

## Exploring the Policy Reforms and Productivity Nexus: Evidence from Indian Banking Sector

Sarfraz Ahmed Shaikh<sup>1\*</sup> Ouyang Hongbing<sup>1</sup> Asif Ishaq<sup>2</sup> Khalid Khan<sup>1</sup> Muhammad Abdul Kamal<sup>1</sup>

1.School of Economics, Huazhong University of Science and Technology, Wuhan. P.R. China

2.National Bank of Pakistan

\*Corresponding author email: sarfaraz@hust.edu.cn

### Abstract

The study investigates the effect of deregulation of the Indian financial system in 1991 followed by various financial sector reforms on productivity growth of Indian scheduled commercial banks, with exclusion of Regional Rural Banks, over the period of time, from 2002 to 2010. The results of our study show that the performance of the Indian banking industry remained satisfactory for the said period despite of the financial turmoil that literally hampered the financial institutions all over the world. This was because Indian financial system remained sheltered from such external shocks as a result of having flexible exchange rate regime, the foreign reserves were high, the capital account is not yet fully convertible, and banks and their customers have limited foreign exchange exposure. Therefore, we recommend that the policy makers should carry on with their current economic policy as it has been successful in sheltering them from external shocks. Furthermore, the study found that the deposits and credits are negatively related with financial system reforms of deregulation, which is surprising. As increase in deposits results in increase in credits. So, we would recommend the policy makers to emphasize on increasing the deposit base of the banks by increasing the interest rates on deposits.

**Keywords:** Financial Sector Reforms, Indian Banking industry, Productivity, Financial turmoil, Deregulation

### 1. Introduction

The banking sector dominates the financial service industry of India, contributing significantly to the level of economic activity. The banking structure in India can broadly be classified into public sector banks, private sector banks and foreign banks. The public sector banks continue to dominate the banking industry, in terms of lending and borrowing, and it has widely spread out branches which help greatly in pooling up of resources as well as in revenue generation for credit creation. The role of banks in accelerating economic development of the country has been increasingly recognized since the nationalization of fourteen major commercial banks in 1969 and six more in 1980. This facilitated the rapid expansion of banking in terms of its geographical reach covering rural India, in turn leading to significant growth in deposits and advances. Eventually, however, the government used banking sector to finance its own deficit by frequently increasing cash reserve ratios (CRR) and statutory liquidity ratio (SLR). This, in turn, affected the resource position of commercial banks adversely, restricting their lending and thereby the ability to generate profits. Besides, inefficiency and lack of competition caused the non-performing loans in public sector banks to rise from 14 % in 1969 to 35 % in 1990. This problem had to be tackled during the nineties by undertaking an array of financial reforms.

Deregulation of the Indian financial system in 1991 followed by various financial sector reforms during the period 1990 through 2000s led to a major restructuring of the Indian banking industry. This includes reductions in the CRR and SLR which were as high as 15% and 38.5% respectively in 1991, and preempted 53.5 % of incremental deposits. The rates were reduced gradually following a series of steps. By 2005, the SLR got dropped to 25 % and CRR to 4.5% of total deposits. The reforms were however, more comprehensive and led to sharp changes in various parameters of banking system. Further, on February 15, 2005, 'Ownership and Governance' and the implementation of Capital Adequacy Framework was formulated and issued to banks. As a result, the restrictions on geographical expansion and ceiling on interest rates were removed. With increased competition, declining margins on current business operations, higher costs and greater risks, banking industry in general, had to face a two pronged challenge. They had on the one hand, to enhance their productivity and on the other, increase their ability to serve the nation in new ways with greater efficiency and effectiveness.

In such a scenario, banking industry had to sustain itself by increased reliance on cost minimization and by ensuring greater efficiency. In general, Indian scheduled commercial banks and the nationalized banks in particular, have had to spearhead the growth in banking business as they account for an overwhelming share of Rs 3,127,122 CRs' as total deposits and Rs 2,311,478 CRs' as advances as on March, 2011. These reforms were broadly aimed to improve the performance of banks despite the unexpected global recession and internal disturbances.

This raises some questions: Whether the performance has improved? In what way and how much? In this regard, continuous year to year assessment of the performance of banks is crucial because the banking industry has undergone innovations and shocks throughout the 90s and onwards due to changing regulations, or unexpected shocks such as economic sanctions due to nuclear detonation, the 1997 Asian Bank crisis or the

financial meltdown of 2007. Therefore, there are strong reasons to expect that efficiency and productivity measures of banks will fluctuate over period of time. Hence, it is essential to examine the performance of the banking industry in India over a period, so that we could evaluate not only the impact of these regulatory changes but also the effects of such shock including substantial improvement in banking technology in more recent years.

Thus, the core objective of this study is to analyze productivity growth in Indian scheduled commercial banks, with exclusion of Regional Rural Banks, over the period of time, from 2002 to 2010 due to the economic reforms that took place in the country during this period. The rest of the study is organized as follows. Section 2 offer Indian banking sector reforms, section 3 is devoted to literature review, section 4 covers the methodology and data, section 5 provides results and discussion of the findings and finally section 6 concludes the study and offer policy recommendations.

## **2. Banking Sector Reforms - INDIA**

At the time of independence in 1949, India inherited a well-developed “western banking system” and until 1979. Fourteen largest commercial banks got nationalized in 1969, in order to ensure that funds were allocated in accordance with the economic plan, and to open / create branches in rural and semi-urban areas, where there is no direct access to services offered by banks. In 1975, Regional rural banks (RRB) got established for increasing the amount of agricultural credit, by 1980, another six commercial banks got nationalized. Specialized “Development financial institutions” (DFIs) were created, such as the “National Bank for Agricultural and Rural Development” (1982) for coordinating and supervising the rural credit cooperatives.

### **2.1. The Early 90’s Reforms**

The reforms that got started in early 90’s for the banking industry have continued till now. The reforms that got started were basically a follow up measures of the financial sector reforms and economic liberalization in the country. Being the life blood for the economy, banking sector was treated and given greater importance during the reforms which were basically aimed for making Indian banking industry more productive and competitive, efficient and versatile, in order for the international accounting standards to be followed and for setting it free from being controlled by the government.

