EFFICIENCY MEASUREMENT OF INDIAN PUBLIC SECTOR BANKS: NON-PERFORMING ASSETS AS NEGATIVE OUTPUT

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ABSTRACT

In this paper we attempt to measure the relative efficiency of Indian PSU banks on overall financial performances. Since, the financial industry in a developing country like India is undergoing through a very dynamic pace of restructuring, it is imperative for a bank to continuously monitor their efficiency on Non-Performing Assets, Capital Risk-Weighted Asset Ratio, Business per Employee, Return on Assets and Profit per Employee. Here, Non-Performing Assets is a negative financial indicator. To prove empirically, we propose a framework to measure efficiency of Indian public sector banks.

Key Words: Efficiency, NPA- Non-Performing Assets, DEA -Data Envelopment Analysis, CAR-Capital Adequacy Ratio, Negative Output, Banking
 JEL Code: E5 and E59 (Related to Banking) & D6 and D61- Related to Efficiency and cost benefit analysis

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I.   OVERVIEW OF INDIAN BANKING

Indian public sector banks are trying to meet challenges from the deregulation of the financial sector and a volatile market situation by constantly seeking ways to how to retain their existing customers and add value to their services. To overcome these obstacles, hosts of banking sector reforms were brought into place over the last decade. In spite of all the structural changes and the reforms that have taken place, still we find the principal causes of weakness and poor performance of the public sector banks are lack of technology implementation and the inability to fulfill customer expectations through proper service (Verma Committee, 1999). Prior to 1969, all banks except the State Bank of India and its seven associate banks were privately owned. The Indian policy makers felt that for success of a planned economy and to undertake proper credit planning, it is essential that the control of the banks do not remain with a few private players. By the Nationalization Act of 1969, fourteen largest privately owned banks were nationalized. In 1980, using the same act, six more privately owned banks were taken over by the government (Sarkar, 1999). The main goals of the nationalization process were: (i) to break the monopsony control of the large business houses over the banking system (ii) to spread banking services to the rural areas and (iii) to mobilize funds for the priority sectors like agriculture, small scale enterprises, export sector, etc. (Bhattacharya, 1997). With excessive focus on social obligations, branch network expansion process, and priority sector lending activities, the objective of spreading banking activities to the masses was achieved but it took a heavy toll on the profitability and efficiency of the Indian banks. The rates of return went down, capital base got eroded and customer service hit the lowest level. Beginning in 1985, Reserve Bank of India (RBI), the central bank of the country initiated gradual deregulation of the banking sector so that scarce investible resources are put to more productive use and it culminated to the fundamental banking sector reforms with the acceptance of the Narasimham Committee report in 1992. With gradual reduction of the cash reserve ratio (CRR) and statutory liquidity ratio (SLR), the banks got more investible money, interest rates on the deposits were made free, branching policy were no longer dictated by the social obligations of serving the masses but more by economic viability, and removal of restrictions on the credit allocations gave the individual banks much more flexibility to design their growth strategies. To increase competitiveness among individual banks, the government allowed entry of new private and foreign banks and the nationalized banks were allowed to approach the capital market for fresh funds. To improve the financial soundness of the banks and their borrowing credibility from the market, the government initiated the internationally accepted capital adequacy norms of 8% as per the Basle Accord and new norms of income recognition and asset classification were introduced (Narasimham Committee, 1991).

