

Impact of Asset and Liability Management on Profitability: A study on public vs private commercial banks in Bangladesh

Muhammad Abu Sayeed* and Mohammad Ziaul Hoque**

1.1 Introduction

Banks' profitability is of utmost concern in modern economy. Banks are in a business to receive deposits or liabilities and to issue debt securities on the one hand and create or invest in assets on the other hand (Fama, 1980). Commercial Banks¹ incur costs for their liabilities and earn income from their assets. Thus profitability of banks is directly affected by management of their assets and liabilities. In addition, different market and macroeconomic factors also influence the ability of the banks to make profits (Short, 1979; Molyneux and Thornton, 1992; Athanasoglou et al, 2008). The asset and liability base of banks in developing countries are narrower than their counterparts in developed countries. This study examines how asset and liability management together with external variables such as degree of market concentration and inflation rate impact the profitability of selected commercial banks in Bangladesh. Although impact of the management of banks' asset and liability on their profitability has been studied by a number of researchers (Hester & Zoellner, 1966; Kwast & Rose, 1982; Vasiliou, 1996; Kosmidou et al, 2004; and Asiri, 2007), the issue of banks' profitability in developing countries has received scant attention from the researchers. This study is an attempt to close this gap, to bring the issues of banks' assets and liability management in developing countries squarely into focus for assisting better performance of the under-performing banks in these countries. As such, the objective of this study is to complete this gap and to provide suggestions for improving banks' profitability through better asset and liability management in Bangladesh.

This study deals with the impact of Asset and Liability Management (ALM) on the profitability of the sixteen Bangladeshi Commercial banks (BCBs) classified into private and public BCBs. A modified Statistical Cost Accounting (SCA) model is applied to test whether the ALM of the private sector banks are better than public sector banks.

This research makes significant contributions to the literature relating to banks' assets and liability management. First of all, this research examines the factors that are responsible for differences between returns from assets and cost on liabilities experienced by banks in a developing country. Secondly, it identifies the reasons for relatively higher level of profitability for private-sector banks compared to public-sector banks which, with the backing of the government, exert much influence in the banking sector in developing countries.

*Jahangirnagar University, Dhaka, Bangladesh

** Monash University, Melbourne, Australia

¹ Commercial banks are treated as trading banks in some countries.

Apart from introductory section this study is presented in five sections. Section two provides an overview of the commercial banking sector in Bangladesh. Section three reviews the literature relating to banks' asset and liability management and their impact on banks' profitability. Section four deals with data, sampling and methodology applied to this study. Section five provides results of the empirical research. Section six contains summary of the study.

2.0 Banking Sector of Bangladesh

Banking sector in Bangladesh is constituted by 4 Nationalized Commercial Banks (NCBs), 5 Development Financial Institutes (DFIs), 29 Private Commercial Banks (PCBs) and 10 Foreign Commercial Banks (FCBs). The NCBs were dominant players until mid-1990s and since then PCBs emerged as the visible player in the market. The PCBs were found to be more profitable as indicated by higher ROA than NCBs. Another problem is the governance of the banking sector in Bangladesh where bank's Board of Directors (BODs) is constituted by the inexperienced persons having no or little exposures to banking operations. However, PCBs and FCBs were better managed than NCBs which are controlled by the bureaucrats. The persistent decline of NII indicates the inefficient management of the assets and liabilities by the NCBs which collectively own nearly 40 percent of the total industry assets. At the same time, liability management by the PCBs and FCBs has been inefficient since these banks are ravaged by persistent excess liquidity at the cost of their profitability.

3.0 Literature Review

A number of authors (Hester & Zoellner, 1966; Kwast & Rose, 1982; Vasiliou, 1996; Kosmidou et al, 2004; and Asiri, 2007) have studies about the influence of the composition of assets and liabilities on the profitability of bank. Hester & Zoellner (1966) employed statistical cost accounting (SCA) method on US banks and found statistically significant coefficients for most of the categories of assets and liabilities and rejected the null hypothesis that there is no relationship between them. Vasiliou (1996), by employing SCA method, suggest that asset management rather than liability management play more prominent role in explaining inter-bank differences in profitability. However, these findings contrast with the findings of Kosmidou et al (2004) who find that liability management contributes more in creating the profitability differences among the banks.

