

UNIVERSITY OF GHANA
COLLEGE OF HUMANITIES



**ECONOMIC CAPITAL REQUIREMENT OF LIFE INSURANCE
COMPANIES IN GHANA: A COMPARATIVE ANALYSIS OF RISK-
BASED CAPITAL AND SOLVENCY II MODELS.**

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INSURANCE**

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature..... Date.....

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Supervisor’s Declaration

I hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Ghana.

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Supervisor's Declaration

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DEDICATION

This work is dedicated, first, to God Almighty for the wisdom and strength given me for the duration of this programme. Secondly, I dedicate this thesis to my family, especially my parents Mr. & Mrs. Mude and Benjamin Kobina Sagoe, who have always been by me and inspired and supported me throughout this study. I humbly dedicate this work to everyone who, in one way or the other, inspired and encouraged me.



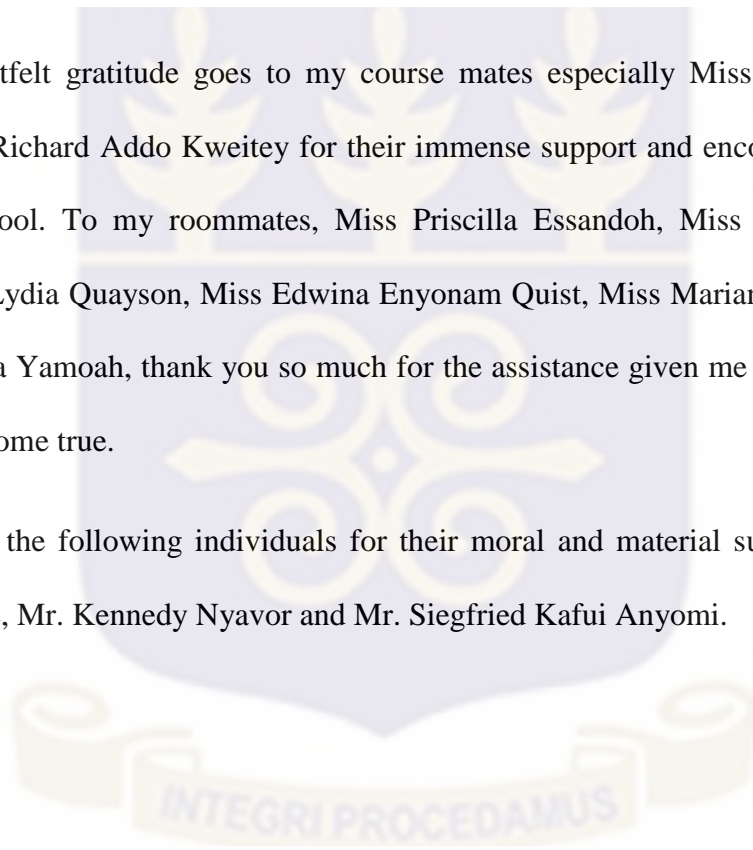
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ABSTRACT

This study computed the Economic Capital Requirement of the average life insurance company in Ghana, using both the Risk-Based Capital Model as used in Ghana and an understanding of the Solvency II model used by the European Union. The Risk-Based Capital Model used in Ghana does not capture the variations in the risk variables in the life insurance industry; meanwhile, the Solvency II approach focuses on such variations.

This study focused on two main risk variables: T-bill rate and inflation. These risk variables were included in the valuation models used for valuing the average life insurance company's assets and liabilities. The research determined that when the risk variables are adequately captured in the computation of the Economic Capital for the average life insurance company in Ghana, the life insurance company would be required to increase its available capital resources 1052 times in order to adequately meet the condition for solvency.

The study, therefore, recommends that the Regulatory Authorities revise the current Risk-Based Capital Model to capture some of the variations in some risk elements so as to adequately prepare for the risks covered by the average life insurance company in Ghana. Thus, preventing the insolvency of the life insurance companies.

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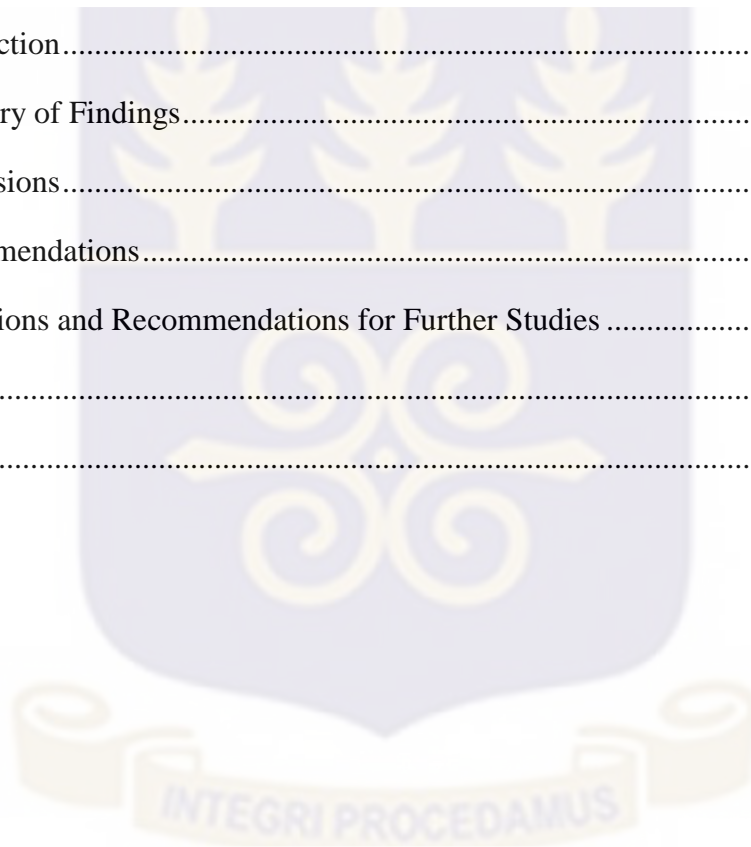


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CHAPTER ONE

INTRODUCTION

1.1 Background

Insurance firms are very significant parts of the financial sector and have contributed towards the Domestic Product (GDP) of many nations through risk management, mobilising savings and investments and helping to efficiently distribute resources in the economy (Versi, 2008; Haiss & Sümegi, 2008; Kasman & Turgutlu, 2009; Ghosh 2013; IAIS, 2014). The durability of the operations of these insurance firms is of utmost importance to policyholders and insurers as well as the general public because it determines the continuity of the insurance business. Solvency is a major deciding factor in the continuity or otherwise of the insurance business. The solvency level of financial institutions is determined by the level of economic capital that they hold.

Kretschmar, McNeil and Kirchner (2010) defined economic capital as the amount of capital required by a financial firm in order to function as a solvent entity at a stated confidence level over a given time period considering the risk profile of the firm. The economic capital is usually calculated internally, sometimes, using models designed by the firms or standard models designed by insurance regulatory bodies. Economic Capital is, also, the amount of capital needed by a firm to support any risk that it takes (Investopedia, 2008). The economic capital is a representation of all the economic resources of an entity as a requirement to protect itself from unforeseen circumstances up to a given level of tolerance for risk (Rowland, 2013). A firm is, thus, insolvent if the economic (market) value of its assets is less than the economic (discounted) value of its liabilities. That is, if it's net economic worth is negative (Cummins, Harrington & Niehaus, 1993).

With the view to controlling the solvency of insurance firms, the insurance industry has been densely regulated in both developed and developing economies all over the world. Over the past 15 or more years, almost all the principal economies have either revised or are still undergoing revisions in their insurance regulations, especially with regards to insurance solvency and with great emphasis on introducing Risk-Based Capital (RBC) systems. (Cummins & Phillips, 2009). The RBC systems were introduced, first, into the insurance industry by Canada in 1992 and in the United States of America in 1994. In 1996, Japan introduced its Solvency Margin while Australia adopted the Risk-Based Capital system in 2001.

The “Enhanced Capital Assessment Framework” was adopted by the United Kingdom in 2004. The Netherlands, also, came up with a new system in 2006. Meanwhile, the Swiss Solvency Test was introduced by Switzerland in the same year, 2006. In 2008, the United States of America introduced their Solvency Modernization Initiative which had one of its objectives being to evaluate the existing RBC system. In 2016, the European Union replaced its Solvency I with the new Solvency II as Ghana adopted the Risk-Based Capital Framework.

This move by the insurance sector to adopt new capital systems for insurance firms is as a result of various factors. According to the NIC Draft Framework, the nature of international businesses has caused risks to be more systemic, and this has put pressure on the liquidity, solvency and operations of the Ghanaian insurance industry because the international standards and supervision requirements have been strengthened. The USA, for instance, adopted the Risk-Based Capital because of the rise in insurance insolvencies experienced by the firms in the industry in the late 1980s and early 1990s. This resulted from a property crisis for the property-liability insurers and asset quality problems for the life insurers.

In the early 2000s, the European equity market experienced declines, and since most of the insurance companies had invested heavily in equities, this weakened most of them even though only a few actually experienced insolvency. Also, the major financial crisis that affected both debt and equity securities beginning in 2008 awakened the insurance regulators to evaluate and revise their solvency surveillance systems. Moreover, the threats that were posed by disastrous life-threatening events such as pandemics and long-term advancements in longevity coupled with the ever-present and continuing concerns about global warming and risks associated with property disasters have raised a cause for caution regarding insurer solvency. Besides, life insurers are faced with the risk of insolvency that arises from minimum return guarantees.

Indeed, various stakeholders (policyholders, insurers, agents, policy makers) have a great interest in the soundness and, hence, survival of insurance companies. However, changes in operations and the operating environment of these insurance firms (for instance, advances in technology, increases in complexity of products) coupled with the fact that risk is inherent in the insurance industry serve as a great threat to policymakers who approve regulations that minimize the risk of insolvency and increase confidence in the financial stability of the insurance sector. Since insolvencies are capable of having a damaging effect on the operations of insurance businesses, the capability to predict whether or not an insurer will be insolvent is regarded as very important and effective in risk management (Sharma, 2002; Díaz-Martínez, Fernández-Menéndez, Segovia-Vargas & Pozo-García, 2004; Charumathi, 2012; Gour & Gupta, 2012).

1.2 Statement of the Problem

In compliance with the International Association of Insurance Supervisors (IAIS), the requirement for financial solvency is 50% or the minimum capital (whichever is higher). This implies that at any point in time the assets of an insurance company should be 150% of its

liabilities or its net assets should be at least equal to the minimum capital requirement for solvency to hold (Solvency Guidelines 2008; Gouri & Gupta, 2012). Under the new solvency framework for life insurers, the requirement for solvency is GH¢ 15,000,000.00 Minimum Capital and GH¢ 3,000,000.00 Solvency Minimum Capital, which is to be adjusted by the annual percentage change in Consumer Price Index (CPI) and rounded up to a multiple of a hundred thousand Ghana Cedis.

However, this margin does not include any risk models as relates to most Risk-Based Capital systems across the world. This was emphasised by Gouri & Gupta (2012) when they mentioned that insurance is a risky business and that even though this requirement may be met, it is possible that the event may expose the insurance firm to a risk that may cost above the amount that was put aside for such events. Thus, it can be concluded that even though the risk-based capital system in Ghana is good because it has moved from the era of ensuring that the amount of assets is equal to liabilities to ensuring that the assets are more than the liabilities, there still exists a gap of not being able to adequately capture the volatility of the risk drivers in the computation of the economic capital.

This leaves us with the question of whether the risk-based system in Ghana is actually risk-based as it is obvious in the computation of economic capital that no risk model whatsoever was adopted. Moreover, no work has been done in Ghana, to the best of my knowledge, comparing the economic capital under Ghana's risk-based framework with the economic capital under the Solvency II framework. This research, thus, estimated the economic capital of the average Ghanaian life insurance company using the risk models and the model specified in Ghana's RBC framework in order to evaluate whether the capital requirements of the average life insurance company will change when risk models are employed.

1.3 Research Objectives

The overriding objective of this study was to estimate the economic capital required to ensure solvency in life insurance companies in Ghana using the Solvency II approach and the Ghanaian RBC approach. Specifically, the study sought to:

- Compare the risk-based supervisory/regulatory framework in Ghana with the Solvency II supervisory/regulatory framework in Europe.
- Quantify the economic capital for the average Ghanaian life insurance company using Solvency II approach and the Risk-Based approach in Ghana.

1.4 Research Questions

This study sought to provide answers to the following research questions:

- What are the similarities and/or differences between the Ghanaian risk-based supervisory/regulatory framework and Solvency II supervisory/regulatory framework in Europe?
- What is the estimated economic capital for the average Ghanaian Life insurance company using the Solvency II approach and the Ghanaian RBC approach?

1.5 Significance of the Study

This study contributes a novel knowledge in the area of insurance solvency policymaking in Ghana as there are currently no studies published in Ghana attempting to estimate the level of economic capital that is required to sustain the life insurance companies against risks and liabilities. Findings from this study provide a reference point to insurance policy makers in Ghana when deciding on appropriate economic capital levels to be raised in financing the liabilities and risks of life insurance companies. This research, also, creates the platform for further research in the area of economic capital requirements and returns in the Ghanaian insurance industry using the stochastic asset and liability models.

1.6 Scope of the Study

The focal point of this study is to estimate and compare the economic capital for the life insurance companies in Ghana by adopting the concept of risk models from the Solvency II framework in order to evaluate how the economic capital requirements for the average life insurer would change. However, to be able to effectively do this, it was needful that a comparative analysis of the other components of both the RBC in Ghana and the Solvency II be done to determine what differences and similarities exist between both frameworks and which specific gap to fill.

1.7 Limitations of the Study

There was the constraint of unavailability of existing literature on the subject in Africa and Ghana to be precise. It was, also, very difficult to obtain the data required for this study from some of the life insurance companies. However, with persistence and explanations of the importance of the results of this research to the life insurance companies, the data used was obtained.

This study was limited by time. The time period of one academic year (eight months) was not enough to fully explore every angle of this title as the researcher would so desire. Consequently, the researcher limited the study to the life insurance industry only even though the study could have covered the entire insurance industry.

