DETERMINANTS OF FINANCIAL PERFORMANCE OF GENERAL INSURANCE INDUSTRIES IN GHANA USING MULTIPLE LINEAR REGRESSION ANALYSIS

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JUNE, 2019
DECLARATION

I hereby declare that this dissertation is my own work towards the B.Sc. In Actuarial Science in the Department of Mathematics and Statistics, University of Energy and Natural Resources, and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text:

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DEDICATION

This work is dedicated to our dearest family members for their educational passion which has brought us this far.
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ABSTRACT

The general objective of the study is to find out the determinants of the profitability of insurance firms in Ghana. Secondary data on financial reports are collected from twenty-seven insurance firms in Ghana for the period 2007 to 2016 was obtained from the National Insurance Commission (NIC).

A descriptive statistic was applied in this study to summarize the basic features of the data. It adopted Pearson’s correlation and the longitudinal time dimension, specifically, the multiple linear regression method to identify the relationship between profitability and the determinants. The study discovered that, apart from the size of insurance firms which has a positive relationship, there is a negative relationship between leverage, liquidity, retention ratio, underwriting risk, equity capital and profitability of insurance firms in Ghana. It was also concluded that, the profitability model adopted has been explained with respect to all the independent variables and that the degree of error is less than 40%.
CHAPTER 1

INTRODUCTION

1.1 Background of the Study

The role of financial institutions in the economy of a country in general and insurance companies, in particular, is basically their efficient and effective financial system in savings mobilization, risk transfer and intermediation. Therefore, financial institutions, channel funds and transfers risks from one economic unit to another economic unit so as to facilitate trade and resources arrangement. According to KPMG (2014), the financial and insurance sector’s activities recorded an average growth rate of 4.8% from 2009 to 2013. In 2013, it accounted for 6% of GDP. Financial and insurance activities form the 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 provide unique financial services to the growth and development of every economy (Pandey I.M, 2007). 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, Ahmad & Zulfiqar, 2011). Insurance companies’ ability to continue to cover risk in the economy hinges on their capacity to create profit or value for their shareholders. Indeed, a well-developed and evolved insurance industry is a boon for economic development as it provides long-term funds for infrastructure development of every economy (Charumathi, 2012). The financial performance of companies is a subject that has
attracted a lot of attention, comments and interests from both financial experts, researchers, the general public and the management of corporate entities. Yet, selecting the most successful firms has always proved to be a difficult task to many as a firm may have a high level of profitability, but at the same time be in a very bad situation regarding its liquidity. The financial performance of a firm can be analyzed in terms of profitability, dividend growth, sales turnover, asset base, capital employed among others. However, there is still debate among several disciplines regarding how the performance of firms should be measured and the factors that affect the financial performance of companies (Liargovas & Skandalis, 2008). A single factor cannot reflect every aspect of company performance and therefore the use of several factors allows a better evaluation of the financial profile of firms. According to Iswatia and Anshoria (2007) performance is the function of the ability of an organization to gain and manage the resources in several different ways to develop a competitive advantage. Financial performance emphasizes variables related directly to the financial report.

According to Ansah-Adu, Andoh and Abor (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. Without profits, no insurer can attract outside capital to meet its set objectives in this ever-changing and competitive globalized environment. Despite the current insurance companies’ development with respect to both total assets and in number, little studies have been conducted to investigate the factors affecting the performance of non-life insurance hence the motivation to examine the firm-specific determinants of the Financial Performance of General Insurance companies in Ghana. The performance of any business firm not only plays the role to increase the market value of that specific firm but also leads towards the growth of the whole sector which ultimately leads to the
overall prosperity of the economy. Assessing the factors that affect the performance of insurers have gained the importance in the corporate finance literature because as intermediaries, these companies are not only providing the mechanism of risk transfer but also helps to channel the funds in an appropriate way to support the business activities in the economy. However, it has received little attention particularly in developing economies (Ahmed et al., 2011). The insurance industry, in particular, is part of the immune and repair system of an economy and successful operation of the industry can set the energy for other industries and development of an economy. To do so, the non-insurance industry is expected to be financially solvent and strong through being profitable in operation.

1.2 Problem Statement

Ghana’s Insurance sector has shown strong resilience in a challenging macroeconomic environment and global development. According to a report by the National Insurance Commission (2013), the insurance market continued to post positive growth in gross written premium. The total gross premium for the year 2013 was GH¢ 582.3 million representing a growth rate of 17.7% from the previous year. Also, the industry average ratio of the Return on Assets (ROA) moved from a negative 12% in 2012 to a positive 10% in 2013. However, the investment income as a percentage of total investments ratio fell from 14% in 2012 to 12% in 2013 due to many factors. Despite the current insurance companies’ development with respect to both total assets and in number, little studies have been conducted to investigate the firm-specific determinants of the financial performance of the non-life insurance sector in Ghana. The absence of empirical studies in Ghana concerning the determinants of insurance companies’ profitability was what motivated us to take up this study.
1.3 General Objective

To examine the trend of key performance indicators of the general insurance companies in Ghana.

1.4 Specific Objective

1. To identify the internal factors in general insurance companies in Ghana that affects their profitability.
2. To determine the relationship between the profitability and internal factors of general insurance industries.

1.5 Research Hypothesis

Null Hypothesis

This research work attempts to provide answers to the following null hypotheses

1. $H_0$: There is a positive relationship between liquidity and profitability of general insurance companies in Ghana.
2. $H_0$: There is a positive relationship between company size and profitability of general insurance companies in Ghana.
3. $H_0$: There is a negative relationship between leverage and profitability for Ghanaian general insurance companies.
4. $H_0$: There is a negative relationship between underwriting risk and profitability of general insurance industries in Ghana.
Alternative Hypothesis

1. H$_1$: There is a negative relationship between liquidity and profitability of general insurance companies in Ghana.

2. H$_1$: There is a negative relationship between company size and profitability of general insurance companies in Ghana.

