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A STUDY OF CONTROL-EFFICIENCY OF BANKS IN INDIA

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ABSTRACT

Many firms in the service industry face the problem of disparate results in terms of efficiency. This problem is a cause of concern for many big organizations such as banks, hotels, courier companies, and so on. In particular, the last decade has witnessed continuous changes in regulation, technology and competition in the global financial services industry, and Indian banks are no exception. Rising cost-income ratios and declining profitability reflect increased competitive pressure. To assess the stability of the banking system, it is therefore crucial to benchmark the performance of banks operating in India. An efficient banking system contributes in an extensive way to higher economic growth in any country. Thus, studies of banking efficiency are very important for policy makers, industry leaders and many others who are reliant on the banking sector.

The present study investigates the efficiency of Indian banks from the viewpoint of control systems, segmented in terms of ownership. For this purpose, a variation of the data envelopment analysis (DEA) model was formulated using control variables and performance variables, and the efficiency scores were calculated for a sample of forty-two major banks operating in India. The results of the analysis present a radically different picture of Indian banking efficiency, in contrast to that presented in the established banking efficiency literature.

KEYWORDS: *financial services, banking efficiency, control systems, data envelopment analysis.*



INTRODUCTION

Wide-ranging reforms covering industry, trade, taxation, external sector, banking and financial markets have been carried out in the Indian economy since mid-1991. A decade and a half of economic and financial sector reforms has strengthened the fundamentals of the Indian economy and transformed the operating environment for banks and financial institutions in the country. The sustained and gradual pace of reforms has helped avoid any crisis and has actually fuelled growth. The most significant achievement of the financial sector reforms has been the marked improvement in the financial health of commercial banks in terms of capital adequacy, profitability and asset quality as also greater attention to risk management. Further, deregulation has opened up new opportunities for banks to increase revenues by diversifying into investment banking, insurance, credit cards, depository services, mortgage financing, securitization, and so on. At the same time, liberalization has brought greater competition among banks, both domestic and foreign, as well as competition from mutual funds, NBFC's, and other financial institutions. Increasing competition is squeezing profitability and forcing banks to work efficiently on shrinking spreads. Because banks still play an important role in the financial market, it is important to evaluate whether banks operate efficiently. In order to compete with other financial institutions, banks must increase their levels of efficiency.

Many emerging economies that adopted financial deregulation policies are now experiencing competitive banking practices. India is no exception, and as an emerging market is becoming a competitive and important market not only for financial products but also for other products. Indian banking is a considerable component in Asian financial affairs and has not been subjected to substantial research compared to the countries in the developed world.

The Indian banking system is still dominated by the public sector banks, and the issues of performance and efficiency have emerged to be the touchstone for the success of such banks. There is an emerging need to develop a comprehensive framework for measuring their efficiency in transforming their resources for better performance. Such type of performance benchmarking has become extremely relevant for their success.

The present study was undertaken to compare the efficiency of public, private, and foreign banks operating in India, from the viewpoint of control systems, to identify the critical factors affecting the efficiency of banks, and to analyze the gap between efficient and inefficient banks. The study has employed a variation of the data envelopment analysis (DEA) model to analyze the efficiency of banks, and discriminant analysis to identify critical factors affecting the efficiency of banks.

LITERATURE REVIEW

Several studies have addressed the question of bank efficiency, especially in developed economies; in contrast, studies analyzing the efficiency of banks in emerging economies such as India are far fewer. However, the literature on the restructuring and development of the financial sector in the transitional economies and emerging markets are abundant. Ownership issues, especially the impact of the entry of foreign banks in transitional economies, are most documented. These studies generally find evidence that ownership matters. Buch (1997) asserts



that foreign-owned banks use modern technology from and rely on the human capital of their parent banks, so that they would be expected to perform better than government-owned or domestic private banks in transitional economies. On similar lines, private banks would be expected to perform better than government-owned banks.