1.8 Organization of the Study

This study is organised in five chapters. Chapter one gives an overview of the background to the study and the key objectives as well as how the results of this work shall be used. Chapter two examines the relevant theories from both an appreciative enquiry and critical points of analysis and gives some perspectives on some empirical works in the area of study. Chapter three gives the general design of the study, key methods of analysis and the collection and analysis of data. This is followed by chapter four which presents the results of the analysis

and the discussion of these results. The final chapter drew conclusions from the results and made recommendations.



CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents various literature or studies done on the subject matter. This enabled the researcher to have pre-knowledge on some methodologies and models that have been employed by other researchers and the research findings and facts relating to the current study.

2.2 Theoretical Review of Insurance Regulations

This section introduces some theories relating to insurance regulations

2.2.1 Reasons for the Movements in the Regulations

As a result of the increasing diversities in the insurance sector and the desire of policymakers to effectively manage the sector towards higher profitability and necessity, both emerging and developed countries are working to improve their regulation and supervision frameworks for the purpose of protecting the insurance industry. This has led to the insurance industry seeing various phases of insurance regulations and supervision frameworks, Ghana and the European Union (EU) not being an exception. The European Union and Ghana have respectively implemented the Solvency II and Risk-Based supervision frameworks since January 2016.

The insurance business thrives on the earning capability of the insurance companies whose activities are built on taking risks. The nature of these risks has, nonetheless, become more complex due to the changing needs of mankind. This, in effect, has necessitated changes in the risk management practices of insurance companies all over the world (NIC Draft Framework; Business and Financial Times Online). The evolving nature of the risks and the nature of international businesses also demand, indirectly, that new regulations be made to

accommodate the changes and protect the best interest of policyholders while protecting the welfare of the insurers and maintaining growth in the insurance market.

In view of the dynamics of the international insurance market, Ghana has moved from the compliance-based approach to risk-based approach (Business and Financial Times Online; NIC Draft Framework). The Ghana Insurance Regulatory Authority (GIRA) has adopted a risk-based supervisory system, and with this, has also designed a risk-based framework to ensure effective supervision. The risk-based approach is a means of assessing the risk profile of an insurance company and allocating high amounts of resources to companies with higher levels of risk so that scarce supervisory resources can be efficiently utilised. The implementation of this risk-based supervision and risk-based framework commenced in January 2016. In line with Batten (1981) and Demsetz and Lehn (1985) who made the assertion that the fundamental objectives of insurance companies - specifically life insurers - include reporting better financial performance, compensating for inadequate consumer knowledge, ensuring reasonable rates and controlling solvency due to the high degree of trust with which they operate, the framework is geared towards policyholder protection, safety and soundness of insurers and growth, development and sustainability of the insurance company.

The sound operation and solvency of an insurance company depend on its economic capital. Economic Capital as defined by Rubin, Lockerman, Tiller & Shic (2009) is the amount needed so that a company can raise funds to cover unexpected risks at a cost that is lower than the cost of equity capital. The Solvency II Directive also defines economic capital as a combination of the Minimum Capital Requirement (MCR) and the Solvency Capital Requirement (SCR). The MCR is the amount of capital required to ensure that solvency would be at 85% confidence level, over a one-year horizon. The SCR offers a stricter

standard by ensuring solvency at a 99.5% confidence level over a one-year horizon. Graham, Hayes, Rochette & Wagner (2010) also used SCR definition of economic capital.

According to the risk-based framework in Ghana, capital is evaluated based on the suitability of its level and quality at all material times under both stressed and normal conditions, depending on an insurer's overall net risk. This evaluation pays particular attention to the effectiveness of the insurer's capital management process for maintaining adequate capital in relation to the risks across all significant activities. As a general rule, it will be required of insurers with higher Overall Net Risk to keep a higher level and quality of capital and to operate a stronger capital management processes.

2.2.2 Risk-Based Capital Systems

The Risk-Based Capital framework originated from the Banking sector. The Basel Committee on Banking Regulations and Supervisory Practices, in late 1987, developed a risk-based framework for measuring capital adequacy. Alfriend (1988) reported that the Risk-Based Capital (RBC) framework which was embraced as an international model for banks tackles credit risk primarily. It has four pillars which are listed below:

- A common international definition of capital: Core/Tier 1 capital consists of permanent shareholders' equity. There is also the Supplemental/Tier 2 capital which is a 'list' of internationally accepted non-common equity items to add to core capital. However, each country has some freedom as to what supplemental components will be considered as capital.
- Four risk weights (0, 20, 50, and 100 percent) are assigned to assets and off-balance sheet items on the basis of broad judgments of relative credit risk. These categories are used to calculate a risk-based capital ratio. Off-balance sheet items are also assigned a credit conversion factor that is applied before the risk weight.

- A schedule for achieving a minimum 7.25 percent risk-based capital ratio by the end of 1990 (3.625 percent from Tier 1 items) and 8 percent by the end of 1992 (4 percent from Tier 1 items).
- A phase-in period, from 1990 to 1992, during which banking organizations can include some supplemental capital items in Tier 1 capital on a temporary basis.

Following the pillar 1 of the RBC designed by the Basel Committee on Banking Regulations and Supervisory Practices, the Risk-Based Capital framework adopted by Ghana also has the capital component divided into two; core capital and the non-core capital, which together form the Available Capital Resources (ACR). Risk-Based Capital (RBC) measures the capital required by individual companies based on the size of the firm, that relates to assets and capital, and the degree of risk taken by each insurer (Cheng & Weiss, 2013; Jaaman, Ismail & Majid, 2007). Pitselis (2009) explained the primary objective of the RBC as promoting financial soundness of insurers and avoiding insolvency.

In theory, the risk-based capital system is a system whereby insurers are required to hold a certain minimum amount of capital against the risk of insolvency depending on the specific characteristics of the insurance company. Under this system, any insurer who fails to meet the minimum capital requirement attracts regulatory action which includes closer monitoring, demands for increased capital, restrictions on growth. A well designed risk-based capital system enables regulators to quickly identify companies that are weak and offer close monitoring and adjusting of risk management practices, rescue weak companies to prevent damage to policyholders and offer a conducive environment and motivation for insurers to hold adequate capital against insolvency (Cummins, Harrington and Niehaus, 1991; NIC Draft Framework).

Both RBC systems being compared in this study have the minimum capital requirement clearly stated as GH¢ 15,000,000.00 for Ghana and in the EU's Solvency II framework, an amount equivalent to the 85% value – at risk of the own funds, which is again calibrated to a floor of 25% of the SCR and a cap of 45% of the SCR. These can either be calculated using the standard model provided in the Solvency II or a firm-specific internal model. Comparing the minimum capital requirements of Ghana and the EU, it is observed that even though there exists a minimum capital that should be met by the insurance firm in Ghana, that amount may not necessarily reflect the level of risk that each insurance firm is exposed to. Meanwhile, the specifications of the EU incorporate an interaction among some specified risk categories in the standard model that computes the required capital, making this capital more risk-sensitive than what exists in Ghana.

2.3 Empirical Review on regulation

Eling, Schmeiser and Schmit (2007) indicated that Solvency II not only overcomes the problems of solvency I but rather there are other factors such as the development of models that are very critical for the success of this new law. Bonsón, Cortijo, Escobar, Flores & Monreal (2010) in assessing the new rules and technologies in insurance supervision under Solvency II and eXtensible Business Reporting Language (XBRL) concluded that the constant utterances made to regulations and business practices affect both internal and external ways of dissemination of information. Zweifel (2014) indicated that Solvency II was slightly more complex and as such required a robust model that provides several risk-based systems designed to determine insurance weaknesses that have suffered critiques in the Solvency I model.

2.4 Theories on Regulation

2.4.1 Economic Theory

Adams and Tower (1994) reported the essence of economic theory, as described in Stigler (1971), to include the incorporation of rational behavior of both producers and consumers and also treats regulation as a product that is subject to the market forces and demonstration of public choice. In this regard, both insurers and the insured are rational and would only continue in business if the business benefits them more than it harms them. To the insurer, the insurance business is only lucrative if the insurer is able to maintain solvency and meet its future obligations to him. So far as this is possible, the insured is ready to make do with the inconvenience of premium payment.

Meanwhile, the insurers would also be ready to continue in business and abide by the interventions that the regulators put in place if only these regulations yield profitable outcome to them. The insurers would easily oblige to regulations which offer more profitability either by enhancing their image before the insurance consumers so as to encourage them to take on more policies, or that which would help enhance their solvency since a solvent firm is better able to continue its operations, which makes the insurance consumers more confident in them and thus either maintaining their share of the market or adding to the already existing market. However, any regulation which gives them pressure to produce more but which does not give them room to remain in operation would not be easily accepted and obliged by.

Having noted that regulations are actually a product of the interactions between market forces of demand and supply simply insinuates that, competition comes about because both consumers and producers of insurance products are rational and each fights for his best interest. In this regard, every entity in this market tries to abreast himself with all the information as can be available to him so as to reap the greater benefits from the market. But in situations where this aggression and competition put some entities in the market at a loss,

then it becomes imperative for the regulatory bodies to intervene with regulations that would protect the best interest of everyone. This is one important reason why the NIC decided to implement the current risk-based system in Ghana. The NIC stated that they have the aim to safeguard the interest of the insurance consumers, and thus are working to ensure that insurance firms are solvent so as to meet their obligations to the policyholders (NIC, 2015).

Cummins, Harrington and Niehaus (1991) also wrote that economic theory reveals that efficiency of resource allocation and operations can be achieved best in competitive markets. Thus, in order to accomplish desirable economic objectives, it is imperative for solvency regulations to be designed to mirror competitive markets in which all material information is readily available to all. In essence, the regulators should not attempt to clear all insurer failures.

2.4.2 Public Interest Theory

This theory also reveals that government intervention is needed when there is the need for social welfare protection or when there occurs an event such as corporate failure (Adams & Tower, 1994). According to Wilson (1974, p.138), the theory postulates that regulations are simply social welfare devices used for redistributive purposes to correct misallocation of resources where there exists market failure or political crisis. These reports from the above authors are a solid basis for which the NIC should implement a new regulatory system. This action follows from the work done by Akotey, Sackey, Amoah and Frimpong Manso (2013) which revealed that among the causes of non- financial profitability of life insurance companies is the fact that insurance companies sometimes pay more claims to the policyholders than they actually deserve due to inaccurate underwriting and insurance premium undercutting. In this regard, it is very appropriate for the NIC to implement a regulation that would seek the appropriate allocation of resources in the insurance industry.

This redistributive process would have a bearing on the profitability, reserving and solvency of the insurance companies as well.

Eling, Schmeiser and Schmit (1999) also asserted that the insurance market is imperfect and this is the reason for regulation in the insurance market. However, they mentioned that these imperfections are as a result of agency problems and costly information. According to them, under the public interest theory, the agency problem which is a problem of differences in incentives between the firm owners and debt holders is what necessitates solvency regulation. The policyholders are the debt holders and the owners of firms take high risks at the expense of their insured under some conditions. Information which would have been the best cure for these alleviations is also costly because it implies that the policyholders have access to certain information about the insurer and his or her operations, such as quality of the insurance products and the propensity of the insurer to settle claims.

The insurance regulatory bodies the world over have, in this regard, strived to bridge the information gap between the policyholders and the insurers. This is evident in the EU when the European Commission introduced an action framework and stated the aim of the framework as “enhancing consumer confidence by promoting full financial market integration while ensuring high levels of consumer protection” as quoted in Eling, Schmeiser & Schmit (2007). Consumer protection has been one of the underlying aims for the introduction and implementation of the risk-based system in Ghana as well (NIC, 2015). Moreover, Munch and Smallwood (1981) also argued that an insurer is capable of modifying her financial strength after receiving premiums from the insured but before the end of the coverage period. Such situations can be used to explain the need for solvency regulations.

2.5 Empirical Review on Solvency

All over the world, diverse analytical methods have been adopted to assess the solvency of insurance companies and other institutions. Some of these methods include accounting-based measures such as financial ratios, data envelopment analysis, standard model, and internal model. Some of the methods are reviewed below.

2.5.1 Accounting-based measures

Majority of the existing literature in insurance and banking studies (Akotey, Sackey, Amoah & Frimpong Manso, 2013; Pasiouras & Gaganis, 2013) used accounting-based measure, the z-score, to measure the soundness of solvency for insurance companies. The Z- score is an accounting measure of distance to default. It measures the number of standard deviations below the mean by which profits must fall in order for an entity to do away with equity. High z-scores depict solvency levels. Some scholars have queried the usefulness of these accounting based ratios and methods although Cihak and Hesse (2010) stated that the Z-score provides an objective measure of soundness across different groups of financial institutions. The argument presented by Paradi, Yang and Zhu (2011) is that although the solvency of firms is easily assessed using financial ratios, their application and usefulness to real market systems in which businesses operate under imperfect market conditions is questionable and that is why this research shall not make use of this measure.

2.5.2 Standard model

The standard model is one of the two models proposed under the Solvency II for computing the Solvency Capital Requirement (SCR). The Standard model is designed by the regulators and adopted by all insurers (or those who do not have internal models). The standard model helps to reduce cost of transactions and allows for comparability of results by the insurance companies. It however has the disadvantage of not giving room to the insurers to determine the capital level suitable to their specific firm risks. Thus the European and Insurance

Occupational Pensions Authority (EIOPA) has duly predicted that the standard model would require more attention and additional work into the future.

2.5.3 Internal model

Internal model is the second model proposed under the Solvency II for the computation of the Solvency Capital Requirement (SCR). The internal model is designed by the individual insurers to depict their specific capital requirements as it matches their firm risks. It also ensures accuracy in analysis and control. The internal model is more accurate because it is tailored to meet the specific needs of the insurer. However, it comes with high transaction costs and does not allow for comparisons by insurance firms. The internal model is one of the most relevant innovations that Solvency II has put across as an alternative for the standard model, for determining the target capital (European Commission, 2002a, p. 16). However, in order to qualify to use the internal model, an insurer's model must be certified by the regulatory supervisor.

