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Life Insurance Companies: Determinants of Cost Efficiency and Profitability

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Abstract

One of the most important aspects of measuring a firm's performance is through its efficiency, of which the firm is expected to achieve effective cost reductions, thereby enhancing profitability. However, most studies conducted to explore the determinants of insurance companies' efficiency and performance have concentrated on the account earnings information and their components. These are known as factors that explain a small proportion of the firm's performance. Also, studies on insurance either lump all the insurance companies together or concentrate on the non-life insurance, making it difficult to evaluate the fast growing life insurance industry in Ghana. Therefore, this study examines the efficiency of life insurance companies in Ghana, utilising data from 12 life insurance companies for a period of 2013-2017. The fixed effect panel regression results show that, the significant determinants of both cost and profit functions are: price of labor, commission, gross premium and net investment income. It was also revealed that, on the average, the life insurance companies were about 71.2% cost efficient and 41.7% profit efficient. Further analysis reveals that both profit and cost efficiency changes have statistically significant positive effect on firms' return on asset. Policy-makers should institute policies that encourage these companies to operate efficiently in order to make effective capital allocation decisions to avoid collapse.

Keywords: life insurance companies, return on assets, input-output variables, cost efficiency, profit efficiency, Ghana.

I. INTRODUCTION

Insurance companies provide unique financial services for the growth and development of every economy. Such specialized key services range from the underwriting of risks inherent in economic entities and activities, and the mobilization of funds through premiums for long term investments. The risk absorption role of insurers promotes financial stability in the financial markets and

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provides a 'sense of peace' to economic entities. The business world without insurance is unsustainable since risky business may not have the capacity to retain all kinds of risks in this ever changing and uncertain global economy (Ahmed et al., 2011).

According to national insurance commission (NIC, 2014), the activities of the financial and insurance sectors in Ghana recorded an average growth rate of 4.8% from 2009 to 2013. In 2013, it accounted for 6% of GDP of Ghana. Financial and insurance activities form a core component of the services sector and have been growing over the last few years. From 8.8% of services GDP in 2009, its activities increased to 13.2% of services GDP in 2013. Insurance companies' ability to continue to cover risks in the economy hinges on their capacity to create profit or value for their shareholders through the efficiency of operations, in order to escape collapse.

Efficiency, which is one of a firm's performance indicators, is a subject that has attracted a lot of attention, comments and interests from financial experts, researchers, the general public and the management of corporate entities (Liargovas & Skandalis, 2008). The efficiency of the firms which is enhanced through cost reduction in the production process is one of the principal foundations guiding the insurance companies in ensuring safety and the health conditions of these companies (DeYoung et al., 2001). According to Ansah-Adu et al. (2012), insurers' profitability is influenced by both internal and external factors. Whereas internal factors focus on an insurer's specific characteristics, the external factors concern both industry features and macroeconomic variables. The factor found to have significant impact on the performance of insurance companies in Ghana was efficiency. Several other researchers from both developed and emerging markets have found efficiency to influence firm's performance especially the stock returns.

Ghana's insurance sector has shown strong resilience to the challenging macroeconomic environment and global development. For example, according to a report by the national insurance commission (NIC, 2013), the insurance market continued to show positive growth in gross written premium. The total gross premium for the year 2013 was GH¢ 582.3 million, representing a growth rate of 19 percent from the previous year. Although a greater percentage of total industry premiums is generated from the non-life sector, the percentage growth in premiums from life assurers far outweighs that of the non-life sector. For instance, whereas the non-life sector grew by 17.7 percent in 2014, the life business recorded a remarkable growth of 32 percent. In other words, the growth rate of the life sector is almost twice that of the non-life business (NIC, 2014). With this remarkable growth in the life part of the industry, it is not clear whether the life firms attained this growth because they are more efficient in their operations. What account for this growth is not studied in the Ghanaian life insurance sector.

Incidentally, studies in the insurance sector in Ghana have rather focused on general insurance and/or non-life insurance. For example, Ansah-Adu et al. (2012) only studied the cost efficiency of insurance companies in Ghana while Alhassan and Addison (2013) researched on the market structure, efficiency and performance of life insurance companies in Ghana with focus on the cost determinant part of efficiency. A clear gap in these previous studies is a study that combines cost and profit efficiency of life insurance companies. Relatively, little thorough research has been done in Ghana to assess the efficiency of life insurance companies. The absence of empirical studies in Ghana concerning the efficiency of life insurance companies is what has motivated this study. Clearly, the majority of the studies on the determinants of insurance performance have concentrated on only the account earnings information and its components as

the explanatory variables. However, since earnings can only explain a small proportion of a firm's performance, other kinds of information sources are needed to explain such performance (Abuzayed et al., 2009; Dake & Tuffour, 2021; Tuffour, Ofori-Boateng & Ohemeng, 2020). In addition, studies which estimated performance with efficiency in their models did not specifically look at efficiency alone as a subject, just like other researchers have done with efficiency of banks in Ghana (e.g., Oteng-Abayie, 2017; Danquah et al., 2018). The lack of studies on life insurance firms in Ghana, especially on efficiency and performance need to be addressed. This is another gab this study seeks to fill as it employs the efficiency score of the firms and its impact on the firms' performance.

