Asset Liability Management and the Profitability of the Life Insurance Industry in Nigeria

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Abstract

This study is a panel data analysis of asset liability management and its effect on the profitability of life insurance companies in Nigeria. An inappropriate asset liability mix can be detrimental to the profitability of the organization. The objective of this study is to assess the relationship between assets, liabilities and profitability of life insurance companies in Nigeria. The expost facto research design is adopted and cross sectional data is sourced from ten life insurance companies covering years 2008-2019. Descriptive analysis and inferential statistics are carried out to test the suitability of the data for the study. Data are further subjected to the fixed effect and random effect regressions. Hausman test is carried out and the null hypothesis of a random effect model is rejected. The results reveal that assets largely have a statistically significant relationship with profitability, while some liabilities are significant. This provides evidence that profitability is associated with balance sheet items and a proper asset liability management has a direct effect on the overall profitability of the life insurance industry. It is therefore recommended that insurers should inculcate proper asset liability management policies and channel more of their resources to assets/liabilities which have the highest positive influence on profitability.

Keywords: Assets, Liability, Insurance, Profitability, Nigeria

1 Introduction

Asset Liability Management (ALM) can be defined as any continuous management process that defines, implements, monitors and back tests financial strategies to jointly manage a firm's assets and liabilities (Deelstra & Jansesen, 2002). The banking and insurance sector operate in a very dynamic marketing environment as a result of rapid changes in technology, consumer tastes, economic and social forces (Fagbemi & Olowokudejo, 2011). An ALM strategy aids in the achievement of financial goals for given levels of risk and under predefined constraints. Owing to the increase of technicalities in insurance activities and regulation, and the use of increased complex models, ALM plays a central part in an insurance company's financial strategy. Corlosquet-Habart, Gehin, Janssen and Manca (2015) give the objective of ALM as that of ensuring the proper coordination between assets and liabilities to achieve the financial targets for a specified level of risk and under predefined constraints. Thus the ALM department is responsible for producing studies providing recommendations on marketing strategy and asset allocation.

Deelstra and Jansesen (2002) assert that ALM has two major goals. One of which is to cover liquidity and interest rate risks in order to ensure solvency of the company thus increasing its capacity to meet its financial obligations; and the other, to increase profitability of the company. In this regard, ALM can be viewed as a management tool to maximize investment returns while minimizing risks. Rossano (2003) maintains that an insurance company must have a good knowledge of its asset and liability risks to ensure its financial strength and honour its contractual commitments to clients. To achieve this, the ALM department must ensure proper coordination of assets and liabilities to achieve a financial goal with an accepted level of risk under predefined constraints, produce studies providing recommendations on marketing strategy and asset allocation, and, calculate the capital requirement for market risks in the respective ALM frameworks (Briys & De Varenne, 1997; Gilbert, 2016).

Baum (2006) defines ALM as the practice of managing a business to ensure that decisions taken with respects to assets and liabilities are coordinated in order to ensure effective utilization of the organization's resources and increase its profitability. Thus, ALM incorporates a means of quantifying and managing risks in order to lead to higher returns and profitability (Gilbert, 2016). A proper understanding of the concept of ALM would provide an organization with a true picture of its risk/return trade-off embarked upon (Shubiri, 2010). Insurance company's profitability is not only vital for the operation of the company but it also contributes significantly to the growth of the economy. This implies that if insurers can effectively manage their assets and liabilities, then there is a possibility of improving overall profitability (Sayeed & Hoque, 2010). Insurance profitability can be hampered by both internal and external factors. Internal factors encompass the ALM culture of the company while the external factors reflect the economic and legal environment that affect the operation of insurance companies. Common macroeconomic factors that determine profitability include GDP, inflation rate and interest rates (Tee, 2017).

ALM covers a wide variety of areas (Trenca & Cociuba, 2014). In the life insurance industry, it is synonymous with interest rate risk management with associated risks such as interest rate risk, liquidity risk, credit risk, market risk and currency risk etc. This is largely because these risks are attached to assets and liabilities of the insurance firm (Mehari & Aemiro, 2013). ALM does not just aid in protecting from risk; it also provides a safety net for the organization thus opening up opportunities which enhance networth. With the increase in demand for funds in the insurance sector, insurers have reassessed the features of their assets

and liabilities. Intense competition together with increasing volatility in interest rates have encouraged insurers to strike a balance between the spreads of its assets and liabilities, profitability and long term viability (Kozak, 2011; Obalola, Ime & Abaas, 2014). A mismatch between the asset and liability may affect the market value of the insurance company's equity and its entire profitability (Darush, 2013).

1.1 Statement of the problem

The assessment and management of risk in the insurance industry has undergone changes in the last couple of years. One of the major changes has been the identification of the risk of a mismatch between assets and liabilities which tends to be one of the critical risks, insurers, especially those in the long term business are exposed to.

Determining the benchmark between liabilities and assets in an insurance business is mostly challenging. This is because for a life insurance business which is a long-term business, there is always the presence of undesirable and unavoidable risks which the insurer faces. These risks often arise from basic financial instruments the insurer adopts as the insurance system may be incomplete without hedging using some financial instruments. The insurer then discovers that genuinely risk-free assets do not exist and government bonds may not be a sufficient proxy. Moreover, the volume of outstanding insurance liabilities may significantly exceed the assets available to service them (Albrecher, Bauer, Embrechts, Filipovic, Koch, Korn, Loisel, Pelsser, Schiller, Schmeiser & Wagner, 2017).

As asset liability management does not just serve to protect from risk, it enables the insurer, as a liability-driven intermediary, to ensure that claims are met when they are due, thus enhancing overall networth and maximizing the profitability of the organization (Ramlall, 2009; Tamiru, 2013). Since ALM aims at managing financial risk exposures associated with the assets backing liabilities, several considerations must be made in the pursuit of an appropriate ALM mix (Gilbert, 2016). These include what sources of financial risk should fall within the scope of ALM; on what basis the risk should be measured and managed; what assets and what liabilities should be included, and which, if any, should be excluded. As investigating all these points is a tall wish for any one paper, ascertaining what assets and liabilities should be included in order to maximize profitability for the insurance company is therefore the focal point of this study.

1.2 Objectives of the study

The major objective of this study is to explore the relationship between assets, liabilities and the profitability of life insurance companies in Nigeria. Sub objectives include to:

i. Assess the relationship between assets and profitability of life insurance companies.
ii. Determine the relationship between liabilities and profitability of life insurance companies.
iii. Assess the effect of macroeconomic factors on the profitability of life insurance companies.