This process of validation demands that every detail of the model along with the underlying assumptions be documented (See European Commission, 2002a, pp. 18-20). The model needs to be examined periodically in order to ensure that the model is robust to the ever-changing financial setting. Thus, it is important to have in place structures and standards that would be used for the validation of these internal models. These structures and standards would help to ensure some form of orderliness within the insurance industry, making sure that the results to be obtained from these internal models are accurate and as close as possible to that of the standard models. For instance, the target capital realized from the internal model should be equal to or greater than but not lower than the requirements for the minimum capital under the Solvency I rules (European Commission, 2005, p. 2).

Moreover, the insurance regulators can recommend that insurer uses an internal model if the insurer has specific conditions that differ vastly from the underlying assumptions of the standard model (European Commission, 2003b, p. 38; European Commission 2005, p. 2). Insurers whose internal model is not accepted by the insurance supervisory authorities or who decide not to use an internal model are expected to use the standard risk model to compute their target capital. This is a holistic model and it covers all four risk categories of: market risks, which include fluctuations in the market prices that are relevant, underwriting risks which may result from premium computations and claims reserving, credit risk which includes default from debtors, and operational risk which may result from the inadequacy or failure of the internal processes, systems, people or external occurrences (Basel Committee on Banking Supervision, 2001, p. 96 as cited in Eling, Schmeiser & Schmit, 2007).

2.6 Overview of the Insurance Industry in Ghana

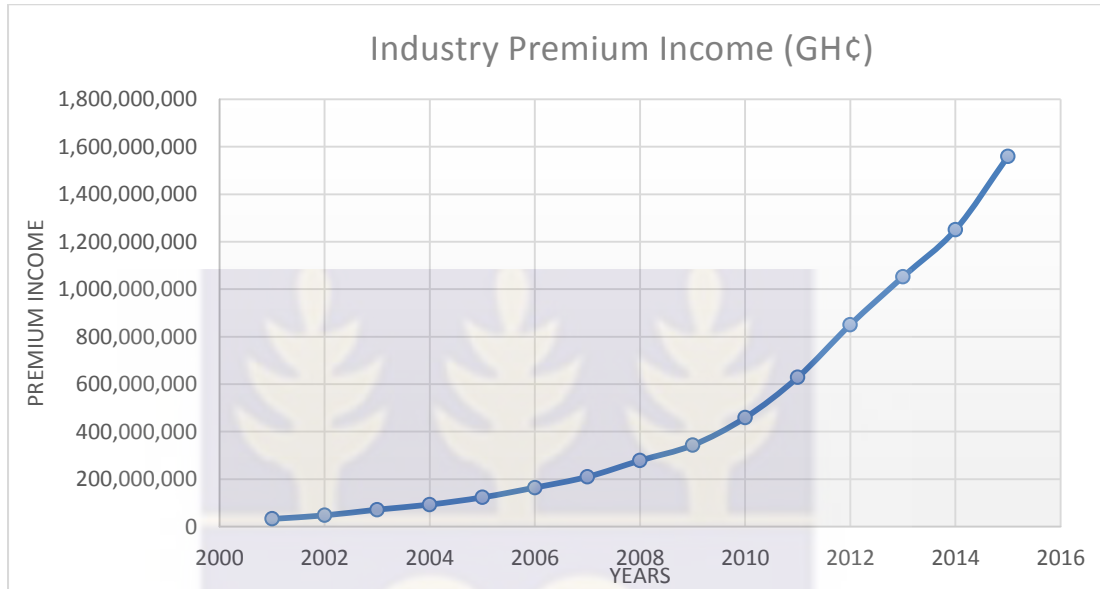
The insurance industry in Ghana started operations in 1955, when the first insurance company, Gold Coast Insurance Company, was opened (http://www.sic-gh.com/subcat_select.cfm?prodcid=1&tblNewsCatID=1). Insurance companies in Ghana are primarily divided into three groups: Life Insurance (this comprises life savings, accident indemnity, hospitalization insurance, and many more), Non-Life Insurance (this also comprises household contracts, burglary, fire, public liability, consequential loss and others) and Composite Insurance (which is a combination of Life and Non-Life insurance). There are intermediaries that work in the insurance industry and they include the insurance brokers, loss adjusters, agents and actuarial firms. The insurance regulatory and supervisory body as mandated under the Insurance Act 724, 2006, is the National Insurance Commission. Universally, insurance was instituted for the purposes of transferring risk, but in recent times, the work of insurance has advanced to channeling funds in appropriate ways to support economic activities.

In the global insurance market, it was expected that by 2016, non-life insurers shall grow by 2.8%, aided by sound economic activities. The life insurance sector, however, was expected to be stronger both in the developed and developing economies. Thus, the global in-force premium forecast experience a growth of up to 4.8% in the same year, 2016. Particularly to the life insurers, the low yield environment is a bit of a challenge to profit making. The insurance industry in Ghana performs just like the global market. Despite the fact that the non-life sector is the highest contributor to industry premiums, the life insurance sector presents the highest percentage growth in premiums. For example, whereas the non-life sector grew by 17.7 percent in 2014, the life business recorded a remarkable growth of 32.0 percent. In other words, the growth rate of the life sector is almost twice that of the non-life business (NIC, 2014).

Insurance penetration, however, still falls far below the expected benchmark, in spite of the tremendous advancement in the growth of premiums from both sectors of the industry. The value of the insurance penetration ratio is obtained by dividing the insurance premiums by Gross Domestic Product (GDP). According to the reinsurer Swiss Re's global insurance report, total premiums in Africa amounted to US\$71.9 billion in 2012, which translates into a penetration rate of 3.65%. As one would expect, this is well below the global average, which is 6.5%, though it is above 2.65%, which is the average for emerging markets (KPMG, 2013). Insurance penetration in Ghana, whilst low, is expected to rise with the growth in urbanization and enabling support from the regulator, who has, for example, launched a new micro-insurance framework that also targets the informal sector. According to the Ghana Insurance Association, major challenges in the insurance market remain price undercutting, high outstanding premium resulting from the granting of credit, and other unfair marketing practices that tarnish the reputation of the industry (KPMG, 2013). Graphs 1, 2 and 3 present

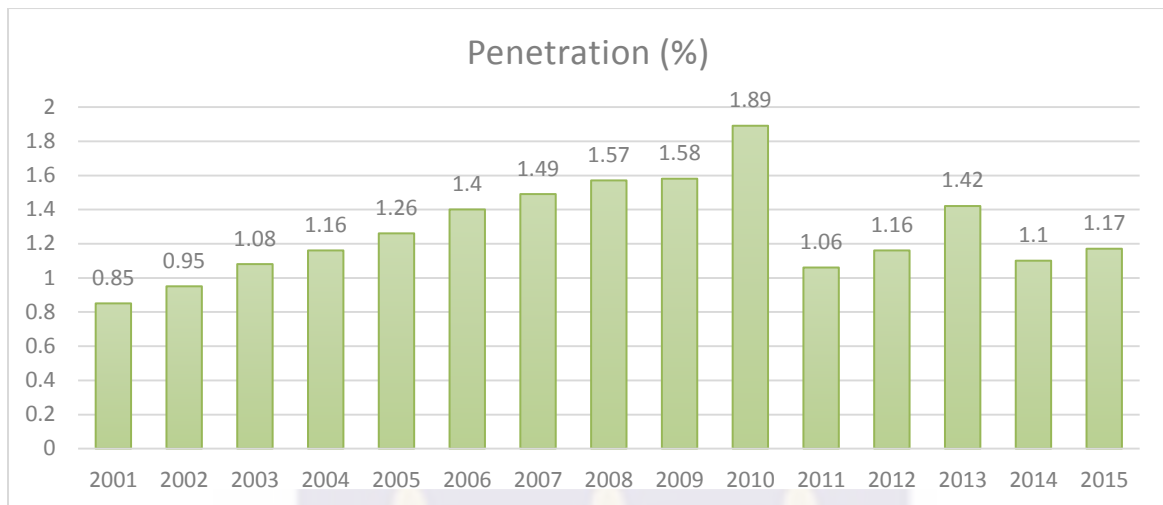
the gross premium income, premium income growth rate and insurance penetration from 2001 to 2015.

Graph 1: Insurance Industry Premium Income



Source: Author’s Calculations (2017)

The graph indicates that the premium income of the insurance industry increased consistently from 2001 to 2015. Thus, the lowest premium income received by the industry as reported by NIC (2014 & 2015) is GH¢ 32,251,600.00 and the highest premium income was received in 2015, an amount of GH¢ 1,560,000,000.00.

Graph 3: Insurance Industry Penetration Rates

Source: Author's Calculation (2017)

Insurance penetration rate explains the level of insurance development of an insurance industry in an economy. This rate is estimated as the ratio of premium underwritten in a specific year to the GDP. The insurance industry penetration rate for the years 2001 through to 2015 is presented in the graph above. The graph explains that the industry experienced continuous growth from 2001 to 2010. However, there was a drastic decline in the rate of development from 2010 to 2011 by a rate of 0.83. 2012 and 2013 showed growth in the development in the industry, though by a small margin. Some of the reasons for this rapid decline could be attributed to the misconceptions about the insurance industry, fraudulent claims, and agents' inability to properly communicate the insurance products to the prospective buyers, lack or low motivation of agents among others (www.yen.com). As at 2015, the insurance penetration rate stood at 1.17.

The industry has also witnessed massive growth in the number of insurance entities. The number of insurance entities excluding agents grew from 97 in 2010 to 105 in 2013. As at December 2015, the NIC has licensed twenty-six non-life insurance firms, twenty-three life

assurance companies and one reinsurance company. The industry also has sixty-nine brokerage firms, three reinsurance broking companies and one loss adjuster (NIC, 2015). The details of all the licensed insurance entities are presented in Table 1.

Table 1: Licensed Insurance Entities as at December, 2015

Type of Insurance Entity	Number
Non-Life Companies	26
Life Companies	23
Reinsurance Companies	3
Insurance Brokers	69
Bancassurance	7
Reinsurance Brokers	1
Loss Adjusters	1
Agents	6,000

Source: NIC Report (2014 2015)

The enactment and the implementation of the new insurance regulation, Act 724 (2006) have resulted in remarkable changes in the structure, competition, efficiency and the growth of the industry. Apart from its compliance with the core principles of the International Association of Insurance Supervisors, it has strengthened the NIC to provide a robust insurance regulatory environment. The Act has also facilitated the entry of foreign insurance firms into the Ghanaian market. This has resulted in keener competition especially among the top six companies (NIC, 2014).

2.7 Overview of the Risk-Based Supervisory/ Regulatory systems in the EU and Ghana

This section provides a detailed overview of the Risk-based Supervisory/Regulatory system in Ghana and the Solvency II system in the EU

2.7.1 Overview of the Solvency II Supervisory/ Regulatory Framework in the EU

Solvency II has three pillars that guide its operations. These pillars are relevant in assisting in the measurement and management of market, credit, liquidity, insurance and operational risks. The primary concern of the three pillars is capital requirement, risk measuring and management and public disclosures respectively. Pillar I consists of the quantitative requirements for determining adequate capital, the methods used for valuation of assets and liabilities, own funds calculation and calculation of capital required (Solvency II Directive, 2009)

In Solvency II, Capital requirement is outlined in two levels: Minimum Capital Requirement (MCR) and Solvency Capital Requirement (SCR). Both the MCR and SCR are relevant in alerting both the insurance companies and regulators about whether an action needs to be taken or not. When the capital of an insurance company is below the MCR this is an indicator that the company puts the stakeholders (policyholders and beneficiaries) at risk if it should continue to operate. Thus, the MCR serves as a threshold that can call for ultimate actions by the regulators. If the capital lies between the MCR and the SCR this may also trigger some regulator actions.

Minimum Capital Requirement (MCR) as defined in the Solvency II directive is the amount of economic capital that is needed to ensure that over the one-year horizon the probability of insolvency will not be more than 15%. In the same way, the Solvency Capital Requirement (SCR) is the amount of economic capital required to ensure that the probability of insolvency

will not be more than 0.5% over the coming year. The Directive, however, provides standard formulas for the calculation of the MCR and SCR and this is placed in a linear, factor model.

The factors used for the model are below:

- Life risk: mortality, longevity, revision, catastrophe risks.
- Default risk: expense, disability, lapse risks.
- Market risks: interest rate, equity, property, spread, currency, illiquidity, concentration risks.
- Non-life risks: premium reserve, lapse, catastrophe risks.
- Health insurance: expense, premium reserves, epidemic risks.

Article 74(1) of the Solvency II Directive states that all assets and liabilities must be valued using the market consistent approach. This means that assets should be valued at the amount at which two parties can easily reach a consensus of exchange, and the amount at which liabilities can be easily settled between willing parties. Own funds are, also, outlined in two levels: basic own funds and ancillary own funds. The capital resources that are available to the insurer are its own funds. The essence of the own funds is to ensure that the insurer has adequate levels of capital for meeting regulatory requirements.