These authors did not incorporate the variables relating to macro economic and market structure in their model. In fact, a number of bank specific or macroeconomic factors such as market structure, Inflation, gross domestic product (GDP) growth rate, etc do impact bank's net earnings which were ignored by these authors. With this view, Kwast & Rose (1982) expanded the traditional SCA model by including market structure and macro economic variables. Nonetheless, their model found no evidence that differential returns and costs on different categories of assets and liabilities exist between high and low profit banks. In a recent study, Asiri (2007) has applied SCA method and finds that

assets are positively and liabilities are negatively related to the profitability of the Kuwaiti banks.

4.1 Methodology: The Traditional Model

Statistical Cost Accounting (SCA) model is described by Hester & Zoellner (1966) as a regression method by which “rates of return are imputed to earning assets and deposit liabilities” (p. 373). The current study adopts the SCA model with some modification proposed by Kwast & Rose (1982). This research endeavours, for the first time, to apply this model in modified form to examine the impact on ALM on the profitability of the commercial banks in Bangladesh

A bank earns revenue from many sources and prominent of these are interest income, service fees and commissions from its assets and income from using liabilities. On the other hand, costs of banks are also sourced from bank’s assets and liabilities. These expenses include interest expenses on deposits, other liabilities and administrative expenses. Now, if we subtract operating costs from operating revenues we will get net operating income for the banks.

Thus variations in banks’ net operating income, Y_{bt} can be expressed for bank b and time t in terms of variations of assets and liabilities in the following way:

$$Y_{bt} = \alpha_1 + \sum \alpha_{2i} A_{ibt} + \sum \alpha_{3j} L_{jbt} + e_{bt} \quad \text{---(1)}$$

Where,

A_i = i th asset

L_j = j th liability

α_1 = net fixed income that is not dependent on assets and liabilities.

e_{it} = stochastic term

α_{2i} = marginal rates of return on assets

α_{3j} = marginal costs of liabilities.

As banks have wide variations in their business volume, all the variables of equation (1) are divided by a bank’s average total asset (TA_{bt}) (Kosmidou et al, 2004). Thus equation (1) takes the form of:

$$Y_{bt} / A_{bt} = \alpha_1 / TA_{bt} + \sum \alpha_{2i} A_{ibt} / TA_{bt} + \sum \alpha_{3j} L_{jbt} / TA_{bt} + u_{bt} \quad \text{----(2)}$$

Where, the stochastic term $u_{bt} = e_{bt} / TA_{bt}$

4.2 The Modified Model

The structure of the traditional SCA model implies that all banks experience identical interest rates on bank's assets and liabilities. In reality, a number of factors may affect bank's earning and costs relating to assets and liabilities. These factors are market structure and macroeconomic conditions. If these factors are not included in the model, regression results will be unreliable and coefficients will be biased. Kwast & Rose (1982) incorporated the influences of these factors and presented a modified model as equation 3. This modified model is adopted to study, for the first time, selected commercial banks in Bangladesh.

$$Y_{bt}/A_{bt} = \alpha_1/TA_{bt} + \sum \alpha_{2i}A_{ibt}/TA_{bt} + \sum \alpha_{3j}L_{jbt}/TA_{bt} + \sum \alpha_4H_t + \sum \alpha_{5f}M_{ft} + u_{bt} \quad \text{-----}(3)$$

Where

H = Herfindahl Index of market concentration associated with each bank

M = Inflation as a binary variable for number of years.

The Herfindahl Index is the sum of the squared market shares of the firms in the market. Pasiouras and Kosimidou (2007) found a direct relationship between market concentration and firm profitability. Thus, the inclusion of H in the model helps to assess the influence of local market concentration on bank earnings.

Oguzsoy and Guven (1997) found that banks' profitability is adversely affected by inflationary situation which make banks vulnerable to default risk, interest rate risk and liability risk. Due to onslaught of so many risks, bank may face a huge amount of loss in a variable inflationary environment. Since inflation is one of the most important macroeconomic variable that impact bank's profitability, it is included in the model as a binary variable (M) in equation (3).

This study conducts two different regressions for each set of bank by assuming two income measures as dependent variables: total operating income ($Y1_{bt}$), and net operating income ($Y2_{bt}$).

When total income ($Y1_{bt}$) is the dependent variable in the first regression, each element of α_{2i} should approximate the market rate of return earned on the appropriate asset and should have a positive value. At the same time α_{3j} , the return on liability, should also be positive or zero, since it is customary that banks impose service charges on deposit accounts and other non-deposit liabilities. The α_1 coefficient, the constant term, will measure income flows that are unrelated to balance sheet items. In the total income regression, α_1 is expected to be positive.