3. H$_1$: There is a positive relationship between leverage and profitability for Ghanaian general insurance companies.

4. H$_1$: There is a positive relationship between underwriting risk and profitability of general insurance industries in Ghana.

1.6 Significance of the study

- The findings of this study may be useful to policymakers for example; executives of individual general insurance companies in Ghana to assist them in formulating policies to better financial performance and stability. The National Insurance Commission (NIC) may borrow from the findings so as to come up with structures, and policies to assist the insurance industry to grow and enhance contribution to the Gross Domestic Product (GDP).

- The findings of the research may act as a reference to middle level as well as senior level managers on key internal parameters to constantly observe when determining the financial performance of insurance industries in Ghana and adequately address the problem of the undesirable financial performance of insurance companies in Ghana.

- The findings of this research may be beneficial to researchers, academicians and insurance professionals as it adds to the existing body of knowledge in the field of insurance and acts
as a springboard for further research in the same area and other related areas, in the financial sector.
CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This section highlights the available literature that discusses the determinants of the financial performance of general insurance companies both empirical and theoretical. The chapter reviews theoretical implications to the study and also determinants of financial performance and the empirical studies conducted in the area.

2.2 Theoretical framework

The theoretical section tries to uncover whether or not the existing theories suggest what determines the performance of various organizations. The study adopts two main theories namely; Resource-Based View Theory and Dynamic Capability Theory.

2.2.1 Resource-Based View

The Resource-Based View Theory was introduced by Wernerfelt, (1984) and aims at explaining the advantages of resources in organizations. The theory holds that the competitive advantage in organizations lies entirely on how well they are able to organize their resources. The theory explains that an organization may be able to attain the desired competitive advantage through proper utilization of its available resources. The resources entail both human capabilities and physical utilities used in achieving the organizations’ set objectives and targets. The organization resources ought to be well aligned so that their outcomes may not be imitated by their competitors (Barney, 2013). The theory makes the assumption that each organization has unique resources.
from the other competitors. This is not usually the case as organizations tend to imitate resources from their competitors, thus limiting the competitive advantages obtained. The theory’s implication to the study is that the available resources at the insurance companies are a huge determinant on how they perform. As such, the managers at the insurance companies should ensure full maximization of their available resources, for them to perform financially. They should also ensure that they possess resources which are unique to them which are not easily mimicked by their competitors in the insurance sector.

2.2.2 Dynamic Capability Theory

The Dynamic Capability Theory was initially proposed and developed by Teece, Pisano and Shuen, (1997). The theory provides insights on how organization acquires, integrate and reorganize both the internal and external competencies in order to remain dominant and gain competitive advantage. The theory holds that organizations vary in terms of their industry-specific variables. Hence those firms with greater dynamic industry variables are more likely to perform better than those companies having lower industry variables. This makes the organizations endeavor to ensure that they have the required capabilities so as to meet both stakeholders and customers’ demands. The theory makes the assumption that it is impossible for organizations to have similar capabilities and this result in a difference in their performances. The theory’s proposition to the study is that the external environment causes a difference in the dynamic capabilities of the organizations. Therefore, the companies which are advantageous in terms of their industry-specific variables are more likely to perform better. This implies that the performance is determined mainly by how well the insurance companies are able to acquire, align and integrate their industry variables in gaining competitive advantage.
2.3 Determinant of firms’ financial performance

A large number of previous studies relating to the firm’s performance or sometimes corporate performance has identified a number of factors that empirically and even significantly affecting the firm’s performance. For instance, the study conducted by Krishnan and Moyer (1997) found a negative and significant relationship between leverage and firm’s performance while other factors affecting firm’s performance positively include size, growth, tax and risk. The impact of a few of the factors mentioned on the firms’ financial performance is discussed below.

2.3.1 Leverage

Wood (1998) defines leverage as the extent of debt financing by an entity. A business entity which uses more debt in its capital structure is said to be highly leveraged and a business entity that uses less debt is said to be lowly leveraged. A high amount of debt normally attracts the interest charge, however, prudent management of debt is beneficial to a company. The company will enjoy the tax shield because the interest payments by the companies are not taxed. However, if the business entities don’t manage the debts appropriately, the financial performance of that company diminishes.

2.3.2 Liquidity

The International Financial Reporting Standards (2006) defines liquidity as the available cash for the near future, after taking into account the financial obligations corresponding to that period. Almajali et al. (2012) found that firm liquidity had a significant effect on the financial performance of insurance companies. The result suggested that insurance companies should increase the current assets and decrease current liabilities because of the positive relationship between liquidity and financial performance. However, Ahmed et al., (2011) in a similar study of the Pakistani life
insurance industry, claimed that liquidity is not a significant determinant of insurers’ profitability. They posited that, whereas size and underwriting risk are significant and positively related to the profitability of insurance firms, leverage is negative and hence decreases the profitability of insurers significantly. In contrast to the above reasoning, a theoretical model by Jovanovic (1982) suggested that a moderate amount of liquidity may propel entrepreneurial performance, but that an abundance of liquidity may do more harm than good. Therefore, they concluded that the effect of liquidity on firms' financial performance is ambiguous.

2.3.3 Company size

The size of the firm affects its financial performance in many ways. Hardwick (2009) suggested that large insurers are likely to perform better than small insurers because they can achieve operating cost efficiencies through increasing output and economizing on the unit cost of innovations in products and process development. A positive linkage between firm size and its financial performance is expected since large firms have more resources, better risk diversification and better expenses management.