In 1991 India suffered severe balance of payments problems because of the effects of the first Gulf War in 1990-91 with soaring oil prices and a large, rapidly growing fiscal deficit. In 1992, as the reforms for the real sector begins, it was felt that there is a need for restructuring the Indian banking industry. A paradigm shift was brought about in the banking industry due to the initiation of the financial sector reforms. RBI, in 1991 proposed for forming a committee chaired by the former Governor of RBI, M. Narasimham, for reviewing Financial System from the point of view of functioning, organizations and Structure of the financial system. The weakness of the Indian banking system were highlighted in Narasimham Committee report and suggestions were put forward for taking reform measures based on the Basel norms. The issued guidelines subsequently laid down the bases for the banking system reformation for India. Following are some of the outcomes of the proposed report:

#### **2.1.1. Reduced CRR and SLR**

The Cash Reserve Ratio (CRR) and Statutory Liquidity Ratio (SLR) were gradually reduced during the economic reforms period in India. By Law in India, the CRR remains between 3-15% of the Net Demand and Time Liabilities. It is reduced from the earlier high level of 15% plus incremental CRR of 10% to current 4% level. Similarly, the SLR is also reduced from early 38.5% to 25% level. This has left more loanable funds with commercial banks, solving the liquidity problem.

#### **2.1.2. Deregulation of Interest Rate**

The most important and far reaching impact of banking liberalization in India has been the deregulation of the interest rate. The Indian banks are now adopting a completely market driven interest rate structure which was in earlier a govt. driven interest rate structure. The interest rate deregulation has resulted in the integration of the lending rates across spectrum. The prime lending rate of each bank is now synchronized with the bank rate. The bank rate was revived by the RBI to serve as the reference rate for the banking sector. In India, interest rate deregulation has contributed to a downward movement of the domestic interest rates and a narrowing of the domestic-foreign rates differential (Kohli, 2008).

The main aim of the interest rate reforms was to simplify the complex and the tiered interest rate structure that India had during pre-1990. Different interest rates, based upon size, purpose, maturity of loan, group, sector, region, etc., were rationalized to converge at a single lending rate called as prime lending rate. The aim was to provide more options and flexibility to banks for their asset liability management operations and shift towards indirect monetary control.

#### **2.1.3. Fixing Prudential Norms**

Since the beginning of the financial sector reforms, an important task of the policy makers was to bring in an appropriate regulatory framework. The design of an appropriate regulatory framework which encourages

competition and efficiency in banking services and at the same time ensures a safe and sound banking sector may be very difficult and complex component of the banking sector liberalization process. The Narasimham Committee provided guidance on the actual design of the regulatory mechanism. These “Prudential Regulation” consists of broadly of capital adequacy norms, restrictions on the lines of activities that banks can participate in, restrictions on entry and deposit insurance (Sen and Vaidya, 1997). It helped banks in reducing and restructuring non-performing assets (NPAs). The prudential regulatory framework for banks was designed to address issues relating to market structure, Capital adequacy norms , Accounting and provision for NPAs , Supervision of banks and Privatization of banks.

#### **2.1.4. Market Structure**

Following the recommendation of the Narasimham committee, RBI had issued a policy guideline in January, 1993 regarding the entry of private sector banks in to the industry in large scale. The first new private sector banks entering the market was UTI bank in 2nd April 1994, In this way, there are 10 new private sector banks had entered the banking industry till 1995.

Even during the reform period the public sector banks are still having the largest banking network in India comprising around 90 percent of the total branches in 2005. In 1994 the share of public sector banks in total branch network was 93.5 percent and that of private sector banks was a meager 6.5 percent. Thus the market structure of the Indian banking sector has not change much during the reform era. Though many new private sector banks have come up during the liberalization period but they are very slow and apprehensive.

#### **2.1.5. Banking Diversification**

Banks were allowed by the Reserve Bank of India for engaging in diverse activities like transactions related to securities which involves dealing, underwriting, brokerage etc., leasing activities, transactions related to foreign exchange . As the CRR and SLR requirements were lowered during the 1991 reform period, it enabled banks in order to diversify their activities, thereby enabling the banks to stabilize their income, reducing the costs of funds and there on underwriting and lending costs by engaging in activities where returns are not perfectly correlated.

#### **2.1.6. Introduction of CRAR**

Capital to Risk Weighted Asset Ratio (CRAR) was introduced in 1992. The Capital to Risk Asset Ratio (CRAR) suggested by BIS in 1992 was 8 percent, i.e. Tier I & Tier II capital should be equal to minimum of 8 percent of the total assets of the bank. The Narasimham committee 1991 recommended that all banks must reach the figure in a phased manner latest by March 1996. In 1995, 13 of the 27 public sector banks had attained the 8 percent capital to risk assets ratio, 11 had reached 4 percent and remaining less than 4 percent. This move to achieve capital adequacy norms has been greatly boosted by the infusion of fresh capital in several public sector banks by the govt. in its 1993-94 and 1994-95 budgets by the amount of Rs.57000 million and Rs.56000 million respectively.

#### **2.1.7. Competition**

Through competition, Enhancing efficiency and productivity has been one of the major objectives of banking sector reforms. In 1993, guidelines were issued by RBI related to establishing new banks in the private sector. Moreover, the foreign banks were also given more liberty for entry. Foreign banks were also permitted, depending on their size, strategies and objectives, to choose to operate either as branches of their overseas parent, or, corporatize as domestic companies. This was expected to impart greater flexibility in their operations and provide them with a level-playing field with their domestic counterparts.

#### **2.1.8. Operational Autonomy**

During the reform period, commercial banks enjoyed the operational freedom. If a bank satisfies the CAR then it gets freedom in opening new branches, upgrading the extension counters, closing down existing branches and they get liberal lending norms.

### **2.2. Highlights of the Late 90's Reforms**

Keeping in view the need of further liberalization, the Narasimham Committee II on Banking Sector reform was set up in 1997. This committee's terms of reference included review of progress in reforms in the banking sector over the past six years, charting of a program of banking sector reforms required to make the Indian banking system more robust and internationally competitive and framing of recommendations in regard to make the Indian banking system more robust and internationally competitive.

#### **2.2.1. Direct Credit**

An important aspect of India's financial sector reforms has been the direct credit policies. Under the directed credit policy commercial banks are required to provide 40% of their commercial loans to the priority sectors which include agriculture, small-scale industry, small transport operators, artisans, etc. The Narasimham committee recommended and gave following suggested that reduction of the directed credit to 10% from 40% , narrowing down the definition of priority sector to focus on small farmers and low income target groups.

The policy of 40% of loans to the priority sectors has not been abolished by the govt. However, the definition of the priority sector activities has been broadened with the new inclusion and reclassifications. The

Committee on Banking Reforms also suggested that the inclusion of activities related to food processing, dairying and poultry in the priority sector list as this will increase the list of activities under the priority sector credit and also improve the quality of the portfolio.

### **2.2.2. Regulation and Supervision**

The basic aim of the prudential measures, as discussed earlier, was strengthening the banking system and at the same time ensuring safety & soundness via greater accountability, public credibility as well as transparency. During the second half of the nineties, prudential regulations played a significant impact on the banking system, ensuring stability of the system even in the face of external as well as internal uncertainties. Also, for supervision, the supervisory strategy of the “Board for Financial Supervision” being the part of reform was based on a comprehensive approach focusing on restructuring system of inspection, enhancing external auditors role, establishing off-site surveillance and to strength the corporate governance, procedures of audit as well as internal controls.

