Chapter - IV

EMPIRICAL RELATIONSHIP BETWEEN SIZE AND EARNING

4.1 Concept of Earning

Earning is a derived term from profit and in accounting sense both the term convey more or less the same meaning. There are variants of the concept of earnings and these variants are usually denoted by terms like: net current earnings, gross earnings, net surplus, gross surplus, net profit before taxes and net profit after taxes etc.[1] Earning of a bank is normally defined in two ways :

(i) Total earning before taxes represents the difference between total income and total expenses.This is referred to as net operating income or net current revenue or net earnings before taxes.

(ii) Net earning after taxes or profit after taxes or net profit can be derived after making adjustment to net current earnings to provide for taxes on profit, losses on recoveries on loans and investment due to bad and doubtful debt.

This definition of earning in a bank resembles more or less the definition of profit in other empirical studies relating to industry (see Singh and Whittington[2] and Stigler[3].) In these studies profit is defined in two ways: (i) Gross profit represents the difference between total income and total expenses and (ii) net profit comprises gross profit minus interest charges minus taxes.

In a way, earnings at branch level also reflect the difference between total income and total cost. Total income comprises of (i) interest income and (ii) non-interest income. Similarly, total cost comprises of (i) interest cost and (ii) non-interest cost. Non-interest income denotes income earned through commission, service charges,etc. Non-interest costs include wage-salary cost and other costs.

The difference between interest earned and interest paid is called spread, whereas the difference between non-interest cost minus non-interest income is defined as burden. The difference between the spread and burden are important in understanding and determining the net profit or loss of the branches. The behaviour of spread and burden with respect to volume of business for the year 1979 is shown in Table 4.1.

In order to have a correct estimate of earnings at branch level, two adjustments are important (a) Adjustment of head office interest and (b) adjustment for overhead expenses.

(a) The need for head office interest adjustment arises out of the fact that branches get interest from head office on surplus funds transferred from branches to head office. On this transfer of funds, rural and urban branches get uniform 10% rate of interest from head office. Similarly,

Table 4.1 : Interest Income, Cost, Spread, and Burden - Ratios to Volume of Business - 1979

Size-Group of Branches (Volume of Business in Lakhs and crores of Rupees)	No.of Branches	Interest Income to volume of business	Interest cost to volume of business	Non-interest income to volume of business	Non-interest cost to volume of business	Net-Head office interest to volume of business	Spread Ratio	Burden Ratio	Earnings without Head Office Interest	Earnings with Head Office Interest
1	2	3	4	5	6	7	8=(3-4)	9=6-5	10=8-9	11=7+10
RURAL BRANCHES										
Less than 10 lakh	19	0.04	0.031	0.002	0.101	0.02	+0.009	0.099	-0.090	-0.070
10-50 lakh	61	0.04	0.041	0.001	0.032	0.02	-0.001	0.031	-0.032	-0.012
50 lakh-1 crore	32	0.04	0.046	0.002	0.015	0.03	-0.006	0.013	-0.019	+0.011
1-5 crore	29	0.05	0.041	0.003	0.013	0.02	+0.009	0.010	-0.001	+0.019
All Branches	141	0.04	0.042	0.002	0.033	0.02	-0.002	0.031	-0.033	-0.015
URBAN BRANCHES										
10-50 lakh	6	0.05	0.031	0.006	0.049	0.01	+0.019	0.043	-0.024	-0.014
50 lakh-1 crore	15	0.02	0.043	0.007	0.025	0.04	-0.023	0.018	-0.041	-0.001
1-5 crore	48	0.04	0.048	0.003	0.016	0.06	-0.008	0.013	-0.021	+0.039
5-10 crore	5	0.04	0.039	0.003	0.016	0.03	+0.001	0.013	-0.012	+0.018
Above 10 crore	6	0.05	0.045	0.003	0.009	0.04	-0.015	0.006	-0.021	+0.019
All branches	80	0.04	0.044	0.003	0.020	0.04	-0.004	0.017	-0.021	+0.019
ALL BRANCHES										
Less than 10 lakh	19	0.04	0.031	0.002	0.101	0.02	+0.009	0.099	-0.090	-0.070
10-50 lakh	67	0.04	0.040	0.002	0.031	0.02	0.000	0.029	-0.029	-0.009
50-1 crore	47	0.03	0.043	0.004	0.018	0.03	-0.013	0.014	-0.027	+0.003
1-5 crore	77	0.04	0.047	0.003	0.015	0.04	-0.007	0.012	-0.019	+0.021
5-10 crore	5	0.04	0.039	0.003	0.016	0.03	-0.001	0.013	-0.012	+0.018
Above 10 crore	6	0.03	0.045	0.003	0.009	0.04	-0.015	0.006	-0.021	+0.019
All branches	221	0.04	0.043	0.003	0.028	0.03	-0.003	0.025	-0.028	+0.002

Note: In rural branches, there are no branches doing the business above Rs.5 crore and in urban branches, no branches have been reported doing the business below Rs.10 lakh.