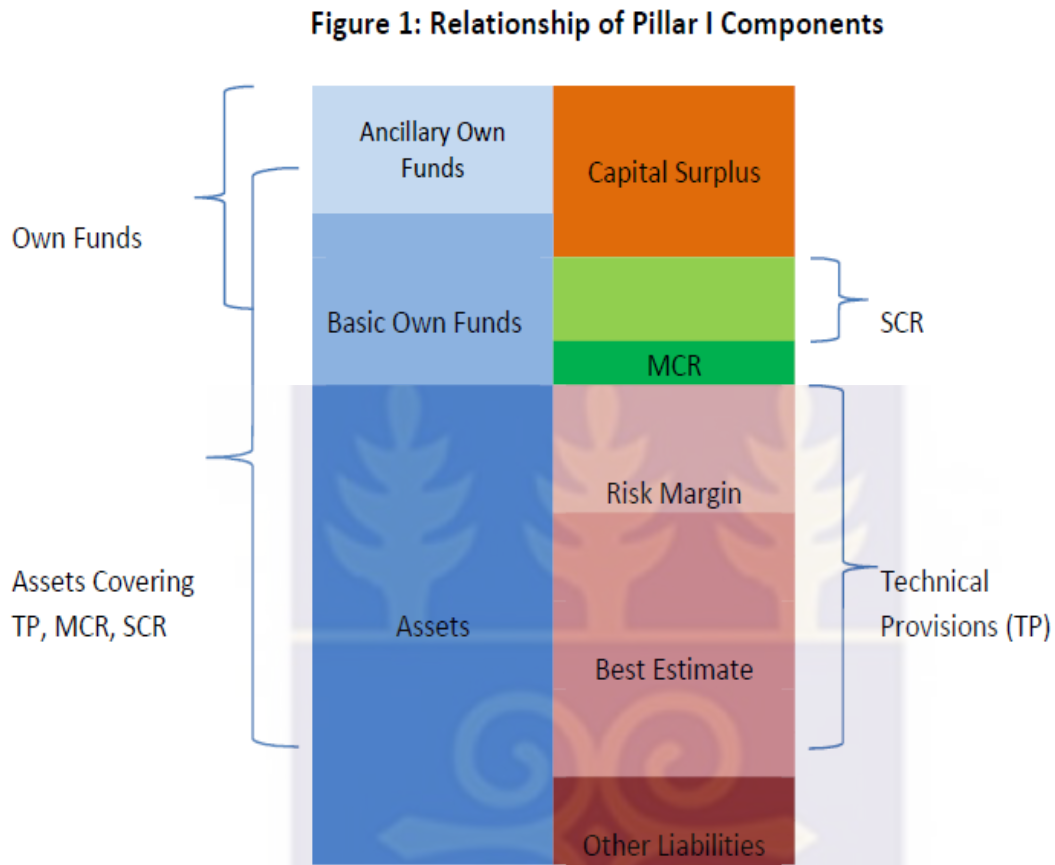
Article 88 of the Solvency II Directive defines Basic own funds as the excess of assets over liabilities, plus subordinated liabilities. Examples of basic own funds include share capital, share premium reserve, reconciliation reserve. Yet, Article 89 of the same Directive defines ancillary own funds to be all items other than basic own funds which can be called up to absorb losses. They are items that are not yet paid up in or called up. Immediately an ancillary own fund is called up, it ceases to be one and is then treated as a basic own fund. Examples of ancillary own funds are unpaid share capital that has not been called up, letters

of credit and guarantees (Solvency II directive, 2009; Wang, 2013). Basic own funds are reported on the balance sheet but the ancillary own funds are not reported on the balance sheet.

The liabilities are also divided into two: Technical Provisions (TP) and non-insurance liabilities. Technical Provisions (TP) are the obligations that the insurer must meet as a result of the contract with policyholders. The technical provisions are calculated as the sum of best estimates and risk margins. The best estimate is the probability-weighted average of the present value of the future cash flows discounted at the risk free rate, whereas the risk margin refers to an amount required to ensure that the value of the technical provisions is equivalent to the amount that would be required by insurers and reinsurers in order to be able to adequately cover associated risks and thus take on the insurance business (Solvency II Directive, 2001). This means that for an insurer to determine its Risk Margin, the insurance obligations for the entire period up to its expiration must be obtained, and the SCR for each year must be determined.

The next step is to discount the annual SCRs at the risk-free rates. The risk margin is finally obtained by multiplying the sum of the SCRs by the cost of capital. The cost of capital as given in the fifth Quantitative Impact Study (QIS 5) is 6% for all participants (QIS Technical Specifications, 2010). In summary, Pillar I consists of own funds, assets and liabilities, SCR and MCR. The relationship among these elements is illustrated in the diagram below:

Figure 1: Relationship of Pillar I Components



Source (Wang, 2013)

Pillar II concerns itself with corporate governance and demands that there must be an effective system that provides for sound and prudent management, which is proportionate to the nature, scale and complexity of operations (Society of Actuaries, 2013). This is ensured by four blocks of governance: Own Risk and Solvency Assessment (ORSA), risk management system, policy processes and procedures and key functions. Some of the specific functions that must be in place include actuarial function, outsourcing, internal audit, internal control and risk management.

The Own Risk and Solvency Assessment (ORSA) works as an internal measure of the solvency of the entire insurance company. The ORSA is quite singular since there are no

other regulations that exhibit such a characteristic, aside the Solvency II. The ORSA enhances the understanding of the insurer and the supervisory body regarding the risk profile of the insurer. This also requires that all insurers provide an ORSA system, whether they go by the standard model or adopt an internal model of their own.

However, any time the regulators notice a shortcoming in the insurer's ORSA they have the right to call for capital add-ons. This makes the insurance companies prudent in producing highly efficient systems by critically analyzing their systems. The Pillar II appears to be the most challenging aspect of the Pillars because it implies a total change of the company's risk culture to ensure that there is some form of synergy across the entire organizational structure.

The fundamental and necessary ingredients of a risk management process include risk identification, risk selection, risk measurement or risk evaluation, and risk monitoring. These also require that processes and procedures are adequately catered for. There is also the need for policies and internal reporting procedures. These elements are all placed under the ORSA in the Pillar II of the Solvency II. The objectives, principles and responsibilities of risk management, as well as the internal risks of insurance companies, are expected to be documented with the means of preventing these risks on a daily basis. The processes and procedures that are followed must also be capable of determining and reporting current risks and those that may occur in the future.

The Supervisory and Reporting aspect of the Pillar II requires that the regulatory and supervisory bodies review the strategies, processes and reporting procedures of the insurance companies, making sure that their internal risks are duly identified, and that the measures put in place can adequately manage the risks. They also ensure that the insurance companies comply with all the regulations.

Pillar III focuses on the public disclosure and reporting requirements. It is stated in the CEIOPS' advice to the European Commission (March 2007) that supervisory reporting requirements in the Solvency II framework should support the risk-oriented approach to insurance supervision while public disclosure requirements should reinforce market mechanisms and market discipline. This implies that the public disclosure and reporting requirements of the Pillar III are in two-folds: one to the supervisory bodies, and the other to the general public. The elements in the disclosure and reports to the supervisory bodies include:

- The structure and amount of own funds, and their quality; this consists of the amounts of the Minimum Capital Requirement (MCR) and the amount of the Solvency Capital Requirement (SCR).
- The main differences between the assumptions of the standard formula and those of any internal model where applicable.
- The amount of any non-compliance with the MCR and SCR, even if these non-compliances have already been resolved, with explanations regarding the origin of those non-compliances, consequences and any remedies found.

The contents of the disclosure and reports to the general public can be summarized to include:

- Descriptions of the business and the company's performance.
- Description of the system of governance and an assessment of its adequacy for the risk profile.
- The risk exposure, concentration, mitigation and sensitivity for each category of risk.
- A description of the bases and methods used for the valuation of assets, liabilities and technical assets, as well as an explanation of any major differences in the bases and methods used for the valuation in their financial statements.

The Solvency and Financial Condition Report (SFCR) is made available for public consumption. The insurance companies must, therefore, make provisions for the interpretation of this report to stakeholders.

2.7.2 Overview of the Ghanaian Risk-Based supervisory/ Regulatory Framework

The Risk-based supervisory and regulatory framework has three main areas of focus; capital requirements, financial reporting and supervisory roles. Capital requirement starts by defining the levels of capital resources considered: Core capital and Non-core Capital. The computations of the available capital resources (ACR), Capital Adequacy Ratio (CAR), Solvency Minimum Capital Requirement, and Solvency Capital Requirement (SCR) have also been specified under this new solvency framework. The specifications for the deductibles and prudential margins, as well as provisions for ordinary shares, are also made known under this section.

The core capital is the total of the capital components of the insurer less the specified items that must be deducted. The capital components allowed by the National Insurance Commission include the ordinary shares in the insurer, contingency reserves, retained earnings from the previous year, net earnings (after tax) in the current year, and other capital elements that the Commission grants approval to. Meanwhile, the items on the deductibles list from the Commission include income deficit, intangible assets, cost of development capitalised research, cost of deferred acquisition, deferred tax, net deferred tax liabilities, investments in subordinated loans & subordinated loans connected to persons, assets that are subject to a charge or any known encumbrance, receivables from reinsurance that are older than six months, corporate stationery like product manuals, amounts due from connected persons and outstanding premiums.

The Non-Core Capital refers to items such as perpetual cumulative and non-cumulative preference shares which were issued by the insurer that has been paid up, unsecured subordinated debt, revaluation reserves, and capital components as may be approved. In summary, the capital resources as defined under the new solvency framework for the life insurers in Ghana are:

CAPITAL RESOURCES = CORE CAPITAL + NON-CORE CAPITAL

CORE CAPITAL = CAPITAL COMPONENTS – DEDUCTIBLES

The Capital Requirements are in three parts: Minimum Capital Requirement (MCR), Minimum Solvency Capital Requirement, and the Solvency Capital Requirement. The Minimum Capital Requirement as stipulated under this framework is simply a stated amount of fifteen million Ghana Cedis (GH¢ 15,000,000.00). The insurers are obliged to ensure that the capital components as stated above, amount to a total of GH¢ 15,000,000.00 or above. The Solvency Capital Requirement is pegged at a minimum of three million Ghana Cedis (GH¢ 3,000,000.00). However, this amount is subject to annual review in order to factor in the changes in the Consumer Price Index (CPI) and to round up to a multiple of a hundred thousand Ghana Cedis (GH¢ 100,000.00). The Economic Capital is the sum of the Solvency Minimum Capital Requirement and the Solvency Capital Requirement.

The Supervisory role of the National Insurance Commission does not end at simply formulating policies. Regarding solvency, the Capital Adequacy Ratio of the insurer is monitored closely to ensure that the insurer can conveniently continue in business.

The insurer, without limiting the solvency and reporting requirements specified in the Act and the Code, is required to monitor its capital adequacy ratio against the Commission's capital adequacy control levels and notify the Commission in writing about any change in its capital adequacy ratio:

From Level 0, the prescribed capital requirement (PCR) to level 1, from level 1 to level 2 (the Minimum Capital Requirement, MCR) or level 3, or from level 2 to level 3.

The insurer is also required to submit a report on its financial condition prepared by its appointed actuary, to the Commission. The details shall include how the insurer complied with the prudential requirements provided by the Commission as well as any directives given by the Commission, an assessment of the risk management systems and internal controls and investment strategy of the insurer, detailed analysis of the financial condition of the insurer, valuation of insurer's policy liabilities, and professional opinion and advice on any such matters that the actuary deems relevant. This report is required to be approved by the Board of the insurer and duly signed by the appointed actuary of the insurer before submission to the Commission, but submission should be made within four months of the end of financial year.

Table 2: Capital Adequacy Ratio and Supervisory Actions

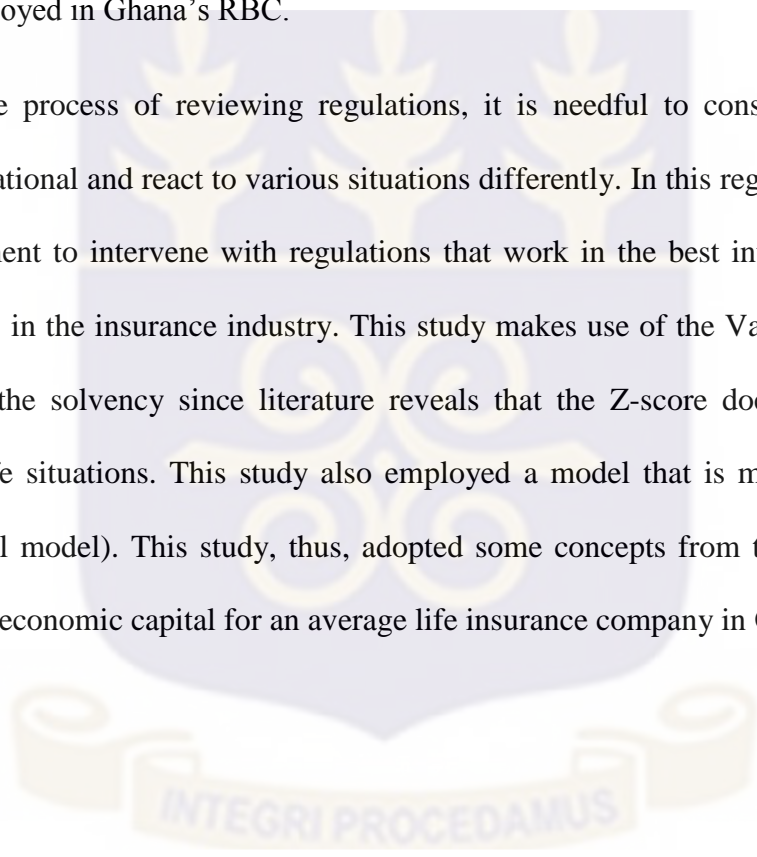
Capital Adequacy Ratio Control Level	CAR	Supervisory implication	Supervisory Action
Level 0 (PCR)	CAR > 150%	No significant problems	Monitor
Level 1	125% < CAR < 150%	Early warning	Strong recommendations
Level 2 (MCR)	100% < CAR < 125%	Serious risk of insolvency	Enforcement action aimed at resuscitation
Level 3	CAR < 100%	Entity not viable	Enforcement action leading to liquidation

Source: NIC (2016)

2.7.3 Conclusion

Risk-Based Capital (RBC) systems emerged from the banking sector and now adopted by the insurance sector. The RBC appropriates the insurer to maintain some minimum amount of capital against the risk of insolvency relative to the attributes of the insurance company. Literature also reveals that it is necessary to review regulations where there exist inherent dissatisfactions with models and/ or approaches employed. This supported the move of the EU from the Solvency I to the Solvency II and also gives a basis for taking a closer look at the models employed in Ghana's RBC.

However, in the process of reviewing regulations, it is needful to consider the fact that consumers are rational and react to various situations differently. In this regard, room is made for the government to intervene with regulations that work in the best interest of everyone who participates in the insurance industry. This study makes use of the Value at Risk (VaR) in determining the solvency since literature reveals that the Z-score does not necessarily apply to real life situations. This study also employed a model that is more standard than specific (internal model). This study, thus, adopted some concepts from the Solvency II in determining the economic capital for an average life insurance company in Ghana.