Finally, previous empirical studies in this area have been concentrated in North America, Europe and Asia, where most of the insurance companies operate in markets that can least be described as near-efficient (Ansah-Adu et al., 2011). It is important to further our understanding by also focusing on developing markets. Based on the gaps identified, the key research questions that follow are: a) what are the key indicators of the life insurance companies' cost and profit, b) what have been the cost and profit efficiency scores of life insurance companies and c) what are the effect of life insurance's cost and profit efficiencies on their financial performance?

Therefore, the main objective of this study is to examine the cost and profit efficiencies of life insurance companies in Ghana, and their effect on performance utilizing 12 life insurance companies for the period 2013 to 2017. The remaining part of the study is structured along the following headings: section two reviews the theoretical and empirical literature on efficiency of firms. Section three expatiates the methodology used. Sections four and five analyses the data, discusses the findings and concludes the paper respectively.

II. LITERATURE REVIEW

Theoretically, in general, there are major concepts that underpin the performance and efficiency of firms including life insurance companies. These theories include the structure-conduct-performance (SCP) model and the efficient structure hypothesis. The structure-conduct-performance model is one of the earliest frameworks used to examine the factors that determine the profitability of firms (Grygorenko, 2009). According to Baye (2010), the structure of an industry refers to factors such as technology, concentration and market conditions. Conduct defines how individual firms behave in the market; it involves pricing decisions (such as interest rate, commission and fees), advertising decisions, decisions to invest in research and development, among other factors. In this case, performance can be viewed in terms of profits and social welfare that arise in the market. The SCP paradigm views these three aspects of the industry as being integrally related and has the assertion that, the market structure causes firms to behave in a certain way. In turn, this behavior causes resources to be allocated in certain ways leading to either an efficient or inefficient market. A failure found in this model is that, it does not recognize that performance can impact structure and conduct, while structure can impact on both performance and conducts (Sathye, 2005; Samad, 2008).

Using the efficient structure hypothesis (ESH), Demsetz (1973) theoretically offered an alternative explanation on the structure conduct performance (SCP) relationship. Demsetz explained that, higher profits of firms are not as a result of their collusive behavior, but because of the high efficiency level, which in turn, leads to larger market shares that firms possess. In other words, profitability of firms is determined

not by the market concentration, but by firm efficiency (Grygorenko, 2009). This hypothesis stipulates that, a firm which operates more efficiently than its competitors gains higher profits resulting from lower operational costs, and also holds an important share of the market. Consequently, an unequal distribution of positions within the market and an intense concentration are created by differences at the level of efficiency (Mensi & Zouari, 2010). Within the purview of the present study, examining cost and profit efficiencies and how they impact on firm performance, the Efficient Structure Hypothesis forms the basis of the study.

In conclusion of the theoretical review, it is worth noting that profitability or firm returns is not the only measure of performance as used in the theories discussed so far. There are other theories such as the expense-preference behavior hypothesis as developed by Williamson (1963) and modified by Rees (1974), which uses utility instead of profits as a measure of performance. However, this study did not go further on the expense-preference behavior as this study uses profitability as a measure of performance. Out of all the theories discussed above, the efficiency structure hypothesis serves as the foundation of the study, as it is employed to determine the performance of insurance companies, because of its direct relevance for the present study.

The methodological and empirical literature focus on firm's efficiency measurements and the corresponding results associated with it. Eltivia et al. (2014) postulated that, there are two main methods used to measure firm's efficiency: parametric and non-parametric. The parametric method estimates the efficiency by statistical methods. The non-parametric method, on the other hand, relies on linear programming to calculate linear segments related to the frontier. The parametric method determines the level of inefficiency based on explicit functional form, either from the frontier itself or standard deviation frontier. In contrast to the non-parametric method, parametric method does not formulate the assumption of the functional form of the frontier as well as assumptions about the distribution of efficiency (Eltivia et al., 2014). Most commonly used efficiency measures are stochastic frontier approach (SFA) and data envelopment analysis (DEA). The former is parametric while the latter is non-parametric in nature. SFA is sometimes referred to as econometric approach while DEA is referred to as programming approach. Both approaches have their own merits and demerits.

DEA is a technique used to evaluate the relative efficiency of decision-making units (DMU).[1] DEA uses a linear program as the base of measurement (Fiorentino et al., 2006), that allows comparison between the efficiency of a combination of several units of input (Cooper et al., 2000), and several units of output (Casu & Molineux, 2003). It was introduced into the financial sector through a behavior model for financial institutions to comprehend the production possibilities (Avkiran, 2006). There are many researches on firm efficiency that used DEA. However, different variables were used by each study for inputs and outputs (Akhtar, 2010). For instance, Akhtar (2010) used DEA to compare efficiency of 40 Pakistani banks by using deposits and capital as inputs and investment portfolio, loans and advances as outputs. Debasish (2006) also measured the relative performance of Indian banks for the period 1998 to 2004 using the DEA model. He observed that, foreign banks were more efficient than domestic banks.

[1] Refers to any entity that is to be evaluated in terms of its ability to convert inputs to outputs.