2.4 Determinants of profitability in insurance companies: An empirical review

Profitability in insurance companies could be affected by a number of determining factors. These factors could be classified as internal, industry, and macroeconomic factors. However, profitability with regard to insurance companies usually expressed as a function of internal determinants. Most researches concerning determinants of profitability of insurance companies are divided into two, such as determinants of profitability in property/liability or general insurance companies and in life/health insurance companies. This study reviews that of the property or the liability.
Almajali, Alamro and Al-Soub (2012) carried out a study to examine and identify the factors affecting the financial performance of Jordanian insurance companies during the period 2002 to 2007. ROA was used as the dependent variable while leverage, liquidity, age, size and management competence index were independent variables. The result was that the factors had no relation at all to the financial performance.

Cristina et al. (2015) conducted a study on the determinants of insurance companies’ financial performance in European Countries. The study used cross-country European aggregate data to establish the relationship between the insurer’s profitability and macroeconomic variables. The study used panel data approach and the Generalized Method of Moments methodology. The results obtained showed that the most important indicator of insurers’ performance and healthiness is its profitability. This implies that the companies should endeavor to mostly ensure that they remain profitable so as to perform. The study was, however, able to determine other factors influencing financial performance.

Mose (2016) conducted a research to study the effect of cash management practices on the financial performance of insurance firms in Kenya between 2013 to 2015. The population of the study was 37 insurance firms in Kenya, however, a sample of 16 insurance firms was selected for the study. He used primary data which was obtained using questionnaires. ANOVA and a simple regression model was employed in the analysis. From the findings, he established that cash budgets were powerful tools in cash management and it was prudent for firms to do budgeting that controls the activities of the firms. He concluded that good cash management practices enhance accountability hence improve financial performance.

Mazviona and Mbakisi Dube (2017) investigated the factors affecting the performance of insurance companies. The study utilized secondary data from twenty insurance companies. The
data collected was from 2010 to 2014. We used factor analysis and multiple linear regression models to determine the factors affecting performance and identifying their impact. The findings revealed that expense ratio, claims ratio and the size of a company significantly affect insurance companies’ performance negatively. Whilst leverage and liquidity affect performance positively. The study shows that insurance companies should introduce mechanisms that reduce operational costs such as automated systems. The study’s findings were however inconclusive as both positive and negative results were obtained.

Owino, (2017) conducted a study on the relationship between organizational factors and performance of insurance brokerage firms in Kenya. Primary data was obtained using self-administered questionnaires. Descriptive statistics were used to generate frequencies, percentages, mean score and standard deviation while correlation and multiple regression analysis were used to ascertain the association between pairs of variable and the influence of the variables on performance. It was found that information technology integration and advancement had the greatest effect on the performance of insurance brokerage firms, followed by organization structure, and discontinuous innovation.
CHAPTER 3

METODOLOGY

3.1 Introduction

This chapter describes the methodology that was used for this research which encompassed the research design, the study population, sampling techniques, instrument/method of data collection and data analysis of the study.

3.2 Research Design

The study was a quantitative research which took the form of a predictive and descriptive design. The descriptive design was used to gain information about the current status of the phenomena to describe what exists with respect to the variables involved.

3.3 Population

Population can be defined as the total collection of elements about which we wish to make some inferences (Cooper and Schindler, 2001). The population for this study was all the general insurance companies in Ghana supervised by the National Insurance Commission (NIC). The study used data for the 10 financial periods, 2007-2016.
3.4 Sample and Sampling Design

All the general insurance companies supervised by the National Insurance Commission were used as our sample. No sampling method was employed because the whole population was used. The population comprised of all 27 general insurance companies in Ghana. The inclusion criterion was that the general insurance industry should be supervised by the National Insurance Commission (NIC).

3.5 Source and Validity of Data

General insurance companies are required by their regulator, National Insurance Commission to furnish it with information. The reliability and validity of data is assured since data was collected from the audited and published end of year financial reports of general insurance companies from the National Insurance Commission. The period used is 2007 to 2016.

3.6 The Multiple Linear Regression Model

The multiple regression model was used to identify the relationship between the profitability of insurance companies and the factors mainly liquidity, leverage ratio, retention ratio, company size, underwriting risk and volume of capital. Data will be analyzed with one dependent variable (profitability) and six independent variables (liquidity, size of companies, leverage ratio, retention ratio, underwriting risk and volume of capital). Following is the regression equations:

The general multiple linear regression model of one dependent variable(Y) and six independent variables($X_i$), $i =1,2,..,6$ is given by;


\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon \]

Where:

- \( \beta_0 \) is the intercept (constant)
- \( \varepsilon \) is the error term.

The specific model for our study is given by:

\[ ROA = \beta_0 + \beta_1 LEV + \beta_2 R + \beta_3 LIQ + \beta_4 UWR + \beta_5 EC + \beta_6 A + \varepsilon \]

Where \( \beta_0 \) and \( \varepsilon \) have their usual meaning. The dependent variable and the six independent variables are presented in table 3.6 below.