Some recent studies investigated the relationship between ownership and bank performance in some Eastern European economies. Kraft and Tirtiroglu (1998) used stochastic frontier analysis (SFA) to examine the bank efficiency in Croatia in the mid-1990's, and found that the newly-organized private banks were more efficient relative to older state institutions. Jemric and Vujcic (2002) used data envelopment analysis (DEA) to analyze bank efficiency in Croatia in the late 1990's, and found that foreign banks and new banks are more efficient. Nikiel and Opiela (2002) used distribution-free efficiency estimation for Polish banks in the late 1990's, and found that foreign banks servicing foreigners and business customers are more cost-efficient but less profit-efficient than other banks in Poland. Isik and Hassan (2003) examined the Turkish commercial banks during the deregulation period, and found that the Turkish private banks began to close their gap with those public banks in the new environment. These studies suggest a positive relationship between foreign ownership and bank performance. Further, several studies on banking in transitional economies suggest relatively strong competitive effects of foreign bank entry. Claessens et al. (2001) investigated performance differences between domestic and foreign banks in eighty countries, both developed and developing, from late-1990's to mid-2000's, and found that foreign bank entry was generally followed by a reduction in both profitability and the overhead expenses of domestic banks, suggesting that foreign participation improves the efficiency of domestic banking.

Similar results were found in emerging Asian economies. Claessens and Glaessner (1998) studied the internationalization process of the financial service industries of eight Asian economies, and argued that the stricter limit on the foreign entry among most Asian countries slows down the institutional development and costs more to provide financial services for them. Kwan (2003) examined the operating performance of banks among seven Asian economies in the 1990's, and found that their operating efficiencies (as measured by country rankings of per unit labor and physical capital costs) are unrelated to the degree of openness of the banking sector. Gilbert and Wilson (1998) studied efficiency of Korean banks in the 1980's and early 1990's, and found that Korean banks had dramatically changed the mix of inputs and outputs during privatization and deregulation of the financial industry, at the same time enhancing potential output and productivity. Berger et al (2005) studied the effects of ownership, especially the foreign ownership on the bank efficiency in China during the period 1994-2001 when important financial liberalization initiatives came into the Chinese banking industry. They applied SFA, with two input variables (i.e. price of capital, and price of funds), and four output variables (i.e. total loans, total deposits, total liquid assets, and other earning assets), with a second-stage regression to capture the impact of ownership on the bank-level profit efficiency along with ROA and ROE. They found that foreign ownership is significantly and positively correlated with bank-level efficiency, while government ownership has the opposite influence, and that this relationship also holds if performance is measured by ROA, but not so if measured by ROE.



There have been several studies analyzing bank efficiency in India. In some studies, bank efficiency was measured by a number of financial indicators and compared over various categories of banks. Sarkar et al. (1998) compared public, private and foreign banks in India to find the effect of ownership type on different efficiency measures. Rammohan (2002, 2003) also used financial measures for comparing operational performance of different categories of banks over a period of time. However, most of the studies which look at the efficiency of Indian commercial banks concentrate on cost, profit, income or revenue efficiencies, using DEA as a technique of analysis. While few studies concentrate on the efficiency of only public sector banks, others look at the relationship between ownership and efficiency.

Bhattacharya et al (1997) used DEA to measure the productive efficiency of Indian commercial banks in the late 1980's to early 1990's and to study the impact of policy of liberalizing measures taken in 1980's on the performance of various categories of banks. They found that the Indian public sector banks were the best performing banks, as the banking sector was overwhelmingly dominated by the Indian public sector banks, while the new private sector banks were yet to emerge fully in the Indian banking scenario.

Sathye (2001) studied the relative efficiency of Indian banks in the late 1990's and compared the efficiency of Indian banks with that of the banks in other countries. He found that the public sector banks have a higher mean efficiency score as compared to the private sector banks in India, but found mixed results when comparing public sector banks and foreign commercial banks in India. He also found that most banks on the efficient frontier are foreign-owned.

