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Financial Crisis and the Performance of Commercial Banks: Indian Experience

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The present study is an attempt to evaluate the performance of commercial banks of India during 2002--2013, its post liberalization period, involving the period before and after financial crisis of 2008. The study used different indicators such as deposits, advances, expenditure, income, profitability, capital adequacy, NPA etc. for this purpose. An attempt is made to study the efficiency of group wise commercial banks before and after the financial crisis using panel data. Assuming variable returns to scale, the DEA - non parametric Malmquist indices of total factor productivity (TFP) have been computed; and the total factor productivity is decomposed into technical efficiency and technological change and technical efficiency change is further decomposed into pure efficiency change and scale efficiency change. Based on various indicators we find mixed evidence on the performance of banks after the financial crisis. The DEA analysis suggests that Indian banks are impacted in terms of declining efficiency during financial crisis but got recovered during the post crisis. Technical efficiency scores increased after the crisis and the pattern of efficiency scores predicted by DEA is U-shaped for the study period. The scale efficiency of public sector banks and technical efficiency of private commercial banks have increased after the financial crisis.

Keywords: *Commercial Banks of India, Financial Crisis, Performance, Panel Data, VRS, Malmquist Index*

Introduction

The objective of this paper is to evaluate the performance of the banks in India during 2002--2013, using different performance indicators such as deposits, advances, expenditure, profitability, and capital adequacy, NPA etc. before and after the financial crisis of 2008. An attempt is also made to assess the efficiency of the commercial banks during this period using non- parametric Malmquist DEA approach. The reason for choosing 2002-2013 as study period is that, during this period banking sector witnessed both robust growth and also got impacted by economic slowdown due to global financial crisis of 2008. A lot of literature and debate has gone

into the subject of efficiency and productivity of Indian banking sector (see Jayaraman and Srinivasan, 2014).

A sound financial system is crucial for an indispensable and vibrant economy. Thus, the performance of any economy to a large extent is dependent on the performance of the banking sector as it being the predominant component of the financial service industry. The Indian banking sector went through structural changes since its independence keeping in view its financial linkages with the rest of the economy and to meet the social and economic objectives of development (Kumbhakar and Sarkar, 2005). Consequently, the sector was initially following strict controls on interest rates, as well as stringent regulations relating to branch licensing, directed credit programs, and mergers. However, the closed and strict regulated environment started showing adverse affect on the sector, resulting in under-performance of the banks over the years. As a result, Indian banking sector underwent a sea of changes through its liberalization policy in early 1990s with implementation of a series of reforms with an objective to make the banking sector more productive and efficient by limiting the state intervention and enhancing the role of market forces.

Like most developing countries, the banking sector in India is characterized by the co-existence of different ownership groups, viz, public and private, and within private, domestic and foreign. The Indian public sector banks (PSBs) came into existence in several phases. In 1955, the Government of India took over the ownership of the Imperial Bank of India and reconstituted it as State Bank of India (SBI) under the State Bank of India Act of 1955. Later, the State Bank of India (subsidiary banks) Act was passed in 1959 allowing SBI to take over seven banks of large states as its associate banks. However, in spite the progress made of SBI and its subsidiaries in terms of geographic coverage and credit expansion, it was felt that bank credits were flowing mainly to the large and well established business firms and primary sectors such as agriculture and small scale industries were almost neglected. This resulted in an announcement of policy of social control over banks in 1969 and consequently fourteen largest private banks were nationalized under the Nationalization Act 1969. In the second phase of nationalization, another six private banks were nationalized in 1980. The private and foreign banks were operating side-by-side, but on a relatively small scale and their activities were restricted through entry regulation and strict branch licensing policies. During the period of 1969-1991, the number of banks increased slightly, but savings were successfully mobilized in part because the number of branches held by public sector banks was encouraged to expand rapidly. Further, relatively low inflation kept negative real deposit interest rates at a mild level, which in turn helped the banks to increase deposits. However, many banks remained unprofitable, inefficient, and unsound owing to their poor lending strategy and lack of internal risk management under government ownership. The prolonged presence of excessively large PSBs resulted in inefficient resource allocation and concentration of power in a few banks.

Facing major economic crisis, the Reserve bank of India (RBI) launched major banking sector reforms in 1991 aimed at creating a more profitable, efficient and sound

banking system, based on the recommendations of the first Narasimham committee on financial sector reforms. The reforms sought to improve the bank efficiency through entry regulation, branch de-licensing, deregulation of interest rate, and diversifying ownership of PSBs by enabling the state-owned banks to rise up to 49 per cent of their capital from the market. The reforms also targeted at improving bank profitability through the gradual reduction of the Cash Reserve Ratio (CRR) and the Statutory Liquidity Ratio (SLR), and to strengthen the banking system by introducing the micro prudential measures (see Bhide *et al*., 2001; Reddy, 2006; Prasad and Ghosh, 2007; and Kumar and Charles, 2011 for extensive review of the recent banking sector reform). These reforms are expected to have an impact on the operations of banks. With reduced statutory requirements banks will have more funds at their disposal for commercial lending and the interest rate liberalization is expected to bring flexibility and competition into the banking system. The competition is further infused by opening up banking sector for the private and foreign banks. Along with these flexibilities, certain regulatory reforms are also introduced, which are meant to equip the banks to face fluctuations in the economy.