Source: Calculated on the basis of respective data for 1979 given in appendix tables 1 to 9.

branches have to pay interest on borrowed funds from head office. On the borrowed funds, rural and semi-urban branches are required to pay 10% rate of interest and branches located in urban and metropolitan areas are required to pay 12% rate of interest. Sometime, it is argued that head office interest adjustment is arbitrary in the sense that this system does not give due weightage to deposit heavy and advance heavy branches.[4] But it would appear that not making any adjustment would be more arbitrary in the sense that it would not give due weightage to the overall business efforts of a branch, when such an effort is of a specialised nature. For example, certain branch may, due to its particular environment and circumstances put more efforts in mobilising deposits and lending activities may be relatively less. If head office interest is not credited to the branch for all its efforts, it will have to show a negative earning. On this consideration, for the purposes of this study, it has been decided to make adjustments for head office interest and thereafter calculate the earnings of the branches.

Table 4.1 shows that if the head office interest is not adjusted (column 8) allbranches in our sample would show losses. With the adjustments of head office interest, only the smaller branches show losses (Column 9).

(b) Certain overhead expenses are incurred at the head office level and hence are not shown in the branch account, though they have a bearing on the business of the branch. Such overhead expenses are director's and local committee member's fees and allowances, law charges, audit fees, taxes on profit, premium to Deposit Insurance Corporation of India, etc. These expenses are not apportioned to the branches and hence are not shown in branch account. Since Bank of Baroda is having over 1500 branches of various size and various level of business and we are studying only 221 branches of these total branches, we are not in a position to apportion precisely these overhead expenses. Hence, for the purposes of the present study, branch earnings have not been adjusted for these expenses. In this sense, these earnings are slightly overestimated. Even if we do some adjustment, it would be only in proportion to the volume of business of the branches; and hence would not have any bearing on our conclusion pertaining to the economies of scale and efficiency.

The concept of earning of the branch and its derivation from various heads of accounts is described in Table 4.2. For purpose of further analysis, earning has been expressed as ratio of earning to volume of business. Henceforth, for the sake of convenience, the word earning is used, instead of ratio of earning to volume of business.

Table 4.2 : Income, Expenditure and Earnings at Branch Level.

(I) Total Expenditures	(I) Total Income
(a) Interest paid on Deposits - On Saving deposits - On term deposits	(a) Interest and Discount-Income
(b) Interest paid on borrowings from banks/other institutions	(b) Commission and Exchange Income
(c) Wage-salary expenses (including overtime)	(c) Other Income.
(d) Rent, taxes, insurance, lighting.	
(e) Postage, telegram, telex	
(f) Stationery and printing.	
(g) Depreciation	

(A) Gross Surplus = Total Income - Total Expenses

(II) Interest paid to Head Office on borrowed funds from head office	(II) Interest from head office on surplus funds transferred to head office.

Net Head Office Interest = Interest received from head office - Interest paid to head office.

(B) Earnings of the branch = Gross Surplus ± Net head office interest

Ratio of earning to volume of business indicates three things; Firstly, it indicates branch's ability to generate income. This is in view of the fact that interest income of the branch is influenced by different factors, namely lending rates

governed by the Reserve Bank of India, policy for providing statutory regulations on priority sector loans, loans to be provided to weaker sections of the society under different scheme, food procurement financing, general monetary and credit-conditions prevailing in the country, loan-mix of rural and urban branches, etc.

Secondly, it indicates branch's ability to control operating cost. This is because interest cost on deposits is governed by the Reserve Bank of India's interest rate policy pertaining to deposits and therefore it is outside the purview of bank's management.

Thirdly, it shows how head office interest adjustment affects the overall profitability of rural and urban branches. Net-head office interest mainly depends on the product-mix of rural and urban branches. If the branches are deposit heavy branches, their net head office interest would be positive and if the branches are advance heavy, their net head office interest would be negative.

Earning at the branch level, therefore, depends on all factors that influence gross surplus and net head office interest. Given the volume of business, higher gross surplus and net head office interest indicate higher efficiency of the branch.