The empirical results stemming from the DEA approach have given varying results. Casu and Molyneux (2003) explained efficiency differences in European banking by using DEA method and found national market characteristics to be the crucial factors. Casu and Girardone (2006) used average DEA efficiency values as independent variables to explicate the competitive intensity of European banking markets. Eisenbeis et al. (1999) investigated the relation between efficiency and other bank performance indicators and found out that, parametric efficiency measures gave higher information content. In contrast, Becalli et al. (2006) provided evidence for a positive relationship between the development of the stock price and efficiency measures for European banks with DEA values having more explanatory power than parametric approaches. Kirkwood and Nahm (2006), using a multivariate model also found the same positive correlation between share price development and DEA efficiencies for Australian banks. Furthermore, Pasiouras et al. (2008) used DEA to study the association between bank efficiency and stock price performance in Greece by measuring technical efficiency and scale efficiency of ten commercial banks listed on the Athens stock exchange between 2000 and 2005. They found that, there was a positive and significant relationship between stock performance and annual change in bank technical efficiency. However, whether this result hold for life insurance in Ghana is not known.

Dutta and Sengupta (2010) conducted a study to investigate the impact of technological innovation on the efficiency of Indian insurance industry. The study aimed at examining whether increasing investment on IT-infrastructure into business operation of insurance companies has a positive impact on efficiency changes or not. They used a panel data set of 12 life insurance companies over the period 2006-2009 to evaluate their efficiency scores by applying data envelopment analysis and calculating the scale efficiency. The study concluded that, increasing investment in IT-infrastructure has a positive impact on the scale and technical efficiency changes under constant and variable returns to scale assumptions.

The SFA on the other hand was independently developed by Aigner et al. (1977), and Meeusen and van den Broeck (1977) as a parametric frontier method. The SFA uses a composed error model in which inefficiency is assumed to have asymmetric (one-sided) distribution and the random error has symmetric (two-sided) distribution. The SFA modifies a standard cost (production) function to allow inefficiencies to be included in the error term. The predicted standard cost function is assumed to characterize the frontier while any inefficiency is captured in the error term, which is constructed orthogonal to the predicted frontier. This assumption forces any measured inefficiencies to be uncorrelated with the regressors and any scale or product mix economies derived linearly from these explanatory variables (Ferrier & Lovell, 1990).

Empirically, Okuda et al. (2003) used SFA to estimate the cost function of the Malaysian commercial banks from 1991-1997 and its impact on bank restructuring. The study, which observed economies of scale but not economies of scope, indicated that, Malaysian domestic banks were making unproductive capital investments. Also, Liadaki and Gaganis (2010) employed the SFA to measure bank cost and profit efficiencies of 171 listed banks operating in 15 EU countries over the period 2002-2006. The results revealed that, profit efficiency changes had a positive and significant effect on stock prices, while changes in bank cost efficiency show no significant impact on stock returns. In addition, Cummins et al. (1996) measured technical efficiency and productivity growth in the Italian insurance market by estimating production frontiers based on a sample of 94 Italian insurers. It was found from the study that, the Italian

insurance industry was about 70 to 78 percent technically efficient and measured total factor productivity gains of about 3.4 percent during the sample period. To avoid collapse, the unknown efficiency state of life insurance companies in Ghana needs investigation.

In another development, a combined (DEA and SFA) technique was used. The study used samples from 28 firm-years of life insurance companies and 113 firm-years of non-life insurance companies from Malaysia. It was revealed that, on average, the total factor productivity growth of the insurance industry in Malaysia is mainly due to technical change while efficiency change contributed a negative change. These findings agree with Cummins et al. (1996) who also found that, most insurance companies in Europe are highly technically efficient. They found that, competition for market share was the main driver of efficiency in the Nigerian insurance market, at least for the period analyzed. They also contended that, even though the Nigerian insurance market had been characterized by some degree of consolidation, they did not find sufficient evidence to suggest that this consolidation had improved the efficiency of the market. However, it was evident based on their findings that, majority of insurance companies in Nigeria operated on declining efficiency.

The specific variables to use in the estimation of efficiency are also of interest as the technique itself. According to Owusu-Ansah et al. (2010), there are basically three types of inputs in the insurance industry. These are labor, business services and material, and capital. They also mentioned that, there are three approaches in choosing output variables in the insurance industry: Intermediation, User-cost and the Value-added approaches. The intermediation approach considers insurers as financial intermediaries that collect funds from policy holders, invest them and pay claims, taxes and costs. The user-cost approach determines outputs by considering their net contribution to revenue.

Eling and Luhnen (2010) mentioned that, out of 87 literatures they reviewed during their study, 74 used the value-added approach to choose their outputs, but there was always controversy among the researchers as to whether claims or premiums are the most appropriate for value-added. However, they found that 40 of the studies reviewed, used claims as output whilst 31 used premiums as output. The outputs used were insurance net earned premiums, long-term insurance net earned premiums and total investment income.

In addition, Fukuyama and Weber (2017) in analyzing the efficiency of 25 Japanese insurance companies with a Malmquist index used insurance reserves and loans as output and the inputs used were the asset value of the company premises, internal personnel and sales representatives. Gaganis et al. (2013) also used two main outputs, insurance premium and invested asset. The chosen output variables follow those of Bikker and van Leuvensteijn (2008). On the other hand, inputs were the price of management, commission cost and the price for labor.

