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Bank Profitability: The Case of Bangladesh

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This study attempts to examine the impact of asset and liability management on the profitability of commercial banks in Bangladesh. Commercial banks are segmented into high profitable and low profitable and private and public banks. While applying Statistical Cost Accounting (SCA) methods study finds high earning banks experience higher returns from their assets and lower returns from their liabilities than the low earning banks. Results are inconclusive with regard to private banks' and public banks' returns. This study finds that assets management of large commercial banks is better than those of small banks, but they are not better than small banks in respect of liability management.

Keywords: Asset, Liability, banks, profitability
JEL classifications: E 42 E44

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 Banks[i] 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. The issue of the impact of assets and liability management on the profitability of the commercial banks in Bangladesh has not been studied until now. 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.

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Asset and liability management (ALM) does not entail only managing individual asset and liability. It is an integrated approach, which requires simultaneous decisions about the types and amounts of financial assets and liabilities the institutions hold, in other words, the asset/liability mix and volume (Gardner and Mills, 1994). Gup and Brooks (1993) argue that ALM in banks requires simultaneous planning of all asset and liability positions on the bank's balance sheet. As such, the objective of ALM is to maximise banks' profits (Tektas et al, 2005). Therefore the core issue of ALM is to find out the optimal combination and composition of banks' assets and liabilities that maximizes the bank's profit, (Asiri (2007). In this study, a modified Statistical Cost Accounting (SCA) model is applied to test whether there are differences in return on assets and cost from liabilities between high earning banks and low earning banks. It also examines whether the financial performances of the private sector banks are better than public sector banks.

Reminder of the paper is as follows. 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 and recommendations.

2. Research Issues

Efficient composition of assets and liabilities of commercial banks is crucial for their sound financial performance. In fact, economic theory suggests that firms/banks attempt to produce to maximise profits while minimizing cost. This means most profitable banks have become efficient banks while maximizing profits (Goldberg and Rai 1996, Berger 1993). As banking firms may attempt to maximize profit by many ways, assets and liability management activities are the most probable methods. In developed countries, a variety of sources and use of funds are available for banks allowing them to diversify asset and liability portfolios. But in developing economy, banks are constrained with low breadth and depth of financial market and as such their asset and liability-base are narrower than those of their counterparts in developed countries. For example, banks in developed countries, such as USA and Australia, can invest their excess cash reserve in short-term trading and investment securities unlike Bangladesh where there is no short-term trading securities but limited existence short-term investment securities, such as government bills and bonds. Constrained by the lack of vibrant money market, Bangladeshi commercial banks (BCBs) have not been able to invest their excess cash reserve for adequate return.

Banking sector in Bangladesh is constituted by four nationalized commercial banks (NCBs), five state-owned development finance institutions (DFIs), thirty private commercial banks (PCBs) and ten foreign commercial banks (FCBs) and regardless of their ownership differences, they experienced very high concentration of asset and liability in loans and deposits respectively unlike their counterparts in developed countries. Banks' aggregated assets comprise of loans and advances, government bond and bills and deposit with the Bangladesh Bank (BB) which is the central bank of the country. Among them, loans and advances amounting to Bangladesh Taka (BDT) 1,543.6 billion (US$ 23.01 billion), constituted 64% of the aggregate assets of BDT 2,406.7 billion (US$ 35.87 billion) in 2006.

Other assets are cash in tills (below 1.0%); deposits with Bangladesh Bank (5.6%), other assets (18.9%) and investment in government bills and bonds (10.5%).

The aggregated liability portfolio of the banking industry can be broadly divided into deposits, capital and reserves, and other liabilities. Deposits in 2006 were 77.3% of the total liabilities which continued to be the main sources of fund for the BCBs. However, 17.6% of the liabilities belong to – other liabilities. According to BB (Annual Report 2004), the high concentration of loans and advances in the asset portfolio has been responsible for vulnerability of assets to credit risk and this is evidenced by the existence of non-performing loans (NPLs). Information provided by the BB shows that net non-performing loans (NPLs) to total advances was 22.9% for state-owned NCBs and 5.5% for PCBs. Another staggering feature is that 77.3% percent of the funds are collected from deposits which constituted main liability of the BCBS which have been offering high interest rates for these deposits as the competition in the banking industry is intensifying. Thus high concentration of loans and advances as the main assets and of deposits as the main liabilities has been adversely affecting BCB's profitably. Therefore the first research question is**:**

Is there any difference between high earning and low earning banks, and between small and large banks in terms of return from assets and cost on liabilities? If so, then to what extent?