4.2 Size-Earning Relationship

Tables 4.3 and 4.4 show simple average and relative dispersion in earnings in different size groups of all, rural and urban branches for 1978 and 1979 respectively. The mean value of earnings, expressed in percentage, indicate average earnings in different size groups of all, rural and urban branches. The coefficient of variation shows deviation from the mean value of earnings within different size group of branches.

Following conclusions are drawn from tables 4.3 and 4.4.

(i) It is apparent from the tables that as the size of the branches increase, the ratio of earning to volume of business has a tendency to increase.

(ii) It can be seen that though the mean value of earnings in some size groups in rural and urban branches are negative, positive relationship between earning and size is observed.

(iii) Though no definite comparison can be made regarding the efficiency of rural and urban branches with respect to earnings, yet, within comparable size group, (i.e. 10-50 lakh, 50 lakh-1 crore) average earnings are found to be higher in rural branches.

Table 4.2 : Simple Average and Relative Dispersion in Earnings in Different-Size-Groups - 1978.

Branch size (Volume of Business) in lakhs and crores of rupees)	No.of branches	Ratio of Earning to volume of business(In Percentage) Mean	Coefficient of variation
RURAL BRANCHES			
Less than 10 lakh	34	-14.07	-1.16
10-50 lakh	40	- 3.26	-1.56
50 lakh-1 crore	39	- 1.22	+1.78
1-5 crore	17	+ 1.57	+1.32
All Branches	126	- 2.05	-5.57
URBAN BRANCHES			
10-50 lakh	14	+ 1.12	+3.07
50 lakh-1 crore	15	- 0.15	-20.64
1-5 crore	45	+ 1.14	+1.07
5-10 crore	3	+1.99	+ 0.79
Above 10 crore	4	+ 1.48	+0.60
All branches	79	+ 0.99	+1.89
All branches			
Less than 10 lakh	34	-14.07	-1.16
10-50 lakh	54	- 2.98	-1.77
50-1 crore	40	+ 0.81	+2.95
1-5 crore	62	- 1.19	+1.29
5-10 crore	3	- 1.99	+0.79
Above 10 crore	4	+ 1.48	+0.60
All branches	205	-0.84	-7.14

Note: In rural branches, there are no branches doing the business above 5 crore rupees; and in urban branches, no branches have been reported below the volume of business of less than 10lakh rupees.

Source: Calculated on the basis of 1978 data given in Appendix Table No.6.

Table 4.4 : Simple Average and Relative Dispersion in Earnings in Different Size-Groups - 1979.

Branch size (Volume of Business) in lakhs and crores of Rupees)	No.of bran-ches	Ratio of Earning to Volume of Business(in Percentage)	
		Mean	Coefficient of variation
RURAL BRANCHES			
Less than 10 lakh	19	-6.99	-1.52
10-50 lakh	61	-1.26	-1.50
50 lakh-1 crore	32	+1.11	+1.56
1-5 crore	29	+1.95	+1.33
All branches	141	-1.20	-4.68
URBAN AREA CHES			
10-50 lakh	6	-1.40	-3.14
50 lakh-1 crore	15	-0.10	+1.44
1-5 crore	48	+3.90	+1.51
5-10 crore	6	+1.03	+0.65
Above 10 crore	5	+1.90	+0.45
All branches	80	+1.90	+1.76
All Branches			
Less than 10 lakh	19	-6.99	-1.52
10-50 lakh	67	-0.90	-1.63
50-1 crore	47	+0.30	+1.52
1-5 crore	77	+2.10	+1.45
5-10 crore	6	+1.03	+0.65
Above 10 crore	5	+1.90	+0.45
All branches	221	+0.20	-15.79

Note: There are no branches in rural area doing the business above Rs.5 crore, and no branches inurban area doing the business below 10 lakh rupees.

Source: Calculated on the basis of 1979 data given in appendix table No.6.

(iv) It is observed from the tables that since there are wide fluctuations in earnings, no consistency is seen in disparison of earnings among different size groups in rural and urban branches. That is to say branches within different size-groups are not homogeneous in terms of earnings.

On the basis of above analysis, following hypothesis is postulated.

There is positive relationship between size and earning at branch level. In other words, average earning has a tendency to increase with the increase in size of rural and urban branches. Thus, economies of scale also exist in terms of earnings.

Gramely[5] in his study has also examined empirically the relationship between size and earning with the help of multiple regression analysis. He found that the coefficient for size variable was positive, that is to say, the ratio of net earning to total assets (dependent variable) increased as the bank size increased. Bank size and other explanatory variables accounted for 23 per cent of variation in net earning ratio. All independent variables were statistically significant at 5 per cent level.