The synthesis of the literature indicates that, theoretically, performance has a link with efficiency since efficiency will lead to high profits. Methodologically, there are two broad approaches, these are the parametric and non-parametric approaches. The two have given birth to the use of DEA and SFA. None is viewed superior to the other, but the variables to include in the model are very important in influencing the results. Whatever the variables used, they should be guided by three approaches in their selection process: intermediation approach, user-cost approach and the value-added approach. Empirically, there is mixed results across both developed and developing countries. The fastest growing life insurance companies in Ghana would require a

careful study of this kind to ascertain the state of efficiency using the input and outputs variables based on the intermediation approach.

III. RESEARCH SAMPLE AND METHODOLOGY

3.1. Analytical Technique

The choice of the SFA for the study stems from the fact that, although the SFA is criticized for its pre-specified functional form and distributional assumptions. However, because of the separation between random errors and inefficiencies, the SFA is more appropriate over the non-parametric method in efficiency studies in transition and developing countries where problems of measurement errors and uncertain economic environments are more likely to prevail (Fries & Taci, 2005). Also, the parametric approaches (SFA) are less prone to measurement errors, because they allow for random errors. On the other hand, parametric approaches can suffer from bias due to imposition of a specific distribution of the unknown pattern of inefficiency (Bauer et at., 1998).

In order to calculate the cost-efficiency, it is needful to calculate cost minimization in advance, and it can be calculated by using the DEA approach. However, DEA does not allow for a random error and measurement error in the construction of the frontier, even though it requires fewer assumptions, less data and fewer samples, and this may lead to severe problems in shaping and positioning the frontier. Furthermore, conventional test of hypothesis associated with the existence of inefficiency and the structure of the production technology cannot be conducted with DEA (Coelli et al., 2005). Therefore, due to the shortfalls associated with DEA, this study employs the parametric stochastic frontier approach (SFA) to establish the cost and profit efficiency frontiers of the insurance companies.

3.2. Study Design, Data and Sampling

The paper employed quantitative research design by using secondary data from the annual financial statements of the selected life insurance companies submitted to the national insurance commission. As at the end of the year 2017, there were 21 registered life insurance companies operating in Ghana (NIC, 2017). All the 21 life insurance companies constitute the population of this study. The study purposely[2] selected 12 out of all the registered life insurance companies in Ghana. The study considered the companies that have operated for 5 years or more in the Ghanaian insurance market. This is because, with regard to the period of study (2013 to 2017), it is expected that these companies might have submitted their annual reports to NIC as it is a basic requirement of the regulator.

3.3. Variables Measurement and Model Specification

To calculate the efficiency scores for both profit and cost, the study used efficiency measurement system (EMS) software which computes efficiency measures. The input and output variables (based on literature and adapted from Bikker & van Leuvensteijn, 2008) use are given in Table 1.

[2] SIC life insurance company limited, Enterprise life insurance company limited, Starlife assurance company limited, Glico life company limited, Vanguard life assurance company limited, Metropolitan life assurance Ghana limited, Phoenix life assurance company limited, Ghana union assurance life company limited, Unique life assurance company limited, UT life insurance company limited, Capital express assurance company limited and Express life assurance company limited.

Table 1
Input and Output Variables

Variables	Symbol	Name	Description
Dependent Variables	**TC**	Total costs	Commission + Total claims
	Π	Profit	Pre-tax profit
Input Prices	w_1	Price of labor	Personnel expenses/total assets
	w_2	Commission	Total commission paid to Sales Agents
	w_3	Management expenses	Total operating expenses without commission
Outputs	y_1	Total gross premium	Annual total premium from policies
	y_2	Net investment income	The annual net investment income
	y_3	Policyholder benefit cover	Total investment/actuarial liabilities
Control Variable		Size	Logarithm of total asset

Source: authors' construct.

To critically examine the efficiency of life insurance companies in Ghana, a panel data methodology was employed. To test whether the fixed or random effects model should be used, the Hausman test was run. The Hausman test basically tests whether the unique errors (ε_i) are correlated with the regressors. The Hausman test revealed that, the probability value (p) was less than the significant level (0.05), hence the null hypothesis (random effect) was rejected and the fixed effect model was then used to run the regression.

The basic panel model is written as follows:

$$\mathbf{Y_{it} = \alpha_i + \beta X_{it} + \varepsilon_{it}} \quad \text{.....} \quad (1)$$

Where:

1). i denotes the cross-sectional dimension and t represents the time-series dimension.
2). Y_{it} represents the dependent variable in the model, which is the firms' financial performance measurement (ROA).
3). X_{it} contains the set of explanatory variables in the estimation model. These are the cost and profit efficiency scores.
4). α is the constant and β represents the coefficients.

