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## **ASSET AND LIABILITY MANAGEMENT AND PROFITABILITY OF DEPOSIT MONEY BANKS: COUNTRY-LEVEL CROSS-SECTIONAL EVIDENCE FROM NIGERIA**

**OYETAYO** Oluwatosin Juliana  
Department of Banking and Finance  
Federal University of Agriculture Abeokuta  
oyetayooj@funaab.edu.ng

**KAJOLA** Sunday Olugboyega  
Department of Accounting  
Federal University of Agriculture Abeokuta  
kajolaso@funaab.edu.ng

**AGBATOGUN** Taofeek Oshindero  
Department of Banking and Finance  
Ogun State University Ago Iwoye  
agbatogunto@funaab.edu.ng

**OWORU** Oluwafemi Olympus  
Department of Accounting  
Federal University of Agriculture Abeokuta  
oworuoo@funaab.edu.ng, +234-8034836504

### **ABSTRACT**

Asset and Liability Management (ALM) is practiced by banks and other financial institutions to mitigate financial risks resulting from a mismatch of assets and liabilities. Effective management of asset and liability items on the balance sheet is what generates revenue, expenses, and ultimately, profits for banks. This study tested the statistical cost accounting (SCA) model on profitability of banks in Nigeria. Against common practices in previous studies in Nigeria, net interest income (NII) and net income (NI) are adopted as proxies for profitability, while return on asset is generated to reflect the earning power of banks upon which ranking into high and low profit is based. A panel dataset of 10 banks from 2010-2022 was developed based on a dynamic SCA model estimated under the GMM framework. Three scenarios of all banks, high-profit and low-profit banks are created for the purpose of analysis. The fundamental hypothesis of SCA model was tested under each scenario generated. Findings reveal, for all banks, ALM affects net income more. Low-profit banks are not employing ALM strategies that help to boost their core area of operation. The net interest income of both high-profit and low-profit banks is highly dependent on the previous year's net interest income. The study recommends that banks should improve on their interest-generating assets (loans and advances) in order to boost net interest income. They should also improve non-interest generating income like fees and commission, in order to safeguard net income.

**Keywords:** Asset and liability management, profitability, statistical cost accounting, net interest income

### **INTRODUCTION**

Asset and liability management (ALM) has been described as a strategic planning procedure that involves the dynamic balancing of all assets and liabilities by rate, amount, and maturity. The main goal is to qualify and control risks of the existence, stability and growth of a system (Brick 2014). In the banking system, ALM directly impact volume, mix, maturity, rate sensitivity, quality, and liquidity of assets and liabilities (Zawaliriska 1999). ALM in commercial banks is determined by the ability of the banks to retain capital, absorb loan losses, support future growth of assets, and provide return to investors (Makau & Memba, 2014).

ALM has two key objectives (Jansen, 2002). The first, to ensure the company's solvency and raise its ability to pay its debts – cover liquidity and interest rate risk. The second is to boost the company's profitability. The main activity of a bank is to mobilize deposits and then lend them to customers and in the end, generate income. This process involves generating current liabilities in the form of deposits, current assets in the form of loans predominantly, and long-term liabilities (debts) and capital (equities).

Banks need the current assets and liabilities (A&L) for their everyday running, while long-term liabilities and capital finance their operations and also serve as a cushion for any loss that may occur from lending activities. Banks therefore have to manage their deposit-taking and lending activities in such a way that current accounts (i.e current assets and current liabilities) yield profits and capital accounts ensure stability.

Theoretically, it is stated that as loan value increases, bank profitability increases and a bi-directional relationship can be established between the two. It is also stated that a decrease in loan quality (resulting in non-performing loans), would have an impact on bank stability and soundness (Al-khouri and Arouri, 2016).

The broad objective of this study is to apply the statistical cost accounting (SCA) model to the A&L data of Nigerian banks. The fundamental hypothesis of SCA (Hester & Kuwenberg, 1975; Kwast & Rose, 1982; Vasiliou, 1998; Kosmidou et al., 2004; Chatterjee & Duta, 2016; Owusu & Alhassan, 2020), is that rates of return for assets are positive and vary across assets and rates of return for liabilities are usually negative and vary across liabilities.

Specifically, and as outlined by Vasiliou (1998), SCA seeks to achieve four objectives: (i) to estimate marginal rates of return and cost on bank portfolio items, (ii) to compare rates of return on various loan categories (iii) to investigate profitability differences across classes of banks, and (iv) to examine bank performance with the lapse of time. This work contributes to the application of SCA model by incorporating a dynamic panel to the original panel model of SCA and employing pooled OLS, difference and system GMM for estimation. This is an improvement on previous studies on SCA application and the original SCA model which is static.

The proceeding part of this paper is divided into three main sections. The next section is the review of theoretical and empirical foundations of ALM. The succeeding addressed the methodology adopted. Results obtained, and conclusion reached and recommendations made are presented as the last parts of the paper.

