UNIVERSITY OF GHANA

DETERMINANTS OF REINSURANCE DEMAND IN THE GHANAIAN INSURANCE MARKET

BY

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DECLARATION

I, Berlinda Brown, do hereby declare that, except for references to people's work, which I have duly acknowledged, the study herein presented is the first of its kind to be submitted to the University of Ghana Business School (UGBS) under the supervision of Dr. Agyapomaa Gyeke-Dako and Dr. Eric Ofosu-Hene.

I am solely accountable for any errors encountered in the course of writing this thesis.

…….. ……

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CERTIFICATION

I hereby certify that this long essay was supervised in accordance with procedures laid down by the University of Ghana. The work has been submitted for examination with our approval as supervisors.

……..…….. ……

DR. AGYAPOMAA GYEKE-DAKO **Date**

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(Co-supervisor)

DEDICATION

This work is dedicated to the glory of the Lord Almighty, who makes all things possible, and to my parents and siblings for giving me the emotional support and advice that I needed throughout my program.

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LIST OF ACCRONYMS

AGR	Annual growth rate
BCD	Business concentration and diversification
BoG	Bank of Ghana
BPT	Breusch Pagan LM Test
CAGR	Compound Annual Growth Rate
CAPM	Capital Asset Pricing Model
CPI	Consumer Price Index
FE	Fixed Effects
GDP	Gross Domestic Product
Gh	Ghana
GP	Growth in premium
HT	Hausman Test
IN	Interest
INF	Inflation
LEV	Insurance Leverage
LIQ	Liquidity
NIC	National Insurance Commission
NY	Number of years of operation
OLS	Ordinary Least Square
OS	Ownership structure
PBIT	profit before interest and taxes
RAO	Return on assets
RE	Random Effects
SIZE	Size of insurance firm
SM	Solvency margin
TA	Total Asset
UR	Underwriting risk
VIF	Variance Inflation Factors

ABSTRACT

This study examined the nature and determinants of reinsurance demand by insurance companies in Ghana. Data gathered from financial reports of insurance companies and macroeconomic variables from the Bank of Ghana database for a period of 7 years (2007-2013) was analysed using the panel random effect regression. The study found firm size, underwriting risks, insurance leverage, profitability and solvency margin to significantly influence reinsurance demand by insurance companies in Ghana. Macroeconomic variables as well as ownership structure, number of years, growth in premium, liquidity, business concentration and product diversification were found not to be a significant factor in reinsurance demand. Based on the study findings, the study recommended that insurance companies, policy makers, regulators, and insurance analysts take the issue of reinsurance with much importance.

Keywords: *Reinsurance, return on assets, underwriting risk, annual growth rate, liquidity, ownership structure, Ghana.*

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Reinsurance has attracted much attention in academic research; increasing the volume of empirical studies on the demand for reinsurance by insurers. In recent years, the number of empirical researches on demand for reinsurance coupled with studies on market failures, information asymmetry and poor regulatory measures in corporate practice and academia is increasing (Werner, 2014). The issue of reinsurance has resulted from great losses attributive to increases in claims on the global insurance markets and major losses that have posed threats on firm survival and financial well-being of the insurer, the insured and uninsured (Dean, 2004; Adams, M., Andersson, J., Andersson, L., & Lindmark, M.,2012).

Attributive to the rampant insolvencies occurring in the insurance industry is the unanticipated claims of huge sums which sweeps all accumulated surplus of over the period. In an attempt to mitigate the probability of insolvency, insurance companies embark on equity accumulation, or strive to reduce volatility associated with claim. They acquire reinsurance in order to create adequate level of solvency. The numerous cases of bankruptcy confronting most insurance companies within the industry (Cummins, Dionne, Gagné, & Nouira, 2008; Werner, 2014) has indeed aroused great attention and interest in the area of reinsurance demand.

Reinsurance according to Kader et al. (2010) on the surface is a mere extension of the key concept of insurance that further transfers risk of the primary insured to another insurance company or a

reinsurer. It is a mechanism employed in transferring the already insured risk to another insurer, technically referred to as the reinsurer (Plantin, 2006). This means that an insured as an individual or corporate body will insure risks (on accident, travel, properties, life etc.) with an insurer and then the insurer now having an insurable interest in the contract insures that interest with a reinsurer (Adams et al., 2012).

The amount of insurance premiums collected from the insured and kept by an insurer is known as retention, and the amount transferred to a reinsurer is known as cession. The reinsurance may come in the form of ceding of all or some portion of an insurer's assumed underwriting risks to another insurer (reinsurer so named). In this case, the primary insurer is entitled to or receives a share of gross annual premiums written under a treaty or single contract (Werner, 2014). This may be classified as treaty reinsurance. Another form of reinsurance is facultative reinsurance where the ceding company buys or contracts reinsurance for each risk they insure from their consumers (Venezian, Viswanathan, & Jucá, 2005.).

On the global scale, the reinsurance industry is dominated by firms such as Munich Re (Germany) which is the leading reinsurance firm with a total capitalization of $37 billion underwritten gross insurance premiums; this is followed by Swiss Re with a total of $31 billion underwritten gross insurance premiums and Africa Re which is not part of the top ten reinsurance firms in world but the largest re-insurer in Africa had a total amount of underwritten gross premiums of $0.7 billion as at 2012 (Mendoza, 2014).

The Ghanaian insurance industry is experiencing great growth potentials in terms of premiums (income) received and claims (expenses) paid (Abor, 2007; Ansah-Adu, Andoh, Abor, 2012; Akotey and Abor, 2013; Akomea-Frimpong, Andoh & Ofosu-Hene, 2015), therefore the need for reinsurance to support the survival of insurance companies in Ghana. Attributing to increases in gross written premiums over time, the insurance industry in Ghana has been affirmed to be among the fastest growing in Africa (Timetric, 2017), in terms of incurred loss, loss ratio, commissions and expenses, combined ratio, total assets, total investment income and retentions.

In terms of gross written premium, the Ghanaian insurance industry experienced growth of approximately 30.4% in compound annual growth rate (CAGR) in 2013 with the life and non-life insurance segment contributing 37.1% and 27.7% in CAGR per annum respectively. With the passing of the new insurance law 2006, the National Insurance Commission (NIC) separated life operations from non-life separations with the objective of strengthening the insurance sector. The improvement in performance therefore could be attributed to the passage and effective implementation of the new insurance Act which has resulted in significant changes in the operations and infrastructure of the industry.

Significant in these changes also is the massive increase in the number of registered insurance companies to 42 in 2007 from a previous of 25 in 2006, representing about 68% increases in a year (Barnor & Odonkor, 2013). Since the introduction of this act, from 2006 to 2009, the average annual growth was approximately 30% with life segment being responsible for the majority development. In 2003, the share of gross insurance premiums was 80.12% for non-life insurance as against 19.88% for life insurance business. In the share of life-insurance business of premiums

increase over the year, against the share of non-life insurance; that of life insurance increased to 42.99% with non-life falling to 57.01% by end of 2011. This reflects the growing importance attached to the life insurance sub sector (Latif & Fiador, 2014).

On the other side, growth in the energy sector has helped nudge expansion in non-life segments. 21 non-life members of Ghana Insurance Association formed a consortium in 2009 to cover risks for the oil and gas industry which are taking a small proportion of the overall risk. This move has helped further the country's aim of developing the economy and underscored Ghana's ambitions.

