OUTPUTS AND INPUTS OF PHILIPPINE COMMERCIAL BANKS

Mario B. Lamberte

I. INTRODUCTION

There is now a trend towards using the neoclassical theory of the firm in analyzing bank behavior in place of the portfolio selection model.[1] This approach treats a bank like any other producing unit. It produces several outputs and uses many inputs. If the neoclassical theory of the firm has to be successfully applied to the banking firm, it is necessary that bank outputs and inputs be identified beforehand. Unfortunately, the bank is an economic institution whose outputs are difficult to define. This difficulty is manifested in the works of various authors who used different variables (e.g., total assets, deposits, loans) to represent bank outputs. A number of economists pointed out that deposit liabilities and earning assets are the appropriate representations of bank outputs since they constitute a greater part of the services which banks provide for both depositors and borrowers. In this connection, Benston (1965) and Bell and Murphy (1968) proposed to classify bank outputs according to the following relatively homogeneous services; demand deposits, time deposits, real estate loans, installment loans, business loans and securities.

Sealey and Lindley (1977), however, argued that only earning assets can be considered as bank outputs and that deposits are strictly bank inputs. Accordingly, the inclusion of deposit liabilities as bank outputs resulted from the failure of previous authors to distinguish between production in the technical sense and production in the economic sense.[2] In technical production, a firm combines inputs and, through some transformation process, generates other goods or services regardless of the standard of value used to measure the latter. Thus, Sealey and Lindley categorized the services technically produced by a commercial bank into: (1) administration of the payments mechanism for demand deposit customers; (2) intermediation services to depositors and borrowers; and (3) other

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1. For example, see Lamberte (1982) and Sealey and Lindley (1977).
2. These concepts are discussed in Frisch (1965).

services such as trust department activities, portfolio advisory services, etc.

On the other hand, production in the economic sense involves the firm's attempt to create a product which is more highly valued than its original inputs. All the technical outputs, then, are not necessarily economic outputs. For a bank, only economic outputs can be strictly considered as outputs.

> Specifically, because of institutional arrangements and market conditions under which a financial firm operates, only those services associated with the acquisition of earning assets are products more highly valued in the market than the original inputs.
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> The services received by depositors of financial firms are more appropriately associated with the acquisition of economic inputs since these require the financial firms to incur positive costs without yielding direct revenue (Sealey and Lindley 1977, p. 1253).

Definitely, banks incur positive costs on savings and time deposits since they do not collect any service charges from such accounts. This is true of U.S. and Philippine commercial banks. In a sense, therefore, both can be considered bank inputs. This conclusion, however, is not applicable in the case of demand deposits, since banks earn from service charges and penalties collected from such accounts. There is overwhelming evidence that U.S. commercial banks indeed incur positive costs on demand deposits. For example, Hester and Zoellner (1966) and Ratti (1980), using a statistical accounting technique to estimate net rates of return on the elements of bank portfolio, obtained results indicating that banks realized negative rates of return on demand deposits. Studies using the Functional Cost Analysis technique also showed the same results. These imply that the service charges collected by U.S. banks from depositors on demand deposit accounts are not sufficient to cover the cost of services. Thus, demand deposits can also be considered bank inputs.

Unfortunately, no study has ascertained whether Philippine commercial banks also incur positive costs on demand deposit accounts. It is then necessary to provide such information in order to properly delineate bank outputs and inputs. The statistical revenue-cost accounting technique presented here is utilized for this purpose. Interestingly, the results do not only aid us in appropriately classifying bank outputs and inputs; they also give us information on the net

rates of return on the elements of bank portfolio.[3]

II. THE STATISTICAL REVENUE-COST ACCOUNTING MODEL

Commercial banks incur costs for the use of funds and realize some returns on their assets. The statistical accounting technique[4] allocates revenue and cost among the elements of bank portfolio. In the model, the gross revenue earned by banks is assumed to be a linear function of the elements of the porfolio. That is,

$$Y_i = y_o + \sum_j y_j X_{ji} \tag{1}$$

where Y_i = gross income of the ith bank,
o = the revenue not associated with any of the elements in the portfolio (balance sheets),
y_j = the gross rate of return on the jth element in the portfolio, and
X_{ji} = the book value of the jth element in the portfolio for the ith bank.