## **2.3. 20<sup>th</sup> Century Reforms**

### **2.3.1. New Entry Policy**

The government announced in February 2010 regarding the issuance of the new banking licenses. RBI suggested favoring the entry of small banks. By keeping absolute capital requirements low and limiting bank size through insisting on a high capital adequacy ratio, the new policy intended to facilitate the entry of small banks that could perhaps serve lower-income clients more cheaply. It would certainly facilitate the conversion of the major microfinance companies into banks. This in turn would greatly facilitate their ability to offer savings and credit products to their customers. The objective of new entry is to spur competition. This could also be achieved by allowing those foreign owned banks that are well established in the country to expand freely in those areas that are the most profitable to them; new investment from overseas banks should also be allowed freely.

### **2.3.2. Mobile Phone Banking**

The early reforms have greatly increased financial inclusion and further improvements are coming from new technology. Mobile phones can be used to make money transfers and other financial transactions without the need for a physical presence at a bank branch or even without having to own a bank account at all (via the use of so-called mobile wallets). The bank provides a new interface for an existing customer to make transactions. The bank controls the technology and the client uses the mobile phone as an alternative means of access to the account and can make a limited range of transactions through the phone. However, cash can only be obtained from bank accounts and transfers can only be made to existing customers of the banking system. This is the route chosen by the RBI for India.

### **2.3.3. Further Steps towards Improving Banking Activities**

For strengthening and putting the consultative process on continuing basis in the regulatory domain, Standing Technical Advisory Committee on Financial Regulation has been formed by RBI. Experts from various fields including banks, academic institutes, NBFIs, financial markets and credit rating agencies form part of this committee which examines and advises RBI on desirable regulatory framework relating to the issues referred to it, which relates to banks, NFIs and other participants in the market.

Summarizing, we can say that India’s economic miracle resulting in its impressive growth rates, is probably the outcome of its reforms that transformed economy’s key sectors into more market based. It has been observed that the banking sector in India has provided a mixed response to the reforms initiated by the RBI and the Govt. of India since the 1991. The sector has responded very positively in the field of enhancing the role of market forces, regarding measures of prudential regulations of accounting, income recognition, provisioning and exposure, reduction of NPAs and regarding the up gradation of technology.

## **3. Review Of the Literature**

Norwegian banks were examined by (Berg et al., 1992) for the period 1980 to 1989. He Found that productivity regress before the deregulation and strong productivity gains as the banks catch-up after deregulation. (Wheelock and Wilson, 1999) used Malmquist decomposition for examining the productivity of USA banks for the period 1984 to 1993. They report a general drop in average productivity caused by failure to catch-up with outward shifts of the production frontier. (Alam, 2001) found that the deregulation period resulted in a productivity surge in the first half of the 1980s followed by a productivity regress in the second half for large US banks. (Mukherjee et al., 2001) confirmed these results, using panel estimation for explaining productivity growth in terms of capitalization, bank size and product-mix.

(Casu et al., 2004) carried out a pan-European study. He compared parametric with the Malmquist method and found that technological change rather than efficiency improvement was responsible for bring about productivity growth in European banking. (Worthington, 1999) finds that Australian Credit Unions exhibited strong technological progress after deregulation and (Neal, 2004) found that productivity improvements were mostly shifts in the frontier with the majority of banks having negative catch-up over 1995-99.



In terms of productivity for Chinese banks, (Chen, 2002, Zhang and Wu, 2005) and (Tan and Wang, 2006) used the Malmquist method to examine the productivity trend of Chinese banks over the 1994-1999, 1999-2003 and 1997-2003 periods respectively. Their basic findings were that the large state-owned banks exhibited lower average growth compared with the joint stock banks. In general average productivity growth was dominated by catch-up rather technical innovation but that there had been in a marked improvement in Total Factor Productivity (TFP) in the latter years.

In contrast (Ni and Wan, 2006) found strong productivity improvement led by technical improvement rather than catch-up, whereas (Sun and Fang, 2007) pose the question, whether foreign banks have stimulated an improvement in Chinese bank productive efficiency? (Sun and Fang, 2007) find that average TFP improved during the period 2001-2004 consistent with the hypothesis that the threat of entry has had significant efficiency effects on incumbent banks.

(Noulas, 1997), using Malmquist productivity index, studies the productivity growth of the Hellenic banking industry in 1991 and 1992. According to the results which shows that although productivity has increased for the banks, but the sources of this growth are different with “technological progress” being the main reason for the productivity growth of state-owned banks whereas increase in efficiency being the reason behind the productivity growth for private banks.

(Avkiran, 2000) looked into Australian banking industry using Malmquist type index in a deregulated period 1986-95. His findings show an overall increase in productivity mainly due to technical progress rather than technical efficiency. (Devaney and Weber, 2000) estimate the Malmquist productivity index for the US rural banking sector over the period 1990-93. Their results suggest that rural bank’s productivity growth for the three-year period is 11%, attributed to technological change rather than pure technical change or scale change.

The empirical evidence, when we look into the studies relating to Indian banking system, on the outcomes of deregulation has been very much scattered or sparse, to date. The table given below highlights some of the studies undertaken on the efficiency and productivity of the banking system in India, followed by a table highlighting further studies carried out on banks productivity in different countries.

Table 1 – Summary of Studies on Efficiency and Productivity of the Indian Commercial Banking

Study	Period	Input	Output	Result
(Saha and Ravisankar, 2000)- <b>DEA</b>	1992 - 1995	Interest expenditure, Establishment expenditure, non-establishment expenditure, and fixed assets	Deposits, advances, investments, non-interest income, spread and total income	Public banks improved their efficiency over the sample period.
(Kumbhakar and Sarkar, 2003) - <b>Translog Shadow cost function</b>	1985 - 1992	Labor and physical capital as inputs with the sum of reserve and equity as the quasi-fixed input	Deposits, loans and investments and branches	Deregulation did not materially enhance TFP of banks, especially for public banks.
(Ataullah et al., 2004) - <b>DEA</b>	1988 - 1998	Operating expenses and interest expenses	(Loan-based model): total loans and advances, and investments. (income-based model): interest and non-interest income	The overall technical efficiency increased gradually over time especially after 1995. Low scale efficiency is the main source of the overall technical inefficiency. Private banks and foreign banks were more impressive in increasing their efficiency. Banks were more efficient in generating earning assets than generating income due to the presence of non-performing loans.
(Mohan and Ray, 2004) - <b>DEA-type Malmquist TFP index</b>	1992 - 2000	Interest cost and operating Cost	Loan income, investment income and non-interest income	No significant difference in terms of TFP growth for public, private and foreign banks
(Galagedera and Edirisuriya, 2005)- <b>DEA-type Malmquist TFP index</b>	1995 - 2002	Total deposits and operating expenses	Total loans and other earning assets	No significant growth in TFP for the overall industry. Public banks were different from private banks in terms of TFP growth and sources of TFP growth.