Kumbhakar and Sarkar (2003) found evidence on Indian banks that while private sector banks have improved their performance mainly due to the freedom to expand output, public sector banks have not responded well to the deregulation measures.

Rammohan and Ray (2004) compared the revenue maximizing efficiency of public, private and foreign banks in India, using physical quantities of inputs and outputs in the 1990's, using deposits and operating costs as inputs, and loans, investments and other income as outputs. They found that public sector banks were significantly better than private sector banks on revenue maximization efficiency, but between public sector banks and foreign banks the difference in efficiency was not significant.

Das et al (2004) analyzed the efficiency of Indian banks using data envelopment analysis using four input measures (viz. borrowed funds (i.e. deposits and other borrowings), number of employees, fixed assets and equity), and three output measures (investments, performing loan assets and other non-interest fee based incomes), and found that, despite liberalization measures aimed at strengthening and improving the operational efficiency of the financial system, Indian banks were still not much differentiated in terms of input- or output-oriented technical efficiency and cost efficiency; however, they found that there were significant differences in terms of revenue and profit efficiencies. They also found that bank size, ownership, and the fact of its being listed on the stock exchange had a positive impact on the average profit efficiency and to



some extent revenue efficiency scores. Also, they found that there was a general improvement in efficiency during the post-reform period.

Mahesh and Rajeev (2007) studied the changes in the productive efficiency of Indian commercial banks after the financial sector reforms using SFA with three input measures (labor, capital and materials) and three output measures (deposits, advances and investment), and found that deregulation had significant impact on all three types of efficiency measures: while deposit and investment efficiencies were found to have improved, advance efficiency was found to have declined marginally. They also found that public sector banks performed better than their private counterparts in all the three efficiency measures, though private banks were found to have shown marked improvement during the post-liberalization period in terms of all three types of efficiency measures.

The issue of performance of banks according to ownership is thus a well-studied issue in the Indian banking efficiency literature. Most studies confirm that ownership does affect banking performance, with public sector banks generally performing better than their private and foreign counterparts.

DATA & METHODOLOGY

The data for the study pertained to a sample of forty-two banks operating in India, of which twenty-nine were public sector banks, ten were private banks, and three were foreign banks. The sample was a convenience sample, containing most of the major banks operating throughout India. The data was obtained from the financial statements of the sample banks for the years 2004-05 and 2005-06 from the Capitaline database.

Various researchers have used data envelopment analysis (DEA) to evaluate bank performance. DEA is a technique to assess the efficiency of production units (in this case, the banks) relative to a set of similar units operating in the same business environment (here, the banking industry). It can identify the benchmark units in comparison to the peers to determine the best practice. A bank is said to be technically efficient if it produces more outputs using less input resources. In particular, there are several different approaches of measuring output, usually classified into two broad approaches: the production approach and the intermediation approach. The production approach, initiated by the contribution of Benston (1964) and Bell and Murphy (1968), describes banking activities as the production of services to depositors and borrowers, wherein output is measured by the number and type of transactions or accounts (both deposit and loan) and inputs used are only physical units (such as labor and capital), since only physical inputs are needed to provide financial services. Under the intermediation approach, financial institutions are thought of as primarily intermediating funds between savers and investors, wherein the inputs of the bank are essentially financial capital (i.e. the deposits collected and the funds borrowed from financial markets and their interest cost), and outputs are measured by the volume of loans and investments outstanding. It has been generally suggested by a number of writers that a researcher can adopt any measure of output for the financial firm as long as the measure is consistent with the researcher's goals (Sealey and Lindley, 1977).