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II.   EFFICIENCY STUDIES IN BANKING INSTITUTIONS

Performance of any firm is often evaluated with its efficiency to transform resources to generate outputs. The concept of efficiency came from the manufacturing industry where it is measured by the ratio of the outputs, which a firm produces to its inputs in the production process. This concept of performance measurement with efficiency figures has been extensively used in case of financial institutions particularly, banking industry. There are several reasons why we should measure the efficiency of banking organizations. The primary reasons are to separate banks that are performing well according to some specified standard to those which are not performing (Berger and Humphrey, 1997). The other compelling reasons are: firstly, to identify the best performers in the entire banking industry operating under similar business environments using their ranking figures in the industry. Bank excelling others are identified the best practice banks. Management practices of these units can be adopted by others and can act as 'benchmarks' to managerial practices necessary for high performance; secondly, efficiency studies can be assess the effectiveness of policies undertaken by the government in terms of deregulation, mergers or changing the market structure with a pre-reform and post-reform period study (Berger and Humphrey, 1997). Thirdly, relative efficiency measurements can identify the areas of weaknesses for a particular bank so that the policy makers can take remedial steps, it can actually measure the amount of input overuse or output underproduction in case of non-efficient bank. Extensive research work has been carried out in the efficiency measurement studies of banking institutions or branches within a single bank (Soteriou and Zenios, 1999).

III.   OBJECTIVE

1. Our research objective is how the non-performing assets as a negative financial indicator affects the efficiency level of all PSU banks in India. Related to this specific context and to the specific model (Paul, Bose, Dhalla efficiency Linkage) we formulated.

IV.   RESEARCH METHOD

The variables –inputs and outputs- of any DEA model were initially assumed to be positive (Charnes et al., 1978). This strict initial condition was relaxed by Charnes et al., (1986). After considering the ration form of the radial models, they end up requiring only non-negativity, provided each unit under evaluation has at least one positive input one positive output. The three initial DEA models will be called "basic" models: the CCR model (Charnes et al., 1978), the BCC model (Banker et al., 1984) and the additive model (Charnes *et. al.*, 1985).

We list several applications dealing with negative data which were forerunners of the first theoretical papers on this issue:

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1. Pastor (1993) considered two unrestricted in sign outputs in order to evaluate a sample of 23 bank branches. These outputs were "increments of time deposits and of demand deposits over a one-year period".
2. Zhu (1994) (also Seiford and Zhu (2002)) used the variable "profit and taxes" as an output in a DEA study of 35 Chinese textile firms, which may be negative in cases of financial loss. In fact, the values for five of the firms were negative.
3. Thore et al. (1994) evaluated a sample of U.S. computer companies, where one of the outputs was "income before taxes".
4. Lovell (1995) considered as output of an FDH model the "rate of growth of GDP per capita", a variable which ranges from -0.083 to 0.128.

It was 1995 when the first theoretical paper devoted to negative data in DEA was published. Pastor (1994) was the first to tackle this issue and to provide a translation invariance classification of the three basic DEA Models. Zhu (1994) performed an interesting application following the path of Pastor (1994).Translation invariance guarantees that a DEA model using the original –negative- data and the same model using the translated –positive- data are equivalent, i.e., both have the same optimal solution(s).

The envelopment form of the input (output)-oriented BCC model is translation invariant with respect only to outputs (inputs) and to non-discretionary inputs (outputs). The result means that, for example, we can deal with any output variable in the input-oriented BCC model, even if all its data are negative, provided all the input variables have non-negative values. If non-discretionary inputs are present, they may also contain negative data. In that case we may consider each non-discretionary input as an output of the model, just by reversing its sign, and then the model can be solved (*Lozano-Vivas et al. 2002*)

V. DATA AND VARIABLES

We have considered five sources variables namely, Establishment, Leadership & Strategy, Human Resources, Technology and Marketing which the bank is using to deliver highest quality of service to their customers. We have considered only those resources variables, which are used by the bank to improve its service delivery standard. All these resources variables were measured by the expenditure incurred in monetary terms (India Rupees in lakhs and Ratio of Assets). We selected five performances parameters - 'Business per Employee', 'Capital Risk-Weighted Assets Ratio', 'Net NPA as % of Net Advances', 'Profit per Employee' and 'Return on Assets' (These are the five major financial indicators according to *Reserve Bank of India)*. Non-Performing Assets is the negative financial indicator. We took the resources expenditure for five years period (2005-2009) and the financial performance earnings for a five years period (2006-2010) averaging them over the five years period. Time lag between investment in resources and performance improvement with its accrual benefits was accounted for by using one year lag (Shafer and Byrd, 2000).