<table>
<thead>
<tr>
<th>Notation</th>
<th>Meaning</th>
<th>How it is Measured</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROA</td>
<td>Return on Assets</td>
<td>Profit after tax ( \frac{\text{total assets}}{\text{Profit after tax total assets}} )</td>
</tr>
<tr>
<td>LEV</td>
<td>Leverage</td>
<td>Total debt ( \frac{\text{Equity}}{\text{Total debt Equity}} )</td>
</tr>
<tr>
<td>R</td>
<td>Retention ratio</td>
<td>Net Premium ( \frac{\text{Gross Premium}}{\text{Net Premium Gross Premium}} )</td>
</tr>
<tr>
<td>LIQ</td>
<td>Liquidity</td>
<td>Current Assets ( \frac{\text{Current Assets}}{\text{Current Liabilities}} )</td>
</tr>
<tr>
<td>UWR</td>
<td>Underwriting Risk</td>
<td>Benefits paid Net Premium</td>
</tr>
<tr>
<td>---------</td>
<td>-------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>EC</td>
<td>Equity Capital</td>
<td>Log of Equity Capital</td>
</tr>
<tr>
<td>A</td>
<td>Size of firm</td>
<td>Log of total assets</td>
</tr>
</tbody>
</table>

In the above regression model, all independent variables enter the equation at once to determine the relationship between the dependent variables and the whole set of predictors.

### 3.7 Mathematical Calculations

Let each of the $k$ predictor variables, $x_1, x_2, ..., x_k$ have $n$ levels. Then $x_{ij}$ represents the $i$ th level of the $j$ th predictor variable $x_j$. Observations, $y_1, y_2, ..., y_n$, recorded for each of these $n$ levels can be expressed in the following way:

\[
\begin{align*}
    y_1 &= \beta_0 + \beta_1 x_{11} + \beta_2 x_{12} + \ldots + \beta_n x_{1k} + \epsilon_1 \\
    y_2 &= \beta_0 + \beta_1 x_{11} + \beta_2 x_{22} + \ldots + \beta_k x_{2k} + \epsilon_2 \\
    \vdots & \\
    y_i &= \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \ldots + \beta_k x_{ik} + \epsilon_i \\
    y_n &= \beta_0 + \beta_1 x_{n1} + \beta_2 x_{n2} + \ldots + \beta_k x_{nk} + \epsilon_n
\end{align*}
\]

The system of $n$ equations shown previously can be represented in matrix notation as follows:

\[
y = X\beta + \epsilon
\]

Where
The matrix \( X \) is referred to as the design matrix. It contains information about the levels of the predictor variables at which the observations are obtained. The vector \( \beta \) contains all the regression coefficients as well as the intercept\((\beta_0)\). To obtain the regression model, \( \beta \) should be known. \( \beta \) is estimated using the ordinary least squares estimates. The following equation is used:

\[
\beta = (X^T X)^{-1} X^T y
\]

It is expanded and further simplified to give out an equation of the form:

\[
\begin{align*}
    n\hat{\beta}_0 + \hat{\beta}_1 \sum_{i=1}^{n} x_{i1} + \hat{\beta}_2 \sum_{i=1}^{n} x_{i2} + \cdots + \hat{\beta}_k \sum_{i=1}^{n} x_{ik} &= \sum_{i=1}^{n} y_i \\
    \hat{\beta}_0 \sum_{i=1}^{n} x_{i1} + \hat{\beta}_1 \sum_{i=1}^{n} x_{i1}^2 + \hat{\beta}_2 \sum_{i=1}^{n} x_{i1} x_{i2} + \cdots + \hat{\beta}_k \sum_{i=1}^{n} x_{i1} x_{ik} &= \sum_{i=1}^{n} x_{i1} y_i \\
    \vdots & \vdots \vdots \\
    \hat{\beta}_0 \sum_{i=1}^{n} x_{ik} + \hat{\beta}_1 \sum_{i=1}^{n} x_{ik} x_{i1} + \hat{\beta}_2 \sum_{i=1}^{n} x_{ik} x_{i2} + \cdots + \hat{\beta}_k \sum_{i=1}^{n} x_{ik}^2 &= \sum_{i=1}^{n} x_{ik} y_i
\end{align*}
\]
where $T$ represents the transpose of the matrix while $-1$ represents the inverse matrix. Knowing the estimates, $\hat{\beta}$, the multiple linear regression model can now be estimated as:

$$\hat{y} = X\hat{\beta}$$

The estimated regression model is also referred to as the fitted model. The observations, $y_i$, may be different from the fitted values $\hat{y}_i$ obtained from this model. The difference between these two values is the residual, $\epsilon_i$. The vector of residuals, $\epsilon$, is obtained as:

$$\epsilon = y - \hat{y}$$

The fitted model can also be written as

$$\hat{\beta} = (X^TX)^{-1}X^Ty$$

$$\hat{y} = X\hat{\beta}$$

$$= X(X^TX)^{-1}X^Ty$$

$$= Hy$$

Where $H = X(X^TX)^{-1}X^Ty$. The matrix, $H$, is referred to as the hat matrix. It transforms the vector of the observed response values, $y$, to the vector of fitted values, $\hat{y}$.

The least squares estimates $\hat{\beta}_0, \hat{\beta}_1, \hat{\beta}_2, \ldots, \hat{\beta}_n$ are unbiased estimators of $\beta_0, \beta_1, \beta_2, \ldots, \beta_n$, provided that the random error terms, $\epsilon_i$, are normally and independently distributed. The variances of the $\hat{\beta}$s are obtained using the $(X^TX)^{-1}$ matrix. The variance-covariance matrix of the estimated regression coefficients is obtained as follows:

$$C = \sigma^2(X^TX)^{-1}$$

$C$ is a symmetric matrix whose diagonal elements, $C_{ij}$, represent the variance of the estimated regression coefficient, $\hat{\beta}_j$. The off-diagonal elements, $C_{ij}$, represent the covariance between
the \(i\)th and \(j\)th estimated regression coefficients, \(\hat{\beta}_i\) and \(\hat{\beta}_j\). The value of \(\hat{\sigma}^2\) is obtained using the Mean Square Error, \(MSE\).