The present study uses ratios instead of absolute quantities, in order to avoid size-effects on the efficiency analysis. Further, the study adopts a different approach to DEA: rather than considering banks as production systems with inputs and outputs, the study views banks as control systems, with control variables and performance variables. The control variables function similarly to inputs, and the performance variables function similarly to outputs in the DEA model. The two control variables were used in the study - the cost to income ratio and the non-performing assets to average working fund ratio - while the four performance variables were used in the study - the net income to average working fund ratio, the net interest income to average working fund, the net operating income to average working fund ratio, and the return on total assets ratio. The efficiency scores obtained in the study from the DEA model are therefore not comparable to the usual banking efficiency scores; rather, they present a different dimension of efficiency – “control efficiency.”

The DEA model used for the analysis is a variant of the usual input-oriented DEA model. For a given set of control variables C_1, \dots, C_m and performance variables P_1, \dots, P_n , evaluated on a set of k control systems, the efficiency of a specific unit (*) is found by solving the LPP:

$$\text{minimize } \left\{ E \text{ s.t. } \sum_{j=1}^k w_j C_{ij} \leq E.C_{i*} \text{ (} i = 1, \dots, m), \sum_{j=1}^k w_j P_{ij} \geq P_{i*} \text{ (} i = 1, \dots, n), \right. \\ \left. \sum_{j=1}^k w_j = 1, w_1, \dots, w_k \geq 0. \right\}.$$

The efficiency score computed from the above may be interpreted in a similar way to the input-oriented DEA efficiency score. The efficiency score is the fraction of the target bank's control parameters that an efficient combination of banks' weighted average control parameters would have, in order to achieve at least as good a weighted average performance as that of the target bank. Thus, a bank with an efficiency score of 1.00 (100%) is efficient, in the sense that no combination of banks has better weighted average performance parameters than the target bank, with lower weighted average control parameters than the target bank; while a bank with an efficiency score less than 1.00 (< 100%) is inefficient, in the sense that a combination of banks can be found which has better weighted average performance parameters than the target bank, with lower weighted average control parameters than the target bank.

ANALYSIS & INTERPRETATION

The descriptive statistics of the inputs and outputs of public, private, and foreign banks in the sample for the year 2004-05 are summarized in Table 1.



TABLE 1: DESCRIPTIVE STATISTICS OF THE INPUTS AND OUTPUTS OF DIFFERENT TYPES OF BANKS (2004-05)

		public banks	private banks	foreign banks	F-value	Sign .
cost to income ratio	Mean	0.9113	0.9232	0.8723	0.3130	0.7330
	Std. Dev.	0.1022	0.0939	0.0291		
non-performing assets to net advances ratio	Mean	1.9259	2.1460	4.7033	2.1200	0.1340
	Std. Dev.	1.3460	1.4601	7.8453		
net income to average working fund ratio	Mean	0.1612	0.4538	0.0116	1.7740	0.1830
	Std. Dev.	0.3801	0.7068	0.0037		
net interest income to average working fund ratio	Mean	7.4952	7.5390	4.0400	52.6070	0.0000
	Std. Dev.	0.5941	0.4796	0.4795		
operating profit to average working fund ratio	Mean	2.3566	1.9360	3.0833	2.9500	0.0640
	Std. Dev.	0.7403	0.7778	0.6048		
return on total assets	Mean	0.7390	0.6265	1.0600	0.3190	0.7290
	Std. Dev.	0.8813	0.7189	0.2972		

There were found to be no significant differences between the different types of banks in terms of control parameters, while there were found to be significant differences between the different types of banks in terms of performance parameters. In particular, there were found to be statistically significant differences in the average net interest income to average working fund ratios and the average capital adequacy ratios of different types of banks. The average net interest income to average working fund ratios of public and private banks were found to be significantly higher than that of foreign banks. On the other hand, the average capital adequacy ratio of foreign banks was found to be significantly higher than those of public and private banks. Also, the average non-performing assets to net advances ratio of foreign banks was found to be quite higher than those of public and private banks, and the average operating capital to average working fund ratio of foreign banks was found to be quite higher than those of public and private banks.