1.3 Research questions

The research questions posed for this study are as follows:

i. Is there any significant relationship between assets and profitability of life insurance companies?

ii. Is there any significant relationship between liabilities and profitability of life insurance companies?
iii. Is there any significant effect of macroeconomic factors on profitability of life insurance companies?

1.4 Study hypotheses

In line with the research questions posed for the study, the following hypotheses are coined:

i. There is no significant relationship between assets and profitability of life insurance companies.
ii. There is no significant relationship between liabilities and profitability of life insurance companies.
iii. There is no significant relationship between macroeconomic factors and profitability of life insurance companies.

1.5 Significance of the study

The insurance business constitutes an area in which ALM is of great importance. This is because of the long term nature of an insurance firm's investment and obligations which amplifies the financial rewards and penalties for good and bad decisions. Thus this study is of great significance to insurers as it would aid insurers in seeking investments in assets that are appropriate to the nature and term of its insurance liabilities. This will enable them maximize returns within its risk tolerance level and available financial resources.

This study is significant to policymakers and regulators as it would guide them in setting informed guidelines on the allocation of resources among assets to maximize the profitability of life insurance companies. Investors will find this study helpful as it would assist them in making informed decisions about where to invest their money. This study will serve as a model to prospective insureds to assess the ability of the insurance company to meet up with its contractual obligations. Finally, scholars who wish to undertake further studies on ALM and the insurance industry would find this study as a significant addition to the pool of existing knowledge.

2 Literature Review

Preamble

In this section, literature on asset liability management (ALM) and profitability will be discussed under the conceptual, theoretical and empirical frameworks.

2.1 Conceptual framework

The challenges faced by insurers globally in their business operations keeps increasing. This is as a result of the increasing complexity of insurance products, emerging risk-based regulations with increased requirements for accuracy and consistency of calculations across the organization; coupled with increasing risk levels as insurers deal with persistent low-yield environments (Rosen & Zenios, 2008; Kannan, 2009). This has led insurers to seek for improved returns from broader and more diversified asset classes (Bergendhal & Janssen,

1999; Orreborn, 2017). Different approaches to ALM has had their fair contribution to the challenges faced by insurers as each proposed model was adapted to either an asset or liability centric approach to ALM (Zenios & Ziemba, 2007). This divergence led to a lack of consistency across the enterprise which did not only result in regulatory scrutiny but also displayed a potential lack of accuracy on both sides of the balance sheet (IBM, 2014).

2.1.1 The concept of asset liability management (ALM)

Rodriguez (2018) defines an asset as a resource with the expectation of providing future benefits which implies a right to receive money. Liabilities, on the other hand, are debts or obligations that arise in the course of business operations and present an obligation to pay. In this regard, ALM can be viewed as a broad denomination for models that are used to forecast the evolution of a company along time, projecting together their assets and liabilities portfolios and computing the predicted cash inflows and outflows (Bergendhal & Janssen, 1999). ALM can be carried out in a bank, an insurance company or other financial institution such as a state pension fund or enterprises with huge and diversified assets and liabilities. To Orreborn (2017), ALM refers to managing the asset allocation with respect to the firm's liability cash flows. This implies managing the risks coming from mismatches between the firm's assets and liabilities. The society of Actuaries (2003:273) define ALM as

> *an ongoing process of formulating, implementing, monitoring and revising strategies related to assets and liabilities to achieve an organization's financial objectives, given the organization's risk tolerances and other constraints.*

The history of ALM hinges on the variation in interest rates in developed countries which was capable of resulting in losses in financial services (Bergendhal & Janssen, 1999). Before the 1970s, there were little variations in interest rates in developed countries which resulted in low losses in asset and liability mismatches. Liabilities arising from deposits, life insurance policies or annuities were invested in assets such as loans, bonds or real estate. All assets and liabilities were held at book value which successfully hid financial risks arising from divulgence in assets and liabilities (Bergendhal & Janssen 1999; Rosen & Zenios, 2008).

A period of volatile interest rates was experienced in the 1970s which continued till the early 1980s. The volatility had precarious implications for financial institutions. The US regulation attempted to cap the interest rate that banks could pay depositors but this only led to an overseas migration for the market for US deposits (Bergendhal & Janssen, 1999). The associated risks did not seem so obvious owing to the accrual accounting employed by most firms. These firms gradually accrued financial losses over the subsequent five or 10 years. One of such firms is the Equitable Life Insurance Company (Deelstra & Janssen, 2002). The lessons learnt in this period led to the development of a sounder ALM. Managers of insurance firms sought ways to manage their balance sheets in order to maintain a mix of deposits through premiums, liabilities and investments in other to be consistent with the main insurance function and ensure long-term growth and risk management. This led to the development of new financial techniques such as gap analysis, duration analysis and scenario analysis in both banks and insurance companies (Fabozzi & Konishi, 1995; Corlosquet-Habart, Gehin, Janssen & Manca, 2015).

However, ALM practices have continued to evolve. Today, banks are increasingly using market value accounting for their business lines in daily trading operations. ALM is used

for the management of assets and liabilities that must be accounted on an accrual basis ((Janssen, 1996; Gilbert, 2016). This covers all traditional insurance activities as well as bank lending and deposit taking. The growth of the derivative market has facilitated a variety of hedging strategies such as securitization which has enabled firms work on their asset and liability risk (Deelstra & Janssen, 2015). The scope of ALM has also widened. ALM departments are beginning to cover a wide variety or risks including foreign exchange risks. Non-financial firms are not excluded. Many corporations have adopted some ALM techniques to manage interest rate exposures, liquidity risks and foreign exchange risks. Some of these corporations manage commodity risks as well (Zenios & Ziemba, 2007; Rodriguez, 2018). The ALM process now acts as a link between risk management and strategic planning. This is because it not only offers solutions to mitigate and hedge risks arising from the interface between assets and liabilities but also provides a long term perspective for the conduct of both the insurance and banking business (Corlosquet-Habart, Gehin, Janssen & Manca, 2015).

2.1.2 Missions of the ALM department for insurance companies

Albrecher, *et al*, (2017) opine that it is important for an insurance company to have the requisite knowledge of appropriate combinations of its asset and liability to promote its financial strength and enhance its ability to honour its contractual commitments to clients. Ukpong and Folarin (2020) maintain that managing financial risks necessitates making organizational decisions about risk that are acceptable and those that are not, both internally and externally. The ALM department is thus saddled with the tasks of maintaining its financial goal with acceptable level of risk under predefined constraints (Bergendhal & Janssen 1999), producing studies providing recommendations on marketing strategy and asset allocation (Deelstra & Janssen, 2002), and calculating the capital requirement for market risks according to the Solvency III framework regulations (Corlosquet-Habart et al, 2015).

