in costs of (1 – CE) percent. The cost efficiency is estimated using the Battese and Coelli (1992) Stochastic Frontier Approach, developed for an unbalanced panel data context, with a translog functional form.[4] The most important advantage of the stochastic frontier approach compared to non-parametric methods is that the former allows random error. The random error has two components, one represents random effects of measurement error, statistical noise, and random shocks that are external to the firm's control and another represents for technical inefficiency which arises within the firm. The inefficiency may be due to noise in the data or misspecification errors or from internal disturbances such as operational risks. The inefficiencies follow an asymmetric half-normal distribution, based on the logic that inefficiencies need not be negative, but invariably increase the costs, and that random errors follow a symmetric standard normal distribution, because random fluctuations can either increase or reduce costs. In addition, it

[4] Another popular functional form is Fourier Flexible (FF), which combines a translog form with a non- parametric Fourier form i.e. trigonometric transformations of the variables and requires estimations of a larger number of coefficients than does the translog specification form. Given the limited data, therefore, the study estimate cost function using translog functional form.

provides point estimates of the efficiency score and allows estimating for unbalanced panel data.

For selecting outputs and inputs of banks, the intermediation approach, proposed by Sealey and Lindley (1977), is used. This approach considers banks as financial intermediaries between savers and investors. Under this method the funds raised as deposits and their costs, interest expenses, will be considered as inputs, since they constitute raw material which is required to be transformed in to outputs such as loans and investible funds, and all the outputs are measured in monetary terms. Our cost function has three outputs and three inputs. The functional specification (in natural logarithm) form in the present case is as follows:

$$\begin{aligned}\ln TC_{it}=&\alpha_0+\alpha_1\ln y_1+\alpha_2\ln y_2+\alpha_3\ln y_3+\beta_1\ln p_1+\beta_2\ln p_2+\beta_3\ln p_3+1/2\alpha_{11}\ln y_1\ln y_1\\&+\alpha_{12}\ln y_1\ln y_2+\alpha_{13}\ln y_1\ln y_3+1/2\alpha_{22}\ln y_2\ln y_2+\alpha_{23}\ln y_2\ln y_3+1/2\alpha_{33}\ln y_3\ln y_3\\&+1/2\beta_{11}\ln p_1\ln p_1+\beta_{12}\ln p_1\ln p_2+\beta_{13}\ln p_1\ln p_3+1/2\beta_{22}\ln p_2\ln p_2+\beta_{23}\ln p_2\ln p_3\\&+1/2\beta_{33}\ln p_3\ln p_3+\lambda_{11}\ln y_1\ln p_1+\lambda_{12}\ln y_1\ln p_2+\lambda_{13}\ln y_1\ln p_3+\lambda_{21}\ln y_2\ln p_1\\&+\lambda_{22}\ln y_2\ln p_2+\lambda_{23}\ln y_2\ln p_3+\lambda_{31}\ln y_3\ln p_1+\lambda_{32}\ln y_3\ln p_2+\lambda_{33}\ln y_3\ln p_3+V_{it}+\eta_{it}U_{it}\end{aligned} \quad (4)$$

In the above specification, TC is total costs; y1, y2, and y3 are outputs as loans, investments in Government and other approved securities and non interest income, respectively, and p1, p2 and p3 are input prices of labour, physical capital and purchased funds, respectively. The price of labour is estimated by salaries and wages divided by number of employees.[5] The price of physical capital is calculated by total expenses of premises and fixed assets divided by total assets.[6] The price of purchased funds is estimated by interest expenses divided by total borrowings and deposits. V_{it} is a random variable, which captures the effects of uncontrollable factors. It is assumed to be independent and identically distributed with N (0, σ^2_v) distribution and independent of U_{it}. U_{it} is a non negative random variable associated with inefficiency in the banks and assumed to be truncation of the N ($\mu_{it,}\sigma^2_u$) distribution. The α, β, λ, and η, parameters are required to be estimated.

[5] Data base on number of officers, clerks and sub staff and salaries and wages of the each group separately is not available. Therefore, the study is constrained to go in division of expenses or price of the each labour group.

[6] Data base on rentals of own premises is not available. Therefore, expenses of premises consist of hiring expenses on other people's owned premises and maintenance expenses of own premises.

The error term representing the inefficiency in the model is specified as:

$$U_{it} = exp\ (-\eta(t-T)) \quad (5)$$

The parameters of the model are estimated by using the maximum likelihood estimation method. Under the above specification, inefficiencies in periods prior to T depend on the parameter η and number of remaining periods (t-T). The positive η indicates inefficiencies decrease overtime ,and, conversely, negative η implies increase of inefficiencies overtime. If η = 0, then efficiency is time-invariant i.e., banks never improve their efficiency. The variances of the error terms in model (4) are reparameterised and expressed as $\sigma^2 = \sigma^2_u+\sigma^2_v$ and$\gamma = \sigma^2_u/\sigma^2$. The value of γ will lie between 0 and 1. If U_{it} equals zero, it indicates full technical efficiency. Then γ equals zero and deviations from the frontier are entirely due to noise V_{it}. If γ equals one, it implies that all deviations from the frontier are due to technical inefficiency. Symmetric assumptions are imposed on all parameters as $\alpha_{ij} = \alpha_{ji}$ and so on in accordance with the economic theory. Estimates of the cost frontier follow.

Maximum likelihood estimates of stochastic cost frontier

variable	parameter	coefficient	standard-error	t-ratio
intercept	α_0	2.473	0.511	4.843*
y1	α_1	-0.040	0.103	-0.390
y2	α_1	0.423	0.136	3.111*
y3	α_3	0.441	0.099	4.465*
p1	β_1	0.083	0.107	0.781
p2	β_2	0.570	0.164	3.470*
p3	β_3	-0.117	0.056	-2.096**
y1y1	α_{11}	0.047	0.011	4.126*
y1y2	α_{12}	0.030	0.016	1.857***
y1y3	α_{13}	-0.021	0.011	-1.967***
y2y2	α_{22}	0.126	0.027	4.683*
y2y3	α_{23}	-0.172	0.016	-10.914*
y3y3	α_{33}	0.156	0.015	10.230*
p1p1	β_{11}	-0.011	0.015	-0.733
p1p2	β_{12}	0.024	0.020	1.230
p1p3	β_{13}	-0.014	0.009	-1.510
p2p2	β_{22}	0.123	0.039	3.143*
p2p3	β_{23}	-0.030	0.013	-2.237**
p3p3	β_{33}	-0.020	0.005	-3.713*
y1p1	λ_{11}	-0.053	0.012	-4.295*
y1p2	λ_{12}	0.045	0.019	2.319**
y1p3	λ_{13}	0.016	0.008	1.884***
y2p1	λ_{21}	0.028	0.015	1.840***
y2p2	λ_{22}	0.091	0.027	3.421*

y2p3	λ_{23}	-0.052	0.014	-3.786*
y3p1	λ_{31}	0.022	0.014	1.576
y3p2	λ_{32}	-0.130	0.019	-6.894*
y3p3	λ_{33}	0.023	0.011	2.170**
sigma-squared	σ^2	0.108	0.008	13.712*
gamma	γ	0.260	0.050	5.226*
Mu	μ	0.336	0.099	3.384*
Eta	η	-0.083	0.016	-5.042*
log likelihood			-204.673	
No. of observations			1052	

Note: * indicates one per cent significant, ** indicates five per cent significant, and *** indicates ten per cent significant