The efficiency scores of the sample banks for the year 2004-05 using the DEA model are shown in Table 2.

TABLE 2: EFFICIENCY SCORES OF THE SAMPLE BANKS (2004-05)

	Efficiency Score		Efficiency Score
STATE BANK OF INDIA	100.00%	CORPORATION BANK	99.99%
HDFC BANK	100.00%	VIJAYA BANK	98.14%
ICICI BANK	100.00%	UTI BANK	96.50%
KOTAK MAHINDRA BANK	100.00%	INDIAN OVERSEAS BANK	96.48%
PUNJAB NATIONAL BANK	100.00%	INDIAN BANK	95.70%
UNION BANK	100.00%	CANARA BANK	95.15%
ABN AMRO BANK	100.00%	FEDERAL BANK	94.58%
ALLAHABAD BANK	100.00%	SYNDICATE BANK	94.41%
ANDHRA BANK	100.00%	STATE BANK OF TRAVANCORE	93.13%
BANK OF CEYLON	100.00%	STATE BANK OF BIKANER AND JAIPUR	92.44%
BHARAT OVERSEAS BANK	100.00%	BANK OF BARODA	91.40%
DUETSCHKE BANK	100.00%	STATE BANK OF HYDERABAD	91.36%
DHANALAKSHMI BANK	100.00%	JAMMU KASHMIR BANK	90.72%
INDUSIND BANK	100.00%	UCO BANK	89.98%
KARNATAKA BANK	100.00%	BANK OF RAJASTHAN	89.83%
LAKSHMI VILAS BANK	100.00%	CENTRAL BANK	89.28%
ORIENTAL BANK OF COMMERCE	100.00%	BANK OF MAHARASHTRA	88.61%
SOUTH INDIAN BANK	100.00%	DENA BANK	87.03%
STATE BANK OF INDORE	100.00%	BANK OF INDIA	86.70%
STATE BANK OF MYSORE	100.00%	ING VYSAYA BANK	82.43%
UNITED BANK OF INDIA	100.00%	DEVELOPMENT CREDIT BANK	61.55%

It was found that only 37.93% of the public sector banks in the sample were efficient, while 70.00% of the private sector banks in the sample and 100.00% of the foreign banks in the sample were efficient. Overall, it was found that only 50.00% of the sample banks were efficient. It was thus found that bank efficiency was dependent on ownership ($\chi^2 = 6.2897$, $p = 0.0431$).

The descriptive statistics of the inputs and outputs of efficient and inefficient banks in the sample for the year 2004-05 are summarized in Table 3.



TABLE 3: DESCRIPTIVE STATISTICS OF THE INPUTS AND OUTPUTS OF EFFICIENT AND INEFFICIENT BANKS (2004-05)

		100% efficient	not 100% efficient	t-value	Sig.
cost to income ratio	Mean	0.8835	0.9391	-1.9336	0.0302
	Std. Dev.	0.0633	0.1155		
non-performing assets to net advances ratio	Mean	2.1610	2.1924	-0.0436	0.4826
	Std. Dev.	2.9760	1.3576		
net income to average working fund ratio	Mean	0.3365	0.1038	1.6121	0.0574
	Std. Dev.	0.6006	0.2773		
net interest income to average working fund ratio	Mean	7.1624	7.3552	-0.5859	0.2806
	Std. Dev.	1.4059	0.5467		
operating profit to average working fund ratio	Mean	2.4857	2.1310	1.5011	0.0706
	Std. Dev.	0.6944	0.8311		
return on total assets	Mean	0.9567	0.5136	1.8180	0.0383
	Std. Dev.	0.5350	0.9805		

There were found to be statistically significant differences in the average cost to income ratios, the average return on total assets ratios, and the average net income to average working fund ratios of efficient and inefficient banks. The average cost to income ratio of efficient banks was found to be significantly lower than that of inefficient banks. The average net income to average working fund ratio of efficient banks was found to be significantly higher than that of inefficient banks. The average return on total assets ratio of efficient banks was found to be significantly higher than that of inefficient banks.