Currently, the non-life sub sector however, continues to dominate in the Ghanaian insurance industry with 48.8 % in total gross written premium in 2013. The life subsector follows with 43.6% share, followed by personal accident and health insurance with 7.6% share (Timetric, 2017; National Insurance Commission, 2014). In comparison with Africa, the Ghanaian insurance industry grew at a CAGR of 30.4 per cent between 2009 and 2013, as compared to Chad with 2.3 per cent, Cote d'Ivoire with 3.9 per cent, and Cameroon with 9.4 per cent and Uganda with 18.8 per cent. Ghana's insurance industry is expected to experience a growth of 23.0 in CAGR in 2018 with support from oil and gas production, an increase in gold production, and the implementation of compulsory fire insurance for commercial buildings (Timetric, 2017).

Judging from the insurers' point of view, the rising demand for insurance products may seem to boost increased revenues from risks underwritten (gross premiums) but this will come with huge losses in terms of claims payments which may be a headache for the insurer thus the need to demand for reinsurance to ease losses.

1.2 Research Problem

The importance of reinsurance to the sustainability of an insurance company cannot be overemphasized considering its role in reducing the risk exposures of the insurance companies. Reinsurance is a sensitive area that has attracted numerous studies on its relevance (Mayers & Smith, 1990; Adams et al., 2012; Werner, 2014). Empirically, Mayers and Smith (1990) first tested the theoretical hypotheses underlying the demand for reinsurance.

Adiel (1996) finds the importance of reinsurance as a strategic finance mechanism to increase insurer capital and earnings and to reduce regulatory costs. Lee and Lee (2012) analysed the effect and magnitude of effect of economic and firm specific determinants of retention decisions of insurers of property liability in Taiwan. Employing factors within the insurers and the reinsurance industry, Curak ,Pervan and Kramaric (2014) examined how these factors affect reinsurance decisions of insurance firms. Results from Curak et al. (2014) showed that demand is influenced by firm profitability, extent of product diversification, cost/price of reinsurance, loss volatility and the financial strength of reinsurers. But the study concluded that this is not exhaustive factors that affect the demand for reinsurance products. Also, some insurance papers (Plantin, 2006; Cummins et al., 2008; Adams, Lin, & Zou, 2011) looked at reinsurance but did little on the factors affecting the demand for reinsurance.

Theories on firm characteristics have been usually related to firm performance and only a few has been done on reinsurance demand (Lee & Lee, 2012; Kaguguri, 2013; Park, 2015). The determinants of reinsurance demand have been studied in corporate finance literature from the last several decades but none has considered looking at it from the life insurers' point of view (Garven

and Tennant, 2003; Burca & Batrinca, 2014; Curak et al., 2014; Werner, 2014). These studies have generated mixed results ranging from those supporting a positive relation to those opposing it.

Also, research papers conducted on this topic have concentrated on the factors that affect the demand for reinsurance products in insurance industries in the developed countries with little studies in developing countries, particularly Africa. Review of literature show no evidence of documented study in Africa on reinsurance demand as at 2015. In Ghana, few published papers exist on the insurance industry (Abor, 2007; Adu-Ansah et al., 2012; Akotey and Abor, 2013). The need for reinsurance products in practice and research in academia in Ghana has become a concern for the players in the insurance industry since only 35% (GH 204 million out of GH 583 million) of life insurance premiums collected in 2013 were insured (Adombila, 2014) leaving room for about 65% uninsured gross premiums by reinsurance companies in the Ghanaian insurance industry as compared to South Africa with 78.6% which indicates that reinsurance in Ghana remains untapped to enable it compete with giants like Munich Re and Africa Re.

Review of empirical literature justifies the importance of reinsurance within the insurance sector of economies. Increases in the business nature of insurance sector and the increase demand for insurance, coupled with the relevance of risk sharing has aroused interest in the area of reinsurance and its determining factors. Other key motivator of this current topic is the development in the insurance sector which includes the separation of life from non-life insurance businesses and the increases in the capital requirement for insurance firms by the National Insurance Commission (NIC). First, the separation of life business from non-life weakens the financial capacity of each category; coupling this with the new capital requirement makes this topic crucial.

It is therefore imperative to investigate and expose the various determining factors of reinsurance purchase by insurance companies in Ghana and also examine the nature of reinsurance within the context of Ghana. The current study will therefore adopt studies by Burca and Batrinca (2014) and Curak et al. (2014) to develop a framework to examine the effect of insurance-specific and some macroeconomic variables on reinsurance demand in Ghana.

1.3 Research Objectives

The general objective of this current study is to determine the factors that affect the demand for reinsurance in Ghana. The objectives of the study are to:

i) Examine the trend in reinsurance demand by insurance companies in Ghana.

ii) Identify the determinants of the demand for reinsurance in Ghana.

1.4 Research Questions

Following from the study objectives, the current study seeks to address the research questions as follows:

i) What is the trend in reinsurance demand by insurance companies in Ghana?

ii) What determines how much of insurance risk portfolio are ceded to reinsurers in Ghana?

1.5 Significance of the study.

This current study which sought to examine the determinants of reinsurance in Ghana is very significant to all stakeholders within the insurance industry; from the insurance and reinsurance companies to other stakeholders which include the government and policy agents as well as the insured. Findings from the study will present a picture of the nature of reinsurance in Ghana over

time, the emerging flow trends, and associated challenges on factors that affect the reinsurance demand which are of key essence to all stakeholders in Ghana.

Findings from this study will serve as a policy direction for the National Insurance Commission (NIC) and other stakeholders within the insurance industry in order for them to be able to better understand the dynamics in reinsurance demand and better appreciate the system and come out with proactive and feasible policies if need be. This will help the policy agencies in policy formulation that will aid in regulating the relationship between the reinsurance contracts ceded and the risk borne by insurers in Ghana. Findings from the study will also assist insurance regulators in addressing pertinent issues relating to the challenges associated with key factor of reinsurance demand in the country.

Also, the current study makes significant contribution to literature by documenting the situation of reinsurance in Ghana. The study will serve as a point of reference for further studies on insurance in Ghana and beyond, and also arouse interest in linking areas of research.

Findings from the study again does not only benefit NIC but will also serve as a guide to both insurers and reinsurers. Thus, findings from the study will expose the nature of reinsurance demand and how they are influenced by various firm and industry-specific variables, as well as macroeconomic factors. This will aid insurance companies make informed decision on their reinsurance demands whiles helping reinsurance companies better understand the rationale behind their clients' demands.

Finally, the individual insured or the insured companies will have a better understanding of the chain of plausible activities their premiums go through. A better understanding of the fact that even insurance companies reinsured in other to share their risk and share costs put them in a better position to evaluate the importance attached to their insurance contracts.

1.6 Scope of the Study

This study is limited to the insurance companies in Ghana. According to the Insurance Act, 2006 (Act 724), the insurance companies in Ghana comprises the non-life and life insurance firms. There are only three (3) reinsurance companies in Ghana (Ghana Re, Mainstream Reinsurance Company, and GN Reinsurance Company). The management, staff or employees, and insurance agents are all part of an insurance company. Together, these firms constitute the scope of the study and it is basically focused on the factors that determine the demand for reinsurance by the life insurance companies in Ghana.

1.7 Organisation of the Study

This current study is organized in five chapters. The first chapter introduced the study by providing a background to the study. It also defines the research problem, outline study objectives and associated research questions. The significance as well as the scope of the study is also explained in the first chapter which is concluded with an organization of the entire study outlining briefly the content of the preceding chapter. The second chapter provides a thorough review of both theoretical and empirical literature within the study area. Relevant theories are reviewed together with a review of previous studies and the result generated therein. Chapter three describes the methodology to the study. It describes the approach to sampling and data collecting as well as the

approach leading to data analysis and discussion. Chapter four entails the analysis of data, results presentation and discussion. The discussion of study findings will be done and discussed in relation to reviewed literature. The last chapter, chapter five concludes the study by proving a summary of study findings, implications of study findings (conclusion) and make constructive recommendation based on findings.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter of the study undertakes a review of relevant literature within the study area. The review focus on both theoretical and empirical literature. This is undertaken to explore the depth of research within the study area and also make a case for which study findings will be discussed. This chapter covers the nature, definition, types and purpose of reinsurance; Ghana's Insurance Industry, theoretical and empirical review on determinants of reinsurance.