### 3.8.1 Test for Significance of Regression

The test for significance of regression in the case of multiple linear regression analysis is carried out using the analysis of variance. The test is used to check if a linear statistical relationship exists between the response variable and at least one of the predictor variables. The statements for the hypotheses are:

\[
H_0: \beta_1 = \beta_2 = \cdots = \beta_k = 0
\]

\[
H_1: \beta_1 \neq 0
\]

The test for \(H_0\) is carried out using the following statistic:

\[
F_0 = \frac{MS_R}{MSE}
\]

where \(MS_R\) is the regression mean square and \(MSE\) is the error mean square. If the null hypothesis, \(H_0\), is true then the statistic \(F_0\) follows the \(F\) distribution with \(k\) degrees of freedom in the numerator and \(n - (k + 1)\) degrees of freedom in the denominator. The null hypothesis, \(H_0\), is rejected if the calculated statistic, \(F_0\), is such that:

\[
F_0 > \bar{F}_{\alpha,k,n-(k+1)}
\]
3.8.2 Calculation of the Statistic $F_0$

To calculate the statistic $F_0$, the mean squares $MS_R$ and $MS_E$ must be known. The mean squares are obtained by dividing the sum of squares by their degrees of freedom. The total mean square, $MS_T$, is obtained as follows:

$$MS_T = \frac{SS_T}{dof(SS_T)}$$

where $SS_T$ is the total sum of squares and $dof(SS_T)$ is the number of degrees of freedom associated with $SS_T$. In multiple linear regression, the following equation is used to calculate $SS_T$:

$$SS_T = y'[1 - \left(\frac{1}{n}\right)j]y$$

where $n$ is the total number of observations, $y$ is the vector of observations (that was defined in Estimating Regression Models Using Least Squares), $I$ is the identity matrix of order $n$ and $j$ represents a $n \times n$ square matrix of ones. The number of degrees of freedom associated with $SS_T$, $dof(SS_T)$, is $n - 1$. Knowing $SS_T$ and $dof(SS_T)$ the total mean square, $MS_T$, can be calculated.

The regression mean square, $MS_R$, is obtained by dividing the regression sum of squares, $SS_R$, by the respective degrees of freedom, $dof(SS_R)$, as follows:

$$MS_R = \frac{SS_R}{dof(SS_R)}$$

The regression sum of squares, $SS_R$, is calculated using the following equation:

$$SS_R = y'[H - \left(\frac{1}{n}\right)j]y$$

where $n$ is the total number of observations, $y$ is the vector of observations, $H$ is the hat matrix and $j$ represents a $n \times n$ square matrix. The number of degrees of freedom associated with $SS_R$, $dof(SS_R)$, is $k$, where $k$ is the number of predictor variables in the model. Knowing $SS_R$
and $dof(SS_R)$ the regression mean square, $MS_R$, can be calculated. The error mean square, $MS_E$, is obtained by dividing the error sum of squares, $SS_E$, by the respective degrees of freedom, $dof(SS_E)$, as follows:

$$MS_E = \frac{SS_E}{dof(SS_E)}$$

The error sum of squares, $SS_E$, is calculated using the following equation:

$$SS_E = y' (1 - H) y$$

where $y$ is the vector of observations, $I$ is the identity matrix of order $n$ and $H$ is the hat matrix. The number of degrees of freedom associated with $SS_E$, $dof(SS_E)$, is $n - (k + 1)$, where $n$ is the total number of observations and $k$ is the number of predictor variables in the model. Knowing $SS_E$ and $dof(SS_E)$, the error mean square, $MS_E$, can be calculated. The error mean square is an estimate of the variance, $\sigma^2$, of the random error terms, $\varepsilon_i$.

$$\sigma^2 = MS_E$$

3.8.3 Test on Individual Regression Coefficients ($t$-Test)

The $t$ test is used to check the significance of individual regression coefficients in the multiple linear regression model. Adding a significant variable to a regression model makes the model more effective, while adding an unimportant variable may make the model worse. The hypothesis statements to test the significance of a particular regression coefficient, $\beta_j$, are:

$$H_0: \beta_j = 0$$

$$H_0: \beta_j \neq 0$$

The test statistic for this test is based on the $t$ distribution.

$$T_0 = \frac{\hat{\beta}_j}{se(\hat{\beta}_j)}$$
where the standard error, $se(\hat{\beta}_j)$, is obtained. The study would fail to reject the null hypothesis if the test statistic lies in the acceptance region:

$$-t_{\alpha/2,n-2} < T_0 < t_{\alpha/2,n-2}$$

### 3.8.4 Coefficient of the Multiple Determination, $R^2$

The coefficient of multiple determination is similar to the coefficient of determination used in the case of simple linear regression. It is defined as:

$$R^2 = \frac{SS_R}{SS_T} = 1 - \frac{SS_E}{SS_T}$$

$R^2$ indicates the amount of total variability explained by the regression model. The positive square root of $R^2$ is called the multiple correlation coefficient and measures the linear association between $Y$ and the predictor variables, $x_1, x_2, x_3, \ldots, x_k$.

The value of $R^2$ increases as more terms are added to the model, even if the new term does not contribute significantly to the model. An increase in the value of $R^2$ cannot be taken as a sign to conclude that the new model is superior to the older model. A better statistic to use is the adjusted $R^2$ statistic defined as follows:

$$R^2_{adj} = 1 - \frac{MS_E}{MS_T} = 1 - \frac{SS_E/(n-(k+1))}{SS_T/(n-1)} = 1 - \left(\frac{n-1}{n-(k+1)}\right)(1 - R^2)$$
3.8.5 Data Analysis Method

The data was analyzed using R version 3.4.2 and the results will be presented in tables.
CHAPTER 4

DATA ANALYSIS AND RESULTS

4.1. Introduction.
In this chapter, the results of the data analysis are presented. The data were collected and then processed in response to the objectives posed in chapter 1 of this dissertation. To examine the trend of the key performance indicators of the general insurance companies in Ghana and the relationship between the profitability and the key performance indicators of the insurance industries.