Table 2- Summary of Other Studies Carried out on Banks Productivity

Study	Country	Period	Input	Output	Result
(Berg et al., 1992)	Norway	1980 – 1989	Labour Hours, Operational expenses deflated by material price index	Short and long term loans, deposits and loan losses treated as negative output	Low TFP growth but strong catch-up following deregulation. Big banks had stronger productivity growth than smaller banks.
(Wheelock and Wilson, 1999)	USA	1984-1993	Labour, physical capital, purchased funds	Four categories of loans, demand deposits	Decline average productivity over the period. The benchmark banks improved technical productivity through technical innovation but average efficiency declined.
(Alam, 2001)	USA	1980-1989	Two categories of deposits, other purchased funds, capital, labour, equity.	Securities, three categories of loans.	Lag in effect between regulatory reform and growth in productivity. Improvements in productivity obtained from technical innovation rather than efficiency gains.
(Drake, 2001)	UK	1984-1995	Physical capital, labour, (deposits)	Loans, Other investments, Noninterest income, (deposits)	Uses both intermediation and Production methods. Productivity growth driven by technical progress. Slower TFP under the intermediation approach.
(Chen, 2002)	China	1994-1999	Physical assets, operating expenses	Deposits, loans, profit	Technological regress but strong catch-up drives TFP. JSB exhibited higher TFP variation
(Canhoto and Dermine, 2003)	Portugal	1990-1995	Labour, physical capital	Loans, deposits, securities, interbank assets/liabilities	Strong technological progress following deregulation. Catch-up weakened as benchmark banks grew strongly.
(Isik and Hassan, 2003)	Turkey	1981-1990	Labour, physical capital, deposits	Short-term loans, long-term loans, other earning assets, non-interest income	Productivity loss 1982-86. Productivity growth 1987-90. Strong catch-up in 1987-90 following deregulation but low technical progress.
(Casu et al., 2004)	Europe	1994-2000	Wage bill/Assets, deposits, physical capital	Loans, other earning assets, non-interest income.	Productivity growth supported by technological progress rather than efficiency gains, except in the UK where catch-up was stronger.
(Zhang and Wu, 2005)	China	1999-2003	Labour, non-deposit funds	Deposits, Profits	TFP driven by efficiency catch-up. SOCBs driven by technical progress
(Tan and Wang, 2006)	China	1997-2003	Labour, physical assets, deposits	Profit, gross income	TFP growth negative until final year, driven by technological regress. Efficiency improvements
(Sun and Fang, 2007)	China	1996-2004	Interest expenses, other expenses, operating expenses, total assets	Interest earnings, other earnings, profit before tax	From 1996 till 2001, TFP was less than 1. Foreign banks entry has no significant impact on Chinese banking efficiency improvement. 2001-04, TFP, TE is positive greater than 1. As China joined WTO, foreign entry has limited impact on Chinese banking.
(Yan, 2008)	China	1995-2004	Op. expenses, deposits, number of staff	Loans, profits	Banking market concentration is declining, which caused bank efficiency improvement. Competition level is positively correlated with efficiency

Overall, there are number of drawbacks from which the studies on productivity and efficiency on Indian banks have suffered. These include: considerably short time span for the observed period, use of a limited sample size for undertaking the study, and the static nature of the analytical method employed.

Therefore, in our study, we attempt to contribute as well as improve the existing literature. The sample period has been extended so that it covers the period of post-regulatory reforms, ranging from 2001 till 2010 and then we look into the determining that weather there has been any improvement in the productivity of Indian banking industry due to these policy reforms.

#### 4. Methodology & Data

##### 4.1. Methodology

In our analysis of productivity for Indian banking industry, we will be using Transcendental Logarithmic (Trans Log) Production Function. The word translog basically stands for “transcendental logarithmic” which is a generalization of the Cobb–Douglas production function. The attraction of this function is its flexibility. It can

approximate virtually any functional form (Intriligator 1978). The translog is estimated by including squares and cross-products of the explanatory variables. Thus the production function is:

$$Q = f(L, K)$$

Where,

- Q = Output
- L = Labor
- K = Capital

Would be estimated as:

$$\ln Q_t = \delta + \pi_1 (\ln L_t) + \pi_2 (\ln K_t) + \pi_3 (\ln L_t)^2 + \pi_4 (\ln K_t)^2 + \pi_5 (\ln L_t \ln K_t)$$

Where,  $\delta$  and  $\pi$  are the associated output elasticities. The function reduces to Cobb-Douglas in case the parameters  $\pi_3, \pi_4$  and  $\pi_5$  being not significantly different from zero.

The translog production functions occurred in the context of researches related to the discovery and definition of new flexible forms of production functions and to the approximation of CES production function. The first form of a translog production may be considered the proposal made in 1967 by J. Kmenta for the approximation of the CES production function with a second order Taylor series, when the elasticity of substitution is very close to the unitary value, which is the case of Cobb-Douglas production function. The form of above mentioned production function is:

$$\ln Y = \ln A_3 + \alpha_3 \ln K + \beta_3 \ln L + \gamma_3 \ln^2 (K / L)$$

Where,

- Y = Output
- L = Labour
- K = Capital

$A_3, \beta_3, \gamma_3$  are the parameters to be estimated

In 1971, Grilichs and Ringstad proposed new forms of production function. One of those form of production function was defined in conditions of relaxing the constraints imposed to the parameters in the Kmenta function, in order to test the homotheticity assumptions, and was written as:

$$\ln Y = \ln A_{kl} + \alpha_k \ln K + \alpha_L \ln L + \beta_k \ln^2 K + \beta_L \ln^2 L + \beta_{kL} \ln K \ln L$$

It is worth mentioning that the term “translog production function” was proposed by Christiansen, Jorgensen and Lau in 1971 and 1973, in two papers which focused on the problems of homogeneity & separability of Cobb-Douglas and CES production functions and their implications for the production frontier. The generalized form of translog production function, which takes into account a number of n inputs (production factors), can be expressed as:

$$\ln Y = \ln A + \sum_{i=1}^n \alpha_i \ln X_i + \frac{1}{2} \sum_{i=1}^n \sum_{j=1}^n \beta_{ij} \ln X_i \ln X_j$$

When we talk about constant return to scale in case of translog production function, it is different from that of Cobb-Douglas where it represents a linear relation. Suppose we have a single input translog function as follows:

$$\ln Y = \beta_0 + \sum_j \beta_j \ln x_{jit} + \sum_j \beta_{jj} (\ln x_{jit})^2 + \sum_j \sum_{k \neq j} \beta_{jk} (\ln x_{jit})(\ln x_{kit})$$