2.2 Definition, Nature, Types and Purpose of Reinsurance

2.2.1 Reinsurance

Reinsurance is considered as a traditional and efficient risk management tool and is also the primary source of interconnection within the insurance industry (Cummins, Feng, & Weiss, 2012); serving as an effective substitute for capital in mitigating the primary insurer's risk bearing probability, hence reducing the possible cost of bankruptcy and financial distress (Garven and Tennant, 2003; Werner, 2014). It represents the most appropriate solution for insurance companies as it helps in the dispersion of risk, achievement of solvency requirements, levelling of risk profile and growth of underwriting capacity (Burca & Batrinca, 2014). In practice, it is the act of an insurance company or insurer, usually referred to as the primary insurer seeding part of its insurance contracts or underwritings to another insurance company or reinsurance for protection or cover against possible occurrences with the aim of averting or sharing these risks.

2.2.2 Nature of Reinsurance

Reinsurance is a global business by nature. Coined from insurance, reinsurance has become a very important aspect of the insurance industry (Curak et al., 2014). The contact between an insured

and the insurance company defines an insurance policy. The insured, also called the policyholder, can receive coverage depending on need. Insurance is usually divided into the product categories non-life insurance and life insurance. Non-life or general insurance protects the policyholder from loss derived form a specific risk. Examples of general insurance include property, health & disability, and commercial insurance.

In life insurance, the insurance company (insurer), pays a sum of money to a beneficiary (not necessarily the policyholder) in the event of death of the insured person (Lee & Lee, 2012). The proceeds can be paid as a lump sum or periodically (annuity). The life policy can be specified in numerous fashions, but usually fall into one of the two categories: protection or investment. The insured pays the insurer for taking the risk (expected cost of losses). This payment, plus additional costs, e.g., administration, etc connected to the policy, can be paid as a lump sum or regularly over time premium.

The nature and scope of reinsurance has evolved over the past 20 to 30 years. Reinsurance now operates in a broader scope. Its operation extends to the macro-level where the spread of risk is not limited between companies but also extends beyond countries and regions. The relationship in the reinsurance market was originally based on a "Gentlemen Agreement" where loyalty and trust played a key role. Recent changes in the market has influenced the relationship which is currently based more on the execution of contracts and the judicious performance of contract obligations and rights (Adams et al., 2011). This has come as a result of the rapid changing economic environment. The nature of the industry has evolved tremendously to a current state where cedants

usually assume only 5 to 10 percent of total risks insured from its previous nature where cedants assumed all or most of the risks.

In the ordinary situation, individuals and corporations who are exposed to risks purchase an insurance policy which indicates the intent of risk transfer to a cedant or insurer. In assuming the risk of an insured, the insurer or insurance company charges a fee, known as insurance premium. The insurer in turn, upon assuming excess risk, or with the intent of sharing risk and reducing its risk of failure transfers part of these risks to a reinsurer or a reinsurance company who also assume the transferred risk at a fee. Cummins (2008) posit that it is unusual for a single insurer or company to assume the responsibilities of all the risks associated with insurance contracts, hence the need for risk allocation. This situation produces two contracts; the initial contract between the insured and the insurance company, and the reinsurance contract. Thus, upon conclusion of an insurance contract with the initial individual or entity effecting the contracts of risk transfer, the cedant further share part of this risk with another insurer (insurance company) or a reinsurer (reinsurance company).

As was mentioned above reinsurance is a global business that spreads out capital through large geographical areas. Due to this fact, reinsurance could also spread the risk and losses over large territory without concentrating it in one place. That is why, all insurance companies buy reinsurance in order to protect themselves from different risks against which they provide insurance to their clients (Mayers & Smith, 1990). However, the purpose of reinsurance is not only to protect, but also to provide capacity to an insurer to cover risks that they would not be able to cover without reinsurance. The objective of reinsurance is risk sharing. Implicitly, reinsurance

contracts do not eliminate or reduce losses, rather, it reduces the risk incidence on the insurer who is then able to better absorb the material consequences of the risks.

2.2.3 Types of Reinsurance

Various type of reinsurance has been identified and explained in insurance literature (Cummins, 2008; Mayers & Smith, 1990; Adams et al., 2012). These reinsurance contracts can be grouped under two main types; facultative and treaty reinsurance. Under the treaty reinsurance are the proportional reinsurance, non-proportional, and excess-of-loss reinsurance among others.

2.2.3.1 Facultative reinsurance

A facultative reinsurance defines an insurance policy between an insurer and a reinsurer that entails the coverage of specific risks, individuals, or contracts. Thus, in a facultative reinsurance contract, the policy does not extend beyond the risk specified in the contract such that there is renegotiation of separate contracts given that several contracts or risks require reinsurance (Mendoza, 2014). This means that any additional contract must go through different negotiations in order to be signed for reinsurance. One feature of a facultative reinsurance is the ability of the reinsurer to turn down a new reinsurance proposal that is facultative in nature. The right of acceptance of denial of a facultative reinsurance contract lies within the powers of the reinsurer.

The facultative nature of this reinsurance type is in the number of possible companies that can cover the contract. The policy can be covered by multiple insurance or reinsurance companies with the level of risk to be covered decided by the ceding company. According to Gary (2001), a

facultative policy reinsures one major policy. Similar to the ordinary insurance underwriting by individual insureds, a facultative reinsurance underwrites and assume risk policies individually.

2.2.3.2 Treaty Reinsurance

A reinsurance treaty according to Gary (2001) is a direct agreement between the insurance company and the reinsurer where the former agrees to cede and the later accept cession within an agreed or pre-determined limit in terms and contract duration. In a treaty reinsurance agreement unlike the facultative type, the reinsurance company or the reinsurer contract to assume all of a particular risk type from the ceding insurer (Adams et al., 2012). Thus, the primary insurer or ceding company advances to cede certain type or class of business to the reinsurer. In turn, the reinsurer consent to all business qualifying under the agreement, often referred to as treaty in this context. This contract is such that it assures the ceding company that all the business qualifying under the treaty will be reinsured in accordance with the contract terms.

2.2.3.3 Proportional Reinsurance

In proportional reinsurance type of reinsurance treaty, a prorated amount or share of the premium is received by the reinsurer on all the policies underwritten or sold by the insurance company it is covering under the reinsurance policy. Consequently, the reinsurer bears a portion of the losses when claims are declared by the insurance company. Thus, the reinsurance company and the insurance company share in the premium and losses arising out of the contract on an agreed percentage (Venezian et al., 2005).

With this type of treaty reinsurance, the sums incurred (liabilities) are shared among the primary insurer reinsurer in a clearly and some contractually agreed proportion as describes within the underlying treaty. Not only are risks shared proportionally among these two parties, but also claims and premiums are also shared in accordance to the respective share of the risks.

2.2.3.4 Non-proportional Reinsurance

The non-proportional type of reinsurance coverage only obliges the reinsurer to intervene when the loss befalling the insurance company exceeds a certain agreed amount or threshold. This amount, referred to as the retention or priority limit is usually based a particular or single risk type or on an entire risk of a particular business category. Implicitly, the reinsurer does not assume proportional share in the losses and premiums of the insurance company (Venezian et al., 2005).