4.2. Hypothesis
This chapter presents the quantitative results to address the research hypothesis:

- There is a positive relationship between liquidity and profitability of general insurance companies in Ghana.
- There is a positive relationship between company size and profitability of general insurance companies in Ghana.
- There is a negative relationship between leverage and profitability for Ghanaian general insurance companies.
- There is a negative relationship between underwriting risk and profitability of general insurance industries in Ghana.
(Alpha was taken as 0.05 significant level)

4.3 Descriptive Statistics

This section presents the descriptive statistics of the dependent and explanatory variables used in this study. The dependent variable used in this study is ROA ratio while explanatory variables are LEV, LIQ, R, UWR, EC and A. The following table 4.3 reports the descriptive of all data variables in the study.

Table 4.3 Descriptive Statistics of study variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROA</td>
<td>4.90</td>
<td>1.79</td>
<td>2.0</td>
<td>9.00</td>
</tr>
<tr>
<td>LEV</td>
<td>1.38</td>
<td>0.21</td>
<td>0.82</td>
<td>1.50</td>
</tr>
<tr>
<td>R</td>
<td>68.30</td>
<td>3.23</td>
<td>62.00</td>
<td>72.00</td>
</tr>
<tr>
<td>LIQ</td>
<td>1.65</td>
<td>0.26</td>
<td>1.31</td>
<td>1.98</td>
</tr>
<tr>
<td>UWR</td>
<td>30.70</td>
<td>10.58</td>
<td>16.00</td>
<td>46.00</td>
</tr>
<tr>
<td>EC</td>
<td>8.50</td>
<td>0.21</td>
<td>8.12</td>
<td>8.85</td>
</tr>
<tr>
<td>A</td>
<td>8.76</td>
<td>0.30</td>
<td>8.27</td>
<td>9.18</td>
</tr>
</tbody>
</table>

From Table 4.3 it can be observed that the ROA ratio measured by Profit after tax divided by total assets ranges from 2 - 9. It has a mean of 4.90 showing a little deviation of 1.79 from its mean value. This indicates that general insurance companies in Ghana had ROA of 4.90 on the average in the period of study.

The Leverage of general insurance companies in Ghana range from a minimum of 0.82 to a maximum of 1.50 and has a mean of 1.38 with a deviation of 0.21.

As far as how much the general insurance companies are efficiently managing their underwriting risk, UWR records a minimum of 16 and a maximum of 46 with a mean value of 30.70.
On the other hand, EC measured by the log of the total capital of the general insurance companies measures how much money investors have invested in the companies. It recorded a minimum of 8.12 and a maximum of 8.15 with an average of 8.50 and a deviation from the mean of 0.21.

### 4.4 Correlational Analysis

Table 4.4 Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>ROA</th>
<th>LEV</th>
<th>R</th>
<th>LIQ</th>
<th>UWR</th>
<th>EC</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROA</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEV</td>
<td>-0.14</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>-0.52</td>
<td>0.03</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LIQ</td>
<td>-0.64</td>
<td>0.40</td>
<td>0.24</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UWR</td>
<td>-0.64</td>
<td>0.42</td>
<td>0.33</td>
<td>0.80</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC</td>
<td>-0.55</td>
<td>0.40</td>
<td>0.40</td>
<td>0.70</td>
<td>0.85</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>-0.49</td>
<td>0.53</td>
<td>0.35</td>
<td>0.84</td>
<td>0.83</td>
<td>0.64</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Table 4.4 shows that most of the correlations were below 0.90. Usually, a decision to delete a variable from a model rests with the researcher based on the fundamentals. In this case, a decision has been made to retain all the variables since none of them have a correlation of more than 0.90. Thus, there is no multi-collinearity between the independent variables. A multiple regression analysis was carried out with the dependent variable being ROA to proxy firm performance and a number of independent variables.
4.5 Model Assumptions

The following diagnostic tests were carried out to ensure that the data suits the basic assumptions of the classical linear regression model (CLRM) underlying the OLS:

4.5.1 Multi collinearity

The existence of a strong correlation between the independent variables was tested using the variance inflation factor (VIF). The outcome implies that the VIF for all variables is significantly less than ten (1.88). Similarly, the 1/VIF significantly exceeds 0.1(range from 0.256452-0.918046) which is consistent with the rule of thumb. Hence, it was found that there is no Multi collinearity problem.

4.5.2 Heteroscedasticity

To check for Heteroscedasticity, Breusch-Pagan/Cook-Weisberg test of Heteroscedasticity was carried out. The test done indicates that there is no problem with Heteroscedasticity because (Prob > chi2 = 0.2092 for ROA). Therefore there is no Heteroscedasticity problem because the p-value is greater than five percent.

4.5.3 Normality

The normal distribution of residual is tested using the Shapiro-Wilk test for normality, it tests the null hypothesis that residuals are normally distributed. In this case, the tests display insignificant p-values (i.e., 0.5158 for ROA) because it is greater than five percent. Therefore, the researchers conclude that residuals have a normal distribution pattern.

4.6 Result of the Multiple Linear Regression Model

This section presents the result of the multiple linear regression model that was made to examine the determinant of the financial performance of insurance industries in Ghana.
Table 4.6 below presents the result of the multiple linear regression model to examine the impact of the explanatory variables on ROA. Hence, ROA ratio is the dependent variable whereas leverage, retention ratio, underwriting risk, liquidity ratio, equity capital and size of the insurance industries are the explanatory variables. Thus, the regression result in Table 4.6 demonstrates both coefficients of explanatory variables and corresponding p-values as follows.