CHAPTER THREE

METHODOLOGY

3.3 Introduction

This Section focuses on the procedure for carrying out the research. It discusses the research design, population of the study, the sample size, the data collection instrument and procedure, how data were collected and analyzed.

3.2 Research Design

The quantitative research design was employed in carrying out this research. According to Boateng (2016, pp. 64), quantitative research is designed to establish the degree of a problem or the existent relationship between aspects of a situation by quantifying the differences. It is often used when there is the need to test for a support or otherwise of any proposed relationship between various sides of a situation. This method is well designed because it begins with well-defined hypotheses or questions that are carved out of existing theories or literature. Quantitative research also uses some unbiased instruments for collecting data and selecting samples. After which the results of the analyses are obtained, often using statistical methods and results are presented by making inferences to the population. This research is, thus, appropriated since its questions have been derived from existing phenomenon, its analysis used some statistical tools and the results also made inferences to the population stated below.

This study adopted secondary data from the annual reports of the life insurance companies submitted to the NIC, the regulatory body in Ghana. The data was obtained from the annual reports of the life insurance companies for the year 2015, annual reports from the NIC, and GSE data from the Bank of Ghana website, as well as other relevant information. Secondary data happened to be the best option for the purposes of this study, as the finding will be based on a

trend within a period of time. Despite the inherent disadvantages of the secondary data that is available to the researcher, there are also a lot of advantages that shall be reaped. However, the researcher has taken adequate measures to critically ensure that the information provided is valid and reliable. In conclusion, the use of secondary data has been of significant value to this research.

3.3 Population of the Study

Patton (2002) defined population as the total accumulation of items from which it is possible to select specific samples. Population, as defined again by Cooper and Emory (1995) is the complete collection of elements about which the researcher desires to draw inferences. An element, in this case, refers to the subject on which the measurement is being taken and is the unit of the study. The population chosen for this research was the insurance industry in Ghana. This comprises a total of 23 life insurance companies, 26 non-life companies, 3 reinsurance companies, 69 broking companies, 1 loss adjuster, 1 oil and gas company, 2 contact offices and 6000 insurance agents as at June 2015 (NIC, 2015).

3.4 Sample Size

From the insurance industry, this study used 19 life insurance companies. The ideal population would have been all the 23 life insurance companies in the Ghanaian insurance industry, but due to unavailability of data on some of the companies, slight differences in the standard methods used in the Solvency II for computing the economic capital for the life and non-life insurance companies, only these life insurance companies whose data were available, were chosen for this research.

Purposive sampling as given by Zikmund (2003) is a non-probability technique of sampling in which a researcher selects the sample as per his own judgment about some suitable attributes that are required to be possessed by the members of the sample. Purposive sampling has the

ability to provide explanations needed for making generalizations on the sample under consideration, and these generalizations could be with regards to theory, analytics and/or logic.

Meanwhile, regardless of how purposive sampling is used, it has the possibility of being influenced by the researcher (researcher biases). Though obvious that purposive sampling is performed based on the judgment of the researcher it is not enough reason not to work towards alleviating these biases, more importantly, because other sampling techniques such as the probability sampling have a reduced probability of researcher biases. Thus, the researcher worked hard to reduce such biases.

In this regard, the researcher purposely selected 19 life insurance companies out of the 23 registered life insurance companies. The study however considered companies that were in operation for at least two years in the Ghanaian insurance industry. This was done to ensure that within the period under consideration (2015) these companies would have fulfilled their regulatory obligation to submit their annual reports to the NIC. This research, therefore, considered the following companies; SIC Life Insurance Company, Enterprise Life Insurance Company, Esich Life Insurance, StarLife Assurance Company Limited, Glico Life, Vanguard Life Assurance, Metropolitan Life Assurance, Phoenix Life Assurance Company Limited, Ghana Union Assurance Life Company Limited, Unique Life Assurance Company Limited, UT Life Insurance Co. Ltd, Capital Express Life Assurance Co. Ltd, Prudential Life, Old Mutual Life, GN Life, Donewell Life, Quality Life, and Ghana Life Insurance.

3.5 Data Collection Instruments

Data collection instrument is defined as the tool or technique that is used to collect data in a research and is deemed very fundamental in the process of research (Saunders, Lewis, & Thornhill, 2009). This study required detailed inquiry of the capital and solvency of life insurance companies in Ghana, and such a detailed analysis was only feasible through the use

secondary data. Though primary research instruments like interview could yield complete enquiry of the problem, it can cause deviations in the unit of analysis from organization to individual. Moreover, it was very challenging to get access to relevant information through primary research instruments.

In view of the above, the content analysis instrument was employed to collect the data for this study. The applicable information needed for the data analysis was collected from the Research Unit of the National Insurance Commission. Both the assets and liabilities were retrieved from the annual financial statements of the companies. The data on inflation, ordinary share index, 91 days Treasury bill (T-Bill) were obtained from the website of the Bank of Ghana.

To ensure the validity of the data, the researcher used more than one source. Even though all the needed data were available at the NIC, a cross-reference was done using information from the websites of some of the firms like SIC and Enterprise.

3.6 Data Collection Procedure

Data collection is the process of obtaining information from selected subjects for an investigation (Silverman, 2004). The data for the ordinary share index, inflation and 91 days T-Bill were obtained from the Bank of Ghana website and inputted into excel worksheets. The specific data for each selected company was collated from their respective annual financial reports. The data for all the variables were manually entered into an excel spreadsheet for analysis. From the financial statements of the firms, the researcher inputted all the variables that were used to calculate the capital resources of the insurance companies.

3.6.1 Data Analysis

3.6.2 Forming an Average Ghanaian Life insurance company

In order to form an average Ghanaian life insurance industry, 19 life insurance companies were used. The researcher found an average of the net premiums, minimum and maximum age for signing on to a policy, premium amount, duration of policy, and benefit (sum assured) of two different life insurance products that are actively sold by the selected life insurance companies. The table below shows how the arrangement of the companies, features of products and the average of the product features were obtained for the analysis. The averages were found in an excel worksheet.

3.6.3 Ghanaian Risk-Based Approach

In calculating the Minimum Capital Requirement (MCR) and Solvency Capital Requirement (SCR) using the Ghanaian Risk Based approach, the study used excel spreadsheets. The question as to which assets and liabilities to include in the calculation was not a difficult one since this is clearly stated in the New Solvency Framework for life insurance companies. The MCR and SCR data were modeled in excel worksheet. Data were put into the following data format:

- The name of the worksheet was named “Solvency Capital Requirement”.
- The first line of the worksheet column contained the date of the report.
- The second line of the worksheet column contained the frequency of the report (eg annual or quarter)
- The first column of the worksheet contained the decision-making units (DMU) names which in this case were the capital resources of the average life insurance company.
- The second column of the worksheet contained the weights of the capital resources that were used in the calculation.

- The third column of the worksheet contained the year under consideration and the respective sub-period.

When the data was prepared as given above, and the values inputted from the financial statements, the values of the MCR and SCR were arrived at for the average life insurance company.

The collection of the data took almost five months and it ended on April 17, 2017.

Calculating Economic Capital

The sum of the ordinary shares, perpetual non-cumulative preference shares, contingency reserve, and income surplus gave the core capital amount. Meanwhile, the non-core capital elements were not available on the financial statements. This led to a total core and non-core capital of an amount equal to the value of the total core capital. Only five of the elements specified in the solvency framework as disallowed assets were retrieved from the financial statements: income deficit, other intangible assets, participation in connected persons, deferred tax assets and due from related parties. Risk discount of various rates is allowed on certain specified assets. The risk discounts are a percentage of the value of the specified assets deducted from the total value of core and non-core capital, to cater for any risk that may arise from these assets. Only seven of the specified assets were retrieved from the financial statements: listed securities, unlisted securities, mutual funds, investment properties, property plant and equipment, other assets and due from reinsurers. Solvency surcharge is obtained by applying margins on the net premium of the various classes of insurance business, in order to cater for the risk inherent in these classes of insurance business.

For the purposes of this study, only two classes of business were considered due to unavailability of data. Term life insurance and whole life insurance businesses are considered in this study. After obtaining the value of the solvency surcharge, the minimum solvency

capital requirement of GH¢ 3,000,000.00 was added to arrive at the solvency capital requirement. The SCR was also calculated as the strict measure for ensuring solvency of the average life insurance company.

3.6.4 Solvency II Approach

This section presents the procedure used in the analysis of the data.

3.6.4.1 The Models

The models explained below show the formulae used as well as descriptions of the variables as the authors used them for modelling. The formulae show clearly how each variable is replicated and what parameters are required by each model. All the models used in this study have been adjusted from past data and the values of the parameters have been given by the authors for their fitted models. However, because the parameters provided by the authors relate to different economic conditions, the researcher fitted the data and obtained parameters that are useful to the study.

3.6.4.1.1 The Wilkie Model

The Wilkie's model is a cascade structure that incorporates diverse investment series. The inflation series is presumed to be the impetus for the other investment series in Wilkie (1986, 1995) as reported by Tee & Ofosu-hene (2017). The Wilkie's investment series are joined together using a combination of statistical evidence and economic assumptions through vigorous study and analysis. The Wilkie's model was chosen for this analysis because Tee & Ofosu-hene (2017) in their analysis of actuarial models that are best for use in developing countries, and specifically Ghana, recommended that the Wilkie's investment models were the best in predicting economic situations for Ghana. Thus, these models of Wilkie (1986, 1995) were employed in modelling the assets of the average Ghanaian life insurance company.

i. The Price Inflation Model

Inflation can be measured by either the retail prices index (Q) or consumer price index (CPI).

It is modeled using a first order autoregressive (AR (1)) process. Wilkie's AR (1) price inflation model is of the form:

$$Q_t = (Q_{t-1}) * \exp(I_t)$$

Where I_t is the force of inflation from (t-1) to (t) and it is given as:

$$I_t = \ln(Q_t - Q_{t-1})$$

Thus: $I_t = QMU + QA * ((I_{t-1}) - QMU) + QSD * QZ_t$

$$QZ_t \sim iid(0,1)$$

This means that QZ_t is a series of independent, identically distributed unit normal variates, (they are assumed to have zero mean and unit standard deviation). Where QMU, QA and QSD are parameters to be estimated.

This model is described to mean that, each year the force of inflation is equal to its mean rate (QMU), plus a percentage of last year's deviation from the mean (QA), plus a random innovation which has zero mean and a standard deviation of QSD (Wilkie, 1986). This dwells on the assumption that inflation, is the factor of economic uncertainty, and relies only on its own past values. Whitten & Thomas (1995) reported that there is significant autocorrelation at lag 1, which gives statistical justification for including the variable (I_{t-1}) , and no other economically feasible autocorrelation or partial autocorrelation is significant at 95%. The AR (1) model of the force of inflation is a statistically stationary series (i.e., in the long run, the mean and variance are constant).

ii. Share Yields model

Share yields are modeled as a function of the current inflation rate and the history of their past trends. The Wilkie's AR (1) model of the share dividend yield is given as: $\ln(Y_t) =$

$$YW * I_t + \ln(YMU) + YN_t$$

$$YN_t = YA * (YN_{t-1}) + YSD * YZ_t$$

$$YZ_t = iid(0,1)$$

That is, YZ_t is a series of independent, identically distributed unit normal variables, (the assumption is that they have zero mean and unit standard deviation). Where, YMU , YA , YW and YSD are parameters to be estimated. This model uses logarithmically transformed dividend yield, $\ln(Y_t)$ as the explanatory variable. Wilkie (1995) described the model to mean that, at any date the logarithm of the dividend yield is equal to its mean value ($\ln YMU$), plus a percentage of its deviation a year ago (YA) from the mean, plus an additional influence from inflation (YW) times the force of inflation in the previous year, plus a random innovation which has zero mean and a standard deviation of YSD .

iii. T-Bill yields Model

The yields on the T-Bill are modelled using an ARIMA (1,1) model. $(1 + r_t) = \mu + \rho[(1 + r_{t-1}) - \mu] + \theta[\varepsilon_{t-1}] + \sigma Z_t$

r_t is the risk free rate at time t , r_{t-1} is the risk free rate at time $t-1$, ε_{t-1} is the error term at time $t-1$, while Z_t is the uniformly distributed normal unit variables. This model explains that the risk free rate is dependent on its one year lag minus the mean risk free rate, plus the one year lag of the error term and an addition of the random innovations.

iv. Actuarial Pricing Model

The model for pricing life insurance products using the commutation functions is as follows for net annual premium for survival insurance, whole life insurance and term life insurance respectively where the payment period is equal to the term of the contract;

- $P_{x:n} = \frac{D_{x+n}}{N_x - N_{x+n}}$; $D_x = v^x l_x$; $D_{x+n} = v^{x+n} l_{x+n}$; $N_x = \sum_{t=x}^{\infty} D_t$

Where $P_{x:n}$ is the net annual premium to be paid by a life age x taking a survival insurance for a period of n years. l_x is the total number of lives alive at age x . l_{x+n} is the total number of lives surviving at age $x+n$. v^x and v^{x+n} are discount rates.

- $P_x = \frac{M_x}{N_x}; M_x = \sum_{y=x}^{\infty} v^{y+1} d_x$

P_x is the net annual premium payable by a life age X who takes on a whole life insurance (annuity). M_x and N_x are commutation functions.

- $P_{x:n} = \frac{M_x - M_{x+n}}{N_x - N_{x+n}}$

$P_{x:n}$ is the net annual premium payable by a life age X who takes on a term life insurance.