However, the turmoil in the international financial markets of advanced economies that started around mid-2007 has exacerbated substantially since August 2008. The first hint of the trouble came from the collapse of two Bear Stearns hedge funds in early 2007 (Prasad and Reddy, 2009). Subsequently a number of other banks and financial institutions also began to show signs of distress. Matters really came to the force with the bankruptcy of Lehman Brothers, a big investment bank, in September 2008. In spite of the fact that Indian banking system is not directly exposed to the sub-prime mortgage assets, the shock has been felt in Indian financial market as well, since India is far more exposed to international markets after macro-economic reforms of 1991. The financial sector, especially banks, is subject to prudential regulations, both in regard to capital and liquidity. As the current global financial crisis has shown, liquidity risks can increase manifold during a crisis and can pose serious downside risks to macroeconomic and financial stability (Mohan, 2008). The RBI's policy response aimed at containing the contagion from the outside in order to keep the domestic money and credit markets functioning normally and see that the liquidity stress does not trigger solvency cascades (Subbarao, 2009). In particular, three objectives were targeted: first, to maintain a comfortable rupee liquidity position; second, to augment foreign exchange liquidity; and third, to maintain a policy framework that would keep credit delivery on track so as to arrest the moderation in growth. Available empirical studies on the impact of financial crisis on the performance of banks in India provide mixed and sometimes conflicting evidence due to the use of different methodologies, time periods and variables. There is a need to provide a comprehensive and methodologically superior procedure in evaluating the performance of Scheduled Commercial Banks in India. This paper is an attempt in this direction and organized into five sections: The next section deals with literature review relevant for the present work. The third section is on materials and methods used in the study. Section four is on empirical findings and the discussion of the results. The final section comes out with summary and conclusion.

Review of Literature

A strong banking sector effectively channels funds from savers to investors by efficiently performing the function of financial intermediation. Moreover, it also leads to what is commonly known as credit creation through the process of money multiplier. Therefore, the sound performance of banking sector is of utmost importance to economic development. Traditionally, the performance and efficacy of banking institutions is measured by financial ratios, but this approach has a major demerit in terms of its subjectivity and reliance on benchmarking ratios (Yeh, 1996). Sherman and Gold (1985) initiated the frontier analysis approach to bank performance assessment. They argued for the application of frontier analysis techniques in bank performance evaluation instead of financial ratios and other traditional financial measures.

Over the past several years, substantial research efforts have gone into measuring the efficiency of commercial banks using frontier efficiency measurement techniques like Stochastic Frontier Analysis, Data Envelopment Analysis, Thick Frontier Analysis, etc. However, earlier studies of the banking efficiency literature were mainly confined to the banking system of US and other well developed European countries (1993a; Berger and Humphrey, 1997; Berger and Mester, 1997). Berger and Humphrey (1997) in their extensive international literature survey documented 130 studies on efficiency of financial institutions covering 21 countries. However, only about 5% studies examined the efficiency of banks in the developing countries. Thus, a lop-sided distribution of the studies in favor of industrially advanced countries was confirmed by the existing surveys on the subject matter.

To get rid of financial repression which existed until 1980s, emerging market economies embarked upon the process of financial deregulation and liberalization of the banking sector. The deregulation policies aimed at eliminating government control and intervention, enhancing competition, improving resource allocation and acquiring more efficient financial institutions, by making them less state-directed and by exposing them to increased market competition (Barajas *et al*, 2000). Consequently, there has been a proliferation of research studies on examining the impact of deregulation and liberalization on the efficiency and productivity of the banking system. Notable studies which reported a positive impact of deregulation on the efficiency and productivity of banks are Berg *et al*. (1992) for Norway; Zaim (1995), Isik and Hassan (2002), Isik (2007) for Turkey; Maghyereh (2004) for Jordan; Barajas *et al*. (2000) for Colombia; Leightner and Lovell (1998), Xiapong *et al*. (2005), Burki and Naizi (2010) for Pakistan. In contrast to aforementioned studies, there are some studies which reported a negative or insignificant effect of deregulatory measures on the efficiency and productivity of banks. Some prominent studies in this context are Humphrey (1991), Humphrey (1993), Humphrey and Pulley (1997), Grabowski *et al*. (1994), Elyasiani and Mehdian (1995), Wheelock and Wilson (1999), Lozano-Vivas (1998) for Spain; Kumbhakar and Wang (2007), Ariff and Can (2008) and Fu and Heffernan (2009) for China.