4.3 Regression Models For Understanding Size-Earning Relationship.

Following linear, semi-logarithmic and double-log functions have been fitted for examing size-earning relationship for all, rural and urban branches.

i) $Y = a + bx + u$

ii) $Y = a + b \log x + u$

iii) $\log Y = \log a + b \log x + u$

where,

Y = Ratio of earning to volume of business (in percentage)

x = Volume of business representing size (in lakhs of rupee)

a = constant

b = Regression coefficient of x

u = Error term.

Equations I) examines the hypothesis that earning is linear function of size, i.e., volume of business (x). This linear form postulates that earnings change by a fixed amount (measured in ratio form which means percentage point) for any given change in size.

Equations (ii) is semi-logarithmic function, where size variable (x) is expressed in common logarithm. This function hypothesises that a given proportionate change in size causes the same absolute changes in earnings. In other words, it implies that absolute change in earnings tend to be a direct

function of proportionate variation in size rather than the absolute amount of such variation.

Equations (iii) is double-log function. This function embodies the hypothesis that a given percentage change in size leads to a certain percentage change in earnings at all levels of size and earnings.

Earnings have been examined with the help of linear, semi-logarithmic and double-log functions for all, rural and urban branches for 1978 and 1979. The results for linear, semi-logarithmic and double-log functions are presented in tables 4.5, 4.6 and 4.7 respectively.

Linear Relationship

When earning is regressed on size fitting linear model for all, rural and urban branches in 1978 and 1979, following conclusions are derived.

(i) It can be seen from table 4.5, that the regression coefficient b, is found to be significant statically with expected positive sign in rural, urban and all branches except in urban branches in 1978.

Thus, economies of scale are found in rural, urban and all branches in terms of earnings.

(ii) It is also apparent from the table that in rural branches size and earning relationship is better explained with the help of this function. This can be seen from the degree of explanation provided by R^2. The value of R^2 in rural branches in 1978 and 1979 is 0.1056 and 0.1253 respectively.

Table 4.5 : Size-Earning Regression Results: Linear Model.

Category of branch	Year	a	b	R^2	F-ratio
Rural Branches	1978	-2.6921	0.0380** (4.054)	0.1056**	16.4350 (1,139)
	1979	-2.6721	0.0252** (4.4600)	0.1253**	19.8080 (1,139)
Urban Branches	1978	0.9620	0.0004 (1.052)	0.0139	1.106 (1,78)
	1979	0.8602	0.0007* (1.9370)	0.0456*	3.7540 (1,78)
All Branches	1978	-1.0978	0.0021* (2.058)	0.0190*	4.237 (1,219)
	1979	-0.6255	0.0020** (2.7820)	0.0342**	7.7420 (1,219)

Note:

1. ** Significant at .1 per cent level.
2. * Significant at 5 per cent level.
3. Figures in parenthesis below regression coefficient are t values; and below F-ratio shows degree of freedom.
4. Individual branch data for 1978 and 1979 were used for running regression.

It may be concluded, therefore, that size-earning relationship is stronger, in terms of total explanation, in rural branches than urban branches.

It seems that a simple linear model is not a 'good fit' for explaining the variation in earnings. However, the low value of R^2 may perhaps be due to non-linear relationship between size and earning. Therefore, to improve size-earning relationship, semi-logarithmic and double-log regressions have been tried.

Semi-Logarithmic Function

To explore further the relationship between size and earning, semi-logarithmic function, of the form stated in equations (ii) is fitted. The results for all, rural and urban branches are given in table 4.6.

Following conclusions are drawn from the result in table 4.6 :

(i) It is observed from the table that there is positive relationship between size and earning. This can be seen from the value of regression coefficient.

However, the effect of rural-urban environment on earning is different. The effect of size on earning is found to be stronger in rural branches than in urban branches.

Table 4.6 : Size-Earning Regression Results : Semi-logarithic Model.

Category of Branch	Year	a	b	R^2	F-Ratio
Rural Branches	1978	-12.3486	3.1897** (9.8663)	0.4398**	97.3427 (1,124)
	1979	-11.2980	2.8506** (9.7598)	0.4066**	95.2537 (1,139)
Urban Branches	1978	0.0594	0.1888 (1.2643)	0.0203	1.5984 (1,77)
	1979	- 3.0335	0.7877** (3.9773)	0.1656**	15.8192 (1,76)
All Branches	1978	- 0.5178	2.0460** (10.045)	0.3322**	100.972 (1,205)
	1979	- 0.1582	1.5705** (10.7780)	0.3466**	116.198 (1,219)

Notes :

1. ** Significant at 1 per cent level
   * Significant at 5 per cent level
2. Figures in parenthesis below regression coefficients are t-values, and below F-ratio shows degree of freedom.
3. Individual branch data for 1978-1979 were used for running regression.

