Chapter VI

SUMMARY

Chapter one introduces the subject matter of the thesis, measurement of X-efficiency among India's commercial banks after 1991, in three perspectives. The foremost one is the importance of financial sector reform in overall economic development this discussion points out the issue of efficiency. The second one is what types of banking sector reforms had been introduced in different phases since 1991. The discussion here also indicates the question of efficiency in India's policy formulation. The third one relates to various concepts of efficiency that are frequently discussed in the literature.

The question of financial sector efficiency in economic development has been discussed on the basis of Adam Smith's concept of division of labour. We have stressed that, notwithstanding the neo classical perception about the neutrality of money in the functioning of the real sector, Pattinkin's treatment of macroeconomic variables has established a close relationship between the real and monetary sector, which Keynes has further strengthened. Our further discussion in this field shows that the present literature advocates two important lines of argument in support of the relationship between finance and economic development. One, based on the circular flow of income in an economy, Schumpeter argues that economic stagnation can be broken only through the development of financial intermediaries. Two, taking que from Adam Smith's concept of division of labour, Gurley and Shaw discusses how the perpetuation of division of labour between the 'deficit' and the 'surplus' units in the society promotes higher economic growth. For the economic prosperity therefore, the importance of financial sector development has been theoretically established. We have also sought to empirically establish this relationship on the basis of cross country

data from UNDP sources in 2013. A further issue of discussion in this context is the line of causation between economic development and financial sector development. In this context we have discussed the views of Patrick, Levine and King, and Levine. This deliberation on the literature however confines that an efficient financial sector is sine qua non for the economic prosperity.

Broadly speaking there had been two types of reformative measures in India's banking sector since 1991, both of which targeted at enhancement of efficiency. The first set of reforms had sought to enable, commercial banks to properly utilise their mobilised funds for reducing CRR and SLR, rationalisation of the private sector lending, proper development of the government security market etc belong to this category. The other set of reforms had sought to introduce market forces in banking industry so that the efficiency is augmented under the pressure of competition. We have discussed that the privatisation of the nationalised commercial banks, the free entry of private domestic and foreign banks had been most important measure in this field. We have also argued that new accounting practices in banking, classification of assets, the ruling in the capital adequacy ratio etc belong to this category in so far as these measures had enabled the rationalised commercial banks to get privatised. These reformative measures corroborate the idea that India's policy makers had sought to bring in efficiency amongst the commercial banking institutions. This justifies the central question of the present thesis: had the efficiency of Indian commercial banks improved in the post reform period?

On the question of various concepts of efficiency, the literature embodies several concepts namely allocative efficiency, scale efficiency, scope efficiency and X-efficiency. The present thesis however deals only with the X-efficiency. Without disputing against other sources of efficiency, we have adopted the measure of X-

efficiency for two basic reasons (i) the question of competition in the context of efficiency is better measured by the concept of X-efficiency and (ii) there are less study in this field in Indian context.

The various concepts of efficiency prior to 1966 are related with technology – the allocative efficiency referring to proper combination of inputs (i.e. appropriate technology) the scale efficiency (to the appropriate scale of production) and the scope efficiency (to the existence of technical scale additives in production. Leibenstein has first introduced the concept of efficiency on the basis of subjective factors. Before the application of his concept of X-efficiency, chapter two has sought to clarify various aspects of this concept. To do so this chapter has sought to find out its genesis. Its genesis has however been found in Hicks Quite Life Hypothesis (QLH) and Bain's Structure Conduct Performance Paradigm (SCPP). This chapter first discusses these two hypothesises along with the concept of X-efficiency detail and then identifies their inter relationship. The QLH argues that in many cases, a monopolist does not seek to maximise his profit by sticking to MR=MC principle. The deviation from MR=MC point is explained by subjective factors, especially his pleasure for quite life. Thus while taking up the decision, the monopolist takes into account his subjective pleasure in addition to monetary revenue and also the pains to account for cost. He may thus strive for the equality between 'emotional' MR and 'emotional' MC, which indeed represents a rational choice for him. In other words the deviation from conventional MR=MC represents undoubtedly financial inefficiency, but is a case of 'rational inefficiency'.