Then, constant return to scale is given by:

$$\eta_{jt} = \beta_j + 2 \beta_{jj} (\ln x_{jt}) + \sum_{k \neq j} \beta_{jk} (\ln x_{kt})$$

The constant return to scale imposes a number of linear restrictions on the parameters of (A) which are:

$$\begin{aligned} \sum \beta_j &= 1 \\ 2\beta_{DD} + \beta_{DF} + \beta_{DE} &= 0 \\ 2\beta_{FF} + \beta_{FD} + \beta_{FE} &= 0 \\ 2\beta_{EE} + \beta_{ED} + \beta_{EF} &= 0 \end{aligned}$$

The translog production functions represent in fact a class of flexible functional forms for the production functions. One of the main advantages of the respective production function is that, unlike in case of Cobb-

Douglas production function, it does not assume rigid premises such as: perfect or “smooth” substitution between production factors or perfect competition on the production factors market.

If we look at the drawbacks of the translog function, we see that there are likely to be a large number of parameters to be estimated for every additional variable added to the model, as it is necessary to include a squared term and cross-products with the existing variables. If  $\lambda$  represents the sum of variables, the number of parameters amounts to approximately  $\lambda(\lambda + 1)/2$ , with a consequent reduction in the degrees of freedom available.

In this study, we are working with three input / independent variables, so our translog production function, in the light of the above theory, will be as follow:

$$\ln Q = \ln \beta_0 + \beta_1 \ln E + \beta_2 \ln FA + \beta_3 \ln D + \beta_{11} (\ln E)^2 + \beta_{22} (\ln FA)^2 + \beta_{33} (\ln D)^2 + \beta_{12} (\ln E)(\ln FA) + \beta_{23} (\ln FA)(\ln D) + \beta_{13} (\ln E)(\ln D)$$

Where

Q	=	Loans & Advances	(Output)
D	=	Deposits	} (Inputs)
E	=	Staff / Employees	
FA	=	Fixed Assets	

For constant return to scale, we need to calculate the following:

$$\begin{aligned} \eta_1 &= \beta_1 + 2\beta_{11} \ln E + \beta_{12} \ln FA + \beta_{13} \ln D \\ \eta_2 &= \beta_2 + 2\beta_{22} \ln FA + \beta_{21} \ln E + \beta_{23} \ln D \\ \eta_3 &= \beta_3 + 2\beta_{33} \ln D + \beta_{31} \ln E + \beta_{32} \ln FA \end{aligned}$$

when constant return to scale, we have  $\eta_1 + \eta_2 + \eta_3 = 1$  and the same linear restrictions apply, which are as follows:

$$\begin{aligned} \beta_E + \beta_{FA} + \beta_D &= 1 \\ 2\beta_{DD} + \beta_{DF} + \beta_{DE} &= 0 \\ 2\beta_{FF} + \beta_{FD} + \beta_{FE} &= 0 \\ 2\beta_{EE} + \beta_{ED} + \beta_{EF} &= 0 \end{aligned}$$

We estimate the above said equation, running several regression for different panel methods starting with “ordinary” and then using “White cross section”, “White Diagonal” and “Cross Section Weights” methods for different combinations of cross sections and periods (Fixed, Random and None). In our case, the cross sections are the banks and period is the number of years.

Furthermore, we check each estimated equation for constant return to scale using Wald test. (i.e. to determine if the Sum of the of  $\eta_1$ ,  $\eta_2$  and  $\eta_3$  is equal to 1). From the estimated equations which passes the CRTS test, we use the values of the coefficients for the best equation (selected on the basis of AIC and R2 value in case of multiple equations passing the CRTS test) to run the following regression for finding the value of  $\ln \beta_0$ :

$$\ln \beta_0 = \ln Q - \beta_1 \ln E - \beta_2 \ln FA - \beta_3 \ln D - \beta_{11} (\ln E)^2 - \beta_{22} (\ln FA)^2 - \beta_{33} (\ln D)^2 - \beta_{12} (\ln E)(\ln FA) - \beta_{23} (\ln FA)(\ln D) - \beta_{13} (\ln E)(\ln D)$$

From here, we will get value of  $\ln \beta_0$  for our 180 observations (20 banks \* 9 years = 180  $\ln \beta$ ) for every years from 2002 to 2010 for 20 banks. After that we calculated the Total Factor Productivity ( $\beta$ ) by taking the anti log of the calculated values of  $\ln \beta_0$  in order to determine whether the productivity of the banks have actually increased or decreased for the said period. For translog the above said procedure is carried out on the “Bank-Wise” panel data set for 20 commercial banks of India. The same procedure will be performed for the time series “aggregate data” collected from 2002 to 2010, for all the Indian Scheduled commercial banks and the performance of the 20 selected banks will be compared with the overall performance of the banking industry to determine which bank is performing well and which is not. On the basis of this, we can categorized our chosen 20 commercial banks into “Good”, “Bad” and “No Change” categories.

#### 4.2. Data

The Reserve bank of India’s database has been used for extracting the data for the following twenty banks on India over the period of ten years, as well as for the aggregate of all schedule commercial banks in India. These banks have been selected randomly and include banks belonging to old private sector, new private sector, public



sector, State bank and its associates and foreign banks. Regional and rural banks are not considered for this analysis. The data set includes bank-wise data on demand deposits, bank wise fixed assets, bank wise loans & advances, bank wise number of employees, bank wise nonperforming assets, aggregate of demand deposits for all schedule commercial banks, loans & advances, fixed assets and number of employees and non-performing assets for all schedule commercial banks of India.

Other data includes yearly weighted average interest rate on loans, interest rate on deposits, interest rate for 364 days treasury bills, Consumer Price Index (CPI), Wholesale Price Index (WPI), Gross Domestic Product (GDP), GDP deflator and personal disposable income and total labor force. These data have been collected for past ten year's period.

Table 3 – The sample of twenty Banks

<b>State bank of India &amp; its Associates</b>	<b>Public Sector Banks (Nationalized)</b>
1. State Bank of India	5. Allahabad Bank
2. State Bank of Hyderabad	6. Bank of Baroda
3. State Bank of Mysore	7. Bank of India
4. State Bank of Patiala	8. Union Bank of India
	9. United Bank of India
<b>Private Sector Banks ( Old &amp; New )</b>	<b>Foreign Banks</b>
10. Axis Bank ( Former UTI Bank)	16. Abu Dhabi Commercial Bank
11. ICICI Bank	17. Bank of America
12. Karnataka Bank	18. BNP Paribas
13. Federal Bank	19. Citi Bank
14. Jammu & Kashmir Bank	20. Deutsche Bank
15. South Indian Bank	

All the values in the data sets have been converted into one common measuring unit i.e. "Millions" from their respective units. Now, In order to perform regression on the collected data set, we first need to convert them in real terms. For that purpose, we need to divide them by CPI and WPI for the respective years.