Like all other banks, BCBs' financial strength is indicated by aggregate net interest income (NII). The NII of the public banks sharply declined from BDT 3.1 billion in 1999 to BDT 1.2 billion in 2000. Since 2001, the NII of the public banks further deteriorated to BDT 1.1 billion in 2004 which shows that NII of the public banks has been threatening their existence. However, industry NII showed a consistent upward trend due to the fact that NII of the private banks has been very high between 1997 and 2004. This raises the second research question:

Do the private banks generate higher return on asset and incur lower cost on liabilities than the public banks?

In order to answer the research questions cited in section 1.2, the following three hypotheses are tested.

- **H1**: High earning banks experience higher return from their assets and lower return from their liabilities than the low earning banks.
- **H2**: Private sector banks generate higher return on assets and incur lower costs on liabilities than the public sector banks.

2.1 Significance of the Study

Although impact of the management of banks' asset and liability on their profitability has been studies 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.

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 identities 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.

2.2 Banking Sector of Bangladesh

Banking sector in Bangladesh is constituted by 4 NCBs, 5 DFIs, 30 PCBs and 10 FCBs and regardless of their differences, asset and liability-base of them are narrower than their counterparts in developing countries. The main assets of the BCBs are loans and advances and investment in government securities while main liabilities are time and demand deposits. 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 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. A comparative position of different types of banks in Bangladesh is shown in Table 2.1.

Table 2.1: Market Share of Different types of BCBs in 2006 (Billion BDT)

Bank Type	No. of Banks	No of branches	Total Asset	% of Asset	Deposit	% of Deposit
NCB	4	3384	786.7	32.7	654.1	35.2
DFI	5	1354	187.2	7.8	100.2	5.4
PCB	30	1776	1147.8	47.7	955.5	51.3
FCB	09	48	284.9	11.8	150.8	8.1
Total	48	6562	2406.7	100	1860.6	100.0

Source: Annual Report (2006), Bangladesh Bank

3. 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. For the first time, Hester & Zoellner (1966) employed statistical cost accounting (SCA) method on US banks. Their study examines whether significant relationship exists between assets/liabilities standardized with total assets with return on assets of individual banks. They 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) investigated portfolio of assets and liabilities between high-profit and low-profit Greek banks by employing SCA method. His regression results suggest that it is the asset management rather than liability management that play more prominent role in explaining interbank differences in profitability. This study implies that high profit banks earn higher return on their assets than that of low profit banks. At the same time high profit banks enjoy lower expenses for their liabilities. 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.

However, 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, gross domestic product (GDP) growth rate, etc do impact bank's net earnings which were ignored by these authors.

Kwast & Rose (1982) provided most comprehensive study on the impact of bank's asset portfolio composition on its earnings. This study expanded the traditional SCA model by including a firm's income to its asset and liability mix. The authors focused on the large US banks and used data from 1970 to 1977 for their estimation. Their model found no evidence that differential returns and costs on different categories of assets and liabilities exist between high and low profit banks. Asiri (2007) has also applied SCA method on 8 Kuwaiti banks. The study finds that assets are positively and liabilities are negatively related to the profitability of the Kuwaiti banks.

4. 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 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:

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

Where,
A_i = ith asset
L_j = jth liability
α_1 = net fixed income that is not dependent on assets and liabilities.
e_{lt} = stochastic term
α_{2i} = marginal rates of return on assets
a_{3j} = marginal costs of liabilities.

As banks have wide variations in their business volume it would be inefficient to use the book value of the assets and liabilities (Kosmidou et al, 2004). In order to avoid this problem, all the variables of equation (3) are divided by a bank's average total asset (A_{bt}). Thus equation (4) takes the form of:

$$Y_{bt}/ A_{bt} = \alpha_{1/}A_{bt} + \sum\alpha_{2i}A_{ibt/}A_{bt} + \sum\alpha_{3j}L_{jbt} /A_{bt} + u_{bt} \quad (2)$$

Where, $u_{bt} = e_{bt} /A_{bt}$

Here the stochastic term u_{bt} is normally distributed random errors which are characterized by a zero mean, homoskedasticity and are non autoregressive.