Overall, there is no consensus about the impact of deregulation on the efficiency of banks across different economies. In some countries, the banking sector is benefited

from deregulation and liberalization policies, whereas in others, the efficiency performance of banks seemed not to be affected or deteriorated. However, majority studies (about 67%) conclude that deregulation and liberalization have had a positive effect on the banks' performance. That is, banks tend to respond positively to more liberal environment, and banks' efficiency and productivity improved significantly during and post-deregulation period. Other studies (about 33%) conclude that deregulation has deteriorated the efficiency performance of banks. Thus, the consequences of deregulation and liberalization differ across countries due to differences in their economic environment.

The literature concerning bank efficiency in India shows that good number of studies has assessed the impact of transition from regulation to competition on the efficiency and productivity of banks. The most of the literature on the effect of deregulation and liberalization on Indian banking industry portraits a positive impact of deregulatory policies on the efficiency of Indian banks. The studies of Bhattacharyya *et al*. (1997), Shirai (2001), Shanmugam and Das (2004),Reddy (2006),Bhide (2008), Ray and Das (2010), Ramathilagam and Preethi (2010) broadly concluded that the deregulatory policy regime has had a positive and favorable impact in terms of efficiency improvement.

In Indian context too, though the majority of studies portrayed a positive impact of deregulation and liberalization policies on the efficiency and productivity of Indian banks yet a few studies also reported an adverse or insignificant effect of these policies on the performance of banks. The studies that reported either an adverse or insignificant effect of deregulation on the performance of Indian banks include Kumbhakar and Sarkar (2005), Galagedera and Edirisuriya (2005), Das and Ghosh (2006), Sanjeev (2006), Sensarma (2005 and 2008), Kalluru and Bhat (2009), Ramathilagam and Chanchu (2009). Thus, the review of the studies pertaining to Indian banking industry also yield the mixed results. In all 33 studies that have been reviewed, of which 25 studies concluded that deregulation has improved the efficiency of Indian banks. However, only 8 studies have provided an evidence of insignificant or adverse effect of deregulation on the efficiency of the banks.

A number of studies have been conducted to study the background causes and impact of the 2007 financial crisis. Whalen (2008), Myers an Sendanyoye (2009) reviewed the background and causes of the financial crisis and effect of the financial crisis. Fratianni and Marchionne (2009) illustrates the role of banks in the subprime crisis, what actions they have taken in reducing leverage, and how security markets have penalized bank equity. The weakness that are unique to the financial crisis of 2007 were the transfer of assets from the balance sheets of banks to the markets, the creation of complex and opaque assets, the failure of ratings agencies to properly assess the risk of such assets, and the application of fair value accounting. Vidyakala and Madhuvanthi (2009) explain that the prudential norms adopted by the Indian banking system and the better regulatory framework in the country have helped the banking system remain stronger even during the global meltdown. The banking industry is indirectly affected

due to the decrease in exports and drying up of overseas financing. The Indian banks do not have big exposures to subprime market and thus the impact recession on the Indian Banking sector was very small. Thus, empirical evidence largely concludes that liberalization had a positive impact on productivity of Indian banks while a study of Indian banks pre and post global crisis reveals that Indian banks have not been materially impacted due to the crisis. An effort is made in this study to provide evidence on the impact of financial crisis of 2008 on the performance of group wise commercial banks in India using simple indicators and the recently developed Malmquist index of efficiency.

Materials and Methods

The basic source for the data collection is the Reserve Bank of India. The study period considered for the empirical analysis is 2002 to 2013. The study period is subdivided in to two sub periods, viz., 2002-2007 and 2008-2013. The data on variables such as deposits, advances, etc. for individual banks have been collected for this period. There are several ways of measuring performance of financial institutions but there is no generally accepted best method (Frimpong, 2010). Researchers use financial ratios such as return on equity (ROE) and return on assets (ROA) and also advanced methods such as parametric and nonparametric approaches (Erasmus and Makina, 2014). As to what approach best suits is still an unresolved question though the DEA approach pioneered by Farrell (1957) is increasingly being preferred by several authors. We use the combination of these methods in evaluating the performance of commercial banks in India. A simple descriptive analysis has been used to study the performance of the scheduled commercial banks before and after financial crisis. In addition, using the panel data for the study period, the non parametric Malmquist indices of efficiency are computed within the DEA framework. The details of DEA are as follows:

Measuring Efficiency

Efficiency measurements can either be input or output oriented. Input oriented measures focus on the extent inputs can be reduced for a bank to be there on the efficient frontier. Output oriented efficient measures focus on output expansion using the available inputs for the bank to be efficient. The present study is based on output oriented efficiency of the banks. Three variables have been used as outputs: loans and advances, interest income and total investment and two variables i.e. Deposits and the number of Employees have been used as inputs. Efficiency has been decomposed into technical and allocative efficiency and their product implies productive efficiency (Farell, 1957). The firms which are technically efficient can produce on the production frontier and the inefficient ones produce below the frontier (Coelli, 1995). The allocative efficiency measures deviation from optimal production levels given the prices of inputs and outputs.