3.4. Measurement of Efficiency and Analytical Technique

Two main types of efficiency concepts are commonly used to measure efficiency level: profit efficiency and cost efficiency. This study employed both methods to measure the efficiency of the life insurance companies. The cost efficiency measures how well a firm is predicted to perform relative to a 'best-practice' firm producing the same output bundle under the same environmental conditions (Berger et al., 2009). In other words, cost efficiency measures how close a specific firm is to the minimum cost, where the minimum cost is determined by best performers in the dataset. The cost of a firm (C) depends on the output vector (y), the price of inputs (w), the level of cost inefficiency (u) and a set of random factors (v) which incorporate the effect of errors in the measurement of variables, bad luck, etc. Thus, the cost function is expressed functionally as:

$$\mathbf{C = C(y, w, u, v)} \quad \text{.....} \quad (2)$$

In logarithmic terms, and assuming that the efficiency and random error terms are multiplicatively separable from the remaining arguments of the cost function, then

$$\mathbf{InC = lnf(y, w) + In(u) + In(v)} \quad \text{.....} \quad (3)$$

The cost efficiency for firm i at time t can be calculated as:

$$\textbf{Cost Efficiency}_{it} = \frac{E(C_i|u=0,\ w,\ y)}{E(C_i|u,\ w,\ y)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

where C_i are total observed costs of insurer i, w and y are the vectors of input prices and output quantities of insurer i respectively. The numerator reflects the minimum cost achievable by the insurer, if the insurer i operates at full efficiency (i.e., $u_i = 0$). The denominator shows actual costs of insurer i given the actual level of efficiency (Aigner et al., 1977).

On the other hand, profit efficiency is a broader concept than cost efficiency since it takes into account the effects of the choice of a certain vector of production, both on costs and on revenues. Two profit functions can be distinguished, depending on whether or not there is market power: the standard profit function and the alternative profit function. The standard profit function assumes that markets for outputs and inputs are perfectly competitive. Given the input and output vectors (w) and (p) respectively, the firm maximizes profits by adjusting the amounts of inputs and outputs.

Thus, the profit function can be expressed as:

$$\boldsymbol{\Pi = \Pi\ (w, p, u, v)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

and in logarithmic terms:

$$\textbf{In}\ (\Pi + \theta) = \textbf{ln}\ f(w, p) + \textbf{In}\ (u) + \textbf{In}\ (v) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (6)$$

where θ is a constant added to the profit of each firm in order to attain positive values, thus able to take logarithms. Profit efficiency is defined as the ratio between the actual profit of a firm and the maximum level that could be achieved by the most efficient firm.

The efficiency estimates were measured by applying frontier analysis which reflects the degree of proximity of the firms to a best-practice frontier. Frontier analysis provides an overall and objective numerical efficiency values and ranking of the firms (Berger & Humphrey, 1997). Among different types of estimation methodologies – non-parametric or parametric techniques, the efficiency measures in this study were estimated by using Stochastic Frontier Approach (SFA), one of the most widely applied parametric techniques (Aigner et al., 1977).

Specifically, Battese and Coelli (1995) modelled a stochastic frontier function for panel data, which allows the estimation of efficiency in a one-step procedure. The model proposed by Battese and Coelli (1995) eliminates some of the anomalies present in the two-step procedure. The proposed stochastic frontier cost model of the firms is specified as follows:

$$\textbf{ln}\ TC_{it} = \textbf{ln}\ f(w_{it}, y_{it}: \beta) + (v_{it} + u_{it})\ \textbf{for i = 1, …, N} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (7)$$

where TC_{it} denotes the observed total cost of the i^{th} firm in the t^{th} period, w_{it} and y_{it} represent the vectors of input prices and output variables. β represents a vector of unknown parameters; v_{it}, are random errors which are assumed to follow a symmetrical normal distribution (and u_{it} asymmetrical).

Additionally, profit functions were estimated similarly as the cost function in equation (7) except that total cost is replaced with total profit on the left-hand side of the equation. In this study, alternative profit function (Berger et al., 1996) is used in contrast to standard profit function, which assumes perfect competition in the input and output markets.

IV. EMPIRICAL RESULTS

4.1. Analysis of Data and Discussion

4.1.1. Key growth indicators of the life insurance companies

The performance of any business firm does not only play the role of improving the market value of that specific firm but also leads to the growth of the whole sector which ultimately translates into the overall prosperity of the economy. In the insurance industry, certain indicators like premium, total asset and others are used to measure the growth of the business. Insurance key growth indicators can be tracked and measured across a period of time. Trends in key growth indicators can help to identify opportunities to model success and plan for improvement. Since growth is used to assess the performance of an entity, the study examined growth indicators of the life insurance industry for the period of 2013-2017. The main indicators considered in this study are premium income, total assets, total investments, benefits cover and total capitalization. Table 2 gives the analysis of these indicators.

Table 2
Key Growth Indicators of the Life Insurance Companies

Indicators	Amount (GH¢'m)					Growth Rates			
	2013	2014	2015	2016	2017	2014	2015	2016	2017
Premium Income	187.2	270.1	355.8	469.6	590.9	44.2%	31.7%	32.0%	25.8%
Total Assets	366.8	492	670	984	1,226.5	34.1%	36.2%	46.9%	24.6%
Total Investments	235.1	371.1	537.7	799	950.3	57.8%	44.9%	48.6%	18.9%
Benefits Cover	243	345.8	464.9	704	814.95	42.3%	34.4%	51.4%	15.8%
Total Capitalization	89.5	104.3	168.2	201.6	242.85	16.5%	61.3%	19.9%	20.5%

Source: authors' compilation.