Net operating income ($Y2_{bt}$) is the portion of total income that is left out after deducting operating costs from the total income. Thus, when this variable provides the income measure in the second regression, the α_{2i} estimates net rates of return on assets. Similarly, the liability coefficients may be interpreted as the marginal cost of a particular liability. The sign of each α_{3j} should, therefore, be negative or zero because operating costs are generally higher than the service charges earned from the deposits. The α_1 coefficient reflects net operating income (costs) which are related to off-balance sheet items. Thus

the sign of α_i may be positive or negative. Moreover, since α_i reflects a net income variable, it may be interpreted as a measure of economies of scale (Kwast & Rose, 1982). Since any differences between the coefficients of these two regressions are the operating costs, comparisons between the two sets of regressions should provide insight regarding operating costs per portfolio item.

This study does not use net income after tax as a dependent variable as tax rate is fixed by the government from time to time and not influenced by ALM. All assets and liabilities are not included as independent variables in this model to avoid perfect co-linearity within the independent variables. Hence, 'cash' and 'fixed assets' on the assets side and 'equity capital' on the liabilities side is excluded from the model.

The explanatory variables used in our analysis are described in Table 4.2. The model Equation (5) is used to estimate different rates of return on the following main four assets and four main liabilities of the balance sheet of the commercial banks in Bangladesh.

Table 4.1:
Explanatory variables relating to BCB's assets and liabilities

Variables	Description
<i>Assets</i>	
A1	Loan
A2	Bill discounted and purchased
A3	Deposit with other banks
A4	Government security
<i>Liabilities</i>	
L1	Fixed/time deposits
L2	Saving deposits
L3	Current and other non-interest bearing liabilities
L4	Other borrowings and funding

In addition, the following explanatory variables are also included in the model to improve the reliability of the results.

Table 4.2 :
Non-Balance Sheet variables

<i>Market structure variable</i>	
H	Herfindahl Index of market concentration on each bank
<i>Macroeconomic variables</i>	
M	Inflation rate

For asset and liability values, average figures are used in the model. For each year, the beginning and ending book values are used to compute the average book values. These values are divided by average total asset of the year to express them as ratios for the same period.

4.3 Sample selection and data collection

The study considered 16 domestic commercial banks for the period from 1995 to 2006 and the remaining Bangladeshi commercial banks (BCBs) were excluded from the study due to paucity of adequate data for the same period. Among the 16 sample Bangladeshi commercial bank, 11 banks are categorized as private banks and 5 banks are considered as public banks. As there is contradictory studies (Short, 1979; Bourke, 1989; Molyneux and Thornton, 1992; Demirguc-Kunt and Huizinga, 1998; Goddard et al, 2004; Ionnotta et al, 2007; Athanasoglou, 2008) regarding the relation between ALM and profitability of the public and private banks, the researchers examine the situation of these two categories of banks in Bangladesh.

Total number of observations is 132 for private banks and 60 for public banks. The source of bank specific data is Bankscope Database provided by Bureau Van Dijk's Company. The period 1995 to 2006 is used to test the variability of time since data for subsequent period were not found from any source. The assets and liabilities for the 18 BCBs under study are classified according to Bankscope database.

The Herfindahl Indexes for various years are calculated in terms of book value of deposit each bank received from the customers. The deposit figures have been collected from Bankscope. Data for inflation have been collected from Datastream Database.

5. Findings

The two regression results using total income (Y1) and net operating income (Y2) as dependent variables are shown in Table 5.1 and 5.2 respectively.

Table 5.1 shows the results of regressions that use Y1 as the dependent variable for private BCBs and public BCBs. It is evident from Table 5.1 that all of the assets and 1/TA have significant contribution to total income (Y1) of the private BCBs. The coefficients of all the liabilities are insignificant. Six out of eleven independent variables have significant impact on total income to assets ratio of public sector BCBs at 5% level. The coefficients of assets are positive and significant as expected. The coefficients of three out of the four liabilities are not significant implying that, like private BCBs, public BCBs are earning very nominal or zero return from these liabilities.

Market concentration variable (H) impacts positively the total income of both private and public BCBs. The impact of inflation rate is positive for both types of banks indicating that these BCBs increase prices as a consequence of inflation.

Table 5.1 reports furthermore, whether coefficients of variables for public BCBs are significantly different from that for private BCBs. The table indicates that private BCBs significantly differ from the public BCBs in pricing of only one asset which is government securities (A3). It could be assumed that public BCBs earn higher return from this asset. Earnings from the rest of the assets and all the liabilities are comparable for these two groups of banks. Therefore, it is not the pricing behavior (that is, interest rates setting) that is creating profitability differences between these private and public BCBs.