Total cost is also written as a linear function of the elements of bank portfolio. Thus,

$$C_i = b_o + \sum_j b_j X_{ji} \tag{2}$$

where C_i = the total current operating cost for the ith bank,
b_o = cost not associated with any of the elements in the porfolio, and
b_j = the rate of cost on the jth element in the portfolio.

Since we are interested in the net rates of return on the various elements of bank portfolio, we subtract (2) from (1). This gives

3. A number of studies have pointed out in a more impressionistic manner the relative differences among net rates of return on the various elements of bank portfolio (for example, short- versus long-term loans, or secured versus unsecured loans), and also indicated their corresponding policy implications (see, for example, the Joint IMF/WB Report of 1980). However, no empirical study to date has shown estimates of the net rates of return on such assets.

4. This model is based on Hester and Zoellner (1966). See also Bond (1971), Longbrake (1973, 1976) and Meyer and Kraft (1961).

$$\bar{R}_i = \bar{r}_o + \sum_j \bar{r}_j X_{ji} \qquad (3)$$

where $\bar{R}_i = Y_i - C_i =$ net income for the ith bank,
$\bar{r}_j = y_j - b_j =$ net rates of return on the jth element in the portfolio, and
$\bar{r}_o = y_o - b_o =$ net fixed revenue that does not vary with any of the elements of the bank's porfolio.

Equation (3) provides estimates of net rates of return (cost) of assets (liabilities). It is expected that the coefficients of the asset items are nonnegative and those of the liability items, nonpositive.

The interpretation of the coefficients of equation (3) requires some clarifications. Hester and Pierce (1975) proposed to interpret the coefficients as the marginal return which an average sample bank would earn if it could substitute a dollar of asset or liability for a dollar of vault cash. Ratti (1980), on the other hand, argued that this interpretation is incorrect. He pointed out that under a balance sheet constraint a dollar increase in loans will indeed result in an increase in expected income, but that this will drain reserves by an equal amount, thereby increasing the expected cost of short-term borrowing. Similarly, a dollar increase in deposits will raise the cost of servicing them, though this will also reduce the expected cost of borrowing. Ratti then suggested that the coefficients should be interpreted as the marginal return or implicit rate of return of an asset or liability item adjusted by the marginal cost and probability of short-term borrowing. Ratti's interpretation seems more intuitive, and, more importantly, it rests on a solid theoretical ground of bank behavior which is lacking in Hester-Pierce's interpretation. This study, therefore, adopts Ratti's interpretation of the coefficients of X_{ji}. In subsequent discussions, the coefficients shall be alternatively called marginal returns, implicit rates of return or net rates of return, keeping in mind Ratti's interpretation.

III. ESTIMATION PROCEDURE

The dependent and independent variables included in the model are listed in Table 1. Three alternative measures of income are considered in this study, namely: (1) net current operating income, (2) net income before taxes, and (3) net income after tax.

TABLE 1
LIST OF VARIABLES INCLUDED IN THE MODEL FOR RATES OF RETURN ON THE ELEMENTS OF BANK PORTFOLIO

Symbol	*Variable definition*	*Means*	*Standard deviations*
	A. Dependent Variables		
R^1	Net current operating income	.0154	.0162
R^2	Net income before taxes	.0152	.0146
R^3	Net income after taxes	.0130	.0131
	B. Independent Variables		
A_0	Reciprocal of total assets	.0008	.0006
A_1	Deposits with banks	.1008	.0450
A_2	Trading account securities	.0678	.0488
A_3	Investments in bonds	.1252	.0674
A_4	Unsecured loans	.2405	.1220
A_5	Loans secured by real estate	.1384	.0776
A_6	Other secured loans	.1329	.0323
A_7	Demand loans	.0667	.0499
A_8	Short-term loans	.3817	.1104
A_9	Long-term loans	.0621	.0567
A_{10}	Equity investments in allied undertakings	.0014	.0017
A_{11}	Bank's properties	.0311	.0143
A_{12}	Other assets	.0528	.0769
L_1	Demand deposits	.1264	.0396
L_2	Savings deposits	.2285	.0965
L_3	Time deposits	.1748	.0908
L_4	Bills payable	.2266	.1239
L_5	Marginal deposits	.0471	.0192
L_6	Other liabilities	.0702	.0366