2.2.3.5 Excess-of-Loss Reinsurance

The excess-of-loss reinsurance is a form of non-proportional reinsurance where the reinsurer only assumes losses that fall in excess of the insurance company's retained limit. Thus, as far as the losses occurring falls within the retained limits of the insurance company, the reinsurance company assumes no risk and does not share in the loss therein. The application of this type of risk to catastrophic events reveals its uniqueness. This type of policy depending on the agreement between the two parties could obligate the reinsurance company to assume risks on a per occurrence basis or the sum of all losses occurring within a stipulated period under the policy.

2.2.3.6 Risk-Attaching Reinsurance

Also known as the claims-made contracts, a risk-attaching reinsurance obliges the reinsurance company to assume all the claims arising and established during the effective period of the policy. This type of treaty reinsurance does not take into consideration the time in which claims are made. They cover all claims even when the losses occurred outside the coverage period. However, no coverage will be advanced on claims that generate outside the coverage period.

2.2.3.7 Loss-Occurring Coverage

In the loss occurring reinsurance policy, losses are covered for all claims made during the contract period, irrespective of the time of inception of the underlying policies. However, the claims obligations of the reinsurance company do not extend beyond the contract expiration date. That is, losses occurring after the lapse of the policy are not covered by the reinsurance company in this type of reinsurance. Contrary to the risk-attaching policy, the time of occurrence of the losses rather that the time claims are made is of key essence in a loss occurring reinsurance contact.

2.2.4 Purpose of Reinsurance

Reinsurance is defined under two main fundamental function that relate to the risk incidence of insurance companies. The purpose of reinsurance hence is in two folds; first, to allow the insurance company some leverage to share its risk by passing on or laying off part of its liabilities from an insurance to another insurer, and second, to insure an insurance company or underwriter against risks of high loss from its business operations

Traditionally, reinsurance companies or reinsurers are identified to serve the following basic purposes as:

i. reinsurance increases the underwriting capacity of direct insurers/cedants to accept risk. Underwriting capacity can be understood as maximum gross amount of risk that the insurance company is able to accept;
ii. it promotes financial stability for cedant. An insurer can avoid being solely responsible for large claims or claims that arise simultaneously because reinsurer usually accepts some part of the consequences of losses;
iii. reinsurance can strengthen the solvency of an insurer/cedant. However, there is no absolute security against bankruptcy and reinsurance is just an instrument that can help the company reduce the possibility of destruction;
iv. it allows countries without highly developed insurance market to easily spread their losses internationally;
v. reinsurance is useful mechanism for overcoming regulatory problems.

In addition, the basic purposes served by reinsurance companies produces some benefits in the insurance industry. These benefits include but not limited to the following; reduced volatility of underwriting results, capital relief and flexible financing, access to reinsurer's expertise and services, especially in pricing, and underwriting and claims management.

So, it could be stated that the main benefits of reinsurance for insurers are financial flexibility, stabilization of underwriting results. As could be seen the reinsurance is important for both – reinsurers and customers. For reinsurers because it gives them the opportunity to accept large risks

which they could not bear themselves and for customers because without reinsurance an insurer could not offer their service to such extend.

2.3 Reinsurance in Ghana

Reinsurance in Ghana is one of the fundamental authorities in the financial sector, particularly, the non-bank financial institutions. Ghana Reinsurance Company, Mainstream Reinsurance Company and GN Reinsurance Company are the three known reinsurance companies of local decent in Ghana. Until the advent of GN Reinsurance, Ghana Reinsurance Company and Mainstream Reinsurance Company enjoyed duopoly.

In Ghana, Ghana Reinsurance Company (Ghana Re) maintains 60 percent reinsurance market as at December, 2015. The company is the leading international reinsurer in Ghana with its international business constituting 33 percent of gross premium while the remaining 67 percent is accounted for by the local market of the reinsurance sector. According to online source from the GhanaWeb, Ghana Re is said to require an amount of approximately US$63 million in capital in order to meet global competitiveness in the manufacturing, and the oil and gas sector.

2.4 Market Trends in the Ghanaian Insurance Industry

In Ghana, the authoritative body mandated to oversee insurance issues is the National Insurance Commission (NIC). The Commission is charged with the sole mandate to regulate the insurance industry by undertaking effective administration, supervision, regulation and control of the sector as stipulated in Insurance Act 2006 (Act 724). The establishment of the NIC was promulgated by the 1989 Insurance Law PNDC Law 229 and is currently the official regulatory document under which all other insurance operations and undertakings in the country are subjected to.

The role of the insurance industry in the financial transformation of the Ghanaian economy over the past years cannot be underemphasized. According to Akotey and Abor (2013), the industry has made impeccable progress and over the past 10 years have been able to impose its presence in the area of life insurance. This has come as a result of the introduction of the Insurance Law 2006 (Act 724) which was passed in the year 2006. One key contribution of the new law is the distinction between life and non-life insurance by separating the operation of these two form of insurance companies.

The life insurance market had experienced tremendous growth over the past 5 years following the introduction of the new law. The sector has also seen increases in the number of life insurance companies as well as businesses within the area.

Before the introduction of the new Insurance Law which distinguished the business of non-life and life insurance companies, the insurance industry in Ghana comprised fifteen insurance companies out of which five, namely Ghana life, GLICO Life, and Enterprise Life Assurance Company (ELAC) specialised in the provision of life insurance. These companies consequently become the top premium income earners, accounting for a greater share of premium incomes generated within the industry.

The number of life insurance companies saw increases from a previous of 19 to 21 representing 11% increase. The companies operating within the insurance business as at 2009 included Quality Life, GLICO Life, IGI Life, Ghana Union Life, Capital Express Life, CDH Life, Unique Life, Express Life, Star Life, ELAC, SIC Life, Provident Life, Vanguard Life, Phoenix Life, Ghana

Life, Metropolitan Life Ghana, Ghana Life, and Donewell Life among others. The ownership stood at about 71% and 29% of local against foreign ownership. IGI Life, ELAC, Ghana Life, Capital Express, and Metropolitan Life constitute the foreign owned companies. Income from Life Assurance premiums amounted to GHS 122,275 in 2014 showing a 34% increase from its previous of GHS 91,245 in 2009 (Duodu, & Amankwa 2011). Management expenses for the same period also shot up to GHS 49,691 from GHS 35,014 representing a 41.9% increase. The net premium recorded 33.3% increase for the period (GHS 89,801 in 2009 and GHS 119,708 in 2014) whilst claims recorded a 38.3% increase.

PwC Ghana (2015) posited that the growth potential of insurance in Ghana is huge for both life and general insurance, although the industry is faced with some peculiar growth-hampering challenges. There is stiff competition in the market and with increasing demand for insurance product which are not entirely satisfied by the insurance companies. Other challenges include product development, policy under pricing and the underwriting losses made by most insurance companies resulting from bad debts; the essence of the Ghana Reinsurance Company (Ghana Re) which was set up and mandated to receive 20% premium in legal cession as reinsurance and to also help absorb or mitigate risk impacts arising from catastrophes.

2.5 Theoretical Review

This section of the literature review looks at well-established theories in literatures which are related to the issues being looked at in this study. Among these theories are the agency theory, the expected utility theory, portfolio theory, and the signalling theory.

2.5.1 Agency theory

The agency theory as applied in insurance and the law of contract is the belief that rationalise the relationship between the parties to a contract agreement; the principal and the agent. According to the theory, parties to an insurance contract have different incentives as well as different level of risk aversion which eventually develops into conflict or moral hazard problems. The challenges resulting from agency contracts or relationships is termed the agency problem. Jensen and Meckling (1976) explained this relationship as a 'nexus of contracts' that exists generally among factors of production in the modern corporation.