2.1.3 Profitability

Profitability can be regarded as the ability of a business to utilize its assets in order to generate revenues in an efficient manner (Charumath, 2012). Olowokudejo and Ajemunigbohun (2016) assert that increased profitability, increased market share, increased industry competitive position and increased customer loyalty and affiliation all enhance organizational performance. The factors underpinning the financial performance of financial firms are often difficult to discern because of the intangible nature of outputs and the lack of transparency over resource allocation decisions. Researchers such as Shubiri (2010) and Mahboob (2015) maintain that profitability is the lifeline of 'for profit' organizations and can be used as a tool for measuring how successfully an organization has been able to achieve its objectives.

Wright (1992) in Wasike (2016) argues that measuring profitability in insurance is difficult in comparison to other financial institutions because of the unique accounting system applied to insurance. During a particular year, the insurance company may not know how much profit or loss it recorded since only 40% of incurred claims were paid by the close of the year. This implies that 60% of incurred claims were carried forward to the succeeding underwriting year. According to Boadi, Antwi and Lartey (2013), the difficulty in measuring insurers' profitability is owing to factors such as actual mortality, investment earnings, scale of shareholder's dividend or bonus and taxation. These in turn depend on fair premium that would cover claim cost, administrative underwriting expenses and reasonable profit. Such fair level

of premium can only be achieved through high level of accuracy in the underwriters' predictions (Yusuf & Dansu, 2014). Profitability can be measured using the return on invested capital (ROIC), return on equity (ROE) and the return on assets (ROA) (Malik, 2011). In determining the profitability of general insurance companies in Poland, Kazimierz (2016) used six measures of profitability which are – profitability ratio of technical activity, assets profitability ratio, equity profitability ratio, sales profitability ratio, profitability of subscribed capitals and profitability of gross premium written.

2.2 Theoretical review

2.2.1 The statistical cost accounting theory

This is an empirical model based on accounting relationships. It attributes the differences in a firm's earnings to difference in the structure of their balance sheet by regressing accounting earnings on the firms' assets and liabilities. It was first applied in the transportation industry by Meyer and Kraft (1961). Hester (1964) further applied it in commercial bank samples from India and the United States. With the banks, it was used to estimate the marginal rates of return and cost on bank portfolio items, to compare the rates of return on various loan categories and to investigate the profitability differences across different classes of banks (Hester & Zoellner, 1966; Vasiliou, 1998). The fundamental hypothesis of the model is that the rates of return for assets are positive and vary across assets while the rates of return for liabilities are negative and vary across liabilities. Hester and Pierce (1975) contend that if this theoretical proposition is correct and the balance sheet items of banks are not just scalar multiples of each other, variation in bank portfolios explains the variations in bank earnings.

The ordinary least square regression is usually used to estimate the parameters of the model on a cross sectional sample of data. The parameters of the assets are expected to have positive signs, while that of liabilities are expected to appear with negative signs. The net income realized by the bank will be a linear function of the elements of its portfolio. To this end, a bank's profit (net income) can be expressed as the weighted sum of its various assets and liabilities (Vasiliou, 1998).

2.2.2 The theory of mismatching

This is a generalized Janssen model also known as the multidimensional model. As illustrated by Ars and Janssen (1994), in this model, a portfolio of asset pools A1, A2, … A_n with some segments containing only interest rate sensitive securities and some only shares are treated with a less realistic model in order to obtain an increased understanding of its different influences. The assets are modelled as one group of interest rate sensitive securities reflecting the rates of return of the asset portfolio in the past. As insurance companies invest mostly in bonds, by assuming the asset portfolio contains N zero-coupon bonds, they are modelled by the rates of returns which have been obtained by the portfolio over the las years.

From the generalized model, the Janssen model progresses to the perfect matching where the relationship between the asset process and liability process are studied in order to establish their matching principles. From the model, the assets A and liabilities B have no perfect match if for some time $t \geq 0$ the asset value A(t) becomes lower than the liability value B(t). This defines the first mismatching time in the period (O,T). In practice, perfect matching of insurance liabilities might be too demanding since low risk investment strategies associated with the highest degree of matching usually produce lower expected returns. This leads to a

final matching which would ensure the assets cover the liabilities at the end of the period (Deelstra & Janseen, 2015).

2.2.3 Asset-liability management theory

This theory was extensively adopted by Oracle (2011). It portrays the core functions of ALM as consisting of managing maturity gaps and mismatches. Structural gaps as an aspect of maturity gaps stresses the importance of balancing maturities as well as cash flows on each side of the balance sheet. Emphasis is placed on balancing the gaps, issuing timely guidelines to adjust focus on right product types and tenors and actively involve asset liability committees in the process. Duration is also used to measure the interest rate sensitivity. The Macaulay's duration, according to Odhiambo (2006), is traditionally accepted as a good measure of the length of portfolio of discounted cash flows over the life of an asset or liability.

It is of common practice to measure duration of portfolio for different product types as well as on an overall portfolio level. This is usually useful in the simulation of how the duration of a portfolio could be affected by future events. Macaulay duration measures the weighted average time-to-maturity of the bonds cash flow while the weightings are the present values of the cash flows (Fabozzi, 2003). Other areas considered in the ALM theory is the dynamic gap management and the management of static gap as these reports simulate future gap positions for assumed business volumes and exercise of options. Also, proposed new volumes, prepayment transactions and assumed deposit roll-overs create a major ALM gap (Simatwa 2015).

2.3 Empirical framework

Kozak (2011) studied the determinants of profitability of general insurance companies in Poland during integration with the European financial system. Using a panel data set of 25 general insurance companies for the period 2002 – 2009, the result of the regression model indicated that an increase in their gross premiums and decrease in total operating expenses had a positive impact on profitability and cost efficiency of insurance companies. Also, GDP growth rate and the market share of foreign owned companies positively impact on the profitability of general insurance companies during the integration period. Using a time series and cross sectional data of select deposit money banks in Nigeria, Ajibola (2016) conducted a panel data regression to explore the relationship between ALM and financial performance. The findings showed that asset variables are positively related to the return on equity while the liability variables were the reverse.