The descriptive statistics of the inputs and outputs of public, private, and foreign banks in the sample for the year 2005-06 are summarized in Table 4.



TABLE 4: DESCRIPTIVE STATISTICS OF THE INPUTS AND OUTPUTS OF DIFFERENT TYPES OF BANKS (2005-06)

		public banks	private banks	foreign banks	F-value	Sign .
cost to income ratio	Mean	0.9166	0.9128	0.9143	0.0110	0.9890
	Std. Dev.	0.0754	0.0546	0.0476		
non-performing assets to net advances ratio	Mean	1.2921	1.3370	7.9500	5.9340	0.0060
	Std. Dev.	0.9492	0.7607	13.6747		
net income to average working fund ratio	Mean	0.1703	0.3065	0.0088	0.7190	0.4940
	Std. Dev.	0.3740	0.5515	0.0057		
net interest income to average working fund ratio	Mean	7.3293	7.5620	4.7467	47.8790	0.0000
	Std. Dev.	0.3749	0.4439	1.0902		
operating profit to average working fund ratio	Mean	1.9510	1.8550	3.3600	5.9600	0.0060
	Std. Dev.	0.6886	0.7400	0.6129		
return on total assets	Mean	0.6531	0.6930	0.7767	0.0640	0.9380
	Std. Dev.	0.6658	0.4311	0.4562		

There were found to be significant differences between the different types of banks in terms of control parameters as well as performance parameters. In particular, there were found to be statistically significant differences in the average non-performing assets to net advances ratios, the average net interest income to average working fund ratios, the average operating profit to average working fund ratios, and the average capital adequacy ratios of different types of banks. The average non-performing assets to net advances ratio of foreign banks was found to be significantly higher than those of public and private banks. The average net interest income to average working fund ratios of public and private banks were found to be significantly higher than that of foreign banks. On the other hand, the average operating capital to average working fund ratio of foreign banks was found to be significantly higher than those of public and private banks. Also, the average capital adequacy ratio of foreign banks was found to be significantly higher than those of public and private banks.



The efficiency scores of the sample banks for the year 2005-06 using the DEA model are shown in Table 5.

TABLE 5: EFFICIENCY SCORES OF THE SAMPLE BANKS (2005-06)

	Efficiency Score		Efficiency Score
CORPORATION BANK	100.00%	INDIAN BANK	99.11%
DUETSCHKE BANK	100.00%	STATE BANK OF MYSORE	97.73%
DHANALAKSHMI BANK	100.00%	UTI BANK	97.68%
STATE BANK OF INDIA	100.00%	ORIENTAL BANK OF COMMERCE	95.87%
BANK OF BARODA	100.00%	SYNDICATE BANK	95.83%
CANARA BANK	100.00%	SOUTH INDIAN BANK	94.76%
HDFC BANK	100.00%	STATE BANK OF HYDERABAD	94.76%
ICICI BANK	100.00%	STATE BANK OF TRAVANCORE	94.44%
KOTAK MAHINDRA BANK	100.00%	JAMMU KASHMIR BANK	93.91%
PUNJAB NATIONAL BANK	100.00%	BANK OF INDIA	93.43%
UNION BANK	100.00%	CENTRAL BANK	93.29%
ABN AMRO BANK	100.00%	STATE BANK OF BIKANER AND JAIPUR	91.51%
ALLAHABAD BANK	100.00%	UNITED BANK OF INDIA	91.51%
ANDHRA BANK	100.00%	BANK OF RAJASTHAN	91.26%
BANK OF CEYLON	100.00%	VIJAYA BANK	89.32%
FEDERAL BANK	100.00%	DENA BANK	87.93%
INDIAN OVERSEAS BANK	100.00%	UCO BANK	87.72%
ING VYSAYA BANK	100.00%	INDUSIND BANK	87.61%
KARNATAKA BANK	100.00%	BANK OF MAHARASHTRA	87.61%
LAKSHMI VILAS BANK	100.00%	BHARAT OVERSEAS BANK	86.98%
STATE BANK OF INDORE	100.00%	DEVELOPMENT CREDIT BANK	77.57%