All these data were collected from Statistical Tables relating to Banks in India (Reserve Bank of India Report, 2005-06, 2006-07, 2007-08, 2008-2009 and 2009-2010) published by Reserve Bank of India, the central bank of the Country. Reserve Bank of India, the central bank of the country, publishes a report called Trends and Progress of

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Banking in India. This is an annual report, which provides a rich source of data on the operations of all the commercial banks in the country. This report contains compiled information on the financial details from the balance sheet and the profit and loss statement of all the individual banks and also according to their groups based on their ownership like public, private and foreign banks operating in India. It also contains information on the performance ratios as prescribed by the central bank and achieved by the individual banks in the country. The data given here are all statutorily audited and are public information.

VI. EMPIRICAL RESULTS: EFFICIENCY ESTIMATION

We measured the efficiency of the banks in converting their resources spending in delivering in major financial indicators of Reserve Bank of India; data were collected from Statistical Tables relating to Banks in India of all the twenty-six public sector banks in our country.

Table 1. Data Envelopment Analysis Summary

| Input/Output*	Max	Min	Average	SD
Employee	0.16164	0.07775	0.11803	0.02308
Establishment	0.01995	0.01025	0.01524	0.00271
Marketing	0.00584	0.00013	0.00204	0.00109
Technology	0.03983	0.01486	0.02430	0.00642
Leadership and Strategy	0.00032	0.00000	0.00009	0.00007
Business per Employee	844.92750	376.39500	538.48529	107.64759
Capital Risk-Weighted Assets Ratio	13.51250	10.98500	12.40490	0.64379
Net NPA as % to net Advances	-0.18500	-1.85000	-0.91933	0.46455
Profit per Employee	5.77000	1.32500	3.40827	1.12090
Return on Assets (in %)	1.47000	0.48000	0.95663	0.25053

* Summary statistics for the Input/Output data, we used the input oriented BCC model to find out the efficiency of the banks in stage One with the DEA-SOLVER (Cooper, Seiford and Tone, 2000).

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Table 2. NPA Factor Efficiency Statistics

Bank Name	NPA Factor*	Efficiency*
Allahabad Bank	0.0000	1.0000
Andhra Bank	0.0000	1.0000
Bank of Baroda	0.0000	1.0000
Bank of India	0.0000	1.0000
Bank of Maharashtra	0.0051	0.8127
Canara Bank	0.0000	1.0000
Central Bank of India	0.6713	0.9240
Corporation Bank	0.0000	1.0000
Dena Bank	0.6448	0.7494
Indian Bank	0.0000	1.0000
Indian Overseas Bank	0.1239	0.9861
Oriental Bank of Commerce	0.0000	1.0000
Punjab and Sind Bank	0.0000	1.0000
Punjab National Bank	0.0000	1.0000
State Bank of Bikaner and Jaipur	0.1916	0.7031
State Bank of Hyderabad	0.0000	1.0000
State Bank of India	0.0000	1.0000
State Bank of Indore	0.4500	0.8788
State Bank of Mysore	0.0000	1.0000
State Bank of Patiala	0.0000	1.0000
State Bank of Travancore	0.2325	0.9351
Syndicate Bank	0.0000	0.9993
Uco Bank	0.0000	1.0000
Union Bank of India	0.0000	1.0000
United Bank of India	0.5726	0.9798
Vijaya Bank	0.0000	0.8582

* Statistics for the NPA Factor/Efficiency Score, we used the input oriented BCC model to find out the efficiency of the banks in stage One with the DEA-SOLVER (Cooper, Seiford and Tone, 2000).