Bain's Structure-performance hypothesis also discusses the question of efficiency. The underlying tone in the hypothesis is how efficiency is guided by the scale of operation, the pricing policies and the competitive forces. He argues that the

barriers to entry enable individual firms to expand their scale, and thus, raise the concentration of a market. But the question is: Are bigger firms more efficient than smaller ones? We note here that Bain defines such efficiencies – as generated through the expansion of scale – as the technical efficiency in the sense of optimal use of resources. This line of argument he juxtaposes against an alternative hypothesis: that smaller firms are more efficient. The theoretical underpinning is that greater competition compels the firms to make all-out efforts to raise productivity – and, hence, more efficient. To Bain, it is the allocative efficiency. Two opposite forces thus prevail in the domain of efficiency: a) the allocative efficiency, varying inversely with the degree of concentration in an industry; and b) the technical efficiency, varying directly with the degree of concentration.

The central theme of Leibenstein's X-efficiency is to account for in/efficiency in terms of subjective factors prevailing at different layers of the organisation. His X-efficiency theory seeks to identify the subjective factors that affect the performance of the individuals associated with the organisation, and, in so doing, the theory analyses how they affect the performance of the firm. Another unique feature of the theory is the shift of focus from the micro level of the firm to its micro-micro level dealing with the individuals. The X-efficiency theory attributes efficiency to psychological factors and tries to understand the black box of the human mind and how it affects performance. His theory deviates from the traditional theory of efficiency on the ground of selective rationality and questions the existence of a rational economic man. X-efficiency is determined by three forms of motivation, inter plant motivation, intra plant motivation and non market input efficiency. The factors that perpetuate X-inefficiency are firstly the production function which is not known with surety, labour contracts that are not extensive to seal out inefficiency and factors inherent in the

individual that cannot be marketed. He says that every individual that makes up the organisation comes with his Activity, Pace, Quality and Time bundle which decides the inert area of the individual. The equilibrium of the individual takes place at the point where every individual in the organisation is in his/her inert area. The prevalence of this situation ultimately leads to entropy which is regarded as the death of the organisation.

All three hypotheses have one thread in common - the prevalence of inefficiency in an organisation. The concept of inefficiency, however, varies across them; so also their interpretations. In Hicks' Quite Life, a monopolist is regarded inefficient as he does not produce at the optimal level of MR=MC. If we analyse this stand of the monopolist from a micro perspective, we can see that the monopolist makes a rational decision as it is based on the equality of his emotional MR and his emotional MC.

The undertone of Bain's SCPP analysis is that a monopolist may be inefficient from the viewpoint of resource allocation although he might be enjoying technical efficiency. Thus, from the monopolist's standpoint, the organisation is efficient, but it is inefficient in the sense it involves wastage of resources. On the other hand, a competitive firm is surely efficient from the macro viewpoint as there is no wastage of resources for a firm operating at the lowest point of the long run average cost curve; but it is not efficient as he cannot enjoy profit as high as a monopolist. Both these firms are inefficient – a monopolist from the welfare viewpoint, and a competitive firm from the individualistic viewpoint.

Leibenstein's X-efficiency theory goes further in-depth - from the micro level to the micro-micro level of an organisation. He analyses inefficiency as a motivational

deficiency. An Individual in an organisation maintains his position of inefficiency as he feels that a movement from this position entails costs much higher than benefits that might accrue to him. Thus, what is inefficient from the view point of an organisation is rational for an individual. However, if everyone in the organisation remains static in their own comfort zone, it will ultimately lead to entropy. According to Leibenstein, the only way to get out of this sluggish position is to introduce competition in the system. Thus, Leibenstein's comfort zone is similar to what Hicks considers 'the quiet life'. What Hicks identifies as plausible factors contributing to 'the quiet life' are discussed at length by Leibenstein while deliberating on the comfort zone. The subjective issues are also there in Bain, *albeit* in an implicit tone, especially when he discusses 'wisdom' as an explanation for technical efficiency.