## LITERATURE REVIEW

### Asset and Liability Management

Although ALM is not a new planning tool. It has evolved from the simple idea of maturity-matching of A&L of various time horizons into a framework that includes sophisticated concepts. Dwelling on economic theory of the firm, which defines profit as revenue less cost, Vasilou (1998) established a structural link between the utility function of a firm and its A&L function. The standard profit equation of the firm given as:

$$Y = f(R, C) \quad (1)$$

Where Y is the profit of the firm, R is revenue and C is cost, is translated to:

$$Y = f(A, L) \quad (2)$$

Where Y is still profit of the firm, however, A represents total assets of the firm and L represents total liabilities.

On the assumption that assets are proxies for revenues and liabilities, proxies for expenses, the parameters of assets are expected to be positive while those of liabilities are expected to be negative. Again, on the assumption of constant marginal return from portfolio elements, a bank is expected to realize a net income that is linearly related to the elements of its portfolio.

Therefore, a bank's net income can be expressed as the weighted sum of its various assets and liabilities, where the weights represent prices or costs ascribable to each item. This equation is expressed as:

$$Y = \sum_{i=1}^M b_i A_i + \sum_{j=1}^N c_j L_j \quad (3)$$

Where Y is the net operating income of a bank (i.e total revenue less total costs);  $A_i$  is the  $i^{th}$  asset,  $i = 1, 2, \dots, M$ ;  $L_j$  is the  $j^{th}$  liability or equity,  $j = 1, 2, \dots, N$ ;  $b_i$  is the net rate of return on assets after deducting directly associated operating expenses, and  $c_j$  is the net rate of cost on liabilities, including operating expenses but eliminating service charges.

Vasilou (1998) cautioned that the interpretation of the A&L parameters may change in response to change in the definition of the dependent variable. This view has provided a strong theoretical background upon which empirical applications of SCA model in both developed and developing countries have been built.

### Concept of Profitability

Profit is represent earnings in financial terms, which a firm achieves after deduction of costs associated with operations. Thus, profitability is the ability of a business to make profit. In other words, profitability describes as the extent to which a business is profitable. Profitability is a quantitative and financial measure utilized to appraise the ability of company to generate earnings that surpass the combination of all the expenses it incur in an investment (Ateke & Simeon, 2018). Profitability is a basic business goal because it determine long term survival. It is an important concept in business. Profitability is generally, regarded as a key determinant of business performance.

### Asset and Liability Management and Profitability

Hester and Zoeller (1966) study on commercial banks in USA was one of the pioneer studies in A&L and bank portfolios. The study adopted net current operating income, net profit after taxes and net profit before income taxes as proxies for profitability. The study found that A&L affect profitability proxies differently. The effect on net income after tax was found to be smaller than those of the net current operating income and net profit before taxes.

Kosmidou et al. (2004) employed SCA model to analyze the link between profits and ALM of domestic and foreign banks in the UK. The study adopted operating income (OI) as a proxy for profitability. The study found that on the asset side, domestic banks' operating profit was significantly and positively affected by their loans and advances as well as their fixed assets, while, the operating profit of foreign banks was affected significantly by all the assets that comprise their portfolios. On the liabilities side, both the high-profit and the low-profit banks have high marginal rates of costs in deposits and short-term funds.

Chatterjee and Dutta (2016) study Indian commercial banks to test SCA model. The study adopted earnings before tax (EBT) as a proxy for profitability for public and private sector banks as well as high-profit and low-profit banks. The study found that all asset items positively and significantly affected EBT in public sector banks. Only loans and advances on the asset side, deposits and placings on the liabilities side, significantly affected EBT in private sector banks. Further, the findings reveal short-term funding on the liability side, is the cheapest for both bank groups. Comparing high-profit with low-profit banks, on the assets side, findings reveal low-profit banks experience higher rate of return on loans and advances,

investments and fixed assets. On the liabilities side, high-profit banks generally do not enjoy cheaper cost of funding than low-profit banks.

Owusu and Alhassan (2020) applied SCA model to commercial banks in Ghana, using net income (NI) and net interest income (NII) as proxies for profitability of banks. The relevance of NII was argued based on the fact that it is the difference between interest income and interest expense which reflects directly the core mandate of banks which is deposit taking. Therefore, assessing banks profitability on this criteria reveals how effective banks have performed at their core mandate. Like Hester and Zoellner (1966), Owusu and Alhassan (2020) established differences in the effect of asset-liability activities on profitability proxies. It is observed that the mean value for NII is greater than NI, regression results also reveal that coefficients in the NII model generate higher rates of return than the coefficients of the NI model. On the assets side, its findings reveal among others, that for the whole sample of banks, the coefficients of asset items were higher under the NII model compared to the NI model. In addition, fixed assets has the highest rate of return on NII, while, cash and equivalent had the highest rate of return on NI. On the liability side, the study reveals savings deposits and fixed deposits had the lowest marginal rate of cost in both the NII and NI models.