Table 4.6 Result of multiple linear regression model

| Variables | Estimate   | Std. Error | Pr(>|z|) |
|-----------|------------|------------|---------|
| Intercept | 114.53140  | 84.01374   | 0.026   |
| LEV       | -50.08991  | 28.85421   | 0.018   |
| R         | -0.20189   | 0.16915    | 0.318   |
| LIQ       | -32.80836  | 20.04690   | 0.046   |
| UWR       | -0.09532   | 0.15472    | 0.582   |
| EC        | -132.78698 | 76.52643   | 0.018   |
| A         | 130.090198 | 73.02095   | 0.017   |

Residual standard error: 1.493 on 3 degrees of freedom

Error rate: 0.3047554

Multiple R-squared: 0.8083

Adjusted R-squared: 0.7249

F-statistic: 2.108 on 6 and 3 DF

p-value: 0.0289

Thus, based on the result from table 4.6, the following model is developed to examine the
determinants of the financial performance of general insurance industries in Ghana.

\[ ROA = 114.53 - 50.09 \text{LEV} - 0.20R - 32.80 \text{LIQ} - 0.10 \text{UWR} - 132.79 \text{EC} + 130.09A \]

The p-value of the f-statistics is 0.0289 which is significant. This means that most of the predictor variables are significantly related to the outcome variable and the data is ideal for making a conclusion on the population’s parameter.

The Multiple R-squared: 0.8083 indicate that “80.83%” of the variability of variation in the measure of ROA which is the measure of the performance of the profitability of the general insurance companies in Ghana can be predicted by the leverage, retention ratio, underwriting risk, liquidity and age of the insurance companies.

The Residual Standard Error is 1.493 corresponding to 30.47% error rate which is lower. This means the regression model is more accurate.

Furthermore, we examined the impact of firm-specific factors on the financial performance of general insurance companies. Based on the multiple linear regression results of the model in Table 4.6, in terms of examination of coefficients of explanatory variables and significance level.

LEV, R, LIQ, UWR and EC had a negative impact on ROA having a coefficient of \(-50.0891\), \(-0.20189\), \(-32.80836\), \(-0.09532\) and \(-0.09532\) respectively. This indicates that one unit change in LEV, R, LIQ, UWR and EC can result in a change on ROA ratio by \(-50.0891\), \(-0.20189\), \(-32.80836\), \(-0.09532\) and \(-0.09532\) units in the opposite direction respectively.

Besides, from LEV, R, LIQ, UWR and EC which had a negative impact on the ROA ratio. A, which is the size of general insurance companies had a coefficient of 130.090198 which indicates
that one-unit change (increase/decrease) in the size of general insurance companies will result in a change on ROA by 130.090198 units in the same direction.

In terms of significance level (corresponding p-value), LEV, LIQ, EC and A had p-values lesser than the selected significance level (5%). This implies that these variables had a statistically significant impact on the ROA at 5%. And also predictor variables R and UWR had p-values greater than the selected significance level (5%). As shown in table 4.6 above, R and UWR had weak and statistically insignificant (p-value = 0.318 and 0.582 respectively) impact on the ROA ratio even at 10%.
CHAPTER FIVE

RECOMMENDATION AND CONCLUSION

The study findings are that the larger the size of a general insurance company, the better the financial performance of general insurers in Ghana. However, the leverage, liquidity, underwriting risk, retention ratio and equity capital appear to be negatively related to return on assets. The study recommends that for general insurers in Ghana to perform better in terms of their return on assets, they should improve on their size. From the study, it is evident that companies that are highly leveraged may be at risk of bankruptcy if they are unable to make payments on their debt. As the relationship between capital and performance was negative, perhaps due to diseconomies of scale, it may be prudent to focus on performance instead of growth of capital for its own sake. The model used in the study focused on firm-specific determinants of the financial performance of general insurers in Ghana. Therefore, other determinants such as macroeconomic factors were not part of the study. Thus, industry and macro-economic factors were not controlled in the present study. The use of regression analysis also means that there is an assumption of linearity with the various models which may not be the case besides the study was conducted for a period from the year ending 2007 until the year ending 2016. As such, only the companies having an operation over this span have been considered.

Further research similar to this needs to be carried out by including both general insurers and life insurers. Then, an analysis should be carried out jointly and separately for the two classes of insurers. Studies in the future should also use panel data and introduce other macroeconomic determinants of the financial performance of insurance firms in Ghana.
REFERENCES


Frankel, R. M., & Devers, K. J. (2000). *Study design in qualitative research: Developing questions and assessing resource needs.* Education for Health, 13(2), 251-261.