Net current operating income is defined as total current operating income *minus* total current operating expenses. Net income before taxes is net current operating income *plus* recovery on charged-off assets, income from assets acquired, profit from assets sold/exchanged, reduction in allowances for probable losses, and miscellaneous income *minus* losses on charged-off assets, loss from assets sold/exchanged, additions to allowance for probable losses, and

other miscellaneous losses.[5]

Net income after taxes is calculated by deducting income taxes paid from net income before taxes.

These alternatives measures of income are included to determine which has the most stable relationship to portfolio variables. It is well-known that net income before taxes reflects the results of a number of nonrecurring and nonoperating transactions and other arbitrary accounting decisions, such as adjusting allowances for probable losses, writing off loans, etc. The same difficulties are also encountered when net income after taxes is used. In contrast, net current operating income is free of these difficulties. It is therefore expected that the latter is likely to have the most stable relationship to portfolio variables.

Note that cash reserves, defined as cash on hand, checks and other cash items, are excluded from the model. The reason for their exclusion is that the balance sheet constraint needs to be satisfied always so that if there are any changes in any of the asset liability items, cash reserve could be adjusted accordingly.[6] This is required in order to be consistent with our interpretation of the coefficients.

Trading account securities are treated separately from investments in bonds. The former include government securities purchased, government and private securities purchased under resale agreements, government and private securities sold under repurchase agreements, and government and private securities purchased under certificates of assignment/participation with recourse and commercial papers primarily held by banks for their trading activities. The latter consist of investments in private and government bonds and other debt instruments carried by banks which are not for trading purposes. Most of these are treasury bills/notes and certificates of indebtedness issued by the government, its political subdivisions and instrumentalities, and/or corporations owned and/or controlled by the government. These may form part of the bank's reserve against deposit liabilities.

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5. Thirty out of 81 observations have net income before taxes greater than net current operating income. This is mainly due to the fact that their reported recoveries on charged-off assets and profit from assets sold/exchanged exceed the losses on charged-off assets and losses from assets sold/exchanged during the accounting period.

6. It is, of course, implied here that banks are operating under the fractional reserve system.

Following Hester and Zoellner (1966), we deflate all variables in (3) by total assets.[7] The equation to be estimated is

$$R_i = a + r_o A_{oi} + \sum_j r_j X^*_{ji} + w_i \qquad (4)$$

where TA_i = total assets of the ith bank,
$R_i = \bar{R}_i/TA_i$,
A_{oi} = a scale variable given by the reciprocal of the total assets of the ith bank, i.e., $1/TA_i$,
$X^*_{ji} = X_{ji}/TA_i$,
r_o = coefficient of the scale variable,
a = the constant term,
r_j = net rate of return on the jth element in the portfolio, and
w_i = the stochastic disturbance term.

To estimate the parameters of equation (4) using the combined cross-section and time-series data, we will use the error components model.[8] This model assumes that the regression error is composed of three independent components — one associated with time, another with the cross-sectional units, and a third being an overall component variable both in the time and cross-sectional dimension. The choice of the error components model is determined by the need to have efficient estimators of the parameters. The latter are obtained by weighting the observations in inverse relationships to their variances.[9]

Two alternative models are tested, namely, Model I and Model II. Both models have basically the same variables except that the former classifies loans according to securities, and the latter, according to maturities.

Since there are three alternative measures of income, three submodels are considered under Models I and II. This raises the number of equations to be estimated to six.