3.6.5 Pricing the insurance product

Risk-Based Capital (RBC) measures the capital required by individual company based on the size of the firm (related to capital and asset) and the degree of risk taken by each insurer (Cheng & Weiss, 2013). The risk taken by each life insurance firm is the amount of life insurance contracts that are sold, with the resultant liabilities. To determine the price paid by the insurance consumers, this study modeled two main life insurance products that are sold in the life insurance sector in Ghana. These are:

- Whole Life Insurance: The insured is protected by the insurer against the risk of death, which is a future risk that has an uncertain time of occurrence. The whole Life insurance has embedded in it the term life assurance.
- The term life assurance demands that the insurer remits the beneficiary (ies) of the insured in the event that the insured passes on during the term of the contract. However, where the insured is alive at the end of the contract term, then the insurer is relieved of any commitments to the insured. The insurance premiums are set according to the features of every contract and are determined by actuarial calculations (Alexandru & Armeanu, 2003). The whole life insurance policy offers protection against the predetermined risk; it is not a savings insurance.

Valuation assumptions

For the cash flow projections, the following assumptions were made for the term and whole life products respectively.

Table 3: Cash flow Assumptions

Main Assumptions	Term Life	Whole Life
Age of Insured	34	48
Premium Term	21	12
Policy year	6	9
Sum Assured	20,000	7000
Premium	42.6667	46.38693

Source: Author's calculation (2017)

From the table, in deriving the cash flow for the term life policy, it was assumed that the policyholder was 26 years and was in the 6th year of the policy. Premiums of GH¢ 42.67 was to be paid for 21 times, and the benefit available to the policyholder was GH¢ 20,000.00. The whole life policyholder was 48 years and had been on the policy for 9 years. The policyholder was expected to pay premiums of GH¢ 46.38 for 12 years so that he can enjoy a benefit of GH¢ 7,000.00.

Table 4: Features of the Whole Life Product

FEATURES OF THE WHOLE LIFE PRODUCT	AVERAGE	STANDARD DEVIATION
AGE AT INCEPTION	34	5
PREMIUM PAYMENT TERM	25	5
POLICY AGE	5	3
SUM ASSURED	25,479	4000

Source: Author's calculation (2017)

The reserve valuation assumptions include 26% interest rate. There was no expense and no expense inflation. The ages at inception range from 18 through to 50. Premium payment stops at age 60 but the insurance cover ceases at age 100 for the whole life insurance. The average age at inception is has a normal distribution with mean 34 and standard deviation of 5. The average sum assured was simulated as a normal distribution with a mean of GH¢ 25,479.00 and a standard deviation of GH¢ 4,000.00. The policy age was an average of 5 years with a standard deviation of 3 years.

Table 5: Features of the Term Life Product

FEATURES OF THE TERM LIFE PRODUCT	AVERAGE	STANDARD DEVIATION
AGE AT INCEPTION	40	5
PREMIUM PAYMENT TERM	15	5
POLICY AGE	4	3
SUM ASSURED	10,788	4000

Source: Author's calculation (2017)

For the net premium valuation, the following basis was used: 26% interest rate, and South African mortality table. There was no expense and no expense inflation. The average number of active policies for the life insurance products was 8570 and that for the whole life insurance policies was 19189.

Asset Valuation and Reserving

The assets of the average life insurance company were valued based on a market consistent approach. The assets were assumed to be invested in equity and 91-days Treasury bill. Sixty percent (60%) of the insurer's assets were placed in equity while 40% of the assets were invested in the 91-days Treasury bill. It was assumed that 2% of the assets were added on every month as a buffer against the actuarial liabilities. Also, the predicted ordinary share yield and the 91-days Treasury bill rates were used to accumulate the assets each month for the one-year horizon.

The reserve for the liabilities was obtained by deducting the present value of the premiums from the present value of the sums assured. That is **PV Sums Assured (Outgoing) – PV of Premiums received (Incoming)**. Ten thousand simulations were made of the reserve based on the features of the average life insurance company as presented above.

Calculating the Economic Capital

The force of inflation and the ordinary share yield were modelled using the Wilkie's model and the 91 days T-Bill using an ARIMA model. After the models were successfully coded and ran using Stata software, the one-year predictions were made for the ordinary share yield and the 91-days T-Bill rate. These rates were used to accumulate the average investment assets of the average life insurance company, for a one-year horizon.

Allocation of Assets and Determination of Premiums

The Economic capital as defined under the Solvency II is the combination of the MCR and the SCR. The one year accumulated value of the assets was set against the actuarial liabilities (reserves) to obtain the economic capital. The surplus / deficit obtained was ordered in ascending order and the 85th percentile found to be the MCR, while the 99.5th percentile represented the SCR. The MCR and SCR were used as strict measures concerning the economic capital calculated.



CHAPTER FOUR

ANALYSIS AND INTERPRETATION

4.1 Introduction

The empirical evidence on the economic capital of life insurance companies in Ghana based on panel data of eighteen life insurance companies for 2015 is presented in this chapter. Panel data was used because the researcher used a set of time series for but for different companies. The chapter highlights the similarities and differences between the Ghanaian risk-based supervisory/ regulatory framework and the Solvency II supervisory/ regulatory framework, capital resources, available capital resources, minimum capital requirement, minimum solvency capital requirement and solvency capital requirement using the Ghanaian risk-based approach, and the Solvency II approach.

4.2 Similarities between the Ghanaian Risk-Based Supervisory/Regulatory framework & the Solvency II Supervisory/Regulatory framework.

Even though the Ghana risk-based system is not specifically divided into three pillars, it was found that both frameworks touch has a bearing on capital requirements, risk management and internal controls, and financial reporting/ public disclosure. Both systems require that the insurer holds some amount of available capital as called by the Ghana sector and own funds, as called in the Solvency II.

The assets are valued using the market consistent approach in both systems. A market consistent value of an asset or liability as defined by Kemp (2009) and reported by Keller, Kemp and Krischnatz (2012) is its market value, if it is readily traded on a market at the point in time that the valuation is struck, and, for any other asset or liability, a reasoned best estimate of what its market value would have been had it been readily traded at the relevant valuation point. This is explained in the Solvency II Framework as reported by Wang (2013)

to mean that assets should be valued at the amount at which two parties can easily reach a consensus of exchange, and the amount at which liabilities can be easily settled between willing parties.

Both systems maintain solvency control levels. The Solvency II system uses its MCR and SCR as control levels that prompt both insurers and regulators about whether or not any action needs to be taken at each point in time. Where the capital of the insurance firm is lower than the MCR, it indicates that the actions of the insurer put the stakeholders (policyholders and beneficiaries) at risk if the insurer continues its operations. Hence, the MCR serves as a margin that can propel actions by the regulators. If the capital falls between the MCR and the SCR, this may call for regulatory action. For the Risk-Based System in Ghana, the Capital Adequacy Ratio (CAR) is used to determine what actions are taken. Where the CAR is more than 150%, then there is no cause to worry, there is only the need for monitoring. When the CAR lies between 125% and 150%, it calls for strong recommendations for improvement in risk areas. When the CAR is between 100% and 125%, enforcement actions are taken to revive the insurance company. Meanwhile, when the CAR is less than 100%, then enforcement actions are taken to close down the insurance company.

Both the Solvency II and the Risk-Based System in Ghana concern themselves with risk management and Corporate Governance and demand that there must be an efficient system which makes provision for sound and wise management, with respect to the nature, scale and complexity of operations. The Solvency II framework enforces this by ensuring that four pillars are in place: Own Risk and Solvency Assessment (ORSA), risk management system, policy processes and procedures and key functions. Specifically, some of the functions that need to be in place include financial, internal audit, risk management, actuarial, compliance, senior management, board oversight. The Risk-Based system in Ghana also demands that there are internal risk management roles duly performed by the Board of the insurance

companies. The Board is also tasked to monitor the levels of solvency with regard to the risk profile of the insurance company. Some of the functions that need to be in place include actuarial function, outsourcing, internal audit, internal control, and risk management.

Solvency II and the Risk-Based system in Ghana also have in common Financial Reporting and Public Disclosure regulations. The Solvency II expects that the reporting requirements aid the risk-oriented approach to insurance supervision on the one hand, while the public disclosure requirements should emphasize market mechanisms and market discipline. The implication is that the reporting and public disclosure requirements come in two ways; one is directed at the supervisory bodies while the other is directed towards the general public and these two reports contain different elements. The report to the supervisory bodies mainly dwells on the capital level of the insurance company, the assumptions used by the company for its internal model, and the amount of non-compliance with the MCR and SCR. Meanwhile, the contents of the disclosure and reports to the general public include descriptions of the business and company's performance, description of the system of governance and the assessment of its adequacy for the risk profile, the risk exposure, as well as the explanation of any major differences in the bases and methods used for the valuation of assets. The Solvency and Financial Condition Report (SFCR) is made available for public consumption. The insurance companies are also expected to make provisions for the interpretation of the report to stakeholders.

The Risk-Based system in Ghana expects that a report on the financial condition of the insurance company be prepared by the appointed actuary and its contents shall include an assessment of the insurer's Risk Management systems, internal controls and investment strategy, a detailed evaluation of the financial condition, a valuation of policy liabilities. The Financial Condition Report is also to be approved by the Board of the insurance company and endorsed by the appointed actuary.

4.3 Differences between the Solvency II Supervisory/Regulatory Framework and the Risk-Based Supervisory/Regulatory

There are a lot of differences between the Solvency II system and the Risk-Based system in Ghana but the study focused on the differences in the capital requirements and methods of computing the economic capital.

Firstly, there are differences in the available capital of both systems. The solvency II calls the capital resources that are available to the insurer the own funds. Meanwhile, the own funds are also in two parts; the basic own funds and the ancillary own funds. The basic own funds refer to the excess of assets over liabilities plus the subordinated liabilities. They include share capital, share premium reserve, reconciliation reserve. Whereas ancillary own funds comprise all items other than basic own funds which can be called up to absorb losses. Basic own funds are reported on the balance sheet but the ancillary own funds are not reported on the balance sheet. In the Risk-Based system, the capital resources available to the insurer are simply called available capital and they are reported on the balance sheet. They are also in two groups, the core capital and the eligible non-core capital.

Secondly, while the Minimum Capital Requirement (MCR) for the Risk-Based system in Ghana is simply a stated amount of GH¢ 15,000,000.00 for every life insurance company, under the Solvency II the MCR is the amount of economic capital that is needed to ensure that over the one-year horizon the probability of insolvency will not be more than 15%. The difference here is that; Solvency II specifies the target criteria so that each life insurance company gets to hold an amount of Minimum Capital that relates to its risk profile. Meanwhile, that of the Risk-Based system in Ghana holds the same amount of GH¢ 15,000,000.00 for every life insurance company regardless of their risk profile.

This element in Ghana's Risk-Based system of Minimum Capital determination can be questioned, since the Risk-Based Capital is geared towards measuring the amount of capital

that is needed by an individual company based on its size (related to capital and asset) and the degree of risk taken by each insurer (Cheng & Weis, 2013). This GH¢ 15,000,000.00 stated for each insurer in the Ghanaian RBC system may be too much or inadequate for the life insurers depending on their size and level of risk taken.

Thirdly, the computation of the economic capital under the Solvency II makes use of stochastic risk models to duly capture the volatilities in the risk elements in the economic capital, so that adequate preparations would be made toward future liabilities. The standard formulas given for calculating the SCR under Solvency II comprise a lot of risk modules such that the process is a bottom-up process. The SCR for the sub-models are first computed and then combined into the model for the total SCR for the firm. Meanwhile, within the computation of the SCR using the Ghanaian Risk-Based approach, there is again a minimum Solvency Capital requirement of GH¢ 3,000,000.00. This again makes the model a bit porous since this amount may not apply adequately to all the life insurance companies in Ghana. However, the risk components embedded are indicated by applying specified prudential margins to increase the technical provisions by adding to the best estimates calculated by the actuary.

4.4 Results from the Economic Capital Computations

4.4.1 Risk-Based Approach in Ghana

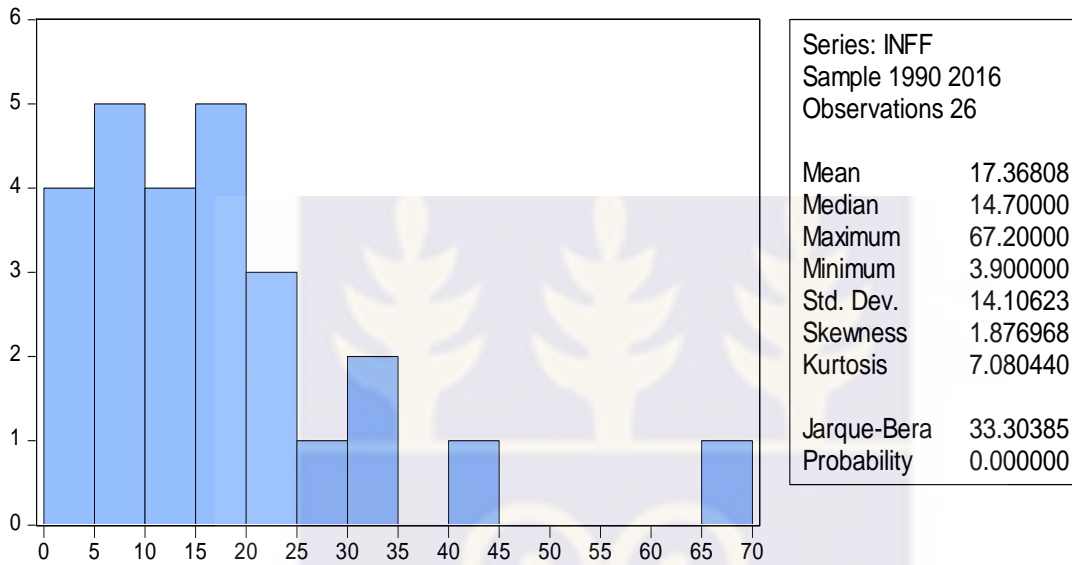
The results obtained from the Ghana approach indicate that the total core capital stands at GH¢ 52,595,216.42. There was no non-core capital. The total disallowed asset was GH¢ 265,995.11. The total risk discount amounted to GH¢ 3,112,421.06, such that the total available capital amounted to GH¢ 49,216,800.26. The Solvency Capital Requirement came to GH¢ 3,012,487.09. The calculations are attached in the appendix.