# APPENDIX A

<table>
<thead>
<tr>
<th>ROA</th>
<th>LEV</th>
<th>R</th>
<th>LIQ</th>
<th>UWR</th>
<th>EC</th>
<th>A</th>
</tr>
</thead>
<tbody>
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<td>6</td>
<td>1.0858</td>
<td>64</td>
<td>1.313606</td>
<td>16</td>
<td>8.117364</td>
<td>8.271579</td>
</tr>
<tr>
<td>9</td>
<td>0.989187</td>
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<td>1.383441</td>
<td>17</td>
<td>8.303914</td>
<td>8.440153</td>
</tr>
<tr>
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<td>72</td>
<td>1.354652</td>
<td>18</td>
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<tr>
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<td>71</td>
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<td>8.824936</td>
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<tr>
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<td>9.177732</td>
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</table>
APPENDIX B

```r
> data1 <- read.csv(file.choose())
> View(data1)
> describe(data1)

<table>
<thead>
<tr>
<th>vars</th>
<th>n</th>
<th>mean</th>
<th>sd</th>
<th>median</th>
<th>trimmed</th>
<th>mad</th>
<th>min</th>
<th>max</th>
<th>range</th>
<th>skew</th>
<th>kurtosis</th>
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<td>ROA</td>
<td>10</td>
<td>4.90</td>
<td>1.97</td>
<td>4.50</td>
<td>4.75</td>
<td>2.22</td>
<td>2.00</td>
<td>9.00</td>
<td>7.00</td>
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<td>-0.52</td>
</tr>
<tr>
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<td>1.13</td>
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<td>1.10</td>
<td>1.12</td>
<td>0.20</td>
<td>0.82</td>
<td>1.50</td>
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<td>0.36</td>
<td>-1.17</td>
</tr>
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<td>-0.93</td>
</tr>
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</tr>
<tr>
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<td>30.70</td>
<td>10.58</td>
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<td>30.62</td>
<td>8.15</td>
<td>16.00</td>
<td>46.00</td>
<td>30.00</td>
<td>-0.23</td>
<td>-1.62</td>
</tr>
<tr>
<td>EC</td>
<td>10</td>
<td>8.50</td>
<td>0.21</td>
<td>8.51</td>
<td>8.51</td>
<td>0.21</td>
<td>8.12</td>
<td>8.85</td>
<td>0.73</td>
<td>-0.17</td>
<td>-0.95</td>
</tr>
<tr>
<td>A</td>
<td>10</td>
<td>8.76</td>
<td>0.30</td>
<td>8.85</td>
<td>8.77</td>
<td>0.42</td>
<td>8.27</td>
<td>9.18</td>
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</tbody>
</table>

> cor(data1)

<table>
<thead>
<tr>
<th></th>
<th>ROA</th>
<th>LEV</th>
<th>R</th>
<th>LIQ</th>
<th>UWR</th>
<th>EC</th>
</tr>
</thead>
<tbody>
<tr>
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<td>-0.5182</td>
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<td>-0.5486</td>
</tr>
<tr>
<td>LEV</td>
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<td>0.4219</td>
<td>0.2425</td>
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<td>0.2442</td>
<td>0.3308</td>
<td>0.4010</td>
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<td>0.2442</td>
<td>1.00</td>
<td>0.8036</td>
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<td>0.9261</td>
<td>0.9353</td>
</tr>
</tbody>
</table>
```

R square: 0.62 0.07 1.02 0.08 3.35 0.07 0.10
A
ROA -0.4966845
LEV 0.5360028
R  0.3459112
LIQ 0.8350099
UWR 0.9261388
EC  0.9353056
A  1.0000000

> lm <- lm(data1$ROA ~ data1$LEV + data1$R + data1$LIQ + data1$UWR + data1$EC + data1$A)
> summary(lm)

Call:
  lm(formula = data1$ROA ~ data1$LEV + data1$R + data1$LIQ + data1$UWR + data1$EC + data1$A)

Residuals:
    Min.     1Q   Median     3Q    Max.     9
-1.488656  1.359454 -0.272320 -0.008866 -0.394521  0.991416  0.600296
         10
-0.122754 -0.971142

Coefficients:
                         Estimate Std. Error t value Pr(>|t|)
(Intercept)               114.53140   84.01374  1.363  0.266
data1$LEV                -50.08891   28.85421 -1.736  0.181
data1$R                  -0.20189    0.16915 -1.194  0.318
data1$LIQ                -32.80836   20.04690 -1.637  0.200
data1$UWR                 -0.09523    0.15472 -0.615  0.582
data1$EC                 -132.78698   76.52643 -1.735  0.181
data1$A                  130.90198   73.02095  1.793  0.171
Residual standard error: 1.493 on 3 degrees of freedom
Multiple R-squared: 0.8083, Adjusted R-squared: 0.4249
F-statistic: 2.108 on 6 and 3 DF, p-value: 0.2885

```r
> # need broom package
> lm.diag.metrics <- augment(lm)
> lm.diag.metrics
# A tibble: 10 x 14
  data1.ROA data1.LEV data1.R data1.LIQ data1.UWR data1.EC data1.A .fitted .se.fit .resid .hat .std.resid .cooksd
   <int>   <dbl>   <int>    <dbl>    <dbl>    <dbl>   <dbl>    <dbl>    <dbl>   <dbl>    <dbl>    <dbl>    <dbl>
1      6   1.09     64    1.31      16     8.12    8.27    7.49
2      9  0.989    62    1.38      17     8.30    8.44    7.64
3      6  1.11     72    1.35      18     8.34    8.52    5.69
4      2  0.820    71    1.39      28     8.49    8.55    2.27
5      4  0.913    68    1.98      38     8.57    8.82    4.01
6      5  1.26     71    1.89      31     8.52    8.90    5.39
7      6  1.05     71    1.71      37     8.62    8.88    5.01
8      4  1.50     68    1.90      37     8.50    8.95    3.40
9      3  1.42     68    1.70      46     8.74    9.12    3.12
10     4  1.14     68    1.88      39     8.85    9.18    4.97
```

# ... with 6 more variables: .se.fit <dbl>, .resid <dbl>, .hat <dbl>,
# .sigma <dbl>, .cooksd <dbl>, .std.resid <dbl>
> par(mfrow = c(2, 2))
> plot(lm)
> my_data <- data1[, c(1,2,3,4,5,6,7)]
> chart.Correlation(my_data, histogram = TRUE, pch = 19)
> sigma(lm)/mean(data1$ROA)

[1] 0.3047554