Sayeed and Hoque (2010) in a study of the determinants of commercial banks profitability using panel data analysis, discovered a significant positive relationship between return on asset and total asset and a significant negative relationship between return on assets and total liabilities. In addition, a significant negative relationship was found between return on asset and growth rate of GDP as well as inflation rates for the affected companies. Gyekyi (2011) in a study of the effects of ALM on the profitability of the Ghanaian National Investment Bank found that the value of assets and liabilities of the bank had a significant effect on its profitability. Decrease in asset value led to an increase in banking profitability. Liabilities also had a significant effect on company's profitability. There was a direct effect of inflation rate on profitability as an increase in inflation rate led to an increase in profitability. Kramaric, Miletic and Pavic (2017) in their study of the profitability determinants of insurance markets

in selected central and eastern European countries observed a significant influence of growth rate of real GDP on the return on assets.

Malik (2011) in a study of the determinants of the profitability of insurance companies found that there is a significant positive relationship between the volume of capital and profitability of insurance companies. A similar study by Tee (2017) on ALM and the profitability of listed banks in Ghana using a robust panel regression revealed that total assets affect profitability positively while total liabilities and credit balances have a significant and negative effect on banks' profitability. There was no significant effect of the macroeconomic variables on profitability. Shrestha (2015) used the pooled OLS regression analysis in studying the effect of ALM on bank profitability in Nepal. The results showed that all assets including fixed assets affect profitability positively while all liabilities had a negative effect on profitability. GDP and inflation rate also had a negative effect on profitability.

Tamiru (2013) used the statistical cost accounting model to estimate profitability as a function of balance sheet and macroeconomic variables in Ethiopia. Using a sample of eight commercial banks over the period 2005 -2010, the model hypothesized that the rate of return on earnings assets is positive and varies across assets while the rate of costs on liabilities is negative and varies across liabilities. The pooled OLS regression indicated that all assets except fixed assets affect profitability positively while all liabilities have a significant negative effect on banks profitability. Real growth rate of GDP also recorded a negative effect on profitability. Lee (2014) studied the effects of firm-specific and macroeconomic factors on profitability of property-liability insurance industry in Taiwan. Using a panel dataset of 15 insurance companies through the time period 1999-2009, the return on assets was used as a dependent variable to measure insurer's profitability. With the ordinary least square regression, fixed effect model and random effect model, the analysis revealed that input cost and return on investment have significant influence on profitability.

2.4 Research gap and contribution to knowledge

Most of the empirical studies bordering on ALM and profitability has been carried out in banks and have largely dealt on strategic measures of bank profitability. These works include that of Sayeed and Ziaul Hoque (2010), Shubiri (2010), Tamiru (2013), Thuku (2015), Shrestha (2015), Tee (2017) and Owusu and Alhassan (2020). While a reasonable number of research work has been done in ALM and insurance companies in recent times, most of these works have been in relation to solvency and stochastic analysis. Such works include that of Chiu and Li (2006), Consigli and Dempster (2008), Yang, Gondzio and Grothey (2009), Das, Lu, Papaioannou and Petrova (2012) and Trenca, Zapodeanu and Cociuba (2017).

Trying to establish a relationship between ALM and profitability of insurance companies is an area that has received very little attention. This is evident in the dearth of literature on the subject. In addition, the SCA model has so far been applied to the banking industry, it is still yet to be fully applied to the insurance sector and to the life insurance divide in particular. Since banks and insurance companies fall in the same financial sector, the researcher deems it fit to apply the same model for insurance companies and examine its workability. This is therefore the gap this study hopes to fill.

This study will be of immense help to insurers as the output would serve as a useful database and resource material in the area of ALM and profitability as a whole. It would also

contribute to existing literature by presenting results on ALM and profitability in life insurance on a developing country like Nigeria.

3 Research methodology

Preamble

In this section, the methodology adopted for the research analysis is discussed. Sub-sections cover the research design, sources of data, population and sample size, description of variables and model specification together with the data analytic procedure.

3.1 Research design

The expost facto research design is adopted as this study is an after-event research and is based on already existing data. The research approach is purely quantitative and data is made up of both time series and cross sectional data.

Secondary data required for the study is sourced from the Nigeria Insurance Association (NIA) Digest, Central Bank of Nigeria (CBN) Database and from the websites of the selected insurance companies for the 12-year period covering 2008 – 2019. The choice of the start date is to consolidate on the 2007 recapitalization of the insurance industry. The researcher considers this time period substantially sufficient for the study.

3.2 Population and sample size

The population of this study is made up of the 18 life insurance companies in Nigeria as at 2019. To achieve a balanced panel study, sample size was selected on two criteria: the existence of the company through the study period (2008-2019) and the availability of financial statements. Ten (10) life insurance companies met these criteria and were duly selected as sample size for the study. These companies are: African alliance Plc, Capital Express Assurance Ltd, FBN Insurance Ltd, Goldlink Insurance Ltd, Great Nigeria Insurance Plc, Lasaco Assurance, Leadway Assurance, Mutual Benefits Life Insurance, Royal Exchange Prudential Life Insurance, Standard Alliance Insurance Plc.

3.3 Description of variables and model specification

Variables used in the analysis are chosen based on relevant theory and literature in line with similar studies on the subject and based on the availability of data.

3.3.1 Dependent variable

Profitability is the dependent variable for the study which is measured by the return on assets (ROA). The return on assets is calculated as a ratio of profit after tax to total assets. Trenca and Cociuba (2014) maintain that the return on assets is a more comprehensive measure of overall firm performance from an accounting perspective as it is a primary indicator of managerial efficiency and indicates how capable the managers of the firm can convert the firm's assets into net earnings. Darush (2013) and Thuku (2015) tend to support this assertion as they posit that ROA as a measure of profitability is not distorted by high equity multipliers.

3.4.2 Independent variables

These consist of various components of assets and liabilities of the life insurance company. Assets include cash at hand and bank balance, property and equipment, financial assets, debtors and prepayment while insurance contract liabilities, trade payables, investment liabilities and other liabilities represent liabilities. Shrestha (2015) asserts that the profitability of an insurance company can be hampered by both internal and external factors. The internal factors consist of the ALM culture of the company while the external factors encompass the economic and legal factors affecting the company. To incorporate the external factors, the researcher adopts two macroeconomic variables, GDP and inflation rate in carrying out an all-embracive analysis.