Data Envelopment Analysis (DEA)

Following Coelli (1995) we have started with the constant returns to scale input oriented DEA. The specification is based on data for K inputs and M outputs of N decision making units (DMU).These are represented by vectors, x_i and y_i respectively for each bank.

$$\begin{aligned} &\max_{u,v} (u'y_i / v'x_i), \\ &\quad s.t \quad u'y_i / v'x_i \le 1, i = 1,2...,N, \\ &\quad u,v \ge 0 \end{aligned} \qquad 1$$

The empirical question is that of finding the values of u and v such that the efficiency measure of each bank is maximized subject to the constraint that all efficiency measures must be less than or equal to one (Macochekanwa and Apani,2016).

The CRS DEA model has been extended to incorporate variable returns to scale (VRS under the assumption that perfect competition does not exist in banking industry). The VRS DEA (using linear programming duality) is represented as follows:

$$\begin{aligned} &\min_{\theta,\lambda} \theta \\ &s.t \quad -y_i + Y\lambda \ge 0 \\ &\quad \theta x_i - X\lambda \ge 0, \\ &\quad N1'\lambda = 1 \\ &\quad \lambda \ge 0 \end{aligned} \qquad 2$$

Where $N1$ is a $N*1$ vector of unit values. The specification provides scores which are less than or equal to those obtained using the CRS model.

In the panel data framework, DEA-like linear programs and a Malmquist total factor productivity (TFP) index are used to measure productivity change. The productivity change will be decomposed into technical change and technical efficiency change. According to Grifell-Tatje and Lovell (1996), the Malmquist indexes have three main advantages relative to the Fisher and Tornqvist indices. Firstly, it does not require the profit maximization, or cost minimization assumption. Secondly, it does not require information on the input and output prices. Finally, if researcher has panel data, it allows the decomposition of productivity changes into two components (technical efficiency change, and technical change or changes in the best practice).Its main disadvantage is the necessity to compute the distance functions. However, the Data Envelopment Analysis can be used to solve this problem. Following Fare *et al*. (1994) the Malmquist (output oriented) TFP change index The Malmquist TFP index calculates the change in productivity between two points by estimating the ration of the distances of each point relative to a common technology. Fare *et al* (1994) specified the following output based Malmquist productivity index that is employed in this study.

$$m_0(Y_{t-1}, Y_t, X_t) = [\left[\frac{d_0^t(X_{t-1}, Y_{t-1})}{d_0^t(X_t, Y_t)}\right] * \left[\frac{d_0^{t-1}(X_{t-1}, Y_{t-1})}{d_0^{t-1}(X_t, Y_t)}\right]]^{\frac{1}{2}} \qquad 3$$

Equation 3 expresses the productivity of the production point (X_{t}, Y_{t+1}) relative to the production point (X_{t}, Y_{t}). The predicted values greater than 1 indicate positive growth in productivity between the period t and period t+1. The above index is a geometric mean of two output-based Malmquist TFP indices. One of the two indices uses the period t technology while the other uses the period t+1 technology (Macochekanwa and Apani, 2016).

Findings and Discussion of the Results

Commercial banks in India constitute the largest segment of the Indian financial system and were predominantly government owned till the early 1990s. The number of banks considered for this study is 48 that include the scheduled commercial banks (SCBs) which are grouped into: public sector banks comprising State Bank of India and its associates (6), nationalized banks (20), and private sector banks (22). The banking system in India had undergone a metamorphic change with the introduction of the first phase of reform in 1991. The objective of early phase of reform was to create an efficient, productive and profitable financial service industry operating within the environment of operating flexibility and functional autonomy. The focus of the second phase of financial sector reforms in 1998 was strengthening of the financial system and introduction of structural improvements with an aim to align Indian banking standards with the internationally recognized best practices. These reforms promoted diversified, efficient and competitive banking system in India. The operational flexibility resulted in a strong balance sheet growth of the banks during this period. One of the major objectives of banking sector reforms is to enhance efficiency and productivity through enhanced competition. The reform process established a competitive banking system in India driven by market forces and it is evident from considerable reduction in interest spread during the reform period as well as change in business strategy like non fund based business, treasury and foreign exchange business. Also, greater emphasis on income and expenditure management during the reform period resulted in a general reduction in operating expenditure as a proportion of total assets in spite of large expenditure incurred on technology upgradation and voluntary retirement of staff. A key achievement of banking sector reform has been the sharp improvement in the financial health of banks which reflect in significant improvement in capital adequacy and improved asset quality (Mohan, 2005). Prior to the global financial crisis i.e. during 2005-2008, the business and financial performance of banks in India was underpinned by strong macroeconomic environment and supporting monetary and financial policies. SCBs exhibited robust growth in terms of aggregate deposits and gross bank credit with improved asset quality and profitability. The effect of global financial crisis was quite visible in Indian banking industry during 2009-2010. Though, the banking industry withstood this test by adopting counter-cyclical prudential regulations framework during credit boom and slowdown period, it was not completely insulated from the effects of the financial crisis. This is evident from decelerated growth of aggregate deposits, loans & advances, net profits and a sharp increase in provisions and contingencies during this period. In 2011, banks in India experienced another test due to challenging operational environment like high interest rates, tight liquidity conditions and high

inflation. Consequently, the major concern in 2012 is deterioration of asset quality and growing NPAs. Below follows the discussion on a few key performance indicators of SCBs before and after the emergence of financial crisis:

Deposits and Advances

Deposits and advances constitute the liability as well as asset side of the banking sector. While deposits are the source of funds or the resources for the banking sector, advances indicate the use of funds or the deployment of funds. Thus, it is amply evident that both asset and liabilities side of the balance sheet is intimately interlinked as evolution of one depends on the other.