This is obvious from the values of regression coefficient. The values of regression coefficient b, in rural branches are 3.1897 and 2.8506 respectively. These values are higher than their corresponding values in urban branches. This implies that 1 per-cent increase in size, i.e., volume of business in rural branches would, on an average, lead to 3.19 and 2.85 percentage point increase in earning.

The regression coefficient, b, is found to be significant statistically in rural branches in 1978 and 1979, whereas in urban branches it is significant statistically only in 1979.

(ii) It can also be seen from the table that semi-logarithmic function explains larger percentage variation in earnings in rural branches than in urban branches.

The coefficient of determination, R^2, in rural branches is found to be significant statistically in 1978 and 1979. The corresponding values of R^2 are 0.4393 and 0.4066 respectively.

In urban branches, the coefficient of determination, R^2, is found tobe statistically significant in 1979 only.The corresponding value of R^2 being 0.1696.

(iii) It seems that in rural branches the size variable is found to be having more influence on earning, whereas in case of urban branches, there may be other important variables than size which might be influencing earning.

Thus, the logarithm of size seems to provide better explanation for earning, than absolute value of size. In otherwords, absolute change in earning tends to be direct function of proportionate variation in size than absolute amount of such variation.

Double-log Function:

To improve the relationship further, double-log function as stated in equation (iii) is also fitted. The results are presented in Table 4.7.

Table 4.7 : Size-Earning Regression Results : Double Log Model

Category of Branch	Year	a	b	R^2	F-Ratio
Rural Branches	1978	-2.8095	0.6209 (1.4229)	0.1123	2.0205 (1,16)
	1979	-2.2430	0.5092 (1.5251)	0.1429	2.3250 (1,14)
Urban Branches	1978	-1.7762	0.3666** (2.4000)	0.1556**	5.0026 (1,37)
	1979	-0.6046	0.1562 (0.7056)	0.0164	0.4979 (1,30)
All Branches	1978	-0.9612	0.2377* (2.2785)	0.0609**	5.1914 (1,80)
	1979	-0.4424	0.1402 (1.2405)	0.0206	1.5387 (1,73)

Notes:

1. ** Significant at 1 per cent level
   * Significant at 5 per cent level
2. Figures in parenthesis below regression coefficient are t-values, and F-Ratio shows degree of freedom.
3. Individual branch data for 1978 and 1979 are used for running regression.

It is seen from the table that, on the whole, there is no improvement in the explanation of size and earning relationship with the help of double-log function. This can be seen from the value of regression coefficient and R^2. It seems that

the exclusion of loss making branches* from rural and urban branches has downward bias in the size and earning relationship of small branches. Thus, double-log function is found to be a poor fit for the explanation of size-earning relationship in rural and urban branches.

4.4 Conclusion

While summarising the discussion on size-earning relationship, following conclusions can be drawn :

(i) It appears that the semi-logarithmic function provides better explanation than linear and double-log models for variation in earnings in terms of size. The relationship between size and earning is explained to the extent of 33 to 35 per cent in all branches, 40 to 44 per cent in rural branches and 2 to 17 per cent in urban branches.

(ii) There is positive relationship between size and earning in all, rural and urban branches. In otherwords, economies of scale also exist in terms of earnings however,

(iii) Size and earning relationship is stronger, in terms of total explanation, in rural branches than urban branches. This can be seen from the value of R^2 in rural and urban branches.

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* In double-log function, the number of observations reduce to very small number, because computer ignores negative sign (i.e. loss making branches). This can be seen from the degree of freedom in double-log function.

References

1 Gramely, Lyle, E., op.cit., p.36.

2 Singh, A. and Whittington, G., Growth, Profitability and Valuation, Cambridge University Press, Cambridge, 1968, p.29.

3 Stigler, George J.Capital and Rate of Return in Manufacturing Industries, Princeton University Press, Princeton, 1963, pp.125-128.

4 Singh, Dampent P. and Varde, Varsha, "Monitoring profitability at Branch level", Journal of Indian Institute of Bankers, April-July, 1981.

5 Gramely, Lyle E., op.cit., pp.36-40.