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Figure 1. NPA Factor vs. Efficiency
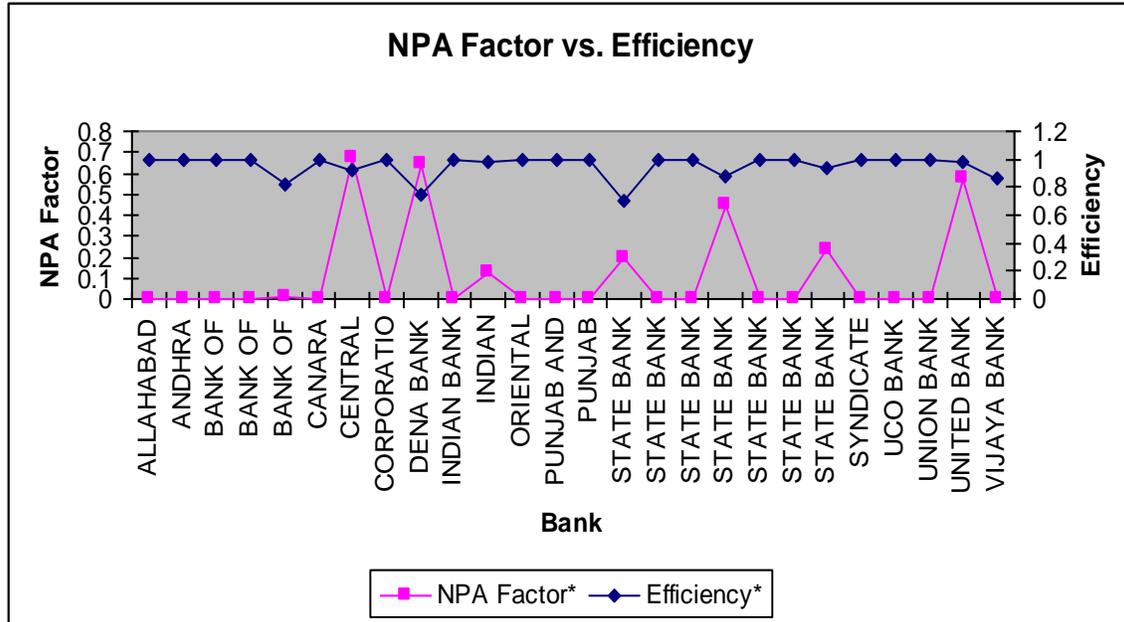
VII.   CONCLUSION

The findings of our model have tremendous application for individual bank management as well as the policy makers in the banking sector as a whole. 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. For instance, increase in scale efficiency shows improvements within the banking industry due to deregulation. This would suggest that further steps need to be taken to improve efficiency in the banking industry substantially. Non-performing assets is the biggest problem for public sector banks for improvement of efficiency level. It is been proved in our study that higher the NPA Factor lower the efficiency.

For instance, we found that increases in non-performing assets tend to be followed by decreases in measured efficiency, suggesting that high levels of sticky NPA cause banks to increase spending on establishment, employee, marketing, technology administering and/or selling off these assets, and possibly become more diligent in administering the performing portion of their existing NPA portfolio. The rationale for the focus on non-performing assets of the financial reform is consistent with the notion that high non-performing assets of Indian public sector banks represent weakness in balance sheet conditions, poor quality of assets, and fragility of the banks.

On the managerial front, our findings can be analyzed both from the macro point of view considering the banking sector as a whole or we can take cases of individual banks and try to study them in-depth. From analysis, we can see that almost 39% of the Indian public sector banks are inefficient in utilizing their establishment, human resource and other capabilities optimally to deliver service of high standard for their customers. Performance improvement potential for individual banks can help them to identify the thrust areas according to their long-term business policies. The empirical findings of our study on resources and performance provide the new direction for better management. We graphically presented the higher the NPA factor lower the efficiency of Indian public sector banks.

Our framework on the Resource-performance linkage in case of banking can help Indian policy makers to formulate performance measurement system of financial institutions by treating them not only from the financial intermediaries' viewpoint, but also to a more realistic service provider's perspectives. Further deregulation and more competition should be allowed within the banking sector for banks to become more efficient and productive.

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