CHAPTER II

SURVEY OF LITERATURE

- Emerging perspectives
- International context
- Indian context
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In the previous chapter, an overview of banking sector has been presented, highlighting the transition of banking system to the present structure and the current scenario in which the Indian banks are operating in the Indian environment. The need to evaluate efficiencies is highlighted in wake of ongoing reforms initiated in the Indian banking sector since early nineties. An in-depth understanding of experiences and findings of other researchers would be quite useful in streamlining the framework of the current study. Thus, this chapter discusses in depth, the existing literature available both in the international and national context in this area.

This chapter is divided into three sections: Section 2.1 discusses the emerging perspectives; Section 2.2 presents the review of literature in the international context and finally Section 2.3 focuses on the research carried out the Indian context.

2.1 Emerging perspectives

Over the last few years, many research studies have been carried out to determine the efficiency of the financial institutions. There are many frontier analysis studies to draw some tentative comparisons of average efficiency levels both across measurement techniques and across countries. This has helped in identification of a framework on basis of the primary results of the many applications of efficiency analysis to policy and research issues.

Many research studies have thrown light on the efficiency of financial institutions with a focus on the U.S. banking system. Berger and Humphrey (1997) have reviewed 130 studies that have been carried out in 21 countries. They have highlighted various measurement approaches used by researchers and found that Data Envelopment Analysis (DEA) was the most popular approach used. Sixty two papers
out of the total number of research papers studied used this approach. The other
approaches under the classification of parametric and non-parametric were:
Parametric - Stochastic Frontier Approach (SFA), Distribution Free Approach (DFA),
Thick Frontier Approach (TFA); Non-parametric - Data Envelopment Analysis
(DEA), Free Disposal Hull (FDH), Index Numbers (IN), Mixed Optimal Strategy
(MOS).

Various studies have evaluated efficiency and associated effects on financial
institution performance from several different perspectives: effects of mergers and
acquisitions (see Berger, Demsetz, and Strahan, 1999, and Resti, 1998)², institution
failure (see Siems, 1992, and Cebenoyan, Cooperman, and Register, 1993)³, and
deregulation issues (see Humphrey and Pulley, 1997, and DeYoung, 1998)⁴,⁵ amongst many others.

In the recent past there have been some studies conducted in U.S.A, Europe and other
parts of the world. There have been limited number of studies conducted in
developing economies, in the last few years there has been an effort to measure the
efficiency of the banking system in developing economies : Kuwait, Namibia, Nigeria, Croatia, Tunisia, Turkey and India amongst others.

The following section reviews the literature related to measurement of efficiency of
financial institutions across the globe. It may be noted that most of the recent studies
have used Data Envelopment analysis (DEA) for measurement of efficiency of the
banks and financial institutions.

2.2 International context

Ayadi et al (1998)⁶ has used the DEA model to determine the quality of bank
management. The sample includes 10 commercial and merchant banks that are
listed on the Nigerian Stock Exchange. The financial characteristics considered
are: interest income, non- interest income, total deposits, total expenses (interest
plus non-interest) and total loans. The period of study is 1991 through 1994. Out of the 10 banks considered for study, only two banks have been found as being efficient. The authors conclude that the weakness of Nigerian banks is attributed mainly to poor management, which can be attributed to excessive credit and liquidity risk, poor loan quality and poor internal generation of funds. The results are consistent with those of Doguwa (1996). The results also are consistent with Alawode (1992) who suggested that as a result of deregulation certain expanded powers are granted to the commercial banks which can be misused thus requiring a more intensive regulatory environment. Older banks have been found to be more efficient.

Avkiran (1999) examined the Australian banks in the deregulated period 1986-1995 for the changes in pure technical efficiency, scale efficiency and the nature of returns to scale. He found that the efficiency scores declined until 1991, followed by a steady rise thereafter. He used DEA and window analysis to study this trend and identified interest expense as an important source of inefficiency.

Bikker (1999) attempted to measure efficiency in the European Banking Industry: Belgium, France, Germany, Italy, Luxembourg, Italy, Luxembourg, Netherlands, Spain, Switzerland and U.K. The model used in the study is the Stochastic cost Frontier approach to estimate the X-Efficiency (overall efficiency) of the European banks and a multi-product translog cost function to compare cost levels. The study has been conducted in the environment after the introduction of Euro. Large differences have been observed in average X- and cost levels between the countries. Each country was found to be efficient on one parameter and inefficient on another. However, Bikker points out, in case of Germany, that the number of the banks is relatively high and as a result average bank size is low. He has attributed the smaller size of the bank for lower efficiency of banks. In Netherlands and the U.K. he has assumed that the larger average size of the banks have resulted in a higher efficiency of the banks. He projects that a “large-scale consolidation and rationalization of the banking sector are expected”.