The third chapter in the thesis reviews the literature belonging to the field of efficiency measurement, especially the measurement of the X-efficiency, in banking and other sectors. With the advancement in the method of measurement of efficiency there are two competing methodologies, namely the Deterministic methodology represented by Data Envelopment Analysis (DEA) and the Econometric Method represented by the Stochastic Frontier Approach (SFA) or the Econometric Frontier Approach (EFA). The former one was developed by Charnes Cooper and Rhodes in 1978. This method measures the efficiency of a decision-making unit as the ratio of weighted outputs and inputs. This method is, however, appropriate only under condition of constant returns to scale.For variable returns to scale, the Banker Cooper Rhodes method is available. But as the method is deterministic, and hence, there is no room for stochastic element, it is not adept to measure X-efficiency which is attributed to factors beyond that which is marketed.

The econometric method belonging to the stochastic frontier approach was developed by Aigner Lovell and Schimidt, and Mauseen and van den Boreck simultaneously in 1977. The method assumes that the stochastic component, as represented by the error term, comprises of white noises and an inefficiency component. The breaking up of the composite error term is done following the Jondrow-Lovell-Schimidt-Materov (JLSM)method which is a two step process. An improvement over the two step process of JLSM is Battese-Coellie's single-step procedure, proposed in 1995, where the explanatory variables are included in the inefficiency term.

The use of stochastic frontier method requires the use of a production function. The productions that are at our disposal are the Cobb-Douglas production function, CES production function, Translog Production function, Hybrid translog production function and the Fourier Flexible production function. The Cobb-Douglas production is the most simple and was used in early efficiency studies. The Cobb-Douglas production function and the CES production function are monotonic in nature, and therefore, can generate only increasing, decreasing or constant returns to scale. Moreover, those functions are capable of analysing only a single-product firm. Because of these, the recent studies use extensively the Translog production and the Fourier flexible form, both of which can deal with multi-product firms with variable return to scale.

The studies under review are grouped in two categories: one includes the studies pertaining to efficiency measurement of banks outside India; and the other includes those functioning in India. Most of the studies outside India are from America and Europe. These studies deal mostly with technical efficiency using both SFA and DEA. Our review has taken into account20 studies in the SFA methodology

and 18 studies in the DEA methodology pertaining to the measurement of banking efficiency in India and abroad.

The treatment of the banks as a producer or an intermediary determines the input- and output- vectors that should be considered in a model. In the studies relating to SFA, the banks are mostly treated as intermediary and the input vector includes labour, capital and purchased fund. The dominant outputs in those models are loans and advances, deposits and investments.

The findings of the empirical studies do not reach at any consensus. The empirical studies relating to banking practices in European and American countries discuss mainly technical efficiency, which is governed by market power, manager's ability, scale of operations and deregulation. In the case of Indian banks, the studies primarily relate to the effects of ownership on the efficiency and how the banks' performance has been changing after the financial sector reforms.

The fourth chapter of the thesis describes the methodology of stochastic frontier analysis and the dataset that has been used. We discuss two methodologies under stochastic frontier process: (i) Generalised Least Squares estimation (GLS) and (ii) Maximum Likelihood Estimation (MLE). The GLS method is discussed in line with here in line with what Kmenta suggests. It differs from the OLS estimation in that it does not rely on the assumptions of homoskedacticity and the absence of autocorrelation. The panel data that have been adopted in this study are very often characterised by heteroskedacticity and autocorrelation. Hence, in the GLS, those are corrected before the ordinary least square process is applied. The methodology then seeks to decompose the residuals into white noises and an inefficiency term. This methodology thus involves two-stage estimations: (a) derivation of residuals in the

first stage, and (b) decomposition of the residuals in the second stage. In the second stage, however, the residuals are regressed on the variable 'time' so that we obtain time variant X-in/efficiency, time invariant X-in/efficiency and the white noise term.

Since the GLS method suffers from some drawbacks, this study has also adopted the maximum likelihood estimator (MLE) using the 'sfa' package from R statistical environment. The MLE method is not affected by heteroskedacticity and hence we need not check for the same. The application of alternative methodologies enables us to make a comparative study on their results.

This thesis has adopted the translog cost function to analyse the behaviour of banks. On the consideration of banks providing intermediary services, the output vector includes: (a) loans and advances, and (b) investment, and the input vector is composed of (a) the price of capital, (b) the price of fund, and (c) the wage rate.