Table-1: Bank Group Wise Deposits & Advances

	Bank group	Advances				Deposits			
		Total 2002-07 (US $bn)	CAGR (2002-07)	Total 2008-13 (US $bn)	CAGR 2008-13	Total 2002-07 (US $bn)	CAGR (2002-07)	Total 2008-13 (US $bn)	CAGR 2008-13
1	Nationalized Banks	731	25.91	2758	22.03	1193	18.13	3741	15.77
2	SBI& Associates	352	25.98	1225	20.86	516	13.40	1533	11.90
3	Private sector banks	274	33.04	994	19.40	347	32.36	1242	15.19
	Total	1357	27.08	4978	21.18	2056	19.02	6517	14.71

Note: CAGR= Compound annual growth rate, Source: RBI

For the sake of uniformity, we have considered the six year period 2002-07 before the crisis and 2008-13 coinciding with and post the crisis. It is evident from the above table that both the asset and the liability side of the balance sheet shows a declining trend post the global financial crisis. For instance, on the liability side, there is a declining trend across bank groups. The decline in deposit growth calculated on a compounded basis during the six year period was the sharpest for the private sector banks. The 6 year CAGR in deposit growth declined from 32.36% during the pre-crisis period to 15.19% post the crisis, a decline by more than half. We can explain this phenomenon by the fact that after the global financial crisis, the confidence in public sector banks increased since they came to be regarded as safer compared to their private sector counterparts. Coming to advances, or the deployment of funds, we observe a similar result. For all banks put together, advances declined on a compounded basis from 27% before the crisis to 21% post the 2008 crisis. The decline has been a common phenomenon across bank groups but it was steepest for private sector banks from 33% before the crisis to 19% post crisis period. It is also pertinent to note that the rate of decline is on similar lines to that of deposit growth decline. Hence, it may be concluded that the decline in credit growth across bank groups post the global financial crisis was due to the decline in deposit growth. Again, the decline in advances growth was the sharpest for private sector banks since deposit growth was lowest among these groups.

Credit Deposit Ratio

This is a useful tool in understanding the relationship between deposits and credit. Usually, after meeting Statutory Liquidity Ratio (the portion of deposits banks are

mandated to invest in Government Securities) of, say, 24% and Cash Reserve Ratio (the portion of deposits banks are mandated to invest with RBI) of 4% only 72% is available for lending and ideally; the Credit Deposit ratio (CD ratio) must be 72%. Here, we try to map the movement in CD ratio of bank groups.

Table-2: Credit Deposit Ratio across Bank Groups

	Bank group	CD ratio range 2002	CD ratio range 2007	CD ratio range 2008	CD ratio range 2013	Incremental CD ratio 2007 over 2002	Incremental CD ratio 2013 over 2008
1	Nationalized Banks	34.79-64.29	59.61-144.09	59.30-112.62	67.67-86.43	86.62	77.22
2	SBI& Associates	44.65-62.24	67.73-77.46	71.54-79.59	78.87-86.94	114.33	92.15
3	Private sector banks	42.32-110.61	55.30-89.70	53.20-94.69	61.04-99.19	75.48	87.15
	Total	37.94-146.59	52.74-144.09	53.20-112.62	61.04-99.19	88.99	82.27

Source: RBI

The absolute ratio or the credit deposit ratio leads us to infer an overall increase over the post crisis period. This might lead us to an erroneous conclusion that credit demand has gone up and banks were engaged in higher leverage since a higher CD ratio implies over leverage and, perhaps, higher borrowings to fund credit growth (since CD ratio of more than 72%, after SLR and CRR implies borrowings to fund credit growth). However, a more meaningful measure, the incremental credit deposit ratio, provides a realistic to picture. This ratio shows a decline across bank groups except for private sector banks (this group shows an increase from 75.48% to 87.15%). The decline in incremental CD ratio buttresses the fact that post crisis, there is a general deceleration. It needs to be further clarified that credit growth is showing a sharp decline since 2013 due to sluggish domestic growth. The rise in incremental CD ratio in the case of private sector banks merits an explanation. In this case, we can attribute some leverage effect. Historically, private sector banks have been borrowers in the money market through call, CBLO (collateralized Borrowijg and Lending Obligation) and notice money markets while public sector banks are lenders. Thus, we can safely assume that higher incremental CD ratio for private sector players is a result of higher borrowings.