It was found that only 37.93% of the public sector banks in the sample were efficient, while 70.00% of the private sector banks in the sample and 100.00% of the foreign banks in the sample were efficient. Overall, it was found that only 50.00% of the sample banks were efficient. Again, it was found that bank efficiency was dependent on ownership ($\chi^2 = 6.2897$, $p = 0.0431$).



The descriptive statistics of the inputs and outputs of efficient and inefficient banks in the sample for the year 2005-06 are summarized in Table 6.

TABLE 6: DESCRIPTIVE STATISTICS OF THE INPUTS AND OUTPUTS OF EFFICIENT AND INEFFICIENT BANKS (2005-06)

		100% efficient	not 100% efficient	t-value	Sig.
cost to income ratio	Mean	0.8936	0.9374	-2.178	0.0177
	Std. Dev.	0.0481	0.0787		
non-performing assets to net advances ratio	Mean	1.9929	1.5638	0.3835	0.3517
	Std. Dev.	5.0327	0.9747		
net income to average working fund ratio	Mean	0.3439	0.0385	2.5723	0.0070
	Std. Dev.	0.5240	0.1465		
net interest income to average working fund ratio	Mean	7.0410	7.3595	1.2594	0.1076
	Std. Dev.	1.0864	0.4041		
operating profit to average working fund ratio	Mean	2.2676	1.7900	2.0703	0.0225
	Std. Dev.	0.7618	0.7331		
return on total assets	Mean	0.8629	0.4800	2.1753	0.0178
	Std. Dev.	0.3909	0.7055		

There were found to be statistically significant differences in the average cost to income ratios, the average net income to average working fund ratios, the average operating profit to average working fund ratios, and the average return on total assets ratios of efficient and inefficient banks. The average cost to income ratio of efficient banks was found to be significantly lower than that of inefficient banks. The average net income to average working fund ratio of efficient banks was found to be significantly higher than that of inefficient banks. The average return on total assets ratio of efficient banks was found to be significantly higher than that of inefficient banks.



The descriptive statistics of the efficiency scores of public, private, and foreign banks in the sample for both years are summarized in Table 7.

TABLE 7: DESCRIPTIVE STATISTICS OF THE EFFICIENCY SCORES OF DIFFERENT TYPES OF BANKS

		public banks	private banks	foreign banks	F-value	Sign.
efficiency score (2004-05)	Mean	94.20%	97.35%	100.00%	1.3903	0.2611
	Std. Dev.	7.85%	5.58%	0.00%		
efficiency score (2005-06)	Mean	94.82%	98.01%	100.00%	2.3866	0.1053
	Std. Dev.	5.68%	4.04%	0.00%		

It was found that there was no significant difference in the average efficiency scores between public, private, and foreign banks for both years.

It was found that the results of the efficiency analyses for the two years was strikingly similar, and that in particular the differences in output ratios between efficient and inefficient banks were even more pronounced in the year 2005-06. In order to identify which output ratios distinguished efficient banks from inefficient banks, stepwise multivariate linear discriminant analysis was performed with the results of the efficiency analysis of the year 2005-06. It was found that the only output ratio which entered the discriminant function was the net income to average working fund ratio. The optimal discriminant function was found to be:

$$D = 2.599 * NI / AWF - 0.497,$$

with centroid values $D = 0.397$ for efficient banks and $D = -0.397$ for inefficient banks, and critical value $D^* = 0$. The optimal discriminant function was found to correctly classify 64.3% of the sample cases; in fact, it correctly classified 95.24% of the inefficient banks in the sample, while it correctly classified only 33.33% of the efficient banks in the sample. In particular, the implied critical criterion for a bank to be classified as efficient was given by: $NI / AWF > 0.1912$.