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7. See also Ratti (1980).

8. This model is discussed extensively in economic literature. For example, see Mundlak (1978), Wallace and Hussain (1969), Medalla (1971), Nerlove (1971a, 1971b), and Fuller and Battese (1974).

9. The TSCSREG Procedure of the Statistical Analysis System (SAS) package is used to estimate the parameters of (4). It follows the algorithm suggested by Fuller and Battese (1974).

Two options are considered for each equation. The first includes the intercept term while the second suppresses it. All intercept terms are, however, found to be statistically insignificant. Therefore, only the results of the second option are discussed.

IV. ESTIMATED NET RATES OF RETURN

The independent variables are first checked for possible multicollinearity problem. Such problem does not exist as may be gathered from the correlation matrix.

Table 2 presents the results of the regression runs. It should be recalled that the coefficients are interpreted as marginal return (alternatively, implicit rates of return, net spread, net rates of return) adjusted by the marginal cost and probability of short-term borrowing.

The coefficient of deposits with other banks (A_1) is statistically not different from zero. This holds true for all the six submodels. It means that banks do not earn a positive net return on their deposits with other banks. It should be noted that banks generally keep this asset mainly to complement cash in vault as primary reserves and/or for check clearing purposes.

Another variable which consistently yields a statistically insignificant relationship with bank income is trading account securities (A_2). Banks, however, regard this asset as relatively less important in view of its average share to total assets.[10] Moreover, banks hold trading securities primarily to accommodate any temporary excess liquidity. Emprically, therefore, trading securities are not an important source of income.

Investments in bonds (A_3) yield a positive net rate of return as generally expected. The attractiveness of this asset lies in its fairly reasonable net rate of return of not less than 5 percent per annum, and it is relatively less risky compared with loans.[11] In addition, it may form part of total reserves, and may also serve as a substitute for agricultural loans as provided for by P.D. 717. The latter are generally regarded as a high-risk, low-yielding type of asset.[12]

The estimated net rate of return on investments appears to be

10. The thinness of trading securities held by banks indicates that banks are not actively trading securities.

11. During the period of analysis, the unweighted average gross yields on CBCIs, Treasury Bills and DBP bonds were 11.28 percent, 11.23 percent and 12.43 percent, respectively.

12. See Villanueva and Saito (1978).

TABLE 2
ESTIMATED NET RATES OF RETURN ON THE ELEMENTS OF BANK PORTFOLIO
(Using the Fuller and Battese Method)

Independent Variables \ Dependent Variables	Model I			Model II		
	R^1	R^2	R^3	R^1	R^2	R^3
A_0	−9.5660	−3.9016	−4.1089	−8.4316	−3.1355	−3.5458
	(−3.26)*	(−1.51)	(−1.92)***	(−2.81)*	(−1.18)	(−1.62)
A_1	.0333	.0286	.0259	.0376	.0304	.0275
	(1.37)	(1.16)	(1.17)	(1.51)	(1.21)	(1.22)
A_2	.0274	.0194	.0260	.0041	.0144	.0232
	(.34)	(.87)	(1.30)	(.19)	(.64)	(1.15)
A_3	.0585	.0645	.0745	.0753	.0765	.0829
	(2.10)**	(2.59)**	(3.49)*	(2.88)*	(3.13)*	(3.97)*
A_4	.0488	.0565	.0559			
	(3.50)*	(4.47)*	(5.28)*			
A_5	.0388	.0414	.0347			
	(2.18)**	(2.38)**	(2.291)**			
A_6	.0112	.0170	.0205			
	(.71)	(1.12)	(1.56)			
A_7				0217	.0460	0487
				(.87)	(1.88)***	(2.31)**
A_8				.0430	.0497	.0500
				(3.54)*	(4.26)*	(4.97)*
A_9				.0210	.0190	.0180
				(1.06)	(.99)	(1.07)
A_{10}	−.0684	.1591	−.0679	−.3814	−.0809	−.3046
	(−.08)	(.20)	(−.10)	(−.45)	(−.10)	(−.45)