Several studies (Achori et al. 2023; Abebe 2022; Dada 2021; Onaolapo and Adegoke 2020; Ogbeifuna and Akinola, 2018; Ajibola 2016; Agbada and Osuji 2013; Adeyele and Maiturare 2012, Akinola 2009; Asiri 2007; Abayomi and Shalem 2001) have worked on the relationship between ALM and profitability of banks in Nigeria. However, only a few (Abebe 2022; Onaolapo and Adegoke 2020) have applied SCA model with apriori expectations on the signs of A&L items.

Abebe (2022) examined a sample of microfinance institutions (MFIs) in sub-Saharan Africa, including Nigeria. The study adopted SCA model with all the A&L items and some macroeconomic variables for control. Return on assets was adopted as a proxy for profitability. The study has findings that confirm that A&L items have both positive and negative effects on returns of the MFIs in the sample. Further, on the liabilities' side, it shows that other short-term financial liabilities exert a positive effect on returns while on the assets' side, net fixed assets exert a negative effect on returns.

Onaolapo and Adegoke (2020) did not mention expressly that their study adopted SCA model, however, A&L items as specified by SCA model were used under a panel regression analysis. Return on assets and return on investments were adopted as profitability measures. The study reveal that A&L items have positive and negative effects on both return on assets and return on investments. Specifically, on the assets' side, loans and advances, log of total assets show positive effects on return on asset, while non-performing loans show negative effect on return on asset. On the liabilities' side, demand deposit and borrowings are found to exert positive effects on return on investment.

Dada (2021) did not mention the adoption of SCA model expressly, however, the study, using return on assets as a proxy for profitability under a panel regression analysis, found that ALM position negatively affects bank profitability in Nigeria. Specifically, on the assets' side, the findings reveal that loans to customers have an adverse effect on the profitability of selected deposit money banks in Nigeria.

A review of the extant literature on asset and liability management has provided a background for understanding the concept and its evolvement over time. On the other hand, it has brought to fore, some gaps in the application of SCA model especially in Nigeria. It is worthy of mention, that virtually all previous works on the application of SCA model in Nigeria have used return on assets and/or return on investment as dependent variable which is the proxy for profitability even though the original SCA model specifies any of the income or profit generated directly from deductions from the total revenue as proxy for profitability. The reason for this can be adduced to the fact that income or profit values directly reflect the changes in the movement of revenue and expense items which derive from the composition of assets

and liabilities per time. Return on assets, return on investment and return on equity are derived as ratios to mirror the earning power or efficiency of companies at generating returns. Therefore, profitability here is implied not actual. This is the gap that this study intends to fill by adopting SCA model full scale with all the A&L items, and income dimensions of profitability.

### DATA AND METHOD

This study adopted ex post facto research design. The population of the study comprised 27 licensed and active commercial banks in Nigeria as of 31st December 2022 (CBN 2022). A sample of 10 commercial banks was purposefully selected on the premise that these banks are listed on the stock exchange, and are consistent in producing and publishing their financial reports between 2010 and 2022. In addition, these banks have the highest in terms of market share, coverage and assets. Annual data on the relevant bank-specific variables are extracted from the individual bank's financial reports and statements of accounts. The banks are categorized into high-profit, low-profit for the purpose of analysis. The return on assets (ROA) is generated or extracted for all banks after which the ranking method is applied to determine the high and the low profit ones.

SCA attributes change in banks' profit to change in the structure of their portfolio of A&L derived by regressing accounting profit on bank assets and liabilities. Therefore, SCA basic panel regression model adapted from banks (Owusu & Alhassan 2016; Sayeed et al. 2012; Rose and Wolken 1986) is given as:

$$Y = a_i + \sum_{i=1}^M b_i A_{it} + \sum_{j=1}^N c_j L_{jlt} + \varepsilon_{it} \quad (1)$$

Equation (1) is modified to incorporate the previous year's effect of profitability thus a dynamic panel model is stated as:

$$Y = a_i + \partial Y_{it-1} + \sum_{i=1}^M b_i A_{it} + \sum_{j=1}^N c_j L_{jlt} + \varepsilon_{it} \quad (2)$$

Where Y is the profitability measure which can be NI or NII.  $Y_{it-1}$  is the lagged value of profitability.  $A_i$  denotes the  $i^{th}$  asset,  $i = 1, 2, \dots, M$ ;  $L_j$  denotes the  $j^{th}$  liability,  $j = 1, 2, \dots, N$ ;  $a_i$  is the constant term showing that there are some income that are not related to the bank's business,  $\partial$  is the marginal effect expected from the previous year profitability.