4.1 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.

$$Y_{bt}/ A_{bt} = \alpha_{1/}A_{bt} + \sum\alpha_{2i}A_{ibt/}A_{bt} + \sum\alpha_{3j}L_{jbt} /A_{bt} + \sum\alpha_4H_t + \sum\alpha_{5f}M_{ft} + u_{bt} \quad (3)$$

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. This indicates that banks' profitability is entwined with non-inflationary environment. Since inflation is one of the most important macroeconomic variables 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 ($Y2_{bt}$). These variables were also considered by Hester & Zoellner (1966) and Kwast & Rose (1982).

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_1 may be positive or negative. Moreover, since α_1 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. The reason is that the elements that are added and deducted from net operating income to bring net income are not related to a bank's portfolio. The major difference here is income tax and rate of such tax is fixed by the government from time to time. Thus, net income after tax is not included in the SCA.

All assets and liabilities are not included as independent variables in this model. Since balance sheet identity is that total assets are equal to total liabilities and owners' equity, inclusion of all assets and liabilities would create 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 reason for such exclusion is that expected rate of return from cash and fixed assets are zero and that the cost of equity is not considered in the computation of net operating income as advocated by Kwast and Rose (1982) and Vasiliou (1996).

To test the first hypothesis, the sample of banks is segmented into high-profit and low-profit bank according to their performances measured by their net operating return on total assets. Individual bank’s operating return on average total assets is compared with the operating return on average total assets of the all the sample commercial banks. Banks with higher market values than the industry average has been classified as high profit bank group, while bank with lower market values has been classified as low profit bank. To test the second hypothesis the sample banks are classified into private banks and public banks. As there are contradictory studies (Short, 1979; Bourke, 1989; Molyneux and Thornton, 1992; Demirgnuc-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.

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
Assets	
A1	Loan
A2	Bill discounted and purchased
A3	Deposit with other banks
A4	Government security
Liabilities	
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

Market structure variable	
H	Herfindahl Index of market concentration on each bank
Macroeconomic variables	
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.

4.2 Sample Selection And Data Collection

Although there are 30 domestic banks in Bangladesh, the study considered 18 domestic commercial banks for the period from 1995 to 2006 and the remaining 12 Bangladeshi commercial banks (BCBs) were excluded from the study due to paucity of adequate data for the same period. These 18 banks owned 63.44% assets of the total BCBs in Bangladesh in 2006. 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. ALM and Profitability: High versus Low Profit BCBs

This section examines whether high profit BCBs manage their assets and liabilities more profitably than the low profit banks. The average net operating returns on assets of the high profit BCBs are greater than the average returns of the all banks under study. Based on this criterion, eight BCBs are grouped as high profit banks. The other ten banks are considered as low profit banks.

Estimated coefficients for the total income and net operating income regressions are shown in tables 5.1 and 5.2 respectively. Each table provides results for the high-profit and low-profit banks, and the differences between the high and low-bank coefficients. It is expected that the asset coefficients and liability coefficients which represent total return on assets and liabilities respectively to be positive (Kwast and Rose, 1982).

Table 5.1 shows that seven out of eleven variables are significant at 5% level. All the assets, Herfindahl index (H) and inflation rate (M) have significant coefficients. The constant term (1/TA) referring to the off-balance sheet has a significant relationship with total income (Y1). None of the liabilities has significant coefficient in this equation. As the dependent variable represents total income here, both assets and liabilities are expected to be positive. All of the coefficients relating to assets and liabilities are positive for these high profit BCBs. Coefficient of L2 is not significant and hence, we can ignore its negative sign. Market concentration ratio represented by Herfindahl index (H) has a positive sign indicating that higher concentration in the market increases total income to total asset ratio of high profitable BCBs. This confirms the structure-conduct-performance (SCP) hypothesis that market concentration positively impact bank profitability. Inflation rate (M) which is a macroeconomic variable is also significant. It implies that high profitable BCBs adjust inflation while setting prices for their assets and liabilities. As regards total return on assets, bills discounted and purchased (A2) earn more than those from loans (A1) and other assets. Return from deposits with other banks (A3) and government securities (A4) are relatively lower than loans and other assets. The R^2 and adjusted R^2 values show that the model has explained the variability of total income ratio (Y1/TA) satisfactorily. The Durbin-Watson statistic is also within the acceptable region.