3.4.3 Model specification

In examining the effect of ALM on the profitability of life insurance companies, the statistical cost accounting (SCA) model is adopted. This model was first postulated by Hester and Zoellner (1966) and had subsequently been adopted by Hester and Pierce (1975), Kwast and Rose (1982) and Vasiliou (1996). The SCA model is based on the assumption that the rate of return of earning assets is positive and varies across assets whereas the rate of cost on liabilities is negative and varies across liabilities. Its basic theoretical framework is based on the fact that ALM has potentially positive or negative energy on the profitability of financial firms in the presence of other factors such as the market structure and macroeconomic conditions. These macroeconomic factors have been incorporated by Kwast and Rose (1982), Sayeed and Hoque (2010), Shubiri (2010), Tamiru (2013) and Tee (2017) in a bid to present the traditional model in a modified way. Tamiru (2013) posits that if these factors are not included in the model, the regression results may be unreliable and the coefficients biased. Thus, the SCA model is basically:

$$Y_{it} = \alpha_1 + \sum \alpha_{2i} A_{ilt} + \sum \alpha_{3j} L_{jkt} + e_{lt} \qquad (1)$$

Where Y represents the profit of the firm
A_i is the ith asset,
L_j is the jth liability,
i refers to different classes of assets,
j refers to different classes of liability,
l represents the number of firms, i.e. $l = 1,2,..k$
t is the time period, $t = 1,2,\ldots T$
α_{2i} is the rates of return and shows the variations in profit by replacing one unit of cash with one unit of the ith asset and is expected to be positive or non-negative.
α_{3j} represents the rate of cost of liabilities and indicates the changes in profit by adding one unit of cash and one unit of jth liability and is expected to be negative or non-positive.
α_1 is a constant term, and
e_{lt} is the stochastics error term accounting for stochastic differences among the firms (Owusu & Alhassan, 2020)

Kramaric, Miletic and Pavic (2017) in adopting this model for the insurance industry stated it thus:

$$Y_{it} = c + \sum^{k}_{k=1} \beta_k X^k_{it} + \varepsilon_{it} \qquad (2)$$
$$\varepsilon_{it} = z_i + u_{it}$$

where Y_{it} is the profitability of the insurance company *i* at time *t*, with *i* = 1…,N; t = 1…,T.
X_{it} are k independent variables;
ε_{it} is the disturbance term with z_i being the unobserved insurance-specific effect and u_{it} being the idiosyncratic error as a one-way error component regression model.

In other to incorporate the effect of macro-economic factors in the analysis, the growth rate of GDP and inflation rate is introduced into the model. This is in line with the works of Tamiru (2013) and Tee (2017). Thus, the modified model used in this study is presented as:

$$Y_{it} = \alpha_1 + \sum \alpha_{2i} A_{ilt} + \sum \alpha_{3j} L_{jlt} + GDP + INFR + e_{lt} \qquad (3)$$

Where Y_{it} is the profitability ratio (ROA) of life insurance company *l* at time *t*,
A_i is the *i*th asset,
L_j is the *j*th liability,
i represents different classes of assets
j represents the different classes of liabiity
l represents the number of firms, *l* = 1,2,..10
t is the time period, *t* = 1,2,…12
GDP is the real GDP growth rate for years 2008-2019; and
INFR is the corresponding inflation rates.
α_1 is a constant term, and
e_{lt} is the stochastics error term.
A description of both the explained and explanatory variables and their apiori expectations is presented in table 1.

Table 1: Description of study variables

Variable	Description	Expected sign
ROA	**Profitability** Return on assets (Profit after tax/total assets)	
	Assets	
CACE	Cash and cash equivalents	Positive (+)
FINAT	Financial Assets	Positive (+)
DBTP	Debtors and Prepayments	Positive (+)
PROPE	Property and equipment	Positive (+)
	Liabilities	
INSCL	Insurance contract liabilities	Negative (-)
TRP	Trade payables	Negative (-)
INVL	Investment liabilities	Negative (-)
OTHL	Other liabilities	Negative (-)
	Macro-economic factors	
GDP	Real GDP growth rate	Positive (+)
INFR	Inflation rate	Negative (-)

Following the description of variables, the model specification can be translated thus:

$$ROA_{it} = \alpha_1 + \alpha_{1i} CACE_{lt} + \alpha_{2i} FINAT_{lt} + \alpha_{3i} DBTP_{lt} + \alpha_{4i} PROPE_{lt} + \alpha_{5j} INSCL_{lt} + \alpha_{6j} TRP_{lt} + \alpha_{7j} INVL_{lt} + \alpha_{8j} OTHL_{lt} + GDP + INFR + e_{lt} \quad (4)$$

4 Data presentation and analysis

Preamble

This section contains the analysis carried out in the data, the results obtained and the subsequent discussion of results. It is made up of the descriptive statistics, stationarity tests, correlation and panel regression tests.

4.1 Presentation of data

The descriptive statistics for the explained and explanatory variables are presented in table 2. It is based on the panel data set organized from 10 life insurance companies with a total observation of 120. Raw data is used for each of the variables and not their log or first difference transformations.

Table 2: Descriptive statistics

Variable	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Berra	Prob.
ROA	3.911708	114.3810	0.000000	11.06112	8.5024	84.475	34637.00	0.0000
CACE	1394718.0	9410464	6488.000	1839992	1.9418	6.7191	144.5719	0.0000
FINAT	12381338	2.60E+08	0.000000	33790534	5.1158	32.255	4802.769	0.0000
DBTP	675144.6	3784933	0.000000	781368.6	1.7610	5.9890	106.6953	0.0000
PROPE	673991.5	6285400	3390.000	939279.1	3.7500	20.118	1746.371	0.0000
INSCL	10362332	2.30E+08	0.000000	29383905	5.2323	33.824	5298.226	0.0000
TRP	439582.2	7467902	0.000000	1004770	4.7901	29.243	3902.471	0.0000
INVL	4384543	26796212	0.000000	7215289	2.0308	5.8722	123.7358	0.0000
OTHL	668139.6	4271337	0.000000	816906.1	2.4583	9.4860	331.2055	0.0000
GDP	0.042917	0.095400	-0.01580	0.032824	-0.1071	1.9680	5.555441	0.0622
INFR	11.83750	16.50000	8.000000	2.525780	0.2530	2.3183	3.603699	0.1650

Source: Authors computation from Eviews 9.0

From table 2, it can be observed that ROA has a mean value of 3.91 with a standard deviation of 11.06 which indicates the variability in the profitability of the sampled companies. CACE with a maximum value of 9410464 and a minimum value of 6488 indicates a wide variability between the maximum and minimum values held as cash and cash equivalents by the select companies. There is also a wide variability among the liabilities of the companies which is indicated by the wide gap between their maximum and minimum values, though they all have a minimum value of 0.000. The GDP growth rate has a mean value of 0.042917 with a variability of 0.032824 from the mean. Inflation rate (INFR) has a maximum figure of 16.5% and a minimum figure of 8.0 with a 2.527 deviation of observations among samples. The comparison between the maximum values and minimum values with the mean value of GDP shows there is a lower variability in the growth rate of GDP. The same applies for inflation rate.