An insurance company's premium income is revenue that is derived from premiums paid by customers. It can be seen from Table 2 that the premium income of insurers grew by 44.2% from GH¢187.2 million collected within the year 2013 to GH¢270.1 million at the end of the year 2014. The insurers, however, achieved a downward growth even though positive in the year 2015. It can be observed that, the premium income of the firms showed an undulating trend for the period under study.

In another development, the total asset of the insurers on the average grew by 35.5% for the period under consideration. Total asset in insurance terms refers to all the available properties of every kind or possession of an insurance company that might be used to pay its debts. There are three classifications of assets: invested assets, all other assets, and total admitted assets. Invested assets refer to items such as bonds, stocks, cash and income-producing real estate. All other assets refer to non-income producing possessions such as the building the company occupies, office furniture, and debts owed, usually in the form of deferred and unpaid premiums. Total admitted assets refer to everything a company owns. All others, plus invested assets equal total admitted assets. Specifically, the total asset of the insurers increased from GH¢492.0 million in 2014 to GH¢670 million in 2015 resulting in 36.2% growth rate. Similarly, the insurers recorded a total asset of GH¢984 million in 2016 which represents a growth of 46.9% from the previous year.

In addition, actuarial liability is the amount that an insurer sets aside to fulfil its insurance obligations and settle all commitments to policyholders and other beneficiaries arising over the lifetime of the portfolio, including the expenses of administering the policies, reinsurance and the capital required to cover the remaining risks. The insurers reserved an amount of GH¢243 million in 2013 to pay their policyholders. This amount increased to GH¢345.8 million depicting a growth rate of 42.3% in 2015. The year 2016 realized another growth of 51.4%, to settle at GH¢704 and 2017 recorded GH¢814.95 million.

Lastly, the total capitalization on the insurers increased from GH¢104.3 million in 2014 to GH¢168.2 in 2015 giving a growth rate of 61.3%. However, there was a major rise in growth in the year 2016 which continued till 2017. Capitalization basically measures the exposure of a company's surplus to various operating and financial practices. A highly leveraged or poorly capitalized company can show a high return on surplus, but might be exposed to a high risk of instability.

4.1.2. Descriptive analysis of the variables

Table 3 displays summary statistics for the dependent, input and output variables that were used in the cost and profit efficiency functions. As can be seen from the table, the mean prices of labor, total management expense and commissions for the sampled life insurance company are 0.111, GH¢5,624 and GH¢3,207 respectively. Similarly, the firms' total average gross premium for the period was GH¢27,808 and they achieved an average investment income of GH¢5,999. Also, the policyholder benefit cover which measures the adequacy of the company's investments to cover the policyholder liabilities was 2.657% within the period.

For the period under study, the maximum profit of GH¢42,093,746 was recorded by Enterprise life insurance company limited in the year 2017 and the minimum profit was achieved by Express life assurance limited in the same year. This result especially with regard to Enterprise life insurance company limited was quite surprising because, SIC insurance limited has been the market leader since the year 2005. Also, the negative profit achieved by Express life company limited is as a result of the takeover by Prudential life Assurance company limited. On the other hand, the maximum total cost was incurred by SIC Life in the year 2017 amounting to GH¢101,277 whilst Capital Express Assurance recorded the minimum cost in 2013.

Table 3

Descriptive Statistics of Input/Output Variables

Measures	Dependent Variables		Input Variables			Output Variables		
	Total Cost	Pre-Tax Profit	Price of Labor	Total Mgt. Expense	Com-missi-on	Total Gross Premium	Net Investment Income	Policy Benefit Cover
Mean	3,579	4,235	0.111	5,624	3,207	27,808	5,999	2.658
Median	6,245	233	0.092	4,745	1,015	12,334	1,980	1.239
Minimum	53	(4,914)	0.019	151	46	325	16	0.002
Maximum	101,277	42,094	0.370	25,370	30,386	158,324	57,083	31.835
Count	60	60	60	60	60	60	60	60

Source: authors' calculation.

4.1.3. Impact of input-output variables on the total cost and profitability of the firms

According to Heizer and Render (2009), increasing productivity means improving the efficiency of the company, while the concept of efficiency is a comparison between inputs and outputs. The input is the resources used to produce the output, while the output is the results after all. For an insurance company to be

efficient, it has to have a very accurate mix of input and output variables to reduce cost and increase profitability.

In view of this, the study examines the impact of the input and output variables on the total cost and profit of life insurance companies. The regression output of the input/output variables and profit is presented in Table 4. It can be observed that, adjusted coefficient of determination (R^2) is 0.729 which means that the input and output variables account for about 72.9% of the firms' profit variance. In general, the F-significant figure of 0.000 shows that, all the independent variables considered as input and output are collectively significant in determining the profitability of insurance companies in Ghana.

Table 4
Regression Results of the Profit Model

	Coefficients	Standard Error	t-Stat	P-value
Intercept	0.051	0.096	0.527	0.598
Price of Labor	-0.444	0.056	-7.928	0.000
Total Management Expense	-0.103	0.454	-0.226	0.822
Commission	0.839	0.192	4.378	0.000
Total Gross Premium	0.312	0.093	3.354	0.001
Net Investment Income	0.386	0.084	4.580	0.000
Policy Benefit Cover	0.109	0.068	1.602	0.112

Note: adjusted R-square= 0.729, significance F= 0.00, and source from authors' calculation.