Loan & Advances and Fixed Assets are divided by the WPI for that year to arrive at the real value terms for these two variables, whereas demand deposits and non-performing loans are divided by their respective CPI value for that year in order to arrive at their real values. Same exercise has been carried out on data for both individual banks and aggregate for all schedule commercial banks. Similarly Gross Domestic product has also been converted into its real value terms by dividing it by GDP deflator. In order to arrive at the yearly average wage rate, we used the data for personal disposable income and divide it by the total labor force to arrive at this value.

## 5. Results & Discussion

After estimating our basic regression equation using different methods for panel data option and with different Cross section and period effects (None, Fixed and Random), we select only those results which satisfies the Wald test results for Constant Result to Scale (10% significance level) in order to calculate the value for  $\ln_B$  and thereon the value for Total Factor Productivity ( $\beta$ ). We basically tested the restrictions that CRTS imposed in case of Trans-log function to prove our wald test. If all 4 restrictions are satisfied, it means that we have CRTS.

Table 4 – Estimation Output (R2, AIC and Wald Test P-value)

<b><u>PANEL OPTION - ORDINARY</u></b>				
<b>ESTIMATION OUTPUT</b>				
<b>OBS #</b>	<b>EFFECT SPECIFICATIONS</b>		<b>R<sup>2</sup></b>	<b>AIC</b>
	<b>CROSS SECTION</b>	<b>PERIOD</b>		
<b>1</b>	Fixed	None	<b>0.983494</b>	<b>0.036629</b>
<b><u>PANEL OPTION – WHITE CROSS SECTION</u></b>				
<b>2</b>	Fixed	None	0.983494	0.036629
<b>3</b>	<b>Fixed</b>	<b>Fixed</b>	<b>0.992325</b>	<b>-0.640127</b>
<b><u>PANEL OPTION – WHITE (DIAGONAL)</u></b>				
<b>4</b>	Fixed	None	0.983494	0.036629
<b>5</b>	<b>Fixed</b>	<b>Fixed</b>	<b>0.992325</b>	<b>-0.640157</b>
<b>6</b>	Random	None	0.864797	-
<b>7</b>	Random	Fixed	0.915740	-
<b><u>PANEL OPTION – CROSS SECTION WEIGHTS</u></b>				
<b>8</b>	Fixed	None	0.983494	0.036629
<b>9</b>	<b>Fixed</b>	<b>Fixed</b>	<b>0.992325</b>	<b>-0.640157</b>
<b>10</b>	Random	Fixed	0.915740	-

At 10% significance, for Wald test, if the P-Value is less than 10% then we reject the null in favor of alternative hypothesis. The null in our case, for Wald test is that the sum of the coefficients of the input variables shows Constant Return to Scale (  $H_0 : \alpha_1 + \alpha_2 + \alpha_3 = 1$  ).

From the table 4, we need to select only one observation for calculating the value of LN\_B using the value of the coefficients of input variables from that one selected observation to be used in equation above.

Selecting on the basis of R2 and AIC (Higher the value R2, the better and lower the value of AIC, the better), we are left with observation number 3, 5 and 9. Since all four observations have got the same values for R2 and AIC, we will look into how significance the input variables are for these observations and select the one which shows the high level of significance (from the estimation results). The table 5 summarizes that p-values obtained from the initial estimations. The lower the P-value, the more significant the variable is.

Table 5 – P-Values of the variables from estimation results

OBS #	EFFECT SPECIFICATIONS		PANEL METHOD	INPUT VARIABLES	( P-VALUE )
	CROSS SECTION	PERIOD			
3	Fixed	Fixed	White Cross-Section	Deposits Fixed Assets Employees	0.4640 0.0190 0.0117
5	Fixed	Fixed	White (Diagonal)	Deposits Fixed Assets Employees	0.4054 0.0243 0.0399
9	Fixed	Fixed	Cross – Section Weight	Deposits Fixed Assets Employees	<b>0.3294</b> <b>0.0199</b> <b>0.0308</b>

Looking at the table 5, we see that observation 9 best match our purpose with p-value of 0.0199 for fixed, 0.0308 for employees (both significant) and 0.3294 (the lowest in all three observations) for deposits. So from the table above, we find that observation 9 has got the lowest set of P-values for the three variables (obtained from the estimation output) making it more significant as compared to the rest of the three observation. (Although p-values for fixed assets and employees for observation 3 are more significant compared to 9 but the p-value of deposits for observation 9 is less compared to observation 3, so since both were significant , we went with the one with lower p-Value for Deposits).

On the basis of this , we select observation 9 , having Fixed cross section and fixed period effect using “ Cross-Section Weight” in order to calculate the value for  $\ln \beta$  and after that the Total Factor Productivity ( $\beta$ ) by taking antilog of  $\ln \beta$  . The estimates of the slope coefficients as well as their signs from the “Fixed-Fixed” estimation using Cross-Section Weight panel method are presented in table 6.

Table 6 - Panel Regression ( Translog )

Dependent Variable: Credits				
Variables	Coefficient	t-Statistic	Probability	
LN_EMP	1.138269	2.181074	0.0308	
LN_FA	0.972910	2.353784	0.0199	
LN_DP	-0.415213	-0.978641	0.3294	
LN_EMP*LN_EMP	-0.037517	-0.737621	0.4620	
LN_DP *LN_DP	-0.016676	-0.357508	0.7212	
LN_FA * LN_FA	-0.035999	-1.320066	0.1889	
LN_EMP*LN_FA	-0.144694	-2.687789	0.0080	
LN_EMP * LN_DP	0.029169	0.390416	0.6968	
LN_DP * LN_FA	0.152193	2.397723	0.0178	
R-squared	0.992325			
Akaike Info Crit.	-0.640157			
F-Statistic	513.5517			
Durbin-Watson	1.175106			

Once again, the results of the probabilities in Table 6 indicates that only one of the coefficient is statistically insignificant (out of three input variables: Deposits, Fixed Assets and Employees) i.e of deposits (LN\_DP) at 5% or 10% significance level whereas the coefficients of Employees (LN\_EMP) and Fixed assets (LN\_FA) are significant with a probability of 0.0199 and 0.0308. As a result, it says that the deposits affect negatively the credits and employees & fixed assets affects positively the credits.

Once again, by observing the signs of the coefficients of the explanatory factors, it is worth to mention that overall they present the expected signs with the exception of 1 factor; The deposits (LN\_DP). Despite the fact that an increase in deposits was assumed to lead to an increase of credits that banks can lend, the above factors present a negative sign. Furthermore, combination of employees and fixed assets thought are significant, but the coefficient bears a negative sign means they together affect negatively on credits. The following table (Table 7) shows the results of the productivity of selected 20 banks.