INFR has a normal skewness of 0 which means it is symmetric around the mean. All other variables are positively skewed except GDP. This implies that all the assets and liabilities used for the study together with the ROA have a tendency for more higher values than the sample mean and are long right tailed. GDP on the other hand with a negative skewness has more lower values than the sample mean.

All the variables aside from GDP and INFR are leptokurtic. This is because they have a kurtosis value greater than 3 indicating the presence of a greater number of higher values from the sample mean. GDP and INFR with kurtosis value of less than 3 are platykurtic with a flattened curve and have a greater number of values lower than the sample mean. The Jarque-Berra probability tests the null hypothesis that the distribution is normal. GDP and INFR though platykurtic, have Jarque Berra probabilities greater than 0.05 which indicate normal distributions. The other not normally distributed variables could be attributed to the high disparity of variations from the sample mean in the raw data.

4.2 Analysis of data

Unit root test was carried out on the data to test for the stationarity of the data. Since the values of the assets and liabilities were huge, the log-transformed data to the same base was used for this analysis and for subsequent analysis to reduce the variability among the data, ensure equivalence in the data and yield more plausible results. The ADF and the PP-Fisher chi square was used in testing for stationarity. It tests for the null hypothesis of a unit root against the alternative that the time series data on the respective variables are stationary. If the null hypothesis is rejected, it means the series is stationary i.e., it is integrated to order zero. However, if the series is non-stationary; it is integrated to a higher order and must be differenced till it becomes stationary or till it gets to the second order differencing, whichever comes first.

Table 3: Unit root test

Variable	ADF		PP-Fisher chi square		Order of Integration
	Statistic	Probability	Statistic	Probability	
ROA	75.8183	0.0000	38.1153	0.0037	I(0)
CACE	49.3364	0.0003	94.4643	0.0000	I(1)
FINAT	62.3675	0.0000	106.812	0.0000	I(1)
DBTP	38.3003	0.0081	47.9672	0.0004	I(0)
PROPE	40.2256	0.0047	121.213	0.0000	I(2)
INSCL	53.3995	0.0001	133.746	0.0000	I(1)
TRP	58.5192	0.0000	118.231	0.0000	I(0)
INVL	36.7650	0.0125	65.6640	0.0000	I(0)
OTHL	45.4358	0.0010	123.133	0.0000	I(0)
GDP	106.872	0.0000	87.1259	0.0000	I(1)
INFR	34.3766	0.0237	51.5879	0.0001	I(1)

Source: Author's computation from Eviews 9

From the table, it can be observed that ROA, DBTP, TRP, INVL and OTHL were stationary at the levels. CACE, FINAT, INSCL and the macro economic variables were stationary at the first difference. PROPE was stationary at the second difference. This indicates the absence of any unit root as all study variables are stationary. This signifies the absence of shocks in the model and the tendency for future statistical behavior to replicate the past behavior.

Correlation analysis

A correlation analysis was conducted to test the level of association between the variables. This is because there is a tendency for several independent variables in a research analysis to lead to misleading and unrealistic valuation of contributions in the course of explaining the dependent variable. This is common where there is high collinearity (0.7 and above) between two or more independent variables. Multicollinearity can lead to unrealistically high standard error estimates of regression coefficients. This can result in false conclusions on the significance of the independent variables in the model being analyzed. This would be contrary to the assumption that independent variables in a research analysis are inter-dependent.

Values of correlation coefficient ranges between +1 and -1. A correlation coefficient of +1 indicates a perfect positive association between the two variables concerned while -1 indicates a perfect negative association. A correlation coefficient of zero indicates the absence of a linear relationship between the variables. The Pearson product correlation, being the most widely used bi-variant correlation statistic was used for this study and the result is as presented in table 4.

Table 4: Pearson correlation matrix for explained and explanatory variables

Variable	ROA	CACE	FINAT	DBTP	PROPE	INSCL	TRP	INVL	OTHL	GDP	INFR
ROA	1.0000										
CACE	-0.0438 0.0081*	1.0000									
FINAT	0.0221 0.0215*	0.3669 0.000*	1.0000								
DBTP	-0.0365 0.0205*	0.3207 0.0004*	0.0469 0.6111	1.0000							
PROPE	-0.5271 0.5675	0.0182 0.8438	0.2232 0.0143*	-0.0475 0.6062	1.0000						
INSCL	-0.0368 0.6896	0.4638 0.0000*	0.4476 0.0000*	0.1630 0.0752	0.2259 0.0131*	1.0000					
TRP	-0.0664 0.0063*	0.1033 0.2615	0.4474 0.0000*	-0.0986 0.2839	0.3768 0.0000*	0.4884 0.0000*	1.0000				
INVL	-0.1001 0.2769	0.3399 0.0001*	0.2267 0.0128*	0.0830 0.3673	0.2178 0.0168*	0.2635 0.0036*	0.1490 0.1042	1.0000			
OTHL	-0.1001 0.0028*	0.2240 0.0139*	0.2280 0.0122*	0.0816 0.3756	0.0274 0.7668	0.4580 0.0000*	0.2033 0.0259*	0.2787 0.0021*	1.0000		
GDP	0.1555 0.0022*	-0.4475 0.0000*	-0.1343 0.1435	-0.2553 0.0049*	-0.0347 0.7068	-0.4705 0.0000*	-0.1138 0.2160	-0.2899 0.0013*	-0.4011 0.0000*	1.0000	
INFR	0.0222 0.8097	0.0385 0.6757	0.0668 0.4684	-0.0277 0.7635	0.0332 0.7190	0.0588 0.5232	0.0691 0.4528	0.0819 0.3733	-0.0450 0.6253	-0.3514 0.0001*	1.000

Source: Authors computation from Eviews 9
* probability values significant at 5% level

Table 4 shows the correlation matrix of the variables with their coefficients and probability at the 0.05 level of significance as computed by Eviews 9 statistical package. The upper value represents the correlation coefficient which indicates the strength of the correlation among the variables, while the lower value shows the probability values which indicate the significance of the correlation coefficient. It can be observed that the correlation coefficients among the variables are mostly below 0.5. There is no perfect negative (-1) or positive (+1) relationship. This indicates the absence of multicollinearity among the variables and adds credence to the data obtained and its suitability for the analysis. From the table, all the assets and liabilities are negatively correlated with ROA (profitability) except FINAT (financial assets). This implies that an increase in these variables leads to a decrease in profitability. The macro economic variables, GDP and INFR, however, are positively correlated with ROA. This implies that an increase in both GDP and INFR results in an increase in profitability. Also, a low negative relationship exists between GDP and the other independent variables as observed in the table.