The time period of the empirics in this thesis spans over 1994-2012. It has been so chosen that we can account for the effects of the first- and second-generation reforms initiated in 1991 and 1998 respectively. Of all the banks that are present in India, we have taken 57 banks comprising of 25 public sector banks, 17 private domestic bank and 15 private foreign banks. For the purpose of estimation, however, the banks with missing values for one or more variables are not taken into consideration. Moreover, as we use the balanced panel, banks that did not exist in 1994 are ignored.

On the basis of paid-up capital, employment, number of branches and deposits, a comparison among three categories of banks reveals that public sector banks were the leaders in all four categories, followed by private domestic banks and private foreign banks. However, the average cost of operation was the least for private

foreign banks, followed by private domestic banks and public sector banks. The wages per employee are seen highest for private foreign banks, followed by public sector banks and private domestic banks. The price of capital is also found highest for private foreign banks but it is the least for public sector banks. For price of fund, however, least variation is noticed across them.

The use of panel data requires the verification of the unit root problem. This study has adopted the Augmented Dickey Fuller (ADF) test and the Levin-Lin-Chu test (LLC) for panel data. The former test, indeed, rejects the presence of a unit root for all the variables under consideration. But it should be noted that although this test is widely used, it overlooks the panel structure, and, thus, fails to appropriately verify stationarity in case of panel data. The LLC is a good substitute for ADF in case of panel data. By applying the LLC also, however, we reject the null hypothesis of the presence of unit root. The heteroskedacticity test has not been conducted as the application of GLS requires the correction for heteroskedacticity and MLE is not affected by the same.

The study adopts Kmenta's GLS method in the study. The first step of this method corrects the presence of autocorrelation, and in the second step, heteroskedacticity is corrected. After applying the OLS method of estimation for the panel data set, the residuals are saved. The residuals, thus saved, are regressed on their lag values to obtain the estimated slope parameter (ρ_i), which is used to correct for autocorrelation. The OLS is again run on the transformed variable that has been corrected for autocorrelation. The variance estimated from the error term in this step is used for correcting heteroskedacticity. After the data have thus been corrected twice, we run a simple OLS. These represent Kmenta's GLS method. Now, we again save the errors of the GLS method under the belief that X-inefficiency is contained in

the error term. Those errors are further regressed on time to break them into time variant X-efficiency and time invariant X-efficiency.

Out of the 57 banks, 30 banks have positive intercepts, and 27 banks have negative intercepts. The coefficient of the intercept value represents the time invariant X-efficiency. Of the 30 banks with positive intercepts, 13 banks are found to be significantly X-inefficient in the beginning of the study. They are SBI, BOB, DENB, INDB, IOB, UCOB, UNITEDB, JKB, SOUINB, BNOVA, CITI, JPMC and STANCB. Six banks (CITYUNIB, DLAXB, KVYSB, NAINB, RATNB and DBS) are found to be time invariantly X-efficient i.e. with a negative significant intercept. Moreover, it has been found that, over the period of the study, 10 banks improved their efficiency level, i.e. those with negative significant slope coefficient. Those are: SBI, BOB, IOB, UCOB, UNITEDB, ICICI, CITI, DEUTB, JPMC and STANCB. On the other hand, banks like HDFC, NAINB, TAMNB, BNP, BARCB and DBS became X-inefficient over this period. The normalised value of the intercept and slope reveal that BOT was the most X-efficient time invariantly while ICICI was most X-efficient time variantly.

The average efficiency scores of the three banks types of banks did not show much of a distance in their score. The highest is scored by the PFB at 76.8, followed by PDB at 74.5 and the least is by PSB at 72.2. If we look at individual scores for PSBs, it appears that the majority of the banks have a score above 70 per cent, while in case of PFBs, the variation is large - ranging from 60 percent to 100 per cent.

But these inferences are subject to the qualification that they involve a number of estimated parameters, which are statistically doubtful in view of their low t-values.

For quite a large number of banks, then, our inferences are inconclusive. These empirical aspects motivate us to use the MLE method in our study.