Table 5.1 shows that seven out of eleven variables are significant at 5% level for high profit banks. All the assets have significant coefficients while none of the liabilities are significant for these banks. The constant term (1/TA) referring to the off-balance sheet has a significant relationship with total income (Y1). On the other hand nine out of eleven variables are found to be statistically significant for low profit banks. Coefficient for the constant value (1/TA) is positive indicating that these banks earn significant amount of revenue from off-balance sheet activities. Furthermore, all asset coefficients are significant and positive though the liabilities coefficients are negative.

Coefficient of Herfindahl index is positive for both high and low profit banks indicating that these banks can take advantage of higher market concentration. Inflation rate (M) does not have negative impact on total income of high profit banks but have no impact on total income on low profit banks.

The Wald coefficient restrictions test is used to measure the significances of the differences between coefficients and Table 5.1 shows that the differences between these two sets of coefficients are statistically significant for all assets and liabilities. High profitable banks earn higher total return on three assets which are loans (A1), bills purchased (A2) and deposit in banks (A3) and lower total return on government securities (A4) compared to the low earning banks. High profitable banks outperform low profitable banks in case of all liabilities.

There is a significant difference in fixed earning of the banks represented by the coefficient of 1/TA. Low earning banks have advantage over high earning banks in this income category. The difference in the coefficient of H is not significant implying that both set of banks utilizes market concentration equally. However, low profit banks act more positively than the high profit banks in increasing their total return when inflation occurs. Overall,

these F-tests show that pricing represented by total return of high profitable banks for assets and to some extent for liabilities is higher than the low profitable banks.

Table 5.1: Regression results for high v low profit BCBs, Dependent variable - Y1. (t-statistics in parentheses of column 2 and 3 and f-statistic in parenthesis of column 4).

Variables	High profit banks	Low Profit banks	Differences
1/TA	0.0239	0.1342	-0.1103
	(2.5114)**	(17.2787)**	(201.4672)**
A1	0.1342	0.0208	0.1134
	(8.5807)**	(4.4638)**	(591.9316)**
A2	0.4170	0.0633	0.3538
	(16.7383)**	(4.3084)**	(579.227)**
A3	0.0862	0.0293	0.0569
	(7.1347)**	(2.8044)**	(29.61279)**
A4	0.0590	0.0272	0.0318
	(2.9293)**	(-4.8599)**	(32.0651)**
L1	0.0011	-0.0333	0.0345
	(0.1114)	(-3.2818)**	(11.4916)**
L2	-0.0056	-0.0682	0.0627
	(-0.4238)	(-6.3180)**	(33.6386)**
L3	0.0062	-0.0507	0.0570
	(1.4812)	(-6.5035)**	(53.2600)**
L4	0.0320	-0.0160	0.0481
	(1.4826)	(-1.0874)	(10.5755)**
H	0.1946	0.1753	0.0194
	(3.8367)**	(8.0657)**	(0.7872)
M	-0.0008	-0.0000	-0.0009
	(-5.0971)**	(-0.1318)	(16.2012)**
R-squared	0.866895	0.820917	
Adjusted R-squared	0.851235	0.804487	
F-statistic	55.35924	49.96552	
Prob(F-statistic)	0.000000	0.000000	
Durbin-Watson stat	1.972677	1.675819	

**significant at 5% level
*significant at 10% level

The regression results of SCA model for high profit banks using net operating income (Y2) as the dependent variable are given in Table 5.2. It is expected that all the asset coefficients that represent net rate of return on the assets to be positive and all liability

coefficients that represents marginal cost of liabilities to be negative in the model using Y2 (Kwast and Rose, 1982). The Table 5.2 shows that nine out of eleven independent variables have significant impact on Y2 for both high profit and low profit banks. The signs of the coefficients are more sensible in these regressions than the previous regressions which used Y1. All assets, except government securities (A4), have positive coefficients and two liabilities have negative coefficients for high profit banks. as regards to low profit banks, all assets other than loans have significantly positive and all liabilities have negative coefficients.