NII is adopted as the profitability measure,  $b_i$  is the marginal rate of return on interest earning assets and  $c_j$  is the marginal rate of cost of interest paying liabilities. NI is adopted as the profitability measure,  $b_i$  is the marginal rate of return on total assets after deducting taxes and is the marginal rate of return on total liabilities after deducting taxes.

In all the above, the sign of  $b_i$  should be non-negative (i.e positive or zero) and each should be non-positive (i.e negative or zero). Consequently, NI and NII are used separately as dependent variables in the models estimated. For the estimation, first, the descriptive or summary statistics is carried out. Second, we test for heteroscedasticity and third, the regression equation is estimated using the pooled OLS and GMM methods.

## RESULTS AND DISCUSSION

**Table 1: Descriptive Statistics for All Banks**

Variables	Mean	Max.	Min.	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability	Observations
NII	14.25	19.29	10.00	3.30	0.15	1.32	15.78	0.00	130
NI	13.76	19.56	7.68	3.48	0.05	1.56	11.25	0.00	130
LTC	15.83	21.76	8.02	3.67	0.03	1.70	9.23	0.01	130
LTB	14.41	20.02	9.05	3.28	0.14	1.54	12.00	0.00	130
CIH	15.38	20.80	9.22	3.33	0.08	1.50	12.32	0.00	130
TSEC	15.18	20.52	10.23	3.34	0.07	1.33	15.29	0.00	130
FAS	14.23	21.07	9.79	3.38	0.17	1.49	12.94	0.00	130
CA	14.72	21.20	8.98	3.77	0.12	1.70	9.44	0.01	130
TA	17.54	22.75	12.83	3.25	0.09	1.29	16.07	0.00	130
CAT	16.00	21.41	8.52	3.55	0.01	1.42	13.53	0.00	130
SAT	15.17	20.95	7.26	3.67	-0.06	1.44	13.27	0.00	130
FAC	14.15	21.18	0.69	4.32	-0.18	2.36	2.95	0.23	130
OST	12.49	20.23	2.56	4.15	-0.21	2.39	2.97	0.23	130
TL	15.04	20.25	8.63	3.51	-0.06	1.42	13.52	0.00	130
OL	14.42	19.65	4.94	3.56	-0.43	2.41	5.94	0.05	130

*Note: NII, NI, LTC, LTB, CIH, TSEC, FAS, CA, TA, CAT, SAT, FAC, OST, TL, OL stands for net interest income, net income, loans to customers, loans to bank, cash and cash equivalent, total securities, fixed asset, current account, total assets, other assets, savings account, fixed account, other short term funds, total liabilities, other liabilities*

The result of the descriptive analysis is illustrated in Table 1. The two profitability measures of NI and NII alongside asset and liability items for all the banks used are analyzed. Net income has a mean of 13.76 with a standard deviation of 3.48. This reveals a very low rate of dispersion or widening out of the net income value for all the bank samples under the period of study. A similar characteristics is observed for NII which has a mean of 14.25 with a standard deviation of 3.30. The minimum and maximum range displayed for both NI and NII alludes to this fact. In terms of asset and liability items, the rate of dispersion from the mean for all the variables is very low except for fixed accounts under liabilities. Under assets, total assets have the highest mean with the lowest dispersion at 3.25. This shows total assets was the highest level of assets held by Nigerian banks which didn't significantly improve within the period of study.

Under liabilities, current account has the highest mean with one of the lowest deviation of 3.55 in that category. This implies deposits in current account was the highest of the liabilities held by Nigerian banks which didn't increase significantly within the period of study. The negative skewness exhibited by virtually all the liability items validate the fact that they are a set of data skewed to the left an indication that their mode is greater than the mean and the probability of generating negative results. The jarque-bera probability values confirm the goodness of fit of the data for all the variables used.

**Table 2: Regression Results for ALM of All banks (Net Income)**

	(1) Net Income Pooled OLS	(2) Net Income Diff. GMM	(3) Net Income System GMM
Loans to Customers	-0.171 (-0.92)	-0.605** (-2.60)	-0.791*** (-3.37)
Loans to Banks	-0.217*** (-5.57)	-0.183*** (-4.13)	-0.158*** (-3.82)
Cash and Equivalent	0.0185 (0.15)	-0.0646 (-0.48)	-0.0816 (-0.58)
Securities	-0.190* (-2.16)	-0.0649 (-0.65)	-0.0349 (-0.35)
Fixed Assets	-0.182 (-1.58)	-0.281* (-2.29)	-0.293* (-2.53)
Other Assets	-0.0883 (-1.25)	-0.151* (-2.04)	-0.195** (-2.82)
Total Assets	0.832** (2.91)	1.629*** (3.93)	2.092*** (5.11)
Current Account	0.217** (2.69)	0.0653 (0.83)	0.103 (1.29)
Saving Deposit	0.266* (2.45)	0.423*** (3.70)	0.345** (2.96)
Fixed Account	0.0920 (1.02)	-0.127 (-1.33)	-0.221* (-2.35)
Other Short Term Funds	0.0360* (2.29)	0.00128 (0.07)	-0.00642 (-0.35)
Total Liabilities	0.110 (1.13)	0.129 (1.35)	0.0630 (0.68)
Other liabilities	0.240* (2.18)	0.107 (1.00)	0.0875 (0.85)
L.Net Income		-0.127*** (-4.77)	-0.138*** (-5.57)
Constant	-3.304*** (-4.75)	-1.981 (-1.85)	-3.239** (-3.14)
r2	0.972		
r2_a	0.966		
pr2			
aic	241.2	.	.
bic	281.4	.	.
Durbin watson			
Sargan		64.80	75.44
AR1			
AR2			
LL			
N	130	104	117