4.4.2 Solvency II Approach

Summary Statistics of GSE Data

The graphs of the summary statistics of the inflation, ordinary share yield and 91 days Treasury bill are presented below:

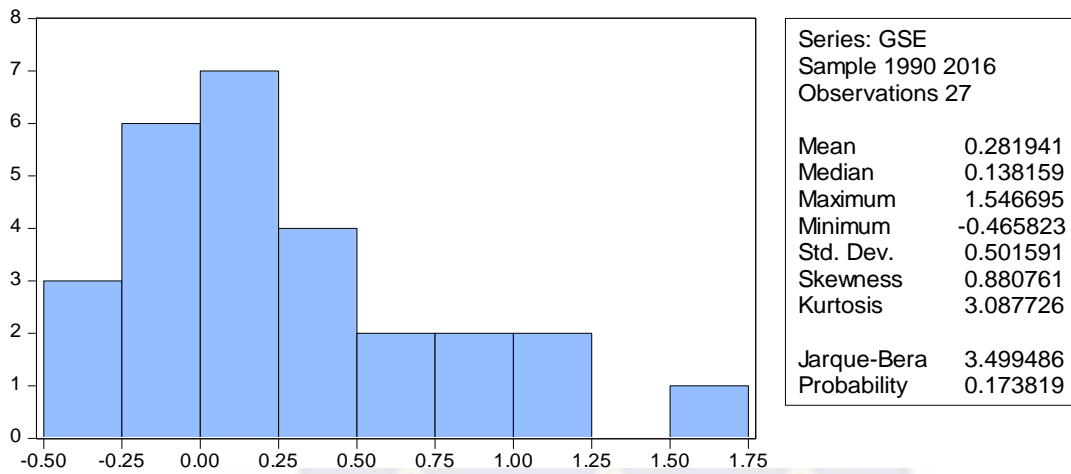
Graph 4: Descriptive Statistics of Inflation data



Source: Author's calculation

From the graph above, the average inflation rate for Ghana for the period 1990 to 2016 is 17.36%. The maximum inflation for the period is 67.2%, the least rate is 3.9% and the standard deviation is 14.10 %. For the period the highest inflation rate was recorded in 1995 and the lowest was recorded in 2012. The standard deviation was 14.11 while the skewness and kurtosis were 1.877 and 7.08 respectively.

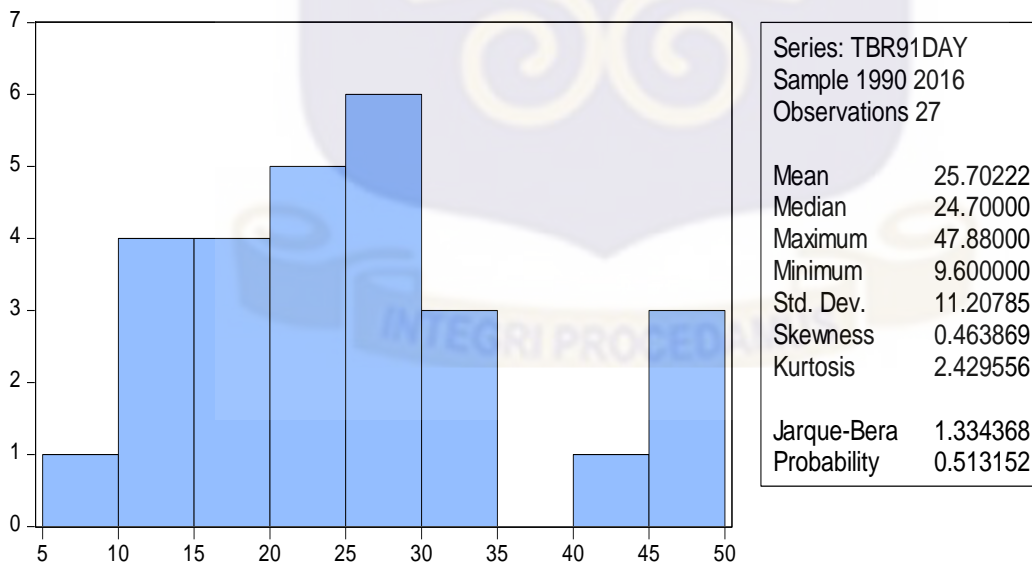
Graph 5: Descriptive Statistics of the Ordinary share index data



Source: Author's Calculation (2017)

The table shows that the average yield on ordinary shares during the period 1990 to 2016 was 0.28. The maximum yield for the period was 1.54 while the maximum yield was -0.47. The standard deviation was 0.502 and the kurtosis was 3.08.

Graph 6: Descriptive Statistics of the 91-days Treasury bill



Source: Author's Calculation (2017)

The summary statistics of the 91-days Treasury bill indicate that the mean rate for the period 1990 to 2016 was 25.7%, the standard deviation was 11.20, the skewness was 0.464 and the

Table 7: Regression of Share Yield and inflation Variables

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-2.046177	0.232581	-8.797696	0.0000
C(2)	0.070684	0.354954	0.199136	0.8441
C(3)	11.62354	2.472917	4.700334	0.0001
R-squared	0.531940	Mean dependent var		-1.383502
Adjusted R-squared	0.487362	S.D. dependent var		1.158357
S.E. of regression	0.829368	Akaike info criterion		2.580164
Sum squared resid	14.44489	Schwarz criterion		2.727421
Log-likelihood	-27.96197	Hannan-Quinn criter.		2.619231
F-statistic	11.93300	Durbin-Watson stat		2.268540
Prob(F-statistic)	0.000345			

It can be realized from the table above that the coefficient of determination (R^2) is 0.4874 which means that inflation and variables account for about 48.74.0% of the firms' yield on ordinary shares. The F statistics (0.000345) which is less than alpha level of 0.05 also reveals that all the variables considered are significant determinants of the ordinary share index. In essence, the logarithm of the dividend yield rate can be explained by its mean value, in addition to a percentage of its deviation a year ago, plus an additional influence from inflation times the force of inflation in the previous year, plus a random innovation which has zero mean and a standard deviation.

In this case, C(1) which is the additional influence from inflation times the force of inflation in that year. C (2) is the logarithm of the mean value of the dividend yield, and C(3) is the sum of the additional influence from inflation times the force of inflation in the preceding year and a random innovation with standard deviation and mean of zero. The table below presents the one-year forecasts for the ordinary share index and 91-days Treasury bill.

Table 8: One year forecast of ordinary share yield and 91-days Treasury bill

ITEM	ONE YEAR FORECAST	FORECAST ERROR
Y(t)	0.33594	0.489236506
r(t)	0.235496	0.067395596

Source: Author's calculation (2017)

Table 9: Reserve and asset valuations

Liability for Term Life Insurance	10,962,267,845.75
Liability for Whole Life Insurance	41,084,833,407.89
Assets for Term Life Insurance	59,792,947.52
Assets for Whole Life Insurance	89,689,421.28
Total Assets	149,482,368.80
Total Liability	52,047,101,253.65

Source: Author's Calculations (2017)

In valuing the assets of the average life insurance company, the T-bill rate obtained from the author's calculations of 23.50% and the equity rate of 33.6% were used. The researcher assumed that 40% of the life insurer's assets were invested in T-bills and 60% in Equity as can be inferred from the financial statements of the average life insurance Company in Ghana. Also, 40% of the total assets were used against the Term –Life insurance products whereas 60% of the company's total assets were used against Whole –Life insurance products. As shown in the table, the total assets for the average life insurance company were found to be GH¢ 149,482,368.80.

In computing the liabilities for both Term-Life and Whole –Life insurance Products, the pricing model stated in Chapter three was used. The total liability for the Term- Life insurance was GH¢ 41,084,833,407.89 while the liability for the Whole –Life insurance product was GH¢ 89,689,421.28. The total liability therefore for the average life insurance

company in Ghana was GH¢ 52,047,101,253.65. Now, setting the liabilities against the Assets, gave an economic capital of (GHC 51,897,618,884.85). This shows that the average life insurance company's assets are lower than its liability. Thus, a negative economic capital. When the VaR (85) was applied using historical simulation, it was realized that there is 15% chance that there would be a loss of GHC 4,768,425.06 per year. And the VaR (99.5) also gave a loss amount of GHC 36,310,584.97 which should be expected over a year. Comparing both VaR (85) and VaR (99.5) to the economic capital obtained, it is realized that variance between the expected loss and the actual loss is GHC 51,861,308,299.88.

Thus, there is the need for about GHC 51,861,308,299.88 amount of assets to reduce the loss amount to the minimum of GHC 36,310,584.97. Meanwhile, the available Capital resources that the average life insurance company has is GH¢ 49,216,800.26. In effect, the average life insurance company would need GH¢ 51,812,091,499.62 more capital in order to meet the minimum expected loss. This amount is about 1052 times more than the current available capital resources of the average life insurance company.

In conclusion, when an understanding of the Solvency II models are used in determining the economic capital of the average life insurance company, by inculcating the risk-free rate and the inflation rate, the available capital resources of the average life insurance company would need to be increased by 1052 times in order to meet the stricter level of expected loss per year using a VaR of 99.5%.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION & RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the study as well as conclusions that have been drawn from the analysis. Based on the conclusions, some recommendations have been made to guide policy makers and other stakeholders in the insurance industry in Ghana.

5.2 Summary of Findings

One of the most recent issues in the insurance sector the world over, is the revision of solvency regulations, with an emphasis on moving towards the Risk-Based capital system. Important issues affecting the solvency of financial firms is the level of capital held against future liabilities. Even though not every insurance company has experienced severe insolvency, the events on the financial markets prompted the insurance regulators to have a second look at the solvency surveillance. In this regard, most principal economies embarked on revising their insurance regulations and with emphasis on moving towards the Risk-Based Capital system.

The objective of this RBC is to ensure that firms are financially sound, and can continue to operate as solvent entities into the foreseeable future. Literature reveals that over the past 15 or more years, principal economies have revised and or are still revising their insurance regulations and especially with emphasis on moving towards the Risk-Based capital. Meanwhile, Alfriend (1988) reported that the RBC originated from the banking sector when the Basle Committee on Banking Regulations and Supervisory Practices designed the framework as an international standard for banks in late 1987. The RBC system was widely adopted by the insurance sector later in the early 1990s when most insurance companies went through various difficult moments financially, as a result of various factors, some of which

include a surge in insurance insolvencies in the US, a decline in equity market in the UK, the desire to have a bring the insurance under a single umbrella in the EU and the changing nature of risks as well as demands from international standards for Ghana.

This study compared the RBC framework in Ghana with that of the EU, with the aim to find out the whether there are any similarities between both systems, what differences there are and also to compare the estimated economic capital for an average Ghanaian life insurance company using the models stipulated in both frameworks. The EU's Solvency II framework was chosen for this comparison because it is the most recent RBC framework and contains so many models, with a high possibility of becoming an international model for regulating insurance solvency in the future (Cummins & Phillips, 2009). It has been mentioned by some researcher's that the economic capital of a firm can be determined using either a standard model which is specified by the national insurance regulatory authority, an internal model that is designed by the individual insurance firm but which meets some requirements from the regulatory authority. These models, contain some risk models.

However, a closer look at Ghana's model for economic capital determination shows that it does not contain any risk model. Therefore, some models for the equity, inflation and T-bill were used to estimate the economic capital for an average life insurance company, and this estimate is compared with the value obtained from using the model in Ghana's framework. This was done to know how the capital requirements of the Ghanaian life insurers will change with an incorporation of risk models in their RBC model, which follows the work done by Wang (2013), to determine the implications of incorporating correlation matrix into the US RBC system.

In order to meet the aims provided above, the following questions were answered:

- What are the similarities and/or differences between the Ghanaian risk-based supervisory/regulatory framework and Solvency II supervisory/regulatory framework in Europe?
- What is the estimated economic capital for the average Ghanaian Life insurance company using the Solvency II approach?

In order to meet the objective of the study the researcher adopted the quantitative research method type by using secondary data from National Insurance Commission. The data used for the study was obtained from the annual reports of the life insurance companies as well as other relevant information. A clear benefit of using the secondary data was that much of the background work needed had already been carried out, for example, the literature reviews, the annual reports.

The study employed the purposive sampling technique to select the sampled firms for the analysis. A purposive sampling is a nonprobability sampling technique in which an experienced individual selects the sample based on his or her judgment about some appropriate characteristic required for the sample members (Zikmund, 2003). The study sampled 19 life insurance companies. The analyses were performed using panel data derived from the financial statements of selected life insurance companies for the year 2015 year as well as time series data on the GSE index, inflation and T-Bill rate. Descriptive analysis, stochastic asset modelling, actuarial pricing techniques, as well as regression were used to do all the data analysis.

The study revealed implications of incorporating some risk models in the computation of economic capital for the average Ghanaian life insurance company. The following were considered: the asset and liability valuation methods, solvency control levels, target criteria,

net premiums, listed stock, core capital elements, non-core capital elements, force of inflation, GSE index, and 91-days T-Bill rate. The following observations and findings were made:

It was observed that potential policyholders who would enter the life insurance contract at ages above 53 may stand to lose, especially if their sums assured are huge since they would end up paying more than the sums assured. The insurers, however, mostly limit the age at entry into a life insurance contract to ages between 50 and 54. Hence, the possibility of the insured losing from insurance is almost non-existent.

It was revealed that both RBC frameworks have a bearing on capital requirements, corporate governance and reporting and public disclosure. Both countries maintain solvency levels that prompt diverse regulator actions at various points. They also have measures in place to ensure prudent management of the insurance companies by ensuring that functions such as actuarial, internal audit, outsourcing, internal audit, internal control, risk management are present in Ghana and financial, internal audit, risk management, actuarial, compliance, senior management, board oversight are present in the EU. The two economies also employ the market consistent approach in valuing their assets and liabilities.

In addition, both Ghana and the EU have some principles in their frameworks that emphasize on risk management practices.

Meanwhile, there are differences in the frameworks used by the two countries. With the capital required, the capital resources available to the insurer has different definitions and roles in each framework. Available capital, which consists of the core and non-core capital in Ghana, and Own funds, which consists of basic own funds and ancillary own funds in the EU. The ancillary own funds are not reported in the financial statements; meanwhile, both core and non-core capital are reported in the financial statement.