Table 5.1:

Regression results for private vs public BCBs, Dependent variable - Y1, (t-statistics in parentheses of column 2 and 3 and f-statistic in parenthesis of column 4)

Variables	Private banks	Public banks	Differences
1/TA	0.0531 (4.8069)**	0.0263 (1.4354)	0.0268 (2.1324)
A1	0.0694 (2.7319)**	0.0909 (3.4755)**	-0.0215 (0.6769)
A2	0.3608 (5.8863)**	0.2771 (3.8202)**	0.0838 (1.3312)
A3	0.0650 (4.8407)**	0.1285 (5.1648)**	-0.0635 (6.5197)**
A4	0.1202 (2.4883)**	0.1758 (3.2968)**	-0.0557 (1.0898)
L1	0.0146 (0.4267)	0.0170 (0.9726)	-0.0024 (0.0193)
L2	0.0011	-0.0289	0.0301

	(0.0272)	(-0.7319)	(0.5772)
L3	-0.0059	-0.0126	0.0067
	(-0.3766)	(-1.9982)*	(1.1359)
L4	0.0026	-0.0570	0.0597
	(0.0400)	(-1.2605)	(1.7369)
H	0.2798	0.2676	0.0122
	(3.4213)**	(4.2428)**	(0.0371)
M	0.0010	0.0007	0.0018
	(2.1946)**	(2.8617)**	(46.4206)**
<hr/>			
R-squared	0.757479	0.725850	
Adjusted R-squared	0.713782	0.669901	
F-statistic	17.33465	12.97344	
Prob(F-statistic)	0.000000	0.000000	
Durbin-Watson stat	1.387989	1.346557	
<hr/>			
	**significant at 5% level		
	*significant at 10% level		

The second set of regressions was separately run for private BCBs and public BCBs based on net operating income (Y2) as dependent variables. Table 5.4 shows the regression results for private BCBs and public BCBs respectively along with their differences.

Table 5.2 suggests that all the assets have significant and positive impact on net operating income (Y2) of private BCBs. The coefficients of three liabilities (L1, L2 and L3) are significant at 5% level and the other liability (L4) at 10% level. Surprisingly, the coefficient of saving deposits (L2) is positive and it may be argued that these banks pay only nominal interest on this deposit but charge high service fees. As regards to public BCBs, eight out of eleven independent variables are found to have significant impacts on net operating income (Y2) of these banks. All assets are significant and have positive coefficients as expected. Among the liabilities, only fixed deposit (L1) has significant impact on Y2 of the public BCBs.

The coefficient of 1/TA is negative for private BCBs while positive for public BCBs. It indicates that private banks are experiencing decreasing returns to scale and that net operating income from off-balance sheet activities is negative. The positive coefficient of 1/TA which represents economies of scale suggests that public BCBs earn net positive income from off-balance sheet activities. That means that these banks enjoy increasing returns to scale in their operation.

The coefficients of market concentration (H) and inflation rate (M) are found to be significant for Y2 of private BCBs. in this regression analysis. The positive coefficient of H reconfirms the favorable impact of market concentration on profitability of BCBs. However, the impact of H on Y2 of public BCBs are not significant while the impact of

M is negative for these banks. The negative relationship of inflation rate with net interest income and positive relationship with total income suggests that inflation rate has a positive relationship with both operating revenues and earnings. However, its impact is more severe on operating expenses. As a result, net operating income for public BCBs is adversely affected by inflation.

Table 5.2 further shows that private BCBs earn significantly higher net return from assets, loans (A1) and government securities (A2) compared to the public BCBs. Higher returns on these two assets are sufficient to create profitability differences between the two types of banks. In the liability side, coefficients of three variables are significantly different between the private and public BCBs. Public BCBs experience lower marginal costs on current deposits and other non-interest bearing liabilities (L3) and other borrowings and funding (L4) whereas private BCBs experience lower marginal costs in savings deposit (L2). Both groups of banks have insignificant differences in marginal costs of fixed deposits (L1), the largest source of liabilities. In addition, coefficients of three liabilities - L2, L3 and L4 are not significant for determining Y2 for public BCBs. Therefore, differences found for these three variables are not meaningful. It means that private BCBs are employing significantly better asset management strategies than the public BCBs, but there is no conclusive evidence which banks are employing better liability management strategies. The findings do not provide adequate support that private sector BCBs are applying better ALM than the public sector BCBs.