Table 7 - Productivity of Selected 20 Commercial Banks of India.

<b>ABU DHABI COMMERCIAL BANK LTD</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	0.736793	0.899192	0.51091	0.54932	0.68245	1.27628	0.94862	0.93561	0.86390
<b>ALLAHABAD BANK</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	0.81087	0.85238	0.94647	1.08085	1.35880	1.60969	1.82278	2.07975	2.26278
<b>AXIS BANK LIMITED</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	0.65441	0.65836	0.56868	0.76926	0.97918	1.31709	1.53418	1.88508	2.07628
<b>BANK OF AMERICA NA</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	2.41013	3.22671	2.89040	3.99037	6.03460	4.52132	4.80914	4.35407	4.44571
<b>BANK OF BARODA</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	1.60663	1.67002	1.50759	1.76585	2.20814	2.77341	2.78077	3.49290	3.74718
<b>BANK OF INDIA</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	1.76193	2.04775	2.06564	2.39330	2.57751	3.06475	2.91979	3.73992	3.88225
<b>BNP PARIBAS</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	0.46004	0.51818	0.50049	0.91665	1.01817	1.20664	2.04918	1.03388	1.06071
<b>CITIBANK N.A</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	0.87515	0.88153	0.91410	0.93655	1.13765	1.15169	1.33729	1.36367	1.23358
<b>DEUTSCHE BANK(ASIA)</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	0.56377	0.57364	0.73058	0.95210	0.63169	0.64459	0.97126	1.28526	1.73138
<b>FEDERAL BANK LTD</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	0.62457	0.70773	0.80073	0.85221	1.12086	1.31925	1.42703	1.59894	1.73113
<b>ICICI BANK LIMITED</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	1.96477	2.02164	1.60991	1.83016	2.76518	3.46246	3.76552	3.94478	2.82092
<b>JAMMU &amp; KASHMIR BANK LTD</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	0.63586	0.74395	0.79227	0.92827	1.14680	1.33283	1.32994	1.43188	1.48513
<b>KARNATAKA BANK LTD</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	0.53707	0.57052	0.62324	0.79251	0.92851	1.08103	1.10273	1.11833	1.21957
<b>SOUTH INDIAN BANK</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	0.59058	0.61668	0.65489	0.77223	0.84261	0.99715	1.12940	1.17637	1.38989
<b>STATE BANK OF HYDERABAD</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	0.80795	0.86232	0.89001	1.11951	1.31121	1.67284	1.97317	2.28239	2.52932
<b>STATE BANK OF INDIA</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	3.04566	3.28397	3.36516	3.96638	4.57522	5.19867	5.45575	7.03126	7.38704
<b>STATE BANK OF MYSORE</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	0.70040	0.71075	0.68285	0.87456	0.97235	1.37267	1.67168	1.35994	1.39635
<b>STATE BANK OF PATIALA</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	0.89529	0.99072	1.14543	1.29719	1.64287	2.11427	2.29457	2.72979	2.57397
<b>UNION BANK OF INDIA</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	0.95644	1.22501	1.34955	1.78062	2.19613	2.23205	1.84599	2.35100	2.60131
<b>UNITED BANK OF INDIA</b>									
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	0.55858	0.57565	0.58524	0.78068	1.01066	1.06052	1.18578	1.49851	1.61537

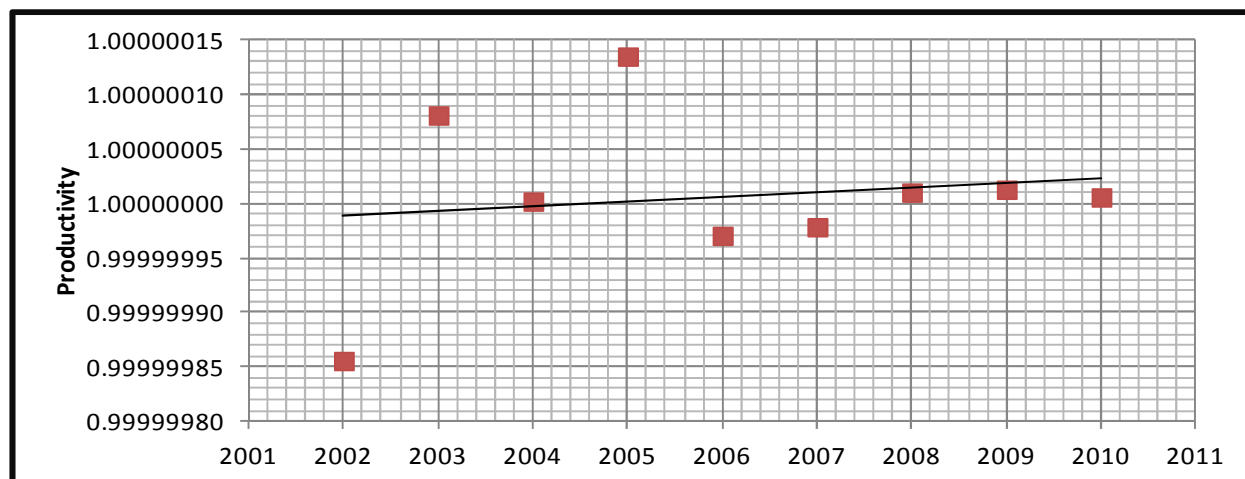


Fig 1 - Total Factor Productivity – Indian Banking Industry (Translog)

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
$\beta$	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

As can be seen from the results above, the banks have performed well during the observed period resulting in an overall increase in the productivity of the banking industry.

In the period of financial crisis, from 2007 onwards, expectations were that the productivity would record a decline for the banking industry as it had for the rest of the world. Instead, great resilience was showed by the Indian financial system, showing a stable trend for the productivity of the banking industry during that period. As we saw how other East Asian Countries suffered from the crisis which were triggered by some external macro-economic factors or shocks, however, Indian financial system remained sheltered from such external shocks as a result of having “flexible exchange rate regime, the foreign reserves are high, the capital account is not yet fully convertible, and banks and their customers have limited foreign exchange exposure.”

Table 8- Comparison of Productivity of Sample Banks with the Overall Banking Industry (Industry Comparison with Sample Banks).