Table 2 (Continued)

Independent Variables \ Dependent Variables	Model I R^1	Model I R^2	Model I R^3	Model II R^1	Model II R^2	Model II R^3
A_{11}	−.0194	−.0634	−.0934	.0442	−.0010	−.0187
	(−.18)	(−.63)	(1.10)	(.41)	(−.01)	(−.23)
A_{12}	−.0158	−.0173	−.0111	−.0204	−.0226	.0157
	(−.95)	(−1.05)	(−.76)	)−1.23)	(−1.37)	(−1.08)
L_1	.1048	.0930	.0574	.0853	.0762	.0406
	(3.39)*	(3.19)*	(2.29)**	(2.64)*	(2.48)**	(1.54)
L_2	−.0708	−.0642	−0527	−0704	−.0683	−.0610
	(−3.46)*	(−3.52)*	(−3.31)*	(−3.86)*	(−3.82)*	(−(3.92)*
L_3	−.0289	−.0300	−.0232	−.0320	−.0345	−.0273
	(−1.68)***	(−1.79)***	(−1.58)	(−1.81)***	(−2.02)**	(−1.84)***
L_4	−0151	−.0274	−0240	−.0199	−.03345	−.0302
	(−1.07)	(−2.09)**	(−2.15)**	(−1.35)**	(−2.44)**	(−2.60)**
L_5	−.0261	−.0244	−.0512	−.0267	−.02276	−.0466
	(.37)	(.36)	(−.87)	(−.37)	(−.32)	(−.76)
L_6	.0413	.0306	.0223	.0444	.0358	.0275
	(1.37)	(1.00)	(.82)	(1.42)	(1.12)	(.97)
Variance component for Cross section	.00006067	.00003310	.00001846	.00005777	.00003461	.00001974
Variance component for time series	.00000931	.00000635	.0000052	.00000962	.00005584	.00000425
Variance component for error	.00002366	.00003107	.00002878	.00002465	.00003137	.00002906
Transformed reg. M.S.E.	.00003143	.00003784	.00003300	.00003337	.00039013	.00003382

Note: *Significant at .01 level. **Significant at .05 level. *** Significant at .10 level.

slightly higher if income is defined as net income before taxes than when it is defined as net current operating income. The difference suggests the magnitude of capital gains realized by banks on bonds. Thus, the average capital gain on bonds is about .60 percent per annum under Model I, and about .12 percent per annum under Model II.

Both unsecured loans (A_4) and loans secured by real estate (A_5) give positive net rates of return. As expected, the former yield relatively higher marginal returns than the latter. The difference in their net yields may be regarded as a premium for risk-taking since unsecured loans are riskier than loans secured by real estate.

Again, the estimated net rates of return on unsecured loans and loans secured by real estate are observed to be slightly higher if income is defined as net income before taxes than if it is defined as net current operating income. The difference suggests that banks made excessive write-offs on loans, particularly unsecured loans, in the previous years. Thus, during the period of analysis, the estimated net gain from recoveries on charged-off loans is .77 percent per annum for unsecured loans and .26 percent per annum for loans secured by real estate.

The coefficient of other secured loans (A_6) is relatively small and statistically not different from zero. This type of loan, therefore, does not significantly contribute to the bank's net income.

When bank loans are classified according to maturity, demand loans (A_7) and short-term loans (A_8) appear to be significantly correlated with bank income. They have approximately the same estimated net rates of return of about 5 percent per annum if bank income is defined either as net income before tax or as net income after tax. However, the coefficient of demand loans is not statistically significant if bank income is taken as net current operating income.

Table 2 discloses higher estimated net rates of return on demand and short-term loans if bank income is defined as net income before tax than when it is taken as net current operating income. Thus, the effect of arbitrary accounting decision, such as excessive write-offs on loans made by banks, is also reflected in Model II.