Total income & Total expenses

Table-3: Income & Expenditure

	Bank group	Income				Expenditure			
		Total 2002-07 (US $bn)	CAGR (2002-07)	Total 2008-13 (US $bn)	CAGR 2008-13	Total 2002-07 (US $bn)	CAGR (2002-07)	Total 2008-13 (US $bn)	CAGR 2008-13
1	Nationalized Banks	121	12.47	369	22.47	109	11.40	264	20.14
2	SBI& Associates	66	8.03	167	19.91	60	7.33	130	16.92
3	Private sector banks	44	30.78	165	19.75	37	26.36	110	13.14
	Total	232	14.20	701	21.18	206	12.61	504	17.85

Note: CAGR= Compound annual growth rate, Source: RBI

The table above provides useful insights about income and expenditure. It may be is observed that total income has registered growth across nationalized banks and state bank group during the post crisis period (2008-13 relative to 2002-07) while there was a decline in income growth for the private sector banks. The low income growth for private sector banks is due to a sharp decline in credit growth for this bank group from 33% during pre crisis period to 19% during the post crisis period as shown in Table-1. Though nationalized banks and state bank group also showed a decline in credit growth, it was not very sharp and the rise in income should lead us to believe that public sector banks showed higher income growth due to higher yield on advances by virtue of more exposure to SME and retail portfolio.

Ovn the expenditure side, however, public sector banks have shown higher growth rate over the period 2008-13 compared to 2002-07 while the private sector banks have shown a sharp decline. This is also attributed to the fact that deposit growth was sluggish for private sector banks post the 2008 crisis since the inherent safety of PSBs were given a premium while parking their funds by the general public and corporates. Lower deposit growth implies lower expenditure and hence slowdown in expenditure growth for private sector banks.

Profitability

Table-4: Operating Profit & Net Profit

	Bank Group	Operating Profit				Net profit			
		Total 2002-07 (US $bn)	CAGR (2002-07)	Total 2008-13 (US $bn)	CAGR 2008-13	Total 2002-07 (US $bn)	CAGR (2002-07)	Total 2008-13 (US $bn)	CAGR 2008-13
1	Nationalized Banks(20)	46	18.00	77	21.69	13	23.79	36	14.90
2	SBI& Associates(6)	69	12.01	35	20.09	22	22.22	73	15.44
3	Private sector banks(22)	6	44.47	30	25.15	5	32.82	22	26.94
	Total (48)	121	18.83	142	22.03	39	23.85	131	17.32

Note: CAGR= Compound annual growth rate, Source: RBI

Operating and net profit of the banks also present a similar picture. Operating profit growth in compounded terms increased for public sector banks while it declined for private sector banks. The decline in operating profit growth for private sector banks was obvious since advances growth was also on the decline for these banks post crisis period. For All Banks as a whole, however, operating profit showed an increase in compounded terms. However, there is a reversal of the trend seen in operating profit in the case of net profit. Net profit of public sector banks witnessed a sharp decline post crisis phase while the decline was less steep for private banks. Growth in net profit was also higher for private sector banks. This is explained by higher incidence of asset quality issues post crisis period. This happened through the growth channel. Countries affected adversely post the 2008 meltdown never recovered fully, leading to muted growth in these economies. It had a spillover effect on India through the export and trade channels. Hence, the crisis contributed to slowdown in Indian economy (though domestic factors like high inflation were also responsible for lower growth). Lower growth directly affects corporates resulting in bank loans turning bad, potentially

resulting in asset quality issues. This led to rising Non-performing Assets in banks and necessitated more provisioning. Higher provisioning has resulted in lower net profit (net profit = operating profit – provisions).

Asset Quality

Table-5: Gross NPA & Net NPA

	Bank group	GNPA				Net NPA			
		GNPA total 2002-07 (US $bn)	CAGR (2002-07)	GNPA Total 2008-13 (US $bn)	CAGR 2008-13	Total 2002-07 (US $bn)	CAGR (2002-07)	Total 2008-13 (US $bn)	CAGR 2008-18
1	Nationalized Banks(20)	42	40.58	66	66.28	17	33.19	35	78.20
2	SBI& Associates(6)	20	37.64	43	68.56	9	37.01	21	63.96
3	Private sector banks(22)	10	33.14	23	53.44	5	53.69	7	45.70
	Total (48)	72	38.60	132	64.49	30	36.50	62	67.21

Note: CAGR= Compound annual growth rate, Source: RBI

Predictably, the Gross Non Performing Assets of the banking industry have increased post crisis period from 38.60% on a compounded basis to 64.49%. Net NPA also showed a similar increase from 36.5% to 67.2%. As stated earlier, since Indian economy was adversely affected through the export channel, lower growth meant lower capacity utilization by corporates, adversely impacting their repayment capacity of bank loans. Higher gross NPAs necessitated more provisioning and hence net NPAs also widened further. The increase was more pronounced for public sector banks and asset quality issues continue even now. As per estimates, total gross NPAs in the Indian banking system at the end of March 2014 amounted to INR 2.43 lakh crores, leading to a Gross NPA ratio of 4.5%.