Table 5.2:
Regression for private vs public BCBs, dependent variable - Y2, (t-statistics in parentheses of column 2 and 3 and f-statistic in parenthesis of column 4)

Variables	Private banks	Public banks	Differences
1/TA	-0.0350 (-4.0062)**	0.0161 (4.5365)**	-0.0512 (34.1544)**
A1	0.0549 (4.0919)**	0.0053 (2.3505)**	0.0495 (13.6675)**
A2	0.1537 (3.0362)**	0.1392 (14.8772)**	0.0146 (0.0828)
A3	0.0421 (4.2898)**	0.0434 (9.1150)**	-0.0013 (0.0171)
A4	0.1033 (3.4777)**	0.0306 (5.5143)**	0.0726 (5.9905)**
L1	-0.0249 (-2.6076)**	-0.0239 (-4.7876)**	-0.0010 (0.0119)
L2	0.0351 (2.5952)**	-0.0032 (-0.6442)	0.0384 (8.0163)**
L3	-0.0167 (-3.9835)**	0.0000 (0.0026)	-0.0168 (15.8960)**
L4	-0.0480 (-1.8924)*	0.0096 (0.8749)	-0.0577 (5.1554)**

H	0.1035 (2.1086)**	0.2005 (20.8957)**	-0.3041 (38.3429)**
M	0.0001 (0.6649)	-0.0008 (-18.1465)**	-0.0512 (34.1544)**
R-squared	0.911852	0.976857	
Adjusted R-squared	0.884428	0.974944	
F-statistic	33.25018	510.7263	
Prob(F-statistic)	0.000000	0.000000	
Durbin-Watson stat	1.875838	1.916202	

**significant at 5% level

*significant at 10% level

6.0 Conclusion

This is a comparative study on the asset and liability management of private versus public Bangladeshi commercial banks (BCBs). It is evident that Private BCBs are better than public banks in terms of asset management, but they do not have any superiority over public banks in terms of liability management. This does not provide conclusive support that ALM in private banks is superior to ALM in public banks. Thus this study could not explain the profitability differences between these two sets of banks through analyzing ALM. Therefore are scopes for further studies to examine whether difference in non-balances sheet items are creating profitability differences in favor of private banks in Bangladesh.

References:

- Asiri, B. K. (2007). Assets-liabilities management in banks - a case of Kuwait. *Indian Journal of Economics and Business*, 6(1), 103-115.
- Athanasoglou, P. P., Brissimis, S. N., & Delis, M. D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Int. Fin. Markets, Inst. and Money* 18, 121–136.
- Bourke, P. (1989). Concentration and other determinants of bank profitability in Europe, North America and Australia. *Journal of Banking and Finance* 13, 65-79.

Demirgüç-Kunt, A., & Huizinga, H. (1999). Determinants of commercial bank interest margins and profitability: some international evidence. *World Bank Economic Review* 13, 379-408.

Fama, E. F. (1980). Banking in the theory of finance. *Journal of Monetary Economics* 6, 39-57.

Goddard, J., Molyneux, P., & Wilson, J. O. S. (2004). The profitability of European banks: a cross sectional and dynamic panel analysis. *The Manchester School* 72 (3), 363-381

Hester, D. D., & Zoellner, J. F. (1966). The relation between bank portfolios and earnings: an econometric analysis, *Review of Economics and Statistics* 48, 372-386.

Iannotta, G., Nocera, G., & Sironi, A. (2007), Ownership structure, risk and performance in the European banking industry. *Journal of Banking and Finance* 31, 2127-2149

Kosmidou, K., Pasiouras, F., & Floropoulos, J. (2004), Linking profits to asset-liability management of domestic and foreign Banks in the UK. *Applied Financial Economics* 14, 1319-1324.

Kwast, M. L., & Rose, J. T. (1982). Pricing, operating efficiency, and profitability among large commercial banks. *Journal Of Banking And Finance* 6, 233-254.

Molyneux, P., & Thornton, J. (1992). Determinants of European bank profitability: A note. *Journal of Banking and Finance* 16, 1173-1178.

Oguzsoy, C. B., & Guven, S. (1997). Theory and Methodology: Bank asset and liability management under uncertainty *European Journal of Operational Research*, 102, 575-600.

Pasiouras, F., & Kosimidou, K. (2007). Factors influencing the profitability of domestic and foreign commercial banks in the European Union. *Research In International Business And Finance* 21, 222-237.

Short, B. K. (1979). The relation between commercial bank profit rates and banking concentration in Canada, Western Europe, and Japan. *Journal of Banking & Finance*, 3, 209-219.

Vasiliou, D. (1996). Linking profits to Greek production management. *International Journal of Production Economics*, 43, 67-73.