The relatively small and statistically insignificant coefficient of long-term loans (A_9) indicates that banks do not realize a positive return on this asset. Apparently, banks are not efficient producers of long-term loans. This explains in part why banks prefer loans of shorter maturity.

Of interest is the finding that the estimated net rates of return on loans (classified either according to securities or maturities) are considerably lower than those on investments in bonds. Since banks are primarily lenders, it is but natural to expect that the marginal return on loans will be higher than that on investments in bonds. This is further reinforced by the substantially higher gross yields (interest plus commissions, premiums, fees and other charges on loan transactions) on loans than on bonds and securities. The results seem to indicate that transaction costs significantly determine the relative net rates of return on investments in bonds and on loans. It is common knowledge that transaction costs of loans are higher than those on investments in bonds. Indeed, the magnitude of the difference between their net spreads makes investments in bonds far more lucrative than loans.

In general, results show that commercial banks in the Philippines would realize a net spread of 3.5 to 5.0 percent per annum on loans, depending on the type of loans and on the manner of defining bank income. Unfortunately, no study in the Philippines has provided any estimates of net spread on loans with which our estimates may be compared. Recently, PNB has indicated that, for an effective lending rate of 19.15 percent per annum, the ideal spread is 3.15 percent (*Daily Express,* 31 August 1981).[13] Although our estimates are slightly higher than those of PNB, they are nonetheless deemed plausible. PNB's lower estimate may be attributed to certain factors. One is that it is financing government high priority projects usually involving higher transaction costs. Another is that its effective lending rate is usually lower than that of ordinary private commercial banks.

Allegedly, the large spread between regulated deposits and loan rates allows banks to enjoy a substantially comfortable profit margin.[14] To verify this, we compared our estimates of net rates of return on loans with those obtained by Ratti (1980) for a sample of U.S. banks believed to be operating under a more competitive market structure. Although Ratti's classification of loans differs from ours, a meaningful comparison can still be made. The results from

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13. The method used to arrive at this figure was not given, however. Presumably, PNB was using the standard accounting procedure commonly used by banks to arrive at the net spread. It was not also made clear whether this holds true for all types of loans.

14. See the ILO Report (1974).

TABLE 3
A COMPARISON OF THE ESTIMATED NET RATES OF RETURN OBTAINED BY U.S. AND PHILIPPINE COMMERCIAL BANKS ON DIFFERENT TYPES OF LOANS
(in percent)

Ratti's study[a]		*This study*[b]	
Real estate loans	2.27	Unsecured loans	5.59
Commercial and Industrial loans	1.87	Loans secured by real estate	3.47
Loans to consumers	1.86	Demand loans	4.87
Loans to farmers	2.55	Short-term loans	5. 0

Sources: a. Table 1 of Ratti's study (1980).
b. Table 2 of this study.
Note: The dependent variable is net income after tax.

Table 3 seem to corroborate the said allegation. While U.S. banks earn a razor-thin rate of return on loans, Philippine commercial banks realize a much larger spread. Even PNB's ideal net spread may be considered high compared to what an average U.S. bank could obtain.

The other asset items mentioned in Table 2 do not significantly contribute to bank income.

The results shown in Table 2 reveal that, except for the third submodel under Model II, the coefficient of demand deposits (L_1) is statistically significant and positive for all submodels. This implies that banks realize a positive implicit return on such accounts. This is indeed contrary to our *a priori* expectation and to the findings of similar studies done in the U.S.[15]

Before making any conclusion, it is necessary to check further our results. It is to be noted that total loans were subdivided into several categories. The latter were used as independent variables in

15. See Hester and Zoellner (1966) and Ratti (1980).

the model. However, demand deposits may be highly correlated with total loans but not with the different types of loans. This may have a bearing on the results we obtained, that is, the use of the different types of loans may have made demand deposits represent total loans; hence, the positive coefficient for demand deposits.