Key Ratios

Table-6: Gross NPA% & Return on Assets

	Bank group	Gross NPA % range 2007	Gross NPA% range 2013	Return on Assets range 2007	Return on Assets range 2013
1	Nationalized Banks(20)	2.70	3.24	0.96	0.71
2	SBI& Associates(6)	2.10	3.78	0.93	0.81
3	Private sector banks(22)	3.32	2.00	0.94	1.29
	Total (48)	2.73	3.00	0.94	0.94

Source: RBI

The table shows that while gross NPA ratio has increased across the banking industry, return on Assets has remained same on an average. However, it is pertinent that while the asset quality of PSBs declined during the post crisis period, it has improved for private sector banks. Naturally, asset quality is a function of economy as well as quantum of advances. Since PSBs have a higher volume of advances, they bore the brunt of the post crisis period which was also a recessionary phase with a deep crisis engulfing the Euro Zone while the U.S continued to suffer from the trauma inflicted during the crisis period.

Return on Assets is the ratio of net profit to average assets. This metric worsened for PSBs due to asset quality issues since it led to lower net profits. Higher delinquency implies more provisioning and lower net profits. However, for private sector banks, asset quality was better since their volume of advances was lower. As a corollary, they had to incur comparatively lower provisioning leading to better return on Assets.

Key Ratio – Capital Efficiency & Margins

Table-6: Capital Adequacy Ratio and Net Interest Margin

	Bank group	CRAR Avg 2007	CRAR avg 2013	NIM Avg 2007	NIM Avg 2013
1	Nationalized Banks(20)	12.29	12.19	2.60	2.40
2	SBI& Associates(6)	12.45	12.23	2.57	2.51
3	Private sector banks(22)	13.55	14.61	2.70	3.03
	Total (48)	12.76	13.01	2.62	2.65

Note: CAGR= Compound annual growth rate, Source::RBI

Capital Adequacy Ratio (CAR) measures the efficient use of capital by banks. This is the ratio of capital to risk weighted assets. On this count, we observe that for Public Sector Banks and SBI & Associates, CAR has declined during the post crisis phase over the previous period. This is due to higher asset quality issues and lower net profit, which reduced the amount of profit that is ploughed back to capital. Since private sector banks had lower asset quality issues, they had higher net profits and in turn better capital adequacy ratios. For PSBs, however, there is an urgent need to shore up their capital base since they have to meet Basel-III capital adequacy norms which kick in from April 2019. Various instruments such as Basel-III bonds have come into forces which are being deployed by PSBs to raise capital. GOI has also decided to reduce their stake in PSBs to 52% which will provide further headroom to raise capital. On the margin front, predictably, private banks showed better margins relative to public sector banks. A major reason for better margins for private sector banks post crisis is their lower asset quality and improvement in their share of low cost deposits since private banks have bulk of corporate salary accounts. Saddled with higher NPAs, public sector banks faced lower margins.

Efficiency scores from DEA

Technical efficiency scores have been estimated under the assumption of variable returns to scale. The results are presented in Table 7. SBI and associates were given the score of 1 implying that it lied on the frontier and other banks' performance was rated relative to its performance. Relative to the frontier bank, other banks' mean efficiency scores ranged between 0.521 and 0.0.543. The mean efficient score for all the three groups was 0.469. This implies that on average banks can increase their performance by 53% without increasing inputs. Except for private banks all other banks have shown an increase in the efficiency.

Table-7: Efficiency Scores

Bank	2002	2008	2013	Bank Mean
SBI and Associates	1.00	1.000	1.000	1.000
Nationalized Banks	0.550	0.538	0.562	0.552
Private Banks	0.620	0.611	0.630	0.621
All banks	0.662	0.652	0.701	0.678
Mean	0.720	0.716	0.730	

Source: Computed using DEAP software

The annual efficiency mean scores of all banks have increased over time, though there was some decline during financial crisis period. The other banks efficiency ranged from 0.552 to 0.621. For all banks, technical efficiency scores remained stable at 0.662 in 2002 to 0.678 in 2013. However, there was some decline during 2008. Thus, the pattern of efficiency scores predicted by DEA appears to be U-shaped overtime.

Decomposition of efficiency scores

The use of panel data enabled us the calculation of Malmquist Indices and the decomposition of productivity change into technical efficiency and technological change. The technical efficiency was further decomposed into pure technical efficiency and scale efficiency.

