CHAPTER 7

ECONOMETRIC RESULTS OF PROFIT FUNCTIONS

The four profit functions developed in the chapter on Research Methodology have been estimated separately using time-series and cross-sectional data.

The four profit functions estimated are-

1) Conventional :
   $p = f(Pi, Qj, Zk)$

2) Risk Factors Adjusted :
   $p = f(Pi, Qj, Zk, Rl)$

3) Social Banking Factors Adjusted :
   $p = f(Pi, Qj, Zk, Sm)$

4) Risk and Social Banking Factors Adjusted :
   $p = f(Pi, Qj, Zk, Rl, Sm)$

where

p	=	Profits (defined as current operating revenue less total current operating expenses)
Pi	=	input prices
Qj	=	output prices
Zk	=	fixed factors of production
Rl	=	risk factors
Sm	=	social banking factors

For the estimation of these profit functions, the Ordinary Least Square method has been applied. All the profit functions are in Cobb-Douglas (double-log) functional form, where the coefficients of each independent variable is the constant elasticity of profit with respect to the particular variable.

The sum of the elasticities of profit function with respect to fixed factors of production shows the degree of returns to scale. In this study, two sets of fixed factors of production have been alternatively used. The first set includes total number of branches (Z1) and fixed assets per branch (Z2) and the second set includes Z1 with total deposits per branch (Z3) as fixed factors of production.

If the sum of the values of coefficients of -

a)	Z1 and Z2 > 1 Z1 and Z3 > 1		There are economies of scale
b)	Z1 and Z2 = 1 Z1 and Z3 = 1		There are neither economies of scale nor diseconomies of scale
c)	Z1 and Z2 < 1 Z1 and Z3 < 1		There are diseconomies of scale

For each sample data, with four types of profit functions and two alternative sets of fixed factors of production, there are total eight profit functions estimated. Initially, we estimated four complete profit equations and then finally arrived at the best-fit profit equations on the basis of statistical tests (t-values, $\bar{R}^2$) and consistency with the theory of profit functions.

For the time-series analysis, the annual data was collected for the period 1970 to 1986 for the following bank groups:

i) All Commercial Banks
ii) State Bank of India and Subsidiaries
iii) Nationalised Banks

The cross-sectional data was collected for twenty eight public sector banks for the years 1985, 1986 and 1987. For the analysis, the average of these three years has been used to arrive at the variables.

7.1 Regression Results

Regression results have been divided into four sets, with each set containing four tables for four sample data. Set A [Appendix VII,Table No. 1 to 4] and Set B [Appendix VII,Table No. 5 to 8] show the regression results of four complete (specified) profit functions, using all the independent variables. The Set A presents the estimated profit functions with Z1 and Z2 as fixed factors of production and Set B presents the estimated profit functions with Z1 and Z3 as fixed factors of production.

The tables in sets C [Appendix VII,Table No.9 to 12] and set D [Appendix VII,Table No. 13 to 16] depict each of the best fit estimated profit functions. Set C shows the best fit profit functions with Z1 and Z2 as fixed factors of production and set D, the best fit profit functions with Z1 and Z3 as fixed factors of production.

The four tables in each set are the results of each of the four bank groups viz., All Commercial Bank group, SBI group and Nationalised Bank group using time-series data and twenty eight public sector banks using the cross-sectional data.

Further, in all the tables there are four equations for four profit functions. Equations I is the estimated conventional

profit function, Equation II is risk-adjusted, equation III is social banking factors adjusted and Equation IV is risk and social banking factor adjusted estimated profit equation.

For our discussion on economies of scale, the best fit equations (sets C and D) have been used.

The major findings of the regression results are -

1) The fixed factors of production, according to 'a priori' specifications, should give positive coefficients and in the Cobb-Douglas functional form, the sum of these coefficients indicate the presence/absence of economies of scale. In the case of SBI bank-group (time-series data), the fixed factors of production Z2 and Z3 have given negative and fluctuating values of coefficients in repeatative exercise. Hence, in the final analysis, these two factors of production (Z2 and Z3) were dropped and Z1 alone was used as a fixed factor of production. These final regression results of the estimated profit functions of the SBI group are given in Table No. 17,Appendix VII.

2) For all the equations, both time-series and cross-sectional, except All Commercial Bank group equations, the risk-adjusted profit function (Equation II) has given the best results. In the case of All Commercial Bank group, the risk and social banking adjusted profit function has given the best resutls. The All Commercial Bank group includes Regional Rural Banks (RRBs), which

are rather more involved in social banking, and therefore, the influence of social banking factors on profits, when the whole banking industry is considered. The inclusion of social banking factors do not have significant listing in the estimated profit functions in the case of other bank groups. These findings suggest that social banking does influence the profits of a bank. However, the most important factor influencing bank profitability is the portfolio management of the bank as explained by the risk variables.

3) Out of the two alternative sets of fixed factors of production included in the profit functions, the second set (Z1 and Z3) gives better results.

4) The theoretical formulation of the profit function assumes that firms are price takers both, in the output and input markets. However, our analysis shows that in some cases, the estimated coefficients either fail to confirm in sign to `a priori' specifications and/or turn out to be statistically insignificant. This finding is consistent with the finding of Mullineaux(1978) that banks are not price takers in these markets. On the other hand, it may also reflect either data limitations in the case of input and output prices or inadequate model specifications,as indicated earlier. However, these finding do not affect the elasticity results on economies of scale in our study.

7.2 The Elasticity Results

The economies of scale are estimated by the sum of the coefficients of all the fixed factor variables in the profit equations. The elasticity results are presented in the following tables.

Table No.I
All Commercial Banks Group:Annual Observations(1970-86)

Type of Profit Function	Elasticities	
	Z1 + Z2	Z1 + Z3
Conventional	2.86	3.06
Risk Adjusted	2.92	5.00
Social Banking Adjusted	3.24	3.96
Risk and Social Banking Adjusted	3.24	4.62

Table No.II
State Bank of India Group:Annual Observations[1970-86]

Type of Profit Function	Elasticities
	Z1
Conventional	3.52
Risk djusted	3.38
Social Banking Adjusted	1.47
Risk and Social Banking Adjusted	2.96

Table III
Nationalised Bank Group: Time Series Data [1970-86]

Type of Profit Function	Elasticities	
	Z1 + Z2	Z1 + Z3
Conventional	2.35	1.70
Risk Adjusted	2.58	1.64
Social Banking Adjusted	2.33	1.30
Risk and Social Banking Adjusted	2.28	1.56

Table No.IV
Public Sector Banks: Cross-Sectional Data
(28 Banks; Average of 3 Years 1985 to 87)

Type of Profit Function	Elasticities	
	Z1 + Z2	Z1 + Z3
Conventional	2.09	2.23
Risk-Adjusted	2.15	2.33
Social Banking Adjusted	2.09	2.27
Risk and Social Banking Adjusted	2.16	2.32

7.3 Overall Findings

The sum of the elasticities of profit with respect to fixed factor variables in the above analysis is more than one for all the equations. This indicates that production functions of Indian commercial banks are characterised by increasing returns to scale. These results corroborate our findings in the cost functions except in the SBI group. The cost function findings suggest that there are diseconomies of scale in the case of SBI group, which is in contrast to profit function results.

Further, in profit function analysis, the sum of elasticity with respect to Z1 and Z3 is greater than the sum of elasticities with respect to Z1 and Z2 in most of the cases.