It can further be observed that, the price of labor has negative effect on profit, which means that excessive expenditure on staff without corresponding output will negatively affect profitability. The negative impact of price of labor on profit contradicts Hopp et al. (2007) who mentioned that, increasing the amount of labor allows employees to spend more time with customers, which results in customer satisfaction leading to a positive correlation with profitability. Also, total management expense has a negative effect on profit making. This means excessive spending does not bring a lot of returns, rather results in lower profitability. However, commission has positive coefficient which means that, increase in these variables will result in higher profitability. This is true in the life insurance industry because when the sales executives are well motivated through commission and other incentives, they turn to sell more insurance policies which result in more premiums that turn to increase profitability. On the other hand, all the output variables were found to be positively related to the profitability of the firms. However, policy benefit cover does not have any significant impact on profitability of the firms as its p-value is greater than the alpha level of 0.05. In respect of the research question 1, it is observed that, the key significant factors determining profit of the life insurance companies are labor, commission, gross premium and net investment income.

Similarly, the regression output of the total cost and the output/input variables is presented in Table 5. The input and output variables of the firms contribute about 65.2% of the variation in total cost of life insurance companies. All the considered input and output variables were found to have a positive impact on the total cost of the firms with the exception of policy benefit cover. Price of labor, commission and total gross premium have significantly positive impact on the total cost. In addition, total management expense even though has a positive impact on cost, it is not a significant variable to determine total cost. This was evident as its p-value (0.634) is greater than alpha level of 0.05. As in the case of profit, the significant factors of cost are similar to that of profit, being price of labor, commission, gross premium and net investment income.

Table 5
Regression Results of the Total Cost Model

	Coefficients	Standard Error	t-Stat	P-value
Intercept	0.054	0.066	0.825	0.410
Price of Labor	0.333	0.078	4.297	0.000
Total Management Expense	0.233	0.486	0.478	0.634
Commission	0.346	0.075	4.622	0.000
Total Gross Premium	0.519	0.070	7.422	0.000
Net Investment Income	0.350	0.141	2.473	0.017
Policy Benefit Cover	-0.129	0.096	-1.344	0.179

Note: adj. R-square= 0.652, significance F= 0.000, and source from authors' calculation.

4.1.4. Efficiency scores of the insurance companies

The estimates of the cost efficiency scores, based on the common frontier have been obtained from the stochastic translog cost function which includes output levels and input prices. The measure of efficiency takes a maximum value of 1, which corresponds to the most efficient life insurance company in the sample. The average estimated cost efficiency scores for the whole sample is 71.2%, or cost inefficiency level of 28.8% (see Table 6), suggesting that an average life insurance company produces with a 0.712 of cost efficiency in the sample or an average company in the sample could have saved about 28.8% of total cost if it had used the best practice cost efficient approaches (technology etc), thereby matching its performance with the best performing firms. This partly addresses research question 2.

The average estimated cost efficiency scores assumed an increasing trend from 2013 to 2016 (see Table 6). The minimum cost efficiency score was recorded in the year 2013 (65.2%) whiles the highest mean score was realized in the year 2016 (79.8%). Table 6 presents the various statistics for each year. The results indicate that the insurance companies were cost efficient over the period under study.

Table 6
Average Cost Efficiency Scores

Year	Mean	Standard Deviation
3013	0.652	0.130
2014	0.668	0.169
2015	0.732	0.267
2016	0.798	0.281
2017	0.708	0.239
Overall	**0.712**	**0.217**

Source: authors' calculation.

On the other hand, the estimates of alternative profit efficiency scores are presented in Table 7. Notably, with respect to research question 2, the average profit efficiency score of all selected life insurance companies in the sample is 0.471, which indicates that during the period, the earnings of firms has been 47.1% of their potential profits on average. In other words, a profit inefficiency of 0.529 suggests that, an average life insurance company could increase its profits by 52.9% if it was to meet the performance of the best-practice firm.

The results show that, the profit scores also follow the same trend as that of the cost estimates. That is, there was a steady increase in the profit efficiency scores from 2013 to 2016 and it fell in 2017. The results reveal that, apart from the year 2016, the life insurance companies were not efficient profitably. This means that, even though these companies were cost efficient, other factors (either internal or external) might have resulted in the low profitability of the firms.

Table 7
Average Profit Efficiency Scores

Year	Mean	Standard Deviation
2013	0.192	0.197
2014	0.241	0.289
2015	0.264	0.316
2016	1.525	0.820
2017	0.132	0.062
Overall	**0.471**	**0.337**

Source: authors' calculation.

As can be observed from Tables 6 and 7, profit efficiency estimates are lower than cost efficiency estimates. This outcome is consistent with the results of earlier studies such as the those done by Lozano-Vivas and Pasiouras (2008) and Mamatzakis et al. (2008). The above efficiency results can be justified by the fact that, the high demand for financial services and also the observed low financial intermediation (and penetration) over the sample period left the life insurance companies in a dominant position as providers of these services. Therefore, since these firms have specifically concentrated on increasing their investment activities, profit efficiencies stayed behind cost efficiencies (Mamatzakis et al., 2008). Additionally, regarding the potential reward of expanding market shares in a rapidly growing market, life insurance companies do not have much incentive to maximize their profits by means of full utilization of their discretionary pricing power (Rossi et al., 2004).