*t* statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Under the net income model for all banks presented in Table 2, all the estimation techniques i.e pooled OLS, difference GMM and system GMM reveal similar results. However, in terms of performance, the system GMM presents the best result displaying coefficient values closest to the prediction of the SCA hypothesis than any other technique. It also has the highest number of statistically significant coefficients.

Under the system GMM, loans to customers and loans to banks have negative and significant effects on net income. This runs contrary to the SCA hypothesis which predicts a positive effect from both. In addition, it provides support for the findings of Dada (2021). Onaolapo and Adegoke (2020) also found components of loans and advances (non-performing loans) exerting negative effects on bank profitability. Cash and equivalent has a negative effect contrary to SCA hypothesis, however, not significant.

Securities has an insignificant negative effect on net income which again, runs contrary to SCA prediction. Fixed assets has a negative and significant effect contrary to SCA prediction. Other assets have a negative and significant effect on net income which is contrary to the SCA prediction of a positive effect. Total assets has a positive and highly significant effect on net income. This strongly conforms to the SCA prediction of a positive effect.

Current account has positive effects on net income running contrary to the SCA prediction of negative effects. Savings deposits have positive and significant effects on net income which again is contrary to the SCA prediction of negative effects. Both provide support for the findings of Onaolapo and Adegoke (2020). Fixed account has negative and significant effects on net income thus conforming to the SCA

prediction of negative effects. Other short term funds have negative effects which conforms to the SCA prediction however, not significant.

Total liabilities have positive effects on net income contrary to SCA prediction of negative effects, however, not significant. Other liabilities have positive effects on net income contrary to the SCA prediction, however, not significant. Other short term funds have the lowest marginal cost of -0.00642 for all banks under net income. This supports the findings of Chatterjee and Dutta (2016). The lag of net income has a negative and significant effect on net income indicating the inadequacies in the profit and loss accounts of these banks which are carried forward from one period to future periods.

**Table 3: Regression Results for the A&L of All Banks (Net Interest Income)**

	(1) Net Interest Income Pooled OLS	(2) Net Interest Income Diff. GMM	(3) Net Interest Income System GMM
Loans to Customers	0.300 (1.04)	0.775 (1.87)	0.676 (1.61)
Loans to Banks	-0.00910 (-0.15)	-0.0630 (-0.80)	-0.125 (-1.73)
Cash and Equivalent	-0.0612 (-0.31)	-0.0387 (-0.16)	-0.141 (-0.60)
Securities	0.329* (2.42)	0.211 (1.31)	0.120 (0.76)
Fixed Assets	0.454* (2.56)	0.755*** (3.46)	0.877*** (4.35)
Other Assets	-0.318** (-2.91)	-0.346* (-2.53)	-0.425** (-3.28)
Total Assets	0.0476 (0.11)	-0.820 (-1.14)	-0.444 (-0.64)
Current Account	0.0957 (0.77)	0.248 (1.74)	0.312* (2.19)
Saving Deposit	0.0223 (0.13)	-0.168 (-0.80)	-0.274 (-1.31)
Fixed Account	-0.0705 (-0.51)	0.109 (0.64)	0.174 (1.05)
Other Short Term Funds	-0.0223 (-0.92)	-0.0105 (-0.34)	-0.0239 (-0.78)
Total Liabilities	-0.169 (-1.13)	-0.117 (-0.71)	-0.221 (-1.38)
Other liabilities	0.519** (3.05)	0.622*** (3.35)	0.641*** (3.65)
L.Net Interest Income		0.107* (2.32)	0.134*** (3.39)
Constant	-3.035** (-2.82)	-3.477 (-1.90)	-4.568** (-2.77)
r <sup>2</sup>	0.945		
r <sup>2</sup> <sub>a</sub>	0.931		
pr <sup>2</sup>			
Aic	354.1	.	.
Bic	394.2	.	.
Durbin Watson			
Sargan		63.73	67.42
AR1			
AR2			
LL			
N	130	104	117