The positive sign of H implies that the decreasing trend of market concentration in the later years of the study period have negative impact on net operating income for these banks. The coefficient of inflation rate (I) was found negative which contrasts with the equation with Y1 for the same group of banks. Inflation rate has a positive relationship with total income while negative relationship with net operating income for high profitable BCBs. That indicates that operating costs of the banks increases more than the operating revenues of the banks as a result of inflation. The effect of Herfindahl index and inflation rate on net operating income of low earning banks are similar to the effects on high earning banks, As such, net operating income of both group of banks are impacted in similar way by changes in market structure and macroeconomic variables.

The constant term (1/TA) referring to fixed return on total assets net of operating expenses has a positive coefficient for high and low earning banks. That indicates that both banks are experiencing increasing returns to scale in their operations.

Table 5.2 further shows that the net returns on assets and marginal costs for liabilities for high profitable banks are significantly different from the low profitable banks. High profitable BCBs earn higher net return on two assets, namely, loans (A1) and bills discounted and purchased (A2). Since A1 constitutes the major share of bank assets, a significant higher return on them make a significant profitability differences among BCBs. Low profitable BCBs earn higher return from government securities (A4). High profitable BCBs assume much lower marginal costs for all of the liabilities than the low earning banks. That indicates that high profitable BCBs perform better than low profitable counterparts in case of liability management.

These findings support first hypothesis (H1) which states that high earning BCBs experience higher return from assets and lower cost for their liabilities.

Table 5.2: Regression results for high vs low profit banks, Dependent variable - Y2, (t-statistics in parentheses of column 2 and 3 and f-statistic in parenthesis of column 4).

Variables	High profit banks	Low Profit banks	Differences
1/TA	0.0201	0.1502	-0.1300
	(8.0891)**	(13.9515)**	(146.0376)**
A1	0.0146	-0.0018	0.0165
	(2.0948)**	(-1.0085)	(79.4730)**
A2	0.2084	-0.0624	0.2708
	(12.1780)**	(-3.5144)**	(232.372)**
A3	0.0148	0.0271	-0.0123
	(2.6325)**	(3.1740)**	2.0854
A4	-0.0538	0.0616	-0.1155
	(-4.1162)**	(6.3821)**	(142.8173)**
L1	-0.0197	-0.1730	0.1533
	(4.1263)**	(-12.9367)**	(131.3127)**
L2	0.0090	-0.1496	0.1587
	(1.2847)	(-9.5311)**	(102.0972)**
L3	0.0062	-0.1513	0.1576
	(3.5038)**	(-10.4469)**	(118.2639)**
L4	-0.0344	-0.1274	0.0930
	(3.7302)**	(-4.5064)**	(32.7495)**
H	0.1775	0.0432	0.1343
	(15.0963)**	(2.7849)**	(74.8043)**
M	-0.0009	-0.0002	-0.0007
	(-10.1712)**	(-1.360)	(17.0049)**
R-squared	0.934094	0.741344	
Adjusted R-squared	0.926340	0.692200	
F-statistic	120.4709	15.08497	
Prob(F-statistic)	0.000000	0.000000	
Durbin-Watson stat	1.716636	2.072096	

**significant at 5% level
*significant at 10% level

5.1 ALM and Profitability: Private versus Public BCBs

This section tests the second hypothesis (H2) of the study. The second hypothesis examines the differences of impacts of ALM on profitability between private BCBs and public BCBs. Among the 18 sample Bangladeshi commercial bank, 11 banks are

categorized as private banks and 5 banks are considered as public banks. As a result, total number of observations is 132 for private banks and 60 for public banks.

Table 5.3 shows the results of regressions that use Y1 as the dependent variable for private BCBs and public BCBs. It is evident from Table 5.3 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 5.3 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. Private BCBs and pubic BCBs invest only around 15% and 9% of total assets in A3 respectively. 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.

There are no significant differences in coefficients of Herfindahl index indicating that both bank groups are equal in taking advantage of higher market concentration. The significantly different coefficients of inflation rate indicate that private BCBs can increase their pricing more than the public BCBs in response to inflation. More discretionary power of private BCB management compared to public BCBs may be a reason for such differences.