Survey of Literature
Eisenbeis et al (1999) examined the properties of the X-efﬁciencies (technical and allocative) in U.S. bank holding companies using both stochastic and linear programming frontiers and found the scores obtained by the two methods highly correlated. The calculated programming ineﬃciency scores were two to three times larger than those estimated using a stochastic frontier and the patterns of the scores across banks and time were similar. On examining the “informativeness” of the efﬁciency by the two methods, they found that stochastic frontier scores were more closely related to risk taking behaviour, managerial competence and bank stock returns. In general they found that smaller banking ﬁrms on average were less efﬁcient than large banking ﬁrms. Average frontier X-inefﬁciencies declined over the sample period suggesting that banks responded to the increased competition that resulted from the market and the regulatory change.

Hao et al (1999) examined the impact of deregulation on the productive efﬁciency of the private Korean banks using stochastic frontier cost function approach for the period 1985-1995 and concluded that deregulation of 1991 was found to have little or no signiﬁcant effect on the level of sample banks’ efﬁciency. They subsequently employed second stage efﬁciency regression to identify the key determinants of operating efﬁciency. Banks with higher rates of asset growth, fewer employees per million of assets, larger amounts of core deposits, lower expense ratios and nationwide branch networks were found to be more efﬁcient.

Haslem et al (1999) used DEA to analyze the efﬁciency of the US banks operating internationally for the years 1987 and 1992. They have suggested that management should focus on an overall efﬁciency with special attention to namely two inputs, cash and real capital, and one output being the foreign loans. Around 20% of the banks were found to be inefﬁcient each year.
Laeven (1999) carried out the study on the East Asian Banks using DEA. He studied banks operating in Indonesia, Korea, Malaysia, Philippines, and Thailand. He considered five different ownership forms of banks: state-owned, family-owned, company-owned, foreign-owned, and widely-owned (dispersed ownership). He estimated a "grand frontier" for each country to allow for differences across countries. He found that there was a substantial increase in efficiency for Indonesia, the Philippines and Thailand during 1992-96. However, Korea and Malaysia stayed almost the same at their initial levels. They introduced a risk measure and using this model they concluded that family and company ownership should be discouraged and that the foreigners should be encouraged to become group of investors in banks.

Altunbas et al (2000) employed the stochastic cost frontier methodology to evaluate scale and X-inefficiencies (technical and allocative efficiencies), as well as technical change for a sample of Japanese commercial banks between 1993 and 1996. They found that the level of financial capital has the biggest influence on the scale efficiency estimates. They also suggest that X-inefficiency estimates, in contrast, appear less sensitive to risk and quality factors. They also conclude that in the Japanese context, scale inefficiencies dominate X-inefficiencies.

Casu and Molyneux (2000) investigated whether the productive efficiency of the European banking system has improved and converged towards a common European frontier during the period 1993-1997, following the process of EU legislative harmonization by employing the DEA approach. They have further used Tobit regression model approach to examine the determinants of European bank efficiency. They suggest that since the EU’s single market programme there has been a small improvement in bank efficiency levels, although they could find little evidence to suggest that these have converged. They have attributed the differences in efficiency across banks to country specific factors.
Ikhide (2000)\(^{19}\) carried out the efficiency studies in the region of Namibia using the ratios and econometric cost frontier approach. The period considered is 1993-98. The data covered 16 commercial banks covering 4 countries. These included 5 from Namibia, 3 from Botswana, 2 from Swaziland and 6 from South Africa. They found that the ratios were quite high for the Namibian banking industry and the translog cost function suggested that economies of scale exist for the Namibian banks. Consequently, they opine that banks should expand their operations in the country.

Sathye (2001)\(^{20}\) investigated both the technical and allocative efficiency in Australian banks using the DEA methodology. He highlighted that the technical component was more important than allocative component in the overall inefficiency. Domestic banks were found to be more efficient than the foreign banks. Technical efficiency was found to be lower than the allocative efficiency.