*t* statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

The net interest model for all banks presented in Table 3 reveals the system GMM still presenting the best result when compared to the other two techniques of estimation. Loans to customers has a positive effect on net interest income thus conforming to SCA prediction of positive effect. Loans to banks have negative effect contrary to SCA prediction of positive effects, however, not significant. Cash and equivalent have insignificant negative effects on net interest income contrary to SCA prediction of positive effects. Securities have positive effects on net interest income thus conforming to SCA prediction, however, not significant. Fixed assets have positive and highly significant effects on net interest income thus conforming to SCA predictive of positive effects. Other assets have negative and significant effects on net interest income contrary to SCA prediction of positive effects. Total assets have negative effects on net income, contrary to SCA prediction of positive effects, however, insignificant.



Current account have positive and significant effects on net interest income contrary to SCA prediction of negative effects. Savings deposit have a negative effect on net interest income conforming to SCA prediction, however, not significant. Fixed account have positive effect on net interest income contrary to SCA prediction of negative effects, however, not significant. Other short term funds have negative effects on net interest income which conforms to SCA prediction, however, not significant. Total liabilities have negative effects on net interest income which conforms to SCA prediction of negative effects, however, not significant. Other liabilities have positive and significant effects on net interest income contrary to SCA prediction of negative effects. Lag of net interest income have positive and significant effects on net interest income indicating that Nigerian banks do well with interest bearing assets and the effect is transferred from the previous to the future periods.

**Table 4: Regression Result for A&L of High Profit Banks (Net Income)**

	(1) Net Income Pooled OLS	(2) Net Income Diff. GMM	(3) Net Income System GMM
Loans to Customers	-0.393 (-1.20)	-0.0857 (-0.21)	-0.00212 (-0.01)
Loan to Banks	-0.212* (-2.50)	-0.121 (-1.36)	-0.177* (-2.47)
Cash and Equivalent	-0.147 (-1.01)	0.0644 (0.34)	0.0246 (0.17)
Total Securities	-0.131 (-0.78)	-0.386 (-1.80)	-0.413* (-2.36)
Fixed Assets	0.190 (0.62)	0.340 (0.99)	0.434 (1.59)
Other Assets	-0.105 (-0.66)	-0.260 (-1.33)	-0.281* (-2.26)
Total Asset	0.104 (0.36)	0.733 (1.26)	0.850 (1.71)
Current Account	0.579** (2.79)	0.466* (2.15)	0.464* (2.29)
Saving Account	0.0119 (0.07)	-0.0581 (-0.33)	-0.0656 (-0.40)
Fixed Account	0.0620 (0.51)	-0.0527 (-0.39)	-0.0323 (-0.32)
Other Short Term Funds	0.0424* (2.02)	0.0419 (1.96)	0.0303 (1.69)
Total Liabilities	0.334** (2.84)	-0.0545 (-0.36)	-0.122 (-0.90)
Other Liabilities	0.229 (1.30)	0.157 (0.88)	0.211 (1.39)
L.Net Income		0.0762 (0.71)	0.0670 (0.70)
Constant	4.768 (1.10)	-1.024 (-0.20)	-3.366** (-2.68)
r2	0.736		
r2_a	0.655		
pr2			
aic	108.5	.	.
bic	141.3	.	.
Durbin Watson			
Sargan		41.42	46.88
AR1			
AR2			
LL			
N	77	65	71

*t* statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

The result presented in Table 4 illustrates the marginal rates of return for the assets and liabilities of Nigerian banks classified as high profit under the net income model. The system GMM presents the best result compared to the other two. Notable in the result displayed is the fact that the lag of net income does not have a significant influence on the net income of these set of banks. A key asset item like loans to customers have negative (insignificant) effect on net income. Fixed asset and total assets have positive effects on net income, however, not significant.

Some key liability items like savings account, fixed account and total liabilities all exert negative effects on net income even though not significant. Particularly, it can be observed that the total liabilities

marginal cost at -0.122 for high-profit banks under the net income is greater than that of the low-profit banks at -0.0692 under the net income. This is in support of the findings of Chatterjee and Dutta (2016) and directly opposite the findings of Kosmidou et al. (2004). The reason could be that India an emerging economy like Nigeria, have similar financial situations which reflects in the financial positions of their banks.