At the 5% level of significance, p-values less than 5% indicate significant relationships. Thus from table 4, it can be observed that significant relationships exist between ROA and CACE, CACE and FINAT, ROA and FINAT, CACE and DBTP, FINAT and PROPE, CACE and INSCL, etc. Even though the correlation analysis shows the direction and degree of associations between the variables, cause and effect inferences cannot be made regarding the relationship of the variables. Hence, the researcher proceeds to conduct the tests of panel regression analysis.

Table 5: Fixed Effect Panel Data Regression

Dependent Variable: ROA
Method: Panel Least Squares
Sample: 2008 2019
Periods included: 12
Cross-sections included: 10
Total panel (balanced) observations: 120

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-15.84933	22.00774	-0.720171	0.4731
CACE	0.156920	2.496071	0.062867	0.0082
FINAT	2.155105	1.495913	1.440662	0.0152
DBTP	0.157725	0.886842	0.177851	0.0235
PROPE	-0.626305	2.400604	-0.260895	0.0967
INSCL	1.463889	1.987559	0.736526	0.1462
TRP	-1.397277	1.040465	-1.342936	0.0163
INVL	-0.270288	0.852318	-0.317121	0.4518
OTHL	-0.300917	0.847646	-0.355004	0.0033
GDP	76.95894	49.40763	1.557633	0.0012
INFR	0.429958	0.478313	0.898907	0.3709
DUMMY	-1.345385	4.364101	-0.308285	0.0431

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.625260	Mean dependent var	3.911708
Adjusted R-squared	0.593141	S.D. dependent var	11.06112
S.E. of regression	11.15551	Akaike info criterion	7.812756
Sum squared resid	12444.54	Schwarz criterion	8.277338
Log likelihood	-448.7654	Hannan-Quinn criter.	8.001425
F-statistic	1.894454	Durbin-Watson stat	2.167734
Prob(F-statistic)	0.000283		

Source: Computation from Eviews 9

Fixed Effect Model

The fixed effect model treats the unobserved individual heterogeneity (α_i) for each cross section to be correlated with the explanatory variables. It involves a transformation to remove the unobserved effect, α_i, prior to the estimation. It assumes that the correlation between α_i and A_i and that of α_j and L_j is not equal to zero. The researchers consider this model appropriate as the direction of the causal effect is theoretically clear and to guard against the problem of unobserved heterogeneity. As it can be observed in table 5, the Eviews 9 software adds an intercept to the model so that the fixed effects estimates are relative to the constant term and add up to zero. The intercept is not a new variable to estimate so it does not decrease the degree of freedom. Rather, it is the average of cross-sectional specific intercepts fixed effects that are already considered as variables. Year dummy was used and a spike dummy variable was introduced for the year 2014 where there was a spike in economic activities as observed by the increased GDP and the lowest interest rates.

From table 5, it can be observed that CACE, FINAT and DBTP are all positively and significantly related with ROA. Property and Equipment (PROPE) is negatively related and also insignificant with ROA. This can be explained by the fact that property and equipment which are fixed assets is not only incapable of generating much profit but also reduces the opportunity of investment in profitable investments. Technically, the more money invested in this kind of asset, the lesser the opportunity for investment in other profitable assets. The table also reveals that the companies yield significantly higher returns from financial assets (FINAT) and cash and cash equivalents (CACE) as against debtors and prepayments (DBTP) and property and equipment. This may be attributed to the nature of the life insurance business.

All the liabilities are negatively related with ROA except INSCL (Insurance Contract liabilities). While that of TRP (Trade payables) and OTHL (Other liabilities) were significant, INSCL and INVL (Investment liabilities) were not. The growth rate of the real GDP is positive and significant to ROA. This implies that favourable market conditions aid insurance performance and profitability. The dummy variable has a negative coefficient of -1.345 and a p-value of 0.0431. since the p-value is less than 5 percent and the coefficient is negative, we conclude that the independent variables collectively have a significant negative relationship with profitability.

The coefficient of determination (R^2) stat of 0.6252 indicates that 62.5% of the life insurance companies' profitability can be predicted by the ALM and macroeconomic variables used in the study. The adjusted R^2 measures how well the regression model explains the variations in the dependent variable. An adjusted R^2 of 59.3% indicates that the changes in the independent variables explain 59.3% change in ROA while the remaining 40.7% change can be explained by other factors not included in the model. This means the variables are fair explanatory variables for the effect of asset liability management on the profitability of life insurance companies. A positive and insignificant relationship was observed between inflation rate and ROA.

The F-statistic computes the standard F-test of the joint hypothesis that all the coefficients except the intercept equal zero. The F-stat probability displays the p-value corresponding to the observed F-statistic. In the fixed panel data regression an F-Stat Probability of 0.000283 adds to the credence of the model, that most of the models are significant and the model has a good fit. The measurement error associated with the proxy used for the dependent variable is captured by the individual fixed effects. Focusing on the within-individual variation as against the between-individual variation overcomes this error and reduces the potential source of bias.

Random Effect Model

The random effect estimation assumes that the individual specific effects are independent of the regressors and are included as the error term. In line with panel data analysis, we progress to the random effect model as presented in table 6.

As with the fixed effect, the constant is negative and insignificant. CACE, FINAT and OTHL also remain significant. However, in contrast to the fixed effect, DBTP is negatively and insignificantly related to profitability. INSCL and INVL remain insignificant. GDP is significant with 0.0048 while inflation rate remains insignificant with 0.3639. The dummy variable is insignificant and negatively affects profitability. The random effect records an R^2 of 51.4% and an adjusted R^2 of 47.2%. These values are considerably lower than that recorded with the fixed effect. An F-stat probability of 0.09 is also higher than the F-stat probability recorded with the fixed effect.