It is, therefore, hypothesized that demand deposits would yield a negative coefficient if total loans were used in the model instead of the different types of loans. This hypothesis was tested by estimating equation (4) again, but this time total loans appear as one of the independent variables instead of the different types of loans. A positive sign is still obtained for the coefficient of demand deposits. This implies that the hypothesis stating that demand deposits would yield a negative coefficient if total loans were used instead of the different types of loans should be rejected. Indeed, the findings clearly indicate that servicing demand deposit accounts is a relatively important net income earning activity of Philippine commercial banks.

An explanation regarding the positive net rate of return on demand deposits is in order. The costs which commercial banks incur in attracting depositors consist of explicit and implicit interest. The latter refers to the implicit resource costs (e.g., cost of capital, labor and materials) incurred in the process of servicing deposit accounts. At present, banks are prohibited by law to pay explicit interest on demand deposits. Nevertheless, they pay implicit interest on such accounts.

Banks may collect explicit service charges for demand deposit accounts. In addition, they usually require their customers to maintain a minimum balance of ₱500 on their demand deposits. The said minimum balance carries with it foregone earnings which bank deposits could earn if they were invested in interest-earning assets. The foregone earnings are actually the price paid by depositors for the services rendered to them by banks. They may also be regarded as the implicit service charge collected by banks for servicing demand deposits.

Customers are heavily penalized if their outstanding current account falls below ₱500 and/or if they issue checks without sufficient funds. Starting 2 May 1979, the monthly service charge on balances below the minimum was pegged at ₱5.00, while the penalty rate for issuing checks without sufficient funds was set at ₱25.00 per day for every ₱50,000. These may be considered explicit service charges which banks collect from erring depositors. Total service charges,

then, are the sum of implicit and explicit service charges.

Thus, the result showing a positive net rate of return on demand deposits indicates that total service charges exceed the cost of servicing such accounts.

As expected, the coefficient of savings deposits (L_2) is negative and statistically significant for all submodels. The estimated net cost of savings deposits is between 5 and 7 percent per annum, depending on the measure of bank income used. This is more or less the same as the interest rate on savings deposits prevailing during the period under study.[16]

The estimated marginal costs of time deposits (L_3) and borrowed funds (L_4) are about 2 to 3 percent per annum. Interestingly, these estimates are approximately one-half of the estimated marginal cost of savings deposits. The relatively low estimated marginal costs of time deposits and borrowed funds may be attributed to certain factors. One is that larger unit sizes of these funds are usually contracted by banks, thereby reducing transaction costs.[17] Another is the lower turnover rates of these funds besides their more predictable withdrawals since they have fixed maturity dates.[18] This reduces the cost of adjusting reserves to avoid the penalty of having deficits in reserves. In contrast, savings deposits are usually of smaller unit sizes and have higher turnover rates. This increases both transaction costs and the marginal cost and probability of short-term borrowing.

Marginal deposits (L_5) and other liabilities (L_6) do not have any significant effect on bank income.

The three measures of income, namely, current operating income (R^1), net income before tax (R^2) and net income after tax (R^3), appear to have equally stable relationships with the portfolio variables. This may be due to the fact that these three alternative measures of income are not significantly different from one another. Hence, any one of these three measures of income may be used in

16. It should be noted that the interest rate on savings deposits was pegged at 6 percent per annum for quite a time. It was first raised to 7 percent per annum in September 1979, then to 9 percent per annum in December 1979 (cf. C.B. Circular Nos. 696 and 706). The ceiling was finally lifted in July 1981 (cf. C.B. Circular No. 777).

17. The monetary authorities actually set the minimum size of time deposits at ₱100.00 and deposit substitutes at ₱50,000.00.

18. Time deposits have a maturity of not less than 90 days, whereas deposit substitutes have usually a maturity of 30-60 days (see Joint IMF/CBP Banking Survey Commission, 1977).

estimating the implicit rates of return on the various elements of bank portfolio.

The statistical model for estimating the net rates of return on the various elements of bank portfolio appears to be generally plausible. However, caution should be exercised in using the results of the model as basis for making decisions. The obvious weakness of the model is that the estimates may suffer from the vagaries of statistical accounting analysis, especially if a very substantial proportion of joint costs which cannot be easily allocated to any particular bank activity exists. Nonetheless, the approach used in this study is deemed far superior to the ordinary cost accounting method.