**Table 5: Regression Result for Asset and Liability of High Profit Banks (Net Interest Income)**

	(1) Net Interest Income Pooled OLS	(2) Net Interest Income Diff. GMM	(3) Net Interest Income System GMM
Loans to Customers	0.00628 (0.01)	-0.0162 (-0.02)	0.551 (0.87)
Loan to Banks	0.350 (1.89)	0.304 (1.87)	0.0959 (0.75)
Cash and Equivalent	-0.551 (-1.73)	-0.266 (-0.72)	-0.227 (-0.70)
Total Securities	0.687 (1.88)	0.531 (1.32)	0.457 (1.30)
Fixed Assets	1.581* (2.36)	0.792 (1.20)	1.023 (1.85)
Other Assets	-0.765* (-2.20)	-0.446 (-1.22)	-0.450 (-1.77)
Total Asset	-0.697 (-1.10)	-1.202 (-1.09)	-2.539* (-2.52)
Current Account	0.632 (1.40)	0.422 (0.97)	0.229 (0.56)
Saving Account	-0.220 (-0.60)	-0.150 (-0.44)	0.0635 (0.20)
Fixed Account	0.751** (2.83)	0.542 (1.87)	0.307 (1.41)
Other Short Term Funds	-0.00543 (-0.12)	0.000416 (0.01)	0.0168 (0.47)
Total Liabilities	0.123 (0.48)	0.142 (0.47)	0.203 (0.74)
Other Liabilities	0.577 (1.51)	0.430 (1.22)	0.900** (2.94)
L.Net Interest Income		0.625*** (4.57)	0.552*** (4.73)
Constant	-19.01* (-2.01)	-6.731 (-0.66)	3.597 (1.19)
r <sup>2</sup>	0.340		
r <sup>2</sup> <sub>a</sub>	0.135		
pr <sup>2</sup>			
aic	228.5	.	.
bic	261.3	.	.
Durbin Watson			
Sargan		40.72	61.92
AR1			
AR2			
LL			
N	77	65	71

*t* statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table 5 illustrates the marginal rates of return on assets and liabilities under the net interest income model for high profit banks. It is observed that both the pooled OLS and the system GMM techniques present similar number of significant results. However, the presence of the lagged variable with a significant value in the system GMM, makes the system GMM a better choice. Key asset items like loans to customers and loans to banks have positive effects on net interest income, however not significant. This is an indication of the ability of banks in this category to generate income from their core business which is loan and advances.

Although positive as expected, the fact that it is not significant is an indication that these banks have not fared too well in their loan administration activities. Fixed assets have positive effects however, not significant. Total assets have negative and significant effects on net interest income! These banks have piled up total assets at the expense of income generating assets like loans and advances. Key liability items like current account, savings account, fixed account and total liabilities all have positive effects on net interest income, however, not significant. Interestingly, the lag of net interest income have a positive and significant effect on net interest income of these banks unlike the lag of net income.

**Table 6: Regression Result for Asset and Liability of Low Profit Banks (Net Income)**

	(1) Net Income Pooled OLS	(2) Net Income Diff. GMM	(3) Net Income System GMM
Loans to Customers	-0.978** (-2.93)	-0.620 (-1.52)	-0.567 (-1.76)
Loans to Banks	-0.0516 (-0.30)	-0.142 (-0.73)	-0.140 (-0.89)
Cash and Equivalent	-0.483** (-3.19)	-0.413* (-2.18)	-0.397* (-2.46)
Total Securities	0.0990 (0.95)	0.0835 (0.72)	0.0442 (0.46)
Fixed Assets	0.271 (1.24)	0.156 (0.65)	0.0545 (0.33)
Other Assets	-0.245 (-1.67)	-0.192 (-1.18)	-0.101 (-0.76)
Total Assets	3.424*** (4.21)	2.276* (2.19)	2.106** (2.67)
Current Account	0.00582 (0.08)	-0.00133 (-0.02)	0.0166 (0.22)
Saving Account	-1.068 (-1.68)	-0.378 (-0.53)	-0.248 (-0.57)
Fixed Account	-0.564* (-2.21)	-0.262 (-0.66)	-0.155 (-0.53)
Other Short Term Funds	0.00728 (0.29)	-0.0112 (-0.31)	-0.0261 (-0.97)
Total Liabilities	0.0151 (0.10)	0.00422 (0.02)	-0.0692 (-0.44)
Other Liabilities	0.427 (1.39)	0.222 (0.59)	0.226 (0.73)
L.Net Income		0.167 (1.04)	0.146 (1.22)
Constant	-5.778 (-1.70)	-4.407 (-1.15)	-4.351 (-1.59)
r2	0.709		
r2_a	0.568		
pr2			
aic	84.22	.	.
bic	111.8	.	.
Durbin Watson			
Sargan		24.06	29.63
AR1			
AR2			
LL			
N	53	44	48

*t* statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

The results illustrated in Table 6 for the low profit banks under the net income model reveal the pooled OLS, diff GMM and system GMM presenting similar signs for virtually all the items however, with varied level of significance in some cases. For consistency, the system GMM is chosen for analysis. Key asset variables like loans to customers and loans to banks have negative effects on net income. Fixed assets and total assets have positive effects on net income with total assets having significant effects. This is unlike the total assets of high profit banks which does not have significant effect on net income. Key liability items like savings account, fixed account and total liabilities have negative effects on net income, however, not significant. Current account has positive effect on net income, although not significant. The lag of net income does not have any significant effect on net income for these banks just like the high profit banks.