Table 5.3: 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	0.0263	0.0268
	(4.8069)**	(1.4354)	(2.1324)
A1	0.0694	0.0909	-0.0215
	(2.7319)**	(3.4755)**	(0.6769)
A2	0.3608	0.2771	0.0838
	(5.8863)**	(3.8202)**	(1.3312)
A3	0.0650	0.1285	-0.0635
	(4.8407)**	(5.1648)**	(6.5197)**
A4	0.1202	0.1758	-0.0557
	(2.4883)**	(3.2968)**	(1.0898)
L1	0.0146	0.0170	-0.0024
	(0.4267)	(0.9726)	(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)**
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	

**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 5.4 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 another 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 impacts 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 5.4 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 fact, these two assets represent more than 60% of assets for private BCBs and more than 70% of the assets for public BCBs. Difference in net returns on other two assets such as A2 and A3, are not significant between these two banking groups. 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 group of banks have insignificant differences in marginal costs of fixed deposits, 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 for second hypothesis (H2) which states that Private sector BCBs generate higher return on assets and incur lower costs on liabilities than the public sector BCBs.

Table 5.4: 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	0.0161	-0.0512
	(-4.0062)**	(4.5365)**	(34.1544)**
A1	0.0549	0.0053	0.0495
	(4.0919)**	(2.3505)**	(13.6675)**
A2	0.1537	0.1392	0.0146
	(3.0362)**	(14.8772)**	(0.0828)
A3	0.0421	0.0434	-0.0013
	(4.2898)**	(9.1150)**	(0.0171)
A4	0.1033	0.0306	0.0726
	(3.4777)**	(5.5143)**	(5.9905)**
L1	-0.0249	-0.0239	-0.0010
	(-2.6076)**	(-4.7876)**	(0.0119)
L2	0.0351	-0.0032	0.0384
	(2.5952)**	(-0.6442)	(8.0163)**
L3	-0.0167	0.0000	-0.0168
	(-3.9835)**	(0.0026)	(15.8960)**
L4	-0.0480	0.0096	-0.0577
	(-1.8924)*	(0.8749)	(5.1554)**
H	0.1035	0.2005	-0.3041
	(2.1086)**	(20.8957)**	(38.3429)**
M	0.0001	-0.0008	-0.0512
	(0.6649)	(-18.1465)**	(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. Conclusion

Two hypotheses were tested on the basis of data collected from 18 Bangladeshi commercial banks (BCBs). The study segmented these BCBs into high earning and low earning BCBs and private and public BCBs. SCA model as modified in Section Four was applied to measure the impact of ALM on bank's profitability. Regression results of total income (Y1) provide this evidence that high profitable charges higher price (that is,

interest) on assets than low profitable BCBs. Regression results with net operating income (Y2) shows that high earning BCBs earns higher net return from most of the assets and incur lower marginal cost on their liabilities than low profitable BCBs. These results support hypothesis 1 (H1). 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 for H2.

The findings of the study have implications for bank management, bank regulators and policy makers in Bangladesh. This study concludes that rate of returns on assets and marginal costs on liabilities should be rationalized to support the profitable operations of Bangladeshi commercial banks (BCBs). There should be optimum asset and liability portfolio mix to overcome the problems of mismanagement in the banking sector of Bangladesh. The study shows that it is both assets and liability management that are creating profitability differences between banks. Low earning banks should review their pricing and operating costs for each type of assets and liabilities, rather than total asset and liability portfolios.

Impacts of market structure and macroeconomic variable are found significant for different banking groups. In general, BCBs are found to perform better in concentrated market and they are negatively affected by rising level of inflation. The Bangladesh Bank and Government of Bangladesh (GOB) should provide regulatory and other policy measures so that assets of the banks are adequately protected from impairment and loan loss are bought to tolerable limit with a view to ensuring reasonable returns on assets of the BCBs. Since asset base of the BCBs are narrower than their counterparts in advanced economies, efforts should be made to extend this base by instituting an effective money market and by extending breadth and depth of the capital market. In addition, BCBs are to be supported by policy measures which promote non-inflationary environment.

Since liability management in both private and public sector bank are not efficient, efforts are to be made and avenues should be opened for better use of liabilities. As liability-base of the NCBs is very narrow, mechanism should be installed to diversify the sources of liabilities. GOB intervention is required to institute a developed and transparent money and capital market that would assist profitable operation of banks in Bangladesh. Bangladesh Bank – nation's central bank- should have more teeth to improve its regulatory measures that promote efficient management of assets and liability of banks in Bangladesh.

Endnotes

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[i] Commercial banks are treated as trading banks in some countries.

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