Moreover, in the computation of the required economic capital lies some variations. For the EU, some stochastic risk models are incorporated in the computations of SCR, meanwhile, no such model is employed in the computations in Ghana.

Also, the Minimum Capital required of life insurers is simply stated as GH¢ 15,000,000.00 in the Ghana framework. Whereas in the EU framework, the MCR is defined as the capital required to operate as a solvent entity at 85% VaR over a one-year horizon.

These differences motivated this study. Thus, some ingredients which are missing in the derivation of the economical using the Ghana model, specifically risk models, were adopted from the EU to examine what implication(s) it would have on the capital requirement for life insurers in Ghana. With the knowledge that the MCR for Ghana is GH¢ 15,000,000.00, the estimated SCR was found to be GH¢ 3,503,844.12. Meanwhile, the economic capital obtained under Solvency II was (GHC 51,897,618,884.85). This shows that when risk models are used in computing the economic capital of the average life insurance company in Ghana, insurers would be required to increase their capital 1052 times

5.3 Conclusions

This study concludes based on the findings on the similarities and differences in the regulatory frameworks in Ghana and the EU, as well as the economic capital estimated using the methods of computation from both countries. From the findings of the study, it can be concluded that even though there are some similarities between both RBC frameworks, there still exists some difference. And these differences accounted for huge differences in the estimated capital for an average life insurance company over a period of one year.

The MCR in the Ghana RBC framework is simply a specified amount and there was no specific target confidence interval or horizon given for it. The EU's Solvency II framework was specific about what should be held as MCR over a period of one year. The values

obtained as estimate communicate that GHC 51,812,091,499.62 more capital would be held by the average life insurance company in Ghana as economic under the Solvency II approach every year if risk models are employed in the computation of economic capital. The above imply that the average life insurance company in Ghana would be required to increase their available capital resources 1052 times to be able to operate as a solvent entity. This means that even though there have not been instances of surges in life insurance insolvency, it is possible that the capital requirements may not be adequate in the near future.

5.4 Recommendations

In view of the findings from the study, the following recommendations are essential. First and foremost, it is recommended that policymakers should continue to work on improving the RBC framework for life insurers. While it is commendable that the framework touches on risk management procedures and internal control processes, it is essential that the MCR also relates to each firm according to the degree of the firm's risk profile and capital base. Thus, just as the firms are allowed and monitored to put in place risk management processes that are peculiar to their individual needs, we recommend that the MCR and SCR be also set in a way that will correspond to each firm's risk profile and capital base so as not to make room for the possibility of burdening some small firms with too much capital requirements, while putting some big firms at the risk of undercapitalisation. In doing so, it is recommended, again, that target criteria be specified for this purpose.

Also, the NIC should consider revising its capital determination model to incorporate some risk models, since this helps to better capture the risk elements associated with the insurance business. A recommendation is given, again, that the NIC gives room for the use of internal models in determining the economic capital of life insurance firms since it allows for the capital to be well-tailored to suit the company needs. However, adequate monitoring tools

should be put in place to ensure that the internal models consider elements that are mandated by the NIC.

5.5 Limitations and Recommendations for Further Studies

This study has two major limitations, those relating to the data and methodology. With respect to the data, the homogeneity of the insurance companies used in this study is questionable, since firms of different sizes, ownerships and period of existence were used. Also, the data set was short which could affect the results.

In addition, the study did not consider many other factors that actually might affect the level of economic capital aside the risk models. Also, only two life insurance products were modelled. The study also analyzed the efficiency of the life insurance companies together within a particular year. Comparative analysis of specific firms can be considered in future research.

For future studies, all the life insurance products that are being sold in Ghana should be modelled, and more concepts could be adapted from the Solvency II framework. Perhaps, the entire standard formula as stated for each computation could be used. Also, the time series data used for the predictions could be extended to cover decades. Also, analyzing the efficiency of life insurance distribution systems using cost and profit functions could determine whether unmeasured product quality differences exist in the life insurance industry.

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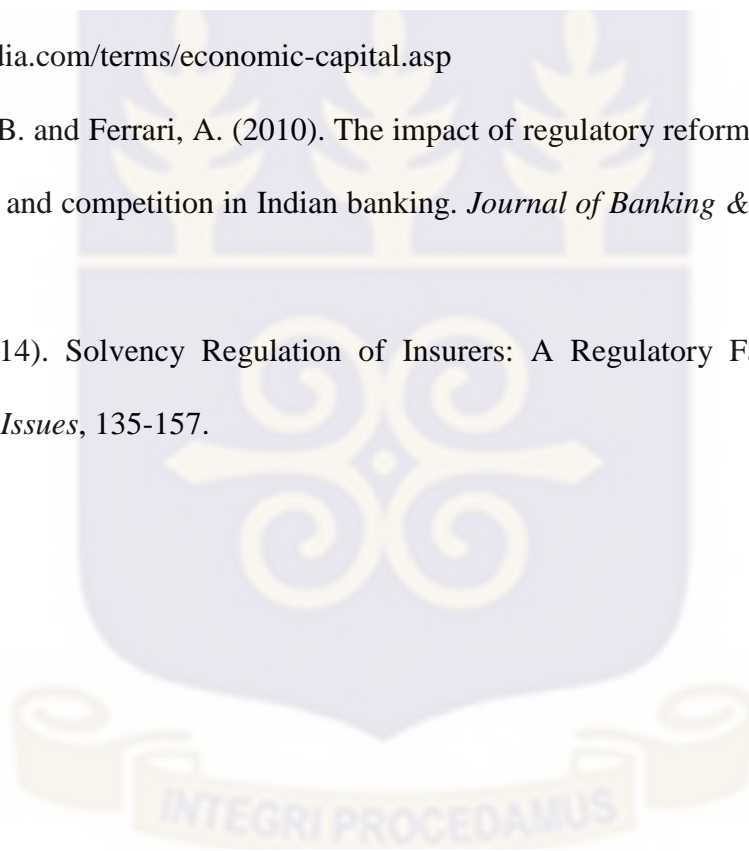
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APPENDIX**Table 1: Volume Based Solvency Requirement Applicable Percentages extracted from New Solvency Framework for life insurers (NIC, 2016)**

Type Of Business	Applicable Percentage
Universal Life and investment products (with and without capital guarantees)	5%
Group Life	15%
Term insurance	10%
Credit Life	12.5%
Whole of Life and Endowment Insurance	7.5 %
Dread Disease	15%
Annuities	15%
Total and permanent disability and income protection	15%
Other Products	20%

Table 2: CALCULATION OF ECONOMIC CAPITAL

CATEGORY	WEIGHT/ DISCOUNT	AMOUNT (GHS)
1) Ordinary share capital		62,507,221.86
2) Perpetual non-cumulative preference share capital		5,438,170.00
3) Contingency reserves		814,136.23
4) Income surplus		18,031,010.83
TOTAL CORE CAPITAL		86,790,538.92
6) Cumulative Preference share capital		
7) Unsecured subordinated loan capital		
8) Revaluation surplus on buildings and investments		
TOTAL NON CORE CAPITAL		-
TOTAL CORE AND NON-CORE CAPITAL		86,790,538.92
11) Income deficit		(6,629,745.17)
12) Deferred Acquisition Cost		
13) Other Intangible assets		376,544.20
14) Deferred tax assets		79,638.40
15) Participations in connected persons		2,245,302.00
16) Encumbered Assets		
17) Due from related parties		5,888,446.80
TOTAL DISALLOWED ASSETS		1,960,186.23
20) Government Bonds	0%	-
21) Bank of Ghana Securities	0%	-
22) Commercial papers	5%	-
23) Listed securities	15%	67,091.03
24) Unlisted Securities	30%	1,976,780.91
25) Mutual funds	10%	12,381.44
26) Investment Properties	20%	340,111.19
27) Land & Buildings	50%	

28) ICT	5%	-
28a) Property, Plant and Equipment	50%	677,286.28
28b) Other Assets	50%	37,999.09
29) Amount due from Agents & Brokers	25%	-
30) Amount Due from Reinsurers	10%	771.11
TOTAL RISK DISCOUNT		3,112,421.06
AVAILABLE CAPITAL RESOURCES		83,678,117.86
33) Universal Life (Long term savings)	5%	-
34) Group Life (mainly term)	8%	-
35) Term (Individual)	6%	133,025.90
36) Funeral	4%	-
37) Whole of Life	3%	370,818.22
38) Endowment	3%	-
39) Microinsurance	2%	-
40) Other	7%	-
41)TOTAL (VOLUME) SOLVENCY SURCHARGE		503,844.12
42)MINIMUM SOLVENCY CAPITAL REQUIREMENT		3,000,000.00
43) SOLVENCY CAPITAL REQUIREMENT		3,503,844.12
44) CAPITAL ADEQUACY RATIO (32/43)		4.19

TABLE 3 : LIST OF LIFE INSURANCE COMPANIES IN GHANA

NO.	LIFE INSURANCE COMPANIES
1	African Life Assurance Company Ltd.
2	A-Plus Life Assurance Company Limited
3	Avance Life Assurance (GH) Ltd. ... Formally Capital Express
4	Beige Assure Company Ltd. ... formally Unique Life
5	Donewell Life Insurance Company
6	Enterprise Life Assurance Company
7	Esich Life Assurance Company Limited
8	First Insurance Company Limited
9	Ghana Life Insurance Company
10	Ghana Union Assurance Life Company
11	Glico Life Insurance Company
12	GN Life Assurance Limited
13	Metropolitan Life Insurance Ghana Ltd.
14	Old Mutual Life Assurance Company (Ghana) Limited
15	Phoenix Life Assurance Company
16	Prudential Life Insurance Ghana Ltd.
17	Quality Life Assurance Company
18	Saham Life Insurance Ghana Ltd.
19	SIC Life Company Ltd.
20	Starlife Assurance Company
21	UT Life Insurance Company
22	Vanguard Life Assurance Company

SOURCE: NIC (2017)



TABLE 4: LIST OF NON-LIFE INSURANCE COMPANIES IN GHANA

NO.	NON-LIFE INSURANCE COMPANIES
1	Activa International Insurance Company Ghana
2	Allianz Insurance Company Ghana Limited
3	Best Assurance Company Limited
4	Donewell Insurance Company Limited
5	Enterprise Insurance Company Limited
6	Equity Assurance Company Limited
7	Ghana Union Assurance Limited
8	Glico General Insurance Company Limited
9	Heritage Energy Insurance Company Limited
10	Hollard Insurance Ghana Limited
11	Imperial General Assurance Company Limited
12	Millennium Insurance Company Limited
13	NSIA Insurance Company Limited
14	Phoenix Insurance Company Limited
15	Prime Insurance Company Limited
16	Priority Insurance Company Limited
17	Provident Insurance Company Limited
18	Quality Insurance Company Limited
19	Regency Nem Insurance Ghana Limited

SOURCE: NIC (2017)

TABLE 5: LIST OF REINSURERS IN GHANA

NO.	REINSURANCE COMPANIES
1	Ghana Reinsurance Company
2	GN Reinsurance Company Limited
3	Mainstream Reinsurance

SOURCE: NIC (2017)

Table 6: Sample table for finding average Ghanaian life insurance company

PRODUCT FEATURE/COMPANY	1	2	3	4	AVERAGE
NET PREMIUM					.	
NUMBER OF ACTIVE POLICY COUNTS						
MINIMUM AGE AT ENTRY						
PREMIUM AMOUNT						
MAXIMUM AGE AT ENTRY						
MINIMUM SUM ASSURED						
MAXIMUM SUM ASSURED						



RESERVE CALCULATIONS - TEF



RESERVE CALCULATIONS - WF



PROPOSED RISK BASED SUPERVISORY FRAMEWORK FOR INSURERS

INTRODUCTION

There have been considerable developments on the Ghana insurance market since the passage of the Insurance Act, 2006 (Act 724). These include a change in the nature of the risks and hence a change in the risk management practices of insurance companies. In addition, the international nature of insurance business has led to risks becoming more systemic, and insurance companies in Ghana have experienced some level of pressure to their liquidity, solvency and operations in the face of strengthened international standards and requirements for supervision

The Ghana Insurance Regulatory Authority (GIRA) has therefore adopted a risk-based supervision approach of its regulated companies, and put together a new legal framework to support this. A risk based supervisory framework has also been developed to guide this new approach to effective supervision vis-a-vis changes in the financial sector and in compliance with global trends.

The risk-based supervisory framework focuses on the understanding of the key activities and risk drivers, and the effectiveness of risk management processes and practices of an insurer. It also promotes the early identification and management of risks, and affords GIRA the opportunity to focus its supervisory attention based on the nature, scale, complexity and the risk profile of insurers. Hitherto, supervision was compliance-based which tended not to identify any future risks which insurers may be confronted with.

The Supervisory Framework

The Framework has been designed to help ensure effective supervision, regulation, monitoring and control of insurance business in order to protect the interest of insurance policyholders; to promote the safety and soundness of insurers; and to promote the stability, growth and development of the insurance industry.

It covers the guiding principles, the risk assessment concepts, and the core process that GIRA will use to guide its supervision of insurers in general. It however accommodates the unique aspects of life, non-life and reinsurance business.

Among others, it makes room for reliance on the work done by third parties such as external auditors and actuaries; provides regulatory risk ratings for each insurer, provides for the communication of findings, conclusions and recommendations to insurers in a confidential, clear and timely manner; provides that the level and frequency of supervisory action on an insurer will depend on the insurer's risk rating; promotes appropriate regulatory action in line with the risk profile of an insurer; pays more attention to finding out the effects of present and likely future events (both internal and external factors likely to impact the risk profile of insurers); and facilitates the development of standards and requirements that will inform best industry standards and practices for dealing with various risk levels.

The key benefits of the Supervisory Framework are that it allows for the systematic assessment of insurers' risks using a formalized framework at regular intervals; allows for the identification of insurers and areas within insurers where difficulties exist; encourages a strong risk management