In every contacting situation, the agency theory assumes rationality of all parties to a contract who are naturally aim at pursuing their self-interested wealth maximizing objectives. Due to the possible agency problems resulting from principal-agent relationships, there has been various governance and contracting mechanisms created to ensure that incentive conflicts between agents to a contract are (re) aligned.

Reinsurance or insurance has been argued by several authors (Garven & Tennant, 2003; Curak et al., 2014) as a key contracting approach in finance that not only hedge against risk loss but also binds managers to act effectively and efficiently in the best possible manner that protects the economic interest of fixed claimants and optimises the shareholder's value. A number of factors influence management decisions in line with reducing the agency problems associated with insurance contracts. They include the underwriting risk, insolvency risks, and the agency problem.

2.5.1.1 Underwriting risk

Despite the effect of transfer of underwriting risks on the level of expected annual earnings and on owners' wealth, primary insurers or insurance companies engage in the transfer of risks to third parties, supposedly other insurance companies or reinsurance companies. According to Adams (1996), one of the main reasons is that the transfer of underwriting risks to third party insurance companies enhances the primary insurer's capacity to underwrite more risk and also undertake other insurable risks. This goes a long way to help enhance the underwriting capacity of the firm and also aid in maximising owner's values. Hence, it is likely for primary insurance companies with less risky policies to demand less reinsurance relative to insurers with higher underwriting risk who are likely to acquire greater reinsurance coverage.

This is due to the role of reinsurance in mitigating the negative effects of mispriced assumed risks, unanticipated losses, and volatility in earnings. Certain risks in the market for non-life insurance such as natural disaster and macroeconomic shocks are highly uncertain. The timing, magnitude and intensity of losses of these environmental disasters are highly uncertain, hence require risk sharing in order to lessen the risk incidence upon occurrence. In this vein, Mayer and Smith (1990) remarked that reinsurance contracts are effective ways of easing the incentive conflicts in agency contracts between the policy holder on one side and the insurance managers and shareholders on the other side; the former whose main focus is the financial welfare of the insurer, and the later who interest is to enhance firm value through increased market shares and business growth.

Due to the agency problems such as moral hazard and adverse selection, and the problem of information asymmetry, insurance companies that are operating in non-life line of insurance such

as property fire, and car accident insurance especially are more likely to acquire reinsurance with the aim of reducing loss exposure in order to enhance their underwriting capacity which in turn will help value creation for its residual claimants. Implicitly, a firm with higher underwriting risk will acquire more reinsurance given the agency problem.

2.5.1.2 Insolvency risk

The likelihood of an insurance company's incapability to meet its financial obligation has also been argued to be one of the major reason behind reinsurance. Insolvency risk is the risk associated with the possible inability to meet debt or financial obligations. Reinsurance has been argued by most researchers (Mayers and Smith, 1990: Berger et al., 1992) to aid primary insurance companies to be able to handle issues related to insolvency risks by reducing financial distress and their expected cost of bankruptcy. This reduces the effect of unanticipated and severe economic shocks on cash flow that may result from major disasters.

The arrangement to hedge against possible unexpected catastrophic events through reinsurance provided the insurance company is not disrupted and also assure continuity of the business. This helps the company to also protect against its assets and also maximise traded market value by protecting against future cash flow volatility (Plantin, 2006).

Insurance companies with high leverage can also mitigate the agency problem of asset substitution and underinvestment by acquiring reinsurance (Mayers & Smith, 1990). Hence, the greater the probability of damage with its associated high cost of bankruptcy and financial distress, the greater the demand for reinsurance by the insurance company. This aspect according to Adiel (1996)

enables less capitalised and relatively smaller firms to assume risk of greater amount and provide coverage than would have otherwise done due to the fact that reinsurance acts as a substitute for equity capital.

With reinsurance, small scaled insurance companies are able to fairly and successfully compete with large firms who are relatively stronger in finances (Garven & Tennant, 2003). It provides smaller firm with the confidence to assure market investors, regulators and financial analysts of the surety of their financial security in the event of unexpected losses (Plantin, 2006).

2.5.2 Expected Utility Theory

Advanced by Von Neumann and Morgenstern (1953), the expected utility theory hypothesises that investors are utility maximising seeking risk-averse. This implies that the rational investor who is risk-averse is expected to do either of these two things; minimise losses or risk at a given level of return, or to maximize returns at given risk level. This trade-off between risk and return is one of the foundational feature in the expected utility theory, with the risk aversion nature of the individual investor explaining the demand for reinsurance by individuals and firms.

Given that individuals have some level of expected utility from their economic decisions, the expected utility theory provides a theoretically feasible argument that provides a better understanding of the operation of the insurance market. This framework has been adopted by studies in an attempt to explain the relationship existing between the parties to an insurance contract, in which case the insurer is usually assumed to be a risk-averse company in search for opportunities to trade on the insurance market. Within the framework of the utility maximisation,

two key approaches have been identified in literature to examine reinsurance (Eden & Kahane, 1988). The first approach according to Eden and Kahane (1988) purports that the existence of reinsurance is for the purpose of loss sharing management between the insurer and the reinsurer. The second approach on the other hand views the existence of reinsurance as a risk-sharing mechanism employed in the allocation of risks underwritten.

Common to both views is the even distribution of all claims and the fact that all companies employ their individual utility functions in evaluating their risk portfolios. An optimal reinsurance situation (i.e. proportional or non-proportional) can be realised given these two assumptions and the alternative approach postulated by Eden and Kahene (1988). This theory explains the rationale of individual firms for purchasing reinsurance, with the main focus rooted in the utility functions of individual reinsurance seeking companies.

2.5.3 Portfolio Theory

The portfolio theory of risk was developed by Markowitz (1952) basing on the behaviour of the individual investor. Similar to the theory of expected utility, the portfolio theory also assumes rationality of the individual and that the individual investor is a risk-averse utility maximize. They seek to optimize their own utility, however, in a consistent and transit way. The theory also assumes a market that is characterized with free frictional cost such that the market is free of taxes or transaction costs. This rational individual who also holds asset with varying degrees of risk and in search of an optimal or efficient portfolio. The rational consumer seeks to maximize his expected returns at a given risk level or minimise cost for some constant returns. Hence the individual

investor, just like the primary insurance company will select the portfolio choice or combinations that produces the maximum utility possible.

This theory therefore explains how insurance firms operate in their corporate risk management through various forms of diversification, a strategic mechanism which include reinsurance (Ryan, 2007). He posits that one of the effective ways of measuring or calculating the expected returns on an investment or security based on its risk level is the use of the capital asset pricing model (CAPM).

Consistent with the portfolio theory is capital structure theory of Modigliani and Miller (1958) and the CAPM. The portfolio theory just like the expected utility theory also explains the operation of insurance companies in their asset diversification through reinsurance which is undertaken with the aim of reducing future impact on the financial strength of the company in the event of major occurrences that have the possibility of crippling their finances and also incapacitating them financially from meeting claims obligations. The rationale is that insurance companies will rather seek a risk sharing mechanism that would ensure financial security whilst enhancing their underwriting capability.

2.5.4 Signalling Theory

The signalling theory is based on the assumption of information asymmetry between the insurer (the insider) and the assured/investor (outsider). The theory holds that the insider is much informed than the outsider. Hence, management/manages or insiders to ensure the financial security of the outsider have incentives to signal the outsider on their financial safety. According to Brennan

(1995), capital structure mix, dividend policy, and risk management policies are among the instruments that managers might use in signalling.

According to Tufano (1996), reinsurance is a form of risk management tool employed by insurance manager to inform investors of firm quality. The effect of reinsurance in reducing the shock of external changes and natural disaster in the earnings of the firm, acting as a signal by enhancing informational value of firm's financial statements. Hence the primary insurer's decision to insuring against the risk of its clients serves as a signal to the primary insured that the insurance company is much concerned about the possible event leading to losses, and hence assuring their financial security in the event of the possible losses.