Barr et al (2002)\(^{21}\) employed a constrained-multiplier, input-oriented DEA model to evaluate the relative productive efficiency of U.S. commercial banks across a 15-year period. They divided the commercial banks into quartiles based on efficiency score, and found that in each year of their 15-year review period each quartile has significantly higher efficiency scores than the quartile beneath it. Non interest income, other non interest expense and purchased funds are found to be inversely related to efficiency whereas earning assets and return on average assets are positively related to efficiency. They suggest that the impact of varying economic conditions is mediated to some extent by the relative efficiencies of the banks that maneuver in these conditions. They also infer that a close relationship exists between efficiency and soundness as determined by bank examiner ratings.

Cinca et al (2002)\(^{22}\) explored up to what point the efficiency score obtained by a particular institution changes under various combinations of inputs and outputs. They have used this methodology on Spanish savings banks and suggest that not
one but many different DEA specifications, containing different combinations of inputs and outputs, should be modeled. They have also suggested that the results be analyzed with multivariate statistical tools. They have found the treatment of deposits as input or output to be of key importance in determining the efficiency of financial institutions.

Darrat et al (2002)\textsuperscript{23} carried out a study on performance of Kuwaiti banks in terms of their cost efficiency, productivity growth, and technological change. The other factors studied are effect of profitability, bank size, market power and degree of capitalization. The period of study is four years i.e. 1994-97. They have used the DEA model and the Malmquist total factor productivity index. The author has used CCR and BCC input oriented models for the study. Size was found to be negatively and significantly related to efficiency. An upward trend in cost efficiency was observed in Kuwaiti banks. Also, technical efficiency was higher than the allocative efficiency; scale efficiency was higher than pure technical efficiency.

Isik and Hassan (2002)\textsuperscript{24} have conducted an in-depth cross section analysis of the Turkish banking sector using DEA. They have measured and compared the input efficiencies of the different group of banks in the system and also related them to a set of bank characteristics: (1) structure, (2) size, (3) ownership and governance, (4) market power and niche, (5) risk variables as well as (6) other bank characteristics. They have also examined the impact of a) bank structure and performance, and b) corporate control and governance on the cost efficiency of Turkish banks.

They have found that technical inefficiency is the dominant source of cost inefficiency rather than the allocative efficiency. Size was not strongly correlated with cost, allocative and technical efficiencies. On the other hand, they also found that being a sizable bank was strongly positively associated with pure technical efficiency and negatively associated with scale efficiency.
Leong and Drolley (2002) have used the DEA model to study the relative productive efficiency of Singaporean banks. They have used three different models on basis of selection of inputs and outputs. One of the models takes into account uses a risk weighted DEA approach by using bank output explicitly in terms of risk weighted assets. These include off balance sheet items that conventional output variables, such as loans, fail to capture. They have employed the longitudinal efficiency analysis approach used in Barr et al (1999) where they divide the derived DEA scores into quartiles and observe how these quartiles interact with traditional indicators of performance and model variables. They conclude that that there are significant relationships between efficiency scores and traditional indicators of bank performance, namely capital adequacy, profitability, loan-to-asset ratio and institution size.

Limam (2002) compared technical efficiency of GCC countries using two different methods: a non parametric model (DEA) and a parametric model (Corrected Ordinary Least squares). Results obtained using two methods were fairly close. He concluded that on the whole the GCC countries have significant scope to improve their technical efficiency. Banks in Bahrain and Saudi Arabia were found to be more efficient as compared to other countries. He also found an association between the following: strong positive relationship between technical efficiency and larger bank size, and also between higher share of equity capital and higher technical efficiency. Weak links were found between technical efficiency -profitability and technical efficiency -date of establishment of banks.

Drake et al (2003) have used the DEA approach to study the technical and scale efficiency of the Japanese banks. They have used a sample in this study consisting of data for 149 Japanese banks for the financial year ending March 1997. Also in this study a strong relationship has been observed between the size and the efficiency of banks. There are clear indications that that the business structure (possibly management style and structure) is a potentially more
important influence on scale efficiency than size. They have chosen to measure the impact of problem loans as an uncontrollable input within the DEA model and have used the provision for loan losses as an indicator of the extent of problem loans.

The study clearly shows that smaller banks in Japan tend to have economies of scale. Thus they are targets for potential mergers. The technical efficiency is eroded with size up to the middle ranking banks. Hence mergers between smaller banks should be planned in such a way that any potential savings in cost not be affected by enhanced levels of overall efficiencies.