4.1.5. Impact of cost and profit efficiencies on return on asset

After estimating the cost and profit efficiency scores based on the stochastic frontier method, in order to investigate the relationship between firms' performance and efficiency, the firms' ROA are regressed against corresponding annual changes in efficiency estimates while controlling for size (using natural log of total assets as a proxy). Table 8 shows the regression results of the changes in the efficiencies and Return on asset of the life insurance companies. Generally, if improvements in cost and profit efficiencies are reflected in ROA, a positive association is expected between these changes and the ROA. The results indicate that, profit efficiency changes have a positive and statistically significant impact on ROA as a response to research question 3. The positive impact of profit efficiency on ROA could be explained by the argument that, when a company achieves positive profit at the end of a year, some of the surpluses are invested in various assets portfolios and this might yield much returns within a period of time. These findings are consistent with Liadaki and Gaganis (2010) who found that, profit efficiency changes had a positive and significant effect on returns, while changes in firm cost efficiency show no significant impact on returns. The authors attributed these results to the idea that, shareholders and investors are more interested in earnings that give positive expectations than costs. Aftab et al. (2011) also found similar results when they studied banks listed on the Karachi Stock Exchange, and found that profit efficiency influences firm performance.

In a similar way, it was revealed that, cost efficiency changes also have positive and statistically significant effect on ROA (Table 8). This means that, cost efficiency scores, which offer an indication of the capability of managers, will be reflected positively in the firms' ROA. Even though this finding deviates from Liadaki and Gaganis (2010) and Vardar (2013) who found a negative relationship between cost efficiency scores and firm performance, it agrees with Beccalli et al. (2006) who found that, changes in firm cost efficiency affect returns positively and significantly among

European listed banks operating in five countries. The current findings also agree with the findings of Pasiouras et al. (2008) who found that there was a positive and significant relationship between stock performance and annual change in bank technical efficiency. Ioannidis et al. (2008) also found a positive and robust relationship between profit and cost efficiency changes and firm performance among sampled developing and developed Asian and Latin American countries. In addition, size was found to be positive but not statistically significant in determining the ROA of the insurance companies.

Table 8
Regression Results of ROA Model

Variables	Coefficients	t-Statistic	P-value
Constant	4.018	1.588	0.126
Profit efficiency	0.191	1.701	0.021
Cost efficiency	0.926	1.900	0.019
Size	0.309	1.223	0.148

Note: R-square= 0.450 and source from authors' calculation.

V. CONCLUSION

5.1. Conclusion and Policy Implications

The main objective of the study is to examine the efficiency of life insurance companies in Ghana. Prior studies on Ghana have concentrated on accounts earnings information and its components as the explanatory variables. Those who estimated performance with efficiency in their models did not specifically look at efficiency alone, while there is no study in the life insurance sector in this context. It can be concluded that, even though the insurance penetration in Ghana has been on the lower side relatively, there is an indication of industry growth. This was evident as all the key growth indicators revealed a positive effect for the period of 2013 to 2017. The positive relationship between size and ROA implies that, size is used to capture the fact that larger insurance companies are better placed than smaller ones in harnessing economies of scale in transactions and enjoy a higher level of profit. However, for firms that become extremely large, the effect of size could be negative due to bureaucracy and other reasons, such as influence costs. Well capitalized insurance companies face lower costs of going bankrupt, which reduces their cost of funding or that they have lower needs for external funding which results in higher profitability. It can also be concluded that, the life insurance companies are highly cost efficient but not really profit efficient. However, it can also be concluded from the results that, efficient life insurance companies (both cost and profit) are more likely to financially perform very well than the inefficient ones. This can explain why some life insurance companies have strategically restructured their operations for a better market share in the insurance market in Ghana.

Therefore, the practical implication and contribution is that, policy makers should not only evaluate insurance policies through the financial stability, but also should investigate the policies that encourage these companies to operate efficiently in order to make effective capital allocation decisions. Also, efficient management of the operations of life insurance companies can help alleviate the high operational cost that erodes their profits. Occupancy cost and salaries are major components of operational cost.

The theoretical contribution is that, the confirmation of the fact that efficiency (both cost and profit) are key determinants of performance, supporting the efficiency structure hypothesis as applicable in the Ghanaian life insurance companies. The study contributes to the depth of application of efficiency structure hypothesis to efficiency and performance in life insurance. The study especially found the efficiency structure hypothesis' advocacy for efficiency of firms as effective in enhancing insurance performance.

It is recommended that, life insurance companies in Ghana should adopt a benchmark management procedure in order to evaluate their relative position and to adopt appropriate managerial procedures for catching up with the frontier of 'best practices'. Besides, they should upgrade the quality of their management practices that improves market share and firm size.

The limitation of this study is the inability to include other external macroeconomic variables which can affect the determination of both efficiency and firm's performance. An insurer's profit may be influenced by not only input price and output, but also by its input quantity, revenue, the economy of scale, or economy of scope. Future studies may sufficiently include control variables to account for firm-level heterogeneities. In general, the present study and its findings show that, stakeholders in the life insurance industry would find empirical basis to institute policies and measures to enhance efficiency and improve life insurance firms' performance.

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