2.6 Empirical Review

The research on the determinants of the insurers' demand for reinsurance indicates that they include market-specific factors and insurers-specific factors, all of them being compatible with the theoretical basis of corporate demand for risk management. With regard to insurers-specific factors, relevant studies examine the influence of financial and operational factors (Mayers and Smith, 1990; Hoyt & Khang, 2000) and of organizational factors and group affiliation factors (Adams and Buckle, 2003; Cole and McCullough, 2006; Powell & Sommer, 2007).

Mayers and Smith (1990) analyze the demand for insurance using data from the reinsurance market, arguing that buying a reinsurance service by an insurance company is similar to buying an insurance service by a company operating in another industry. In this respect, they apply several multiple regressions on a cross-sectional dataset which comprises 1276 U.S. insurance companies.

Their research highlights that organizational structure, company size, geographic concentration and business concentration have a significant influence on reinsurance demand. Thus, mutual insurance companies buy more reinsurance services, and large companies, with a high degree of geographic concentration or with a high degree of business concentration buy fewer reinsurance services.

Based on the idea that the willingness to mitigate risks motivates the decision to use reinsurance, Adams (1996) tests empirically the hypothesis according to which reinsurance is connected to firm-specific factors. He applies a regression model on a panel dataset which includes the life insurance companies from New Zealand, over the years 1988-1993. Study results indicated that, reinsurance is used to a greater extent by small insurance companies and by those with a high financial leverage. Contrary to expectations, stock insurance companies and those with a low degree of business concentration purchase more reinsurance services that those on the opposite side.

In some countries, the high exposure to natural disasters caused changes to the insurance market, in addition to those related to migration and construction patterns. The transfer of catastrophe risks to reinsurers can reduce the probability of financial difficulties occurrence and their costs, by reducing the probability of the insurance company's bankruptcy, arising from a very large loss. Gron (1999) examines 50 U.S. insurance companies during the period 1987 – 1993, covering approximately 60% of the catastrophe reinsurance market. By applying OLS regressions, she notices that insurance companies with a high financial leverage, low liquidity and low rating use catastrophe reinsurance to a greater extent. Also, large insurers and those with a high exposure to

natural disasters demand more reinsurance services. According to the results of research, as prices rise, insurance companies increase the level of risk retention, decrease total limits and increase coinsurance rates.

Garven and Tennant (2003) provide a theoretical and empirical analysis of the demand for reinsurance by designing a single period evaluation model, which is applied to a panel dataset comprising 179 property and liability insurance companies from U.S., during the interval 1980 – 1987. They revealed that reinsurance demand has a positive relationship with financial leverage, assets volatility as well as the length of the tail. Also, according to their research, between the demand for reinsurance and the correlation between the return on investment and claims' cost there is a negative linkage.

Based on the particularities of the taxation system and of the prudential regulations, Carneiro and Sherris (2005) assess the determinants of reinsurance for 98 Australian insurance companies, during the interval 1996 – 2001, emphasizing a connection between capital and risk management decisions. Based on the fact that the dataset has heteroskedasticity and autocorrelation problems, the authors offer a comprehensive discussion on the econometric models used in such studies, justifying their option for the OLS with Panel-Corrected Standard Errors methodology. According to the final results, there is a positive nexus between demand for reinsurance and financial leverage. Furthermore, company size, taxes, return on investment and the company's structure do not have a statistically significant influence.

The international insurance and reinsurance market suffered significant changes in recent decades. Cole and McCullough (2006) analyse the influence of the firm-specific factors and of the international reinsurance market on the demand for reinsurance. They apply several OLS regressions on a dataset comprising 2183 U.S. insurance companies, during the interval 1993 – 2000. As for the influence of the firm-specific factors, the results support the findings of the previous research. The analysis of the U.S. insurers' demand for reinsurance services provided in the international market shows that its determinants are company size, group affiliation and organizational form.

Within the segment of medical malpractice insurance, risk management is particularly important because a large proportion of the market is concentrated by specialized and low-sized insurance companies, which during the last three decades have experienced solvency problems. Based on these aspects, Lei and Schmit (2008) attempt to observe if reinsurance substitutes other forms of risk management for the medical malpractice insurers. They examine 268 U.S. medical malpractice insurance companies, during the interval 1995 – 2001, to test the influence of market and organizational characteristics on reinsurance demand, by applying panel regressions. The research results show that the medical malpractice insurance companies which are assisted by doctors, are not group affiliated, have a larger dimension or a smaller financial leverage, as well as those who have a higher business or geographic concentration, tend to use reinsurance to a lesser extent. Also, insurers that have technical reserves above the required limits, buy fewer reinsurance services.

C.E.O. compensation and corporate governance are closely related to firm performance and risk management policy. In this context, Ho et al. (2011) examine how the structure of the board and its compensation influence the decision to use reinsurance as a hedging tool. By applying 2SLS regressions on a dataset comprising 27 U.S. insurance companies, during the period 1996 – 2009, their research leads to results that support the hypothesis according to which the structure of the board and its compensation influence the insurers' demand for reinsurance.

The financial crisis has raised questions about the interconnections within the financial systems. Generally, reinsurance relationships expose to a very large extent insurance companies to counterparty risk. Cummins et al. (2012) determined factors that lead to a higher degree of reinsurance utilization, exposure and counterparty concentration and to examine the relationship between interconnection and insurers' financial performance. They apply a multiple regression model on a panel dataset comprising observations for the property-liability insurance companies which account for over 90% of the assets of the U.S. insurance industry, during the interval 1993 – 2009. The research results indicate that large insurers buy fewer reinsurance services but have a higher degree of counterparty concentration in reinsurance relationships.

Also, mutual insurance companies, as well as those with a high underwriting risk use more reinsurance but have a lower degree of counterparty concentration in reinsurance relationships. Moreover, insurers with a high financial leverage tend to have a less diversified reinsurance portfolio. As for the relationship between financial performance and reinsurance, it is empirically demonstrated that reinsurance utilization positively impact son the financial performance of insurers or insurance companies.

3.7 Summary

This section of the study reviewed both theoretical and empirical literature within the study area. The review has provided enough empirical and theoretical basis with which the final results of this current study will be related. The next chapter explains the methodology for the study.

CHAPTER THREE

RESEARCH METHODLOGY

3.1 Introduction

The focus of this section of the study is to critically describe the methodological aspect of the study. It describes the method adopted in answering research question or achieving research objectives. The section defines the data employed for the study together with the target population and the study sample as well as the sampling technique. The specific equation adopted, the conceptual framework, type of data employed, and the method of data analysis and the analysis procedure are all explained in this chapter.

For the purpose of this study, the explanatory research design is employed. The explanatory research design has been employed in similar studies (Burca and Batrinca, 2014; Curak et al., 2014) to examine the determinants of reinsurance demand by insurance companies. The choice of research design is influenced by the research problem under investigation as well as the approach leading to data analysis (Mason, 2002).

3.2 Data

First of all, the type of dataset employed for this current study influenced the choice of data analysis. Thus, the data for this study is a panel data of variables from 16 life insurance companies (cross-sectional observations) for 7 years (over time), hence, the use of the panel data analysis technique. The combination of a cross-sectional observation over time provides more informative data. Hence, the use of panel data will be able to detect and estimate cross-sectional effects as well

as time effects that cannot be simply observed in a pure cross-sectional or time series data or analysis (Gujarati, 2004).

The data employed for this current study is a secondary. The insurance-specific variables were calculated from the annual financial data of the 16[1] selected insurance companies while data on macroeconomic variables were taken from the Bank of Ghana financial time series dataset. The data for the study span 7 years period, from 2007 to 2013. Thus, a panel data form of 19 cross sectional observation over a period of 7 years. The data is an unbalanced panel data since the data from the insurance companies were not exhaustive for all the years under consideration.