Going back to the original purpose of this exercise, we note again that banks earn negative implicit returns on savings and time deposits. This is consistent with *a priori* expectations and the evidence provided by studies in the U.S. However, a rather unexpected result demonstrated in this study is that the Philippine commercial banks earn a positive implicit return on demand deposits. It therefore indicates that servicing demand deposit accounts is a direct income-earning endeavor of commercial banks. In other words, banks successfully create this product which is more highly valued than the original input elements. By using the criteria set by Sealey and Lindley (1977), demand deposits, therefore, can be considered as bank output in addition to the bank's earning assets and other income-earning services, such as trust department activities, issuance of letters of credit, etc.

REFERENCES

Bell, F. W., and Murphy, N. B. "Economies of Scale and Division of Labor in Commercial Banking." *Southern Economic Journal* 35 (1968).

Benston, George J. "Interest Payments on Demand Deposits and Bank Investments Behavior." *Journal of Political Economy* 72 (1965).

Bond, R. "Deposit Composition and Commercial Bank Earnings." *Journal of Finance* 26 (1971).

Frisch, Ragnar. *Theory of Production.* Chicago: Rand McNally and Co., 1965.

Fuller, Wayne A., and Battese, George E. "Estimation of Linear Models with Crossed-Error Structure." *Journal of Econometrics* 2 (1974).

Hester, Donald D., and Pierce, J. L. *Bank Management and Portfolio Behavior.* Hew Haven, Connecticut, 1975.

Hester, Donald Do., and Zoellner, John F. "The Relations Between Bank Portfolios and Earnings: An Econometric Analysis." *Review of Economics and Statistics* 48 (1966).

International Labour Office. *Sharing in Development: A Programme of Employment, Equity and Growth for the Philippines.* Manila: National Economic and Development Authority, 1974.

Joint IMF/CBP Banking Survey Commission. *Technical Survey of the Philippine Financial System.* Mimeographed. 1977.

Lamberte, Mario B. "Behavior of Commercial Banks: A Multi-product Joint Cost Function Approach." Ph. D. dissertation, University of the Philippines, 1982.

Longbrake, William A. "Commercial Bank Capacity to Pay Interest on Demand Deposits, Part II: Earnings and Cost Analysis." *Journal of Bank Research* (1976).

Longbrake, William A. "Statistical Cost Analysis." *Financial Management* 2 (1973).

Madalla, G. S. The Use of Variance Components Models in Pooling Cross Section and Time Series Data." *Econometrica* 39 (1971).

Meyer, John R., and Fraft, Gerald. "The Evaluation of Statistical Costing Techniques as Applied in the Transportation Industry." *American Economic Review* 51 (1961).

Mundlak, Yair. "On the Pooling of Time Series and Cross Section Data." *Econometrica* 46 (1978).

Nerlove, Marc. A Note on Error Components Models." *Econometrica* 30 (1971).

————. "Further Evidence on the Estimation of Dynamic Relations from a Time Series of Cross Sections." *Econometrica* 39 (1971).

Ratti, Ronald A. "Bank Attitude Towark Risk, Implicit Rates of Interest, and the Behavior of an Index of Risk Aversion for Commercial Banks." *Quarterly Journal of Economics* 95 (1980).

Sealey, C. W. Jr., and Lindley, James T. "Inputs, Outputs, and a Theory of Production and Cost of Depository Financial Institutions." *The Journal of Finance* 32 (1977).

Villanueva, Delano P., and Anderson Saito, Katrine. "Transaction Costs of Credit to the Small-Scale Sector in the Philippines." *Document of International Monetary Fund.* December 1978.

Wallace, T. D., and Hussain, Ashiq. "The Use of Error Components Models in Combining Cross Section with Time Series Data." *Econometrica* 37 (1969).