**Table 7: Regression Result for Asset and Liability of Low Profit Banks (Net Interest Income)**

	(1) Net Interest Income Pooled OLS	(2) Net Interest Income Diff. GMM	(3) Net Interest Income System GMM
Loans to Customers	-0.638** (-3.27)	-0.668** (-3.14)	-0.226 (-1.28)
Loans to Banks	-0.345** (-3.47)	-0.373** (-3.28)	-0.263** (-2.60)
Cash and Equivalent	-0.371*** (-4.20)	-0.325** (-3.14)	-0.330*** (-3.63)
Total Securities	-0.120 (-1.96)	-0.113 (-1.72)	-0.0708 (-1.45)
Fixed Assets	0.166 (1.30)	0.260 (1.79)	0.107 (1.05)
Other Assets	0.0158 (0.18)	-0.00363 (-0.04)	-0.00723 (-0.09)
Total Assets	2.396*** (5.04)	2.459*** (4.60)	1.434** (3.27)
Current Account	0.0338 (0.76)	0.0500 (1.16)	0.0327 (0.81)
Saving Account	-0.168 (-0.45)	-0.517 (-1.25)	-0.237 (-0.82)
Fixed Account	0.575*** (3.87)	0.644** (2.97)	0.610*** (3.66)
Other Short Term Funds	-0.0224 (-1.54)	-0.0307 (-1.59)	-0.0205 (-1.46)
Total Liabilities	-0.0987 (-1.15)	-0.135 (-1.40)	-0.112 (-1.27)
Other Liabilities	0.0807 (0.45)	0.273 (1.37)	0.471** (2.78)
L.Net Interest Income		0.0948 (0.64)	-0.378*** (-3.89)
Constant	-13.67*** (-6.89)	-15.35*** (-5.95)	-4.103** (-2.80)
r2	0.956		
r2_a	0.935		
pr2			
aic	27.16	.	.
bic	54.74	.	.
Durbin Watson			
Sargan		35.20	81.10
AR1			
AR2			
LL			
N	53	44	48

*t* statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

The results illustrated in Table 7 for the low profit banks under the net interest income model reveals all the techniques of estimated presented virtually similar results. Again, for consistency, the system GMM is selected for analysis. Notably on the assets' side, loans to customers, loans to banks, cash and equivalent have negative effects on net interest income which is significant from loans to banks, cash and equivalent. This is unlike the situation of the high profit banks where loans to customers and loans to banks have positive effects on net interest income. This is an indication that the low profit banks may be making too much losses on their income generating assets like loans and advances.

Unlike the situation for high profit banks, total assets have positive and significant effects on net interest income. This may be an indication that low profit banks invest more of their total assets in income generating asset even though they may not be generating enough returns from them and even making losses. On the liabilities' side, key items like savings account and total liabilities have negative effects on net interest income, however, not significant.

This is unlike the situation of high-profit banks where these items have positive effects on net interest income which are also not significant. The lag of net interest income have negative and significant effect on net interest income of these banks. This is unlike the situation for high profit banks where the lag of net interest income have positive and significant effects on net interest income. Implication is that low level of profit or even losses made by the low profit banks in the previous period continued to negatively affect the net interest income after.

In virtually all the models considered, it is observed that current account displayed positive effects on both the net income and net interest income which is significant for all banks and mostly not significant for classified banks. This is an indication that Nigerian banks generate more returns on current account with little or no cost incurred or returns paid to depositors.

### CONCLUSION AND RECOMMENDATIONS

Conclusively, SCA hypothesis of positive marginal returns for assets and negative marginal costs for liabilities is rejected for the asset and liability management activities of Nigerian banks. The net income for all banks is more affected by the ALM activities than the net interest income. The net income model for all banks has marginal return and cost items that conform more to SCA prediction than the net interest income model. Loans and advances activities of high-profit banks have a positive effect on their net interest income even though not significant.

Whereas, the loans and advances activities of the low-profit banks have a negative and significant effect on their net interest income. The net interest income of low-profit banks is more sensitive to movements in their asset and liability items. High-profit banks under net income carry a higher rate of cost on total liabilities. Both the high-profit and the low-profit banks have net interest income that is positively and significantly sensitive to the previous year's net interest income.

Thus, this study establishes that the previous year's profit can exert a strong influence on the current year's profitability. The current account (demand deposit) even though a liability item to a large extent has not exerted a negative effect on any of the profitability measures for all banks and individual categories. Nigerian banks actually profit from current accounts held even though it's a liability item. Therefore, this study recommends that low-profit banks should focus more on their interest generating assets to make them more profitable. In addition, both the high-profit and low-profit banks need to work on their loans and advances activities to reduce costs or losses that impair on net income.

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