3.2.1 Population and sample size

3.2.1.1 Population

The target population for this study is insurance companies in Ghana. According to the National Insurance Commission (NIC) (2014), there are nineteen life insurers, twenty-six non-life insurers, and 3 reinsurers in Ghana. Thus, there is a total of 45 companies constituting insurance firms in Ghana and which further increased to 27 non-life and 23 life insurance companies as at 2016 (national Insurance Commission, 2016 Report.). The insurance companies in Ghana are presented in figure 3.1 in accordance to their line of business; reinsurance, life, and non-life companies offering insurance services in Ghana.

[1] the insurance-specific data was initially gathered from 19 Life insurance companies. However, 3 insurance companies were eliminated due to insufficient data. Hence, the remaining 16 companies formed the basis for the analysis conducted in this study.

Since the focus of the study is on reinsurance demand by the insurance companies in Ghana, the target population consists of the life insurance companies, and the non-life insurers. Thus, the population for this study comprises the 45 insurance companies (19 life and 26 non-life) in Ghana.

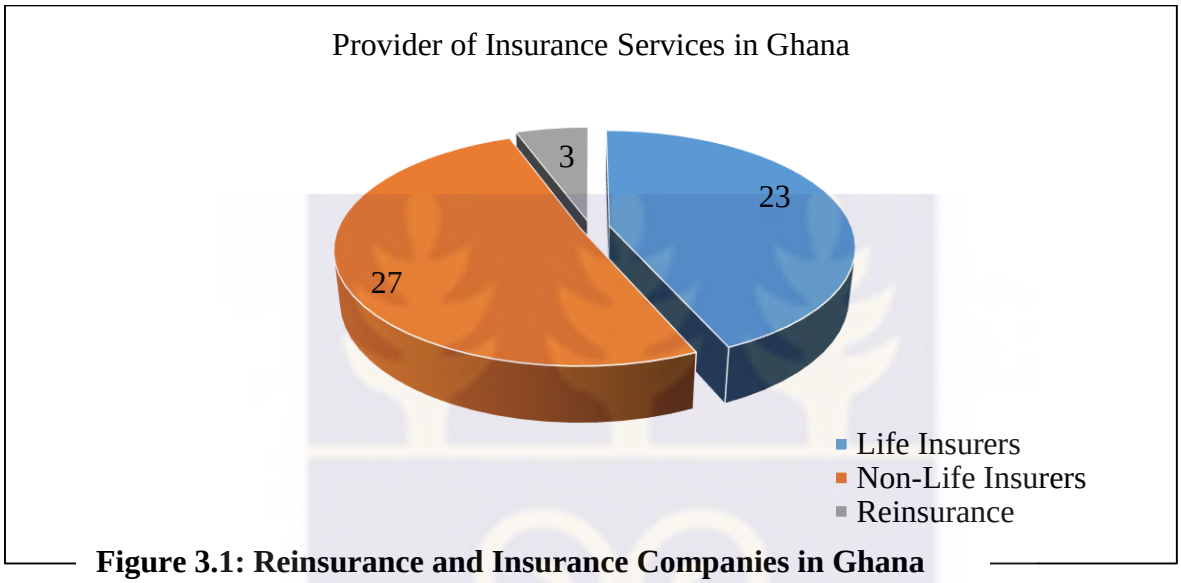

Figure 3.1: Reinsurance and Insurance Companies in Ghana
Source: National Insurance Commission (2016)

3.2.1.2 Sample and Sampling Techniques

In the conduct of research, it is usually almost impossible to study the entire population (Malhotra and Birks, 2007). Similarly, in data collection, it is also very expensive to consider all the elements under a population, and also impossible to reach all members and solicit data from each and every member, especially in a large population study (Miles and Huberman, 2002; Denscombe, 2003). They constitute the same subject upon which inferences are drawn from a population. The approach to selecting the appropriate sample size, frame and the technique to selecting the sample all together defines study sample. For the purpose of this study, a sample of 16 insurance companies are employed. The random sampling approach is employed in sample selection.

In the sample selection, an initial number of 19 life insurance companies were drawn for the study. However, due to lack of data for considerable years, 3 of the initial sample were dropped. The criteria for sample inclusion is that the firm should have data for more than half of the duration under consideration. The period under study is 7 years (2007-2013), hence, for inclusion, a firm should have data for at least four years. The table below presents the study sample, showing the names of the insurance companies, their coding in data and their abbreviation or assigned abbreviations for the purpose of this current study. This is evident in table 3.1 below. Therefore 16 life insurance companies, constituting approximately 84.21% of the total 19 life insurance companies and approximately 35.56% of the total insurance companies (excluding reinsurance companies) in Ghana were employed as the study sample.

Table 3.1: List of Study Sample

Insurance Company	Abbreviation	Coded	Data Type
Capital Express Assurance (Gh) Ltd.	LCAPI	1	Annual
Donewell Life Insurance Company	LDONE	2	Annual
Enterprise Life Assurance Company Ltd.	LENTE	3	Annual
Express Life Insurance Company Limited	LEXPR	4	Annual
Ghana Life Insurance Company	LGLIC	5	Annual
Glico Life Insurance Company	LGLICO	6	Annual
Ghana Union Assurance Life Company	LGUAC	7	Annual
Metropolitan Life Insurance Ghana Ltd.	LMETRO	8	Annual
Phoenix Life Assurance Company	LPHOE	9	Annual
Provident Life Assurance Company Ltd.	LPROV	10	Annual
Quality Life Assurance Company	LQUAL	11	Annual
SIC Life Company Ltd.	LSIC	12	Annual
Star Life Assurance Company	LSTAR	13	Annual
Unique Life Assurance Company	LULAC	14	Annual
UT Life Insurance Company	LUTLI	15	Annual
Vanguard Life Assurance Company Ltd.	LVANG	16	Annual

Source: Author's Compilation

3.3 Model Specification and Variable Measurement

3.3.1 Methodological Framework

Various empirical studies have been undertaken on reinsurance demand by insurance firms within insurance and finance literature (Chang and Jeng, 2012; Curak et al., 2014; Burca & Batrinca, 2013; Altuntas et al., 2015). Reinsurance has gain recognition in finance literature since the work of Mayers and Smith (1990). The factors that have mainly been accounted in literature to explain the demand for reinsurance by insurance companies include firm size, firm profitability, leverage, liquidity, firm concentration and diversification, ownership structure, insurer affiliation, underwriting risk, premium growth, and years of firm operation among others. Studies have generally been limited to internal factors or insurance-specific factors in examining the demand for reinsurance. Following from literature, particularly studies by Burca and Batrinca (2014) and Curak et al. (2014), this study develops a framework that examines how insurance-specific variables and some selected macroeconomic factors determine reinsurance in Ghana. The framework which link insurance specific factors and some selected macroeconomic variables to reinsurance demand is presented in figure 3.2 below.

From the figure below, it is evident that these selected insurance factors as well as macroeconomic factors have influence on reinsurance demand. Thus, the demand for reinsurance by insurance companies in Ghana is conceived to depend on the predictor variables outlined in the framework.