DISCUSSION

The banking industry in India has been subjected to number of changes due to the deregulatory measures taken by the government and the industry. Changes in the national and international market environments, pressure applied by international organizations such as the IMF and the World Bank and the introduction of new technologies have forced authorities to relax controls making the banking industry more competitive and efficient. Beginning with deregulation policies introduced in mid 1990s to early 1990s, Indian banks have changed compared to the



period before deregulation. It is obvious that changes are progressing well though slowly towards a more competitive banking industry in the region.

The present study analyses the control efficiency of banks operating in India, using two control variables (the cost to income ratio and the non-performing assets to average working fund ratio), and five performance variables (the net income to average working fund ratio, the net interest income to average working fund, the net operating income to average working fund ratio, the return on total assets ratio, and the capital adequacy ratio). The efficiency scores obtained in the study from the DEA model are therefore not comparable to the usual banking efficiency scores.

The results of the study show that overall, only 50% of the sample banks were control-efficient. The results also indicate that the control efficiency of the banks was dependent on ownership; only 37.93% of the public sector banks in the sample were control-efficient, while 70.00% of the private sector banks in the sample and 100.00% of the foreign banks in the sample were control-efficient. Interestingly, the results for both years were quite similar, with more pronounced differences between efficient and inefficient banks in the year 2005-06. The major sources of inefficiency in terms of control were identified to be high cost structure relative to income and high non-performing assets relative to net advances, and in terms of performance were identified to be low net income relative to average working fund ratios, low operating profit relative to average working fund ratios, low return on total assets, and low capital adequacy. Finally, the critical discriminating performance variable was found to be the net income to average working fund ratio.

These results contrast with the established literature in banking efficiency in India. Most studies have found public sector banks to be significantly better performing than private banks. The results suggest that, though public sector banks may be efficient, when performance metrics and control systems approach is used as a basis for comparison, public sector banks are at a lower level of efficiency. This could be explained in part by their responsibility to serve small depositors, a group generally ignored by foreign banks as well as many private sector banks; as well as by the provision of low-paid services like tax collection, maintaining and supervising pension and provident fund accounts. Also the smaller scale of foreign banks allows them to deploy a larger share of funds in advances rather than government securities.

The present study suffers some mild limitations. The sampling technique used was quota and judgment sampling, with a relatively small sample size; hence it is difficult to generalize the results of the study. Further, the study considered only two control variables (the cost to income ratio and the non-performing assets to average working fund ratio), and five performance variables (the net income to average working fund ratio, the net interest income to average working fund, the net operating income to average working fund ratio, the return on total assets ratio, and the capital adequacy ratio) to judge the efficiency of banks.

Another limitation of the study is that of the size-effect. The effect of the size of banks on their efficiency is an important issue. Because of the deregulation in the banking industry, there is a trend for banks to merge with others and become larger in size. It is possible that banks that



are large in size achieve scale economies, which a linear DEA model would fail to capture. Another limitation arises from the possibility that the extent and diversity of financial service products offered by banks would have an effect on their efficiency. There is scope for further research to assess the effects of size and product-offering on banking efficiency.

Future research should also probe into the nature and sources of the efficiency advantages in the different bank groups, as well as those at the individual bank level. This analysis has abstracted from risk management issues as well as an explicit consideration of government rules and directives that drive a wedge between the functioning of public sector banks and the private banks. It would be instructive to see to what extent such regulations determine the difference in efficiency between bank groups. A clearer understanding of the relationship between bank efficiency and overall social benefits would enable better evaluation of these regulations. A better identification of the drivers of bank efficiency is essential for policy makers, regulators and managers to improve standards in this most important sector of India's financial system.

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