Luo (2003)\textsuperscript{28} has investigated two dimensions of banking efficiency- profitability and marketability-in sample of 245 large banks in the U.S.A. He suggested that the current problem of inefficiency in large banks is the lower level of marketability efficiency rather than the profitability efficiency. His study has been an innovative endeavor to look at the marketability efficiency. He found that that the location of banks was not significantly related to the profitability or marketability efficiency. He has also shown that overall technical efficiency of the profitability performance can predict the likelihood of bank failure.

Girardone (2004)\textsuperscript{29} in his study has made an effort to investigate the main determinants of cost efficiency in the Italian banks over a three-year period i.e. 1993-96. He has used the Fourier - flexible stochastic cost frontier model in order to measure X-efficiencies and economies of scale. He has shown that the mean X-inefficiencies range between 13-15 percent of total costs and that the efficiency tends to decline over the study period. Their results show that there was no clear relationship between the assets size and bank efficiency, though they have established an inverse correlation of inefficiencies with capital strength and a positive correlation with inefficiencies and bad loans. They have also shown that the quoted banks appeared to be on an average more efficient than their non-quoted counterparts.
Halkos and Salamouris (2004)\textsuperscript{30} have explored the efficiency of the Greek banking sector using DEA and taking certain commonly used financial ratios as output measures. They found that that higher the total assets size, higher was the efficiency. They found a wide variation in the performance of the banks and suggested that as the number of small banks reduces due to amalgamations and mergers, the efficiency increases.

Sturm and Williams (2004)\textsuperscript{31} compared the efficiency of foreign-owned banks operating in Australia with Australian domestic banks after deregulation of the Australian banking system was initiated during the early and mid eighties. They have used DEA, Malmquist Indices and stochastic frontier analysis in their study and found foreign banks to be more input efficient, mainly due to superior scale efficiency, than domestic banks. Overall, bank efficiency has increased in the post deregulation era and competition has resulted in prompt efficiency improvements.

Vedula and Tripe (2004)\textsuperscript{32} reviewed the efficiency of the New Zealand’s retail banks and branch networks over the period 2000-2002 using 14 different specifications of inputs and outputs in DEA model. They have found that the overall efficiency of major New Zealand banks was quite high as most of the models have shown efficiencies greater than 90\%. Also, the banks appeared to be improving their efficiency during the study period. The low dispersion of the scores of best and worst banks in different model also indicated that there were no significant differences in the efficiency of the banks and that the banking sector in New Zealand was reasonably competitive.

2.3 Indian context

Noulas and Ketkar (1996)\textsuperscript{33} conducted the study on the cross section data for year 1993 for the public sector banks (PSBs) using DEA to analyze the technical and
scale efficiency. They acclaim that inefficiency in PSBs was to the extent of 3.75 percent of which majority of the proportion they have attributed to scale inefficiency (2.25 percent), which leaves a proportion of just 1.5 percent to the pure technical inefficiency. They observed that most of the banks were found to be operating under increasing returns to scale.

Bhattacharya et al (1997)\(^3\) carried out a study to identify the productive (Technical) efficiency of Indian commercial banks in the early years of the deregulation period 1986-1991. The relative efficiency scores of 70 commercial banks (public sector, private sector and foreign owned) were calculated using the DEA model and the variation in calculated efficiencies in terms of temporal and ownership characteristics were calculated using Stochastic Frontier Analysis. They have used a single grand frontier which enveloped the pooled input-output data of all banks. Publicly owned banks were found to be the most efficient. Next in order were the foreign banks. Lowest in the order were the private banks. This was in terms of utilizing the resources at their disposal to deliver financial services to their customers. The most striking observation in their study is that over the study period efficiency of foreign banks have been on the rise and the publicly owned banks have shown a decline. Foreign banks were found to be least efficient in the beginning of the sample period but by the end of the period their efficiency estimates were similar to that of the publicly owned bank.