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
<b>Industry <math>\beta</math></b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
<b>Abu Dhabi</b>	0.73679	0.89919	0.5109	0.5493	0.6825	1.2763	0.9486	0.9356	0.8639
<b>Allahbad</b>	0.81087	0.85238	0.9465	1.0809	1.3588	1.6097	1.8228	2.0798	2.2628
<b>Axis Bank</b>	0.65441	0.65836	0.5687	0.7693	0.9792	1.3171	1.5342	1.8851	2.0763
<b>BOA</b>	2.41013	3.22671	2.8904	3.9904	6.0346	4.5213	4.8091	4.3541	4.4457
<b>Baroda</b>	1.60663	1.67002	1.5076	1.7659	2.2081	2.7734	2.7808	3.4929	3.7472
<b>BOI</b>	1.76193	2.04775	2.0656	2.3933	2.5775	3.0648	2.9198	3.7399	3.8823
<b>BNP Paribas</b>	0.46004	0.51818	0.5005	0.9167	1.0182	1.2066	2.0492	1.0339	1.0607
<b>CITI</b>	0.87515	0.88153	0.9141	0.9366	1.1377	1.1517	1.3373	1.3637	1.2336
<b>Deutsche</b>	0.56377	0.57364	0.7306	0.9521	0.6317	0.6446	0.9713	1.2853	1.7314
<b>Federal</b>	0.62457	0.70773	0.8007	0.8522	1.1209	1.3193	1.427	1.5989	1.7311
<b>ICICI</b>	1.96477	2.02164	1.6099	1.8302	2.7652	3.4625	3.7655	3.9448	2.8209
<b>J&amp;K Bank</b>	0.63586	0.74395	0.7923	0.9283	1.1468	1.3328	1.3299	1.4319	1.4851
<b>Karnataka</b>	0.53707	0.57052	0.6232	0.7925	0.9285	1.081	1.1027	1.1183	1.2196
<b>South Indian</b>	0.59058	0.61668	0.6549	0.7722	0.8426	0.9972	1.1294	1.1764	1.3899
<b>BOH</b>	0.80795	0.86232	0.89	1.1195	1.3112	1.6728	1.9732	2.2824	2.5293
<b>SBI</b>	3.04566	3.28397	3.3652	3.9664	4.5752	5.1987	5.4558	7.0313	7.387
<b>SBM</b>	0.7004	0.71075	0.6829	0.8746	0.9724	1.3727	1.6717	1.3599	1.3964
<b>SBP</b>	0.89529	0.99072	1.1454	1.2972	1.6429	2.1143	2.2946	2.7298	2.574
<b>Union Bank</b>	0.95644	1.22501	1.3496	1.7806	2.1961	2.2321	1.846	2.351	2.6013
<b>United Bank</b>	0.55858	0.57565	0.5852	0.7807	1.0107	1.0605	1.1858	1.4985	1.6154

As can be seen from the graphs presented above, the overall productivity of the Indian banking industries shows an increasing trend from 2002 to 2010. Comparing the productivity of our sample 20 banks



with that of the industry, we see that majority of the commercial banks also showed an increasing trend in productivity, with productivity of the individual banks being more than that of the industry average productivity. Several banks have their productivity lower than the industry average in the initial years till 2004. Many of them managed to improve it from 2005 onwards. Once again, Abu Dhabi bank, though it showed an improvement and increase in productivity, but still its lower than the industry average of 1.0. Banks like Karnataka, South Indian, Federal, CITI, AXIS and Allahabad kicked-off in terms of productivity from 2006 onwards. Before that they had productivity lower than that of the industry. Productivity levels for State bank of India, Bank of India, ICICI, Baraoda and Bank of America has been exceptional throughout the period. It has been impressively above the industry average.

Great resilience was showed by the Indian financial system. As we saw how other East Asian Countries suffered from the crisis which were triggered by some external macro-economic factors or shocks, however, Indian financial system remained sheltered from such external shocks as a result of having “flexible exchange rate regime, the foreign reserves are high, the capital account is not yet fully convertible, and banks and their customers have limited foreign exchange exposure.” All the banks showed an increasing trend in terms of productivity , however , Abu Dhabi bank , although shows an inclining trend for productivity but it has been below the industry average , so we can classify it in “Bad Performers” and the rest as “ Good Performers “. Table 9 presents this categorization.

Table 9 - Classification of Banks on the Basis of Change in Productivity

<b>GOOD Performers</b>		
ALLAHABAD BANK	AXIS BANK LIMITED	BANK OF BARODA
BANK OF INDIA	BNP PARIBAS	CITIBANK N.A
DEUTSCHE BANK(ASIA)	FEDERAL BANK LTD	ICICI BANK LIMITED
JAMMU & KASHMIR BANK LTD.	KARNATAKA BANK LTD	SOUTH INDIAN BANK
STATE BANK OF HYDERABAD	STATE BANK OF INDIA	STATE BANK OF MYSORE
STATE BANK OF PATIALA	UNION BANK OF INDIA	UNITED BANK OF INDIA BANK OF AMERICA
<b>BAD Performers</b>		
ABU DHABI COMMERCIAL BANK		

## 6. Conclusion

The reforms initiated in early 90’s for the banking industry still in progress and development, which are basically follow up measures of the financial sector and economic liberalization in the country. Being the life blood for the economy, the banking sector was treated and given greater importance during the reforms which were chiefly aimed for making Indian banking industry more productive and competitive, efficient on standards of international accounting and free from unnecessary government involvement. Furthermore, our study attempted to measure the productivity levels of few of the Indian commercial banks and the Banking industry as a whole, for the period 2002 to 2010 using Translog Productivity Function to determine whether the productivity has improved or not due to the mentioned reforms.

The results of the study show that the performance of the Indian banking industry remained satisfactory for the period 2002 till 2012 despite of the financial turmoil that literally hampered the financial institutions all over the world. This was because Indian financial system remained sheltered from such external shocks as a result of having “flexible exchange rate regime, the foreign reserves were high, the capital account is not yet fully convertible, and banks and their customers have limited foreign exchange exposure. So in present scenario, we would recommend the policy makers to continue with their current policy as it has worked well during the period of financial crisis and have sheltered the Indian banks from external shocks. Furthermore we found that the deposits and credits are negatively related, which is surprising. So for this , we would recommend the policy makers to emphasize on increasing the deposit base of the banks . One way of doing this is to increase the interest rates on deposits. By doing so, people, instead of consuming , would deposit money in banks for higher returns , thereby moving from consumption behavior to saving behavior and thereby increasing the deposits of the banks . However, in doing so, the policy makers should take into account that they should not increase the interest rates too high as it would affect the economic growth and GDP of the country. With somewhat high interest rate than usual, firms will hesitate to borrow from the banks, in order to finance their productions with the fear of high rate of return on loans, thereby reducing the output which in turn reduces the GDP and economic growth.

So with more deposits, bank can increase their lending activities (credits) to various sectors of the economy. Increasing the interest rate will also help the government to fight inflation. As the people deposit their money in the bank, this would result in reduction of liquidity in the market as well as the purchasing power of

households, thereby reducing the prices of the commodities and goods result in pushing down the inflationary pressure.

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