We use the Battesse-Collie method (1992) to measure the X-efficiency. The estimation is done by the maximum likelihood method rather than the OLS. The MLE is not affected by heteroskedacticity, and hence, is best suited for panel data that very often suffers from the problem of heteroskedacticity. The conventional translog cost function is modified in this method to incorporate the trend component. The trend, representing technological changes, interacts with all variables in the model. This study has considered the trend variable to assess whether technological changes influence the banks' efficiency. Looking at the methodology from this viewpoint, we infer that error terms in this model contains X-efficiency (rather than technical efficiency) and white noises.

The MLE is run for two time periods: a) 1994-2012 and b) 2000-2012. The former represents the entire reform period while the latter, only the period of second generation reforms. The MLE is also run with intercept and without intercept. The logic for the latter is that the suppression of the intercept will increase the power of explanation for the arguments under consideration. However, the estimated values of parameters for the model with intercept are more significant than those for the alternative. Therefore, we rely on its results.

The results of the estimation with the intercept reveal that there are 12 positive coefficients, associated respectively with Q_1, Q_2, r_3, $trend$, $\mathrm{Sq}Q_1$, Q_1Q_2, Q_1r_2, Q_1r_3, Q_2Trend, r_1r_3, r_3Trend and r_2Trend, and 17 negative coefficients, associated with α_0, r_1, r_2, $\mathrm{Sq}Q_2$, $\mathrm{Sq}r_1$, $\mathrm{Sq}r_2$, $\mathrm{Sq}r_3$, $SqTrend$, Q_1r_1, Q_1Trend, Q_2r_1, Q_2r_2, Q_2r_3, r_1r_2, r_2r_3, r_3Trend and $time$. The negative sign of time component represents

technological progress. It indicates that the cost frontier is shifting inwards due to technological advancements, and hence, signifies an increase in the technical efficiency over the period of study. However, the estimated coefficient of the trend component reveals that the overall efficiency of the banks has decreased, belying the expectation of the reforms. On the basis of a comparison of the estimated coefficients of time component for the first and second generation reform, this study also suggests that the second generation reform generated more cost efficiency than the first generation reform.

We, however, save the error component in this model as well to break it down into its constituent parts comprising of efficiency and pure white noise. The efficiency scores are estimated using Jondrow-Lovell-Materov-Schimidt (JLMS) method and the Farrell's distance formula. In the latter, the highest score for the most efficient bank is unity.

. The average efficiency scores for three groups of banks reveal that the most efficient group is the public sector banks with a score of 80.24 per cent, followed closely by the private foreign banks at 79.93 per cent and the private domestic banks at 77.3 per cent. Of the total 57 banks in the study, it is found that six banks, namely SBI, ICICI, BBK, BNOVA, DBS and SGB, belonged to the efficiency category of 90-99 per cent. To the category of 80-90 per cent belong 23 banks, SBH, SBP, SBT, ALLB, BOB, BOI, CANB, CORPB, IOB, OBC, PNB, UCOB, UNIONB, ADCOMB, BOA, BOT, BNP, BARCB, JPMC, AXISB, JKB, FEDB and KARB. Another 20 banks get the efficiency score of 70-80. Those are SBH, SBM, ANDB, VIJB, BOM, PNSB, SYNB, CENB, DENB, INDB, DLAXB, INDUSB, CITYUNIB, HDFC, INGVYSB, KVYSB, LVILB, NAINB, RATNB, SOUINB, TAMNB and OMINB. Among the remaining banks, four banks (UNITEDB, CATSYRB, HSBC and

STANCB) are found in the slab of 60-70 per cent and two banks (CITI and DEUTB) in the lowest rung of 50-60.

Similar analysis for the period 2000-2012 showed that the average efficiency scores of all the banks are than the respective scores for the entire period 1994-2012. The PSB scored 87 per cent (as against 80.24 per cent for 1994-2012), the PDB 88 per cent (as against 77.3 per cent for 1994-2012) and the PFB 83 per cent (as against 79.93 per cent for 1994-2012). Bank-wise comparison between these estimates suggests that the PSBs have registered an increase of 2 – 16 per cent, and the PDBs 6-20 per cent. In the case of PFB, six banks have gained efficiency ranging by 8-16 per cent while the others experienced a fall in efficiency.

Finally, the comparison between the GLS and the MLE methods indicate that notwithstanding numerical differences, the results are similar insofar as the category of most efficient banks in each category is concerned.