Das (2000)\(^3\)\(^5\) calculated the overall efficiency of 27 public sector banks for one year (1998) using the DEA model. The overall efficiency incorporates technical efficiency and allocative efficiency. The results show that State Bank Group banks have performed better than nationalized banks and they display lower dispersion as compared to nationalized banks. There was little variation over allocative estimates over all banks thus indicating a low level of competition amongst the public sector banks. Using regression, they found that size and non-performing loans were negatively correlated with efficiency estimates.
Pal et al. (2000)\textsuperscript{36} examined the operational efficiency of 68 major Indian commercial banks for the year 1999 using output oriented (CCR) DEA model. They have given a compiled summary of inputs and outputs used by other studies in calculation of efficiency measures. They have taken five inputs and five outputs. They found that 16 banks were efficient during the study period. The best 5 banks were obtained as ICICI Bank, UTI Bank, Citibank, Jammu & Kashmir Bank and Oriental Bank of Commerce. The five worst banks obtained were Indian Bank, UCO Bank, United Bank of India, Banque Nationale De Paris and Central Bank of India.

Saha (2000)\textsuperscript{37} performed a frontier model approach followed by DEA to determine the technical efficiency of 27 public sector banks over the three year period (1992-95). He observed that the efficiency of these banks generally improved over the three year period. UCO Bank, Syndicate Bank and Central Bank of India continued to be at the lower end of the relative efficiency scales during the study period. On the other hand, Corporation Bank, Oriental Bank of Commerce, State Bank of India, Canara Bank, State Bank of Hyderabad, Bank of Baroda and Dena Bank have consistently been amongst the relatively more efficient banks.

Shanmugam and Lakshmanasamy (2001)\textsuperscript{3} used three different approaches—non parametric approach, stochastic frontier function and random coefficient approach to measure the efficiency of the domestic banks in India for the year 1999. Their study revealed drastic differences across different models. The range was between 52- 80 percent for the technical efficiency. A rank correlation has been used to establish relationship between the scores observed from the three models. Deposits were found to be an important factor in determine the output of the banks across the three models.

Mukherjee et al (2002)\textsuperscript{39} have determined technical efficiency and benchmark the performance of 68 commercial banks using DEA. The period chosen for study is 1996-99. Public sector banks have been generally found to be more efficient than
private and foreign banks. Their efficiency trend has generally improved over the study period. Also, PSBs have been rated uniformly in terms of self appraisal as well as peer group appraisal.

Das (2003) examined the efficiency of 65 banks operating in India for the performance period 1995 using non parametric frontier methodology. In general, he observed that the technical efficiency scores were higher as compared to allocative efficiency scores. Also, most of the technical efficiency could be attributed more to pure technical inefficiency. The study reflected no significant efficiency measure differences between public and private sector banks, though foreign banks showed significant differences from public and private sector banks in terms of pure technical efficiency.

Kumar and Verma (2003) determined the technical efficiency of 27 public sector banks for the year 2001. They used the CCR input oriented DEA model to reduce the multiple - input, multiple - output situation for each bank to a scalar measure of efficiency of the 27 public sector banks, seven were found to be efficient. They have also carried out Tobit regression analysis to show that technical efficiency is positively related to higher profitability, larger branch network and higher staff productivity. The SBI group has outperformed the nationalized banks. Also, they have found that large banks are more efficient in comparison to small and medium banks in utilizing the critical inputs in their production process. They estimated that sixty three percent of the public sector banks had potential for profitability increase through efficiency improvements during the observed period.

Sathye (2003) carried out a study with 94 banks commercial banks (public, private and foreign) using the DEA model for the year 1998. Technical efficiency has been calculated using a variable returns to scale (VRS) input oriented model of the DEA methodology using two different models comprising different inputs and outputs. The study shows that as per one model public sector banks have a
higher mean efficiency score as compared to the private sector and foreign commercial banks in India. As per the other model they have a lower mean efficiency score than the foreign banks but a still higher score than private sector commercial banks. Most banks on the frontier were foreign owned.

In the Indian context, few studies have made an effort to measure the efficiency of the banking system over a time period of more than one year. It may be observed that out of 10 studies conducted in the Indian Banking included in this sector only 3 studies have taken study period of more than one year. Only five out of the ten studies have considered different ownership amongst banks. Most of the studies have taken the public sector banks into account. Thus it leaves a wide scope to evaluate efficiency of banks operating in India over a period of time and across different ownership structures.

In this chapter, certain aspects related with the literature of banking efficiency have been compiled. It has helped to know various perspectives that have been considered in banking efficiency in the Indian and the global context. It has brought to light various concepts and methodologies that have been studied regarding the efficiency of the banking sector. The next chapter will provide inputs to the conceptual framework adopted in the current study highlighting various definitions, concepts and measurement models related with efficiency studies.
References:


Chapter II


Survey of Literature

40