Table-8: Malmquist Index Summary of Means

Bank	Efficiency change	Technological change	Pure efficiency change	Scale efficiency change	Total factor productivity change
SBI and Associates	1.020	0.980	0.980	1.053	1.020
Nationalized Banks	1.015	0.984	0.976	1.050	1.018
Private Banks	1.020	1.020	0.980	0.950	1.020
Mean	1.017	0.994	0.978	1.017	1.019

Source: Computed using DEAP software

Table-9: Malmquist Index Summary of Annual Means

Year	Efficiency change	Technological change	Pure efficiency change	Scale efficiency change	Total factor productivity change
2002	1.030	0.981	1.030	1.102	1.126
2008	1.126	0.882	1.020	1.145	1.100
2013	0.946	1.021	0.940	1.007	1.104
Mean	1.034	0.961	0.996	1.084	1.018

Source: Computed using DEAP software

Table-8 indicates that there was minimal growth in total factor productivity for the banks averaging 2%. The mean growth in total productivity is 2%. This was mainly accumulated through improvement in efficiency as technological progress across banks was on regress of an average 0.6%. Decomposition of technical efficiency shows that pure efficiency was on regress across banks and scale efficiency was the driver of technical change.

The summary of annual means indicated that total factor productivity improved by 12.6% between 2002 and 2013 before marginally increasing by 4.6% between 2008 and 2013. Between 2002 and 2007, total factor productivity regressed by an average of 4%. Overall, total factor productivity change improved by a mean of 2% largely driven by changes in technical efficiency. However, scale efficiency was the driver of the growth in total factor productivity over the years compared to pure efficiency.

Overall, the major finding of the research is that inefficiency exists among banks in India Average mean efficiency score is 0.73. Thus, on average output can be increased by 27% without increasing inputs. The results further pointed out that banks have not gained much through growth in total factor productivity. Minimal growth in total factor productivity of 2% in reported mainly driven by efficiency gains than technological gains. Efficiency gains were driven by scale efficiency as compared to pure technical efficiency growth.

Summary and Conclusion

The objective of this paper is to evaluate the performance of the banks in India during 2002--2013, using different indicators such as deposits, advances, expenditure, revenue, profitability, and capital adequacy, NPA etc. before and after the financial crisis of 2008. An attempt is also made to assess the efficiency of the commercial banks during this period using DEA analysis. The reason for choosing 2002-2013 as study period is that during this period, banking sector witnessed both robust growth and also got impacted due to the economic slowdown due to global financial crisis of 2008. Indian banking sector underwent a sea of changes through its liberalization policy in early 1990s with implementation of a series of reforms with an objective to make the banking sector more productive and efficient by limiting the state intervention and enhancing the role of market forces. Like most developing countries, the banking sector in India is characterized by the co-existence of different ownership groups, viz, public and private, and within private, domestic and foreign. The empirical evidence supports that Indian banks are impacted in terms of their performance and efficiency during financial crisis but got recovered during the post crisis. However, based on various performance indicators we find mixed evidence on the performance of banks after the financial crisis. The details are presented below:

- Both the asset and the liability side of the balance sheet of commercial banks indicate a declining trend during the post global financial crisis period. The decline in deposit growth is the sharpest for the private sector banks compared to public sector banks indicating an improvement in the confidence in public sector banks compared to the private banks.
- There is a decline in credit growth across bank groups post global financial crisis due to the decline in deposit growth. The decline in advances growth has been sharpest for private sector banks.

- The incremental credit deposit ratio has declined across bank groups except for private sector banks. However, there has been rise in incremental CD ratio in the case of private sector banks due to higher borrowings.
- Nationalized banks and state bank group have shown a decline in credit growth. However, there was an increasing trend in growth in total expenditure during 2008-13 compared to 2002-07 while the private sector banks had a sharp decline.
- Operating profit growth in compounded terms has increased for public sector banks while it declined for private sector banks.
- The Gross Non Performing Assets of the banking industry have increased post crisis period. Net NPA also has shown a similar increase. However, the asset quality of PSBs has declined during the post crisis period, but improved for private sector banks.
- Capital Adequacy Ratio of public sector banks has declined during the post crisis period over the previous period and the private sector banks had lower asset quality issues, they had higher net profits and in turn better capital adequacy ratios.
- Relative to the frontier bank group, other banks' mean efficiency scores ranged between 0.538 and 0.0.701. The mean efficient score for all the three groups was 0.730. This implies that on average banks can increase their performance by 273% without increasing inputs. Except for private banks all other banks have shown an increase in the efficiency.
- The summary of annual means indicated that total factor productivity improved by 12.6% between 2002 and 2013 before marginally increasing by 4.6% between 2008 and 2013. Between 2002 and 2007, total factor productivity regressed by an average of 4%. Overall, total factor productivity change improved by a mean of 2% largely driven by changes in technical efficiency. However, scale efficiency was the driver of the growth in total factor productivity over the years compared to pure efficiency.
- The important finding of the research is that inefficiency exists among banks in India as average mean efficiency score is 0.763. Thus, on average output can be increased by between 27% without increasing inputs.
- The results further pointed out that banks have not gained much through growth in total factor productivity. The minimal growth in total factor productivity that is reported mainly driven by efficiency gains than technological gains. Efficiency gains were driven by scale efficiency as compared to pure technical efficiency growth.

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