Table 6: Random effect panel data regression

Dependent Variable: ROA
Method: Panel EGLS (Cross-section random effects)
Sample: 2008 2019
Periods included: 12
Cross-sections included: 10
Total panel (balanced) observations: 120
Wallace and Hussain estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-9.146984	18.39499	-0.497254	0.6200
CACE	0.182097	1.926694	0.094513	0.0249
FINAT	1.062885	1.296785	0.819631	0.0042
DBTP	-0.018699	0.839568	-0.022272	0.0823
PROPE	-0.642690	2.038774	-0.315234	0.0432
INSCL	1.484563	1.834458	0.809265	0.2201
TRP	-0.989171	0.959882	-1.030514	0.3051
INVL	-0.398618	0.748164	-0.532795	0.0953
OTHL	-0.289772	0.780097	-0.371456	0.0010
GDP	71.25152	44.82077	1.589699	0.0048
INFR	0.422075	0.462955	0.911698	0.3639
DUMMY	-0.935070	4.286857	-0.218125	0.0827

Effects Specification

	S.D.	Rho
Cross-section random	2.315264	0.0419
Idiosyncratic random	11.07463	0.9581

Weighted Statistics

R-squared	0.514172	Mean dependent var	3.168155
Adjusted R-squared	0.472602	S.D. dependent var	10.90352
S.E. of regression	11.07983	Sum squared resid	13381.14
F-statistic	0.824289	Durbin-Watson stat	2.019456
Prob(F-statistic)	0.090301		

Source: Computation from Eviews 9

Hausman Test

The Hausman test is carried out to select which model is a better fit for the data out of the fixed and random effects. It operates on the theory that one of the models is inconsistent with the data. Its null hypothesis is that the preferred model is the random effect. Thus, a p-value of less than 0.05 would lead to a rejection of the null hypothesis. The Hausman test for this analysis is presented in table 7.

Table 7: Hausman test

Correlated Random Effects - Hausman Test

Equation: Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	3.731765	10	0.0156

With a p-value of 0.0156, we reject the null hypothesis and conclude that the fixed effects model is a better model for our panel data regression analysis. This conclusion is strengthened by the fact that the fixed effect model has removed omitted variable bias by measuring changes within the assets and liabilities across time. Additionally, the fixed effect model as a more conservative model, provides consistent estimation results and does not require distributional assumptions or an absence of omitted variables for consistency.

4.3 Discussion of Findings

This study sought to establish the relationship between asset liability management and the profitability of life insurance companies in Nigeria. The results provide evidence that there exist a positive and significant relationship between asset and profitability as the coefficients of three of the four assets sampled are positive and significant. However, their individual significance varies. This result is consistent with the works of Malik (2011), Naveed, Zulfgar and Ahmad (2011) and Kripa and Ajasllari (2016). According to these authors, the positive relationship between cash and cash equivalents and profitability as well as financial assets and profitability can be explained by the fact that by collecting more premiums insurance companies provide more funds to carry out investment, have more capacity to respond to complaints, increase their market share which reflects positively on profitability.

While financial assets and cash and cash equivalents were highly significant, debtors and prepayment were less. This result is in line with the works of Kripa and Ajasllari (2016) and Yuqi (2007). They are of the view that this result can be explained by the fact that increase in fixed assets beyond an optimal level does not positively affect the profitability of a company. The overall positive relationship between assets and profitability can be interpreted as the capability of companies in the life insurance market to benefit from economies of scale.

The coefficients of the liabilities except INSCL are negative. This implies the negative relationship that exists between liabilities and profitability. The significance of the individual liabilities also differs, for while TRP and OTHL are significant, INSCL and INVL are not. These findings also coincide with that of Chen and Wong (2004), Malik (2011), Burca and Batrinca (2014), and Kripa and Ajasllari (2016).

A summary of the analysis is presented in table 8.

Table 8: Comparison of test result with apriori expectation

Independent variable	Expected relationship with profitability	Actual result	p-value	Statistical significance	Hypothesis status
Cash and cash equivalents (CACE)	+	+	0.0082	Significant	Null hypothesis was rejected
Financial assets (FINAT)	+	+	0.0152	Significant	Null hypothesis rejected
Debtors and prepayment (DBTP)	+	+	0.0235	Significant	Null hypothesis rejected
Property and equipment (PROPE)	+	_	0.0867	Insignificant	Failed to reject Null hypothesis
Insurance contract liabilities (INSCL)	-	+	0.1462	Insignificant	Failed to reject Null hypothesis
Trade payables (TRP)	-	-	0.0163	Significant	Null hypothesis rejected
Investment liabilities (INVL)	-	-	0.4518	Insignificant	Failed to reject Null hypothesis
Other liabilities (OTHL)	-	-	0.0033	Significant	Null hypothesis rejected
Growth rate of GDP	+	+	0.0012	Significant	Null hypothesis rejected
Inflation rate (INFR)	_	+	0.3709	Insignificant	Failed to reject Null hypothesis

Source: Author's composition from analysis

This analysis reveals that the profitability of life insurance companies in Nigeria is highly affected by all the assets of study except Property and equipment. Similarly, trade payables and other liabilities though negative, significantly affects profitability of the companies.

5 Conclusion

The objectives of this study were to assess the relationship between assets and profitability, liabilities and profitability and the effect of the macro economic factors on the profitability of life insurance companies. The statistical cost accounting (SCA) model was employed and a panel data approach was used with time series data from 2008 – 2019 covering 10 life insurance companies. The central hypothesis of the SCA model was confirmed as most of the estimated rate of return on assets were positive while that of liabilities were negative, varying across assets and liabilities. This is also an evidence that profitability is associated with

balance sheet items as most of the asset and liability compositions were statistically significant when regressed against the return on assets. Thus, the researcher believes that to a large extent, the objectives of this study has been attained.

The empirical findings reveal that profitability of life insurance companies in Nigeria is positively affected by the assets except property and equipment. This implies that although property and equipment (fixed assets) may not be able to generate profit for the company, other lines of assets can fulfill that role. This results provides empirical evidence consistent with the view that, the better managed the asset and liability is, the better the returns. The implication of this study to policymakers and regulators of insurance business in Nigeria is that it informs them that different assets and liabilities contribute differently to the profitability of the company. This creates a need to identify assets with higher returns and liabilities with lower cost in order to increase profitability. Efficient management of these assets and liabilities will enable insurers maximize profit and create value for shareholders.

5.1 Recommendation

Based on the findings of the study, the researcher recommends:

1. An improvement in asset liability management to enhance greater profitability.
2. Life insurance companies should make more investments in financial assets and keep more of cash and cash equivalents as they are capable of yielding higher coefficients in generating profit.
3. Insurers could adopt the statistical cost accounting measure as the analysis could help them identify assets which might generate more profit so they can direct their investment.
4. Insurers should endeavor to employ proper asset liability management policies to help in maximizing their profits. They can achieve this by channeling more of their resources to assets which have the highest positive influence on profits while limiting those with less significant influence.
5. Life insurance companies should avoid high levels of debt as these have a negative impact on profitability.
6. Insurers' investment in fixed assets should be minimal as fixed assets have a negative impact on profitability.

5.2 Further Study

For further study, the asset liability mix can be tested with other measures of profitability such as return on equity (ROE), the net profit margin, operating profit margin and the EBITDA margin. Similarly, other types of assets and liabilities other than the ones used in the study can be adopted to test the validity of the results.

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