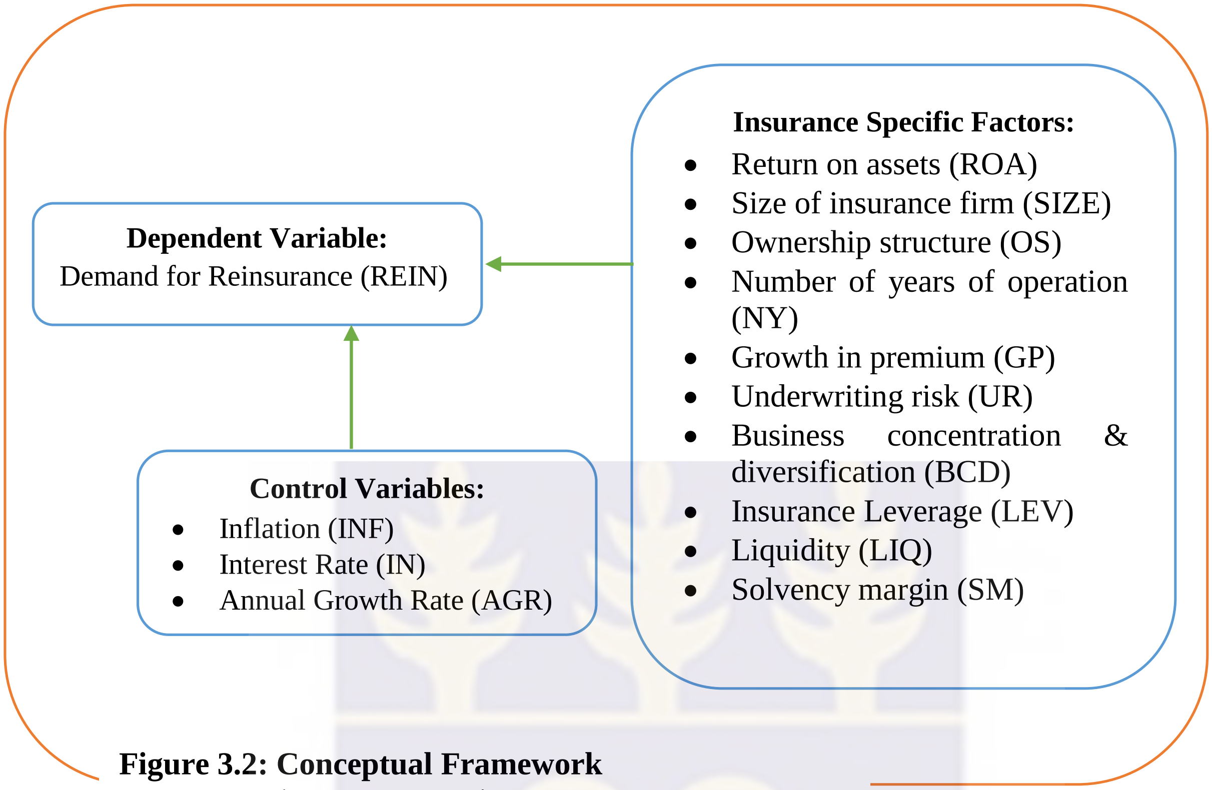

Figure 3.2: Conceptual Framework
Source: Author's Construction, 2017.

3.3.2 Model Specification

This study which sought to examine the determinants of reinsurance demand by insurance companies in Ghana makes use of a panel data consisting of 16 cross-sectional observations for a 7-year period. A general regression model of demand of *"i"* insurance companies over "*t*" years is employed to a reinsurance demand equation. The model is as expressed in its general form as in (1) below.

$$REIN_{it} = f(X_{it}) + \varepsilon_{it} \qquad (1)$$

where REIN = Reinsurance ratio, ratio of premiums ceded to reinsurance to gross written premium.

X_{it} = Demand determining factors

Equation (1) can be expressed in a more functional form as in (2) below.

$REIN_{it} = \alpha_i + \beta' X_{it} + \varepsilon_{it}$ …………………………….…………………………….………….. (2)

where α_i represents insurer specific unobserved heterogeneity

β is the vector of parameter estimates or coefficient of the reinsurance demand determinants.

X_{it} is a vector of explanatory variables

i = Banks (Cross-sectional observations)

t = time dimension (in years. 2007-2013)

ε_{it} represents the vector of error term

Equation (2) above can be expressed in its extended form, including all the factors considered by this study to influence the demand for reinsurance as shown in equation (3) below.

$REIN = f(ROA, SIZE, OS, NY, GP, UR, BCD, LEV, LIQ, GP, SM, INF, IN, AGR)$ …………… (3)

where ROA = Return on assets

SIZE = Size of insurance firm

OS = Ownership structure

NY = Number of years of operation

GP = Growth in premium

UR = Underwriting risk

BCD = Business concentration and diversification

LEV = Insurance Leverage

LIQ = Liquidity

SM = Solvency margin

INF = Inflation

IN = Interest

AGR = Annual growth rate;

are the demand determining factors.

3.3.3 Definition of Variables and Expected Signs

The variables of the model include the reinsurance ratio as a dependent variable and the insurance-specific and macroeconomic variables are the regressors or independent variables. The independent variables are return on assets (ROA), firm size (SIZE), ownership structure (OS), number of years of operation (NY), business concentration and diversification (BCD), insurance leverage (LEV), liquidity (LIQ), solvency margin (SM), inflation (INF), interest rate (IN), and annual growth rate (AGR). The macroeconomic variables served as the control variables in the model.

3.3.3.1 Reinsurance Ratio (REIN)

The reinsurance ratio is used in most of the studies to quantify the reinsurance services purchased by the insurance companies and it's computed as the ratio of premiums ceded in reinsurance to gross written premiums. The reinsurance ratio reflects the volume of reinsurance transactions between insurers and reinsurers.

$$REIN = \frac{Premiums\ ceded\ to\ reinsurer}{Gross\ written\ premium}$$

3.3.3.2 Returns on assets (ROA)

Return on asset is a profitability measure which measures a firms' financial performance within a given period of time. It reflects the efficiency of management in the use of firm's assets. ROA is calculated as a ratio of earning to total assets. Higher ROA is an indication of better utilization of the assets of insurance companies in generating positive profit (Burca & Batrinca, 2014). It implies that assets invested has generated higher profit for a period. According to Powell and Sommer (2007), higher profitability is an indication of a firm's ability to manage financial distress and have enough to offset possible losses arising from risky investments. This will mean profitable firms will have less demand for reinsurance, hence higher rate of premium retention. Insurance companies that are more profitable have a greater capacity to absorb unexpected large losses and do not face the problem of underinvestment, due to smaller extent of reinsurance services. Consequently, reinsurance demand is expected to respond negatively to return on assets. Following from literature, this current study compute ROA as the ratio of profit before interest and taxes (PBIT) to total asset (TA) (Cole and McCullough, 2006; Elango et al., 2008)

$$ROA\ ratio = \frac{PBIT}{TA}$$

3.3.3.3 Company Size (SIZE)

The size of a company, usually referred to as company size and represented by the log of total assets defines how huge a company is in terms of its assets or scale of operation. A company with huge value of total asset is relatively bigger in size than one with a relatively small market value in total assets. Relative to larger firms, smaller firm is argued to have less capacity in absorbing possible losses resulting from risky investment, hence will have lower tendency of premium

retention and be willing to share risk by demanding reinsurance (Burca & Batrinca, 2014; Curak et al., 2014). Thus, the smaller the size of the insurance firm in terms of asset capacity, the greater the reinsurance demand from reinsurance companies, hence a negative relationship between firm size and reinsurance demand. Firm size is calculated as;

SIZE = ln (TA)

3.3.3.4 Ownership Structure (OS)

The ownership structure of an organization has been argued to be a key determinant in its operation and profitability (Barnor and Odonkor, 2013). It determines an organizations' mode of operation, its riskiness, as well as its organizational philosophy or organogram. Ownership structure is also expected to influence an insurer's (insurance company's) demand for reinsurance. It is a dichotomous variable assuming local or foreign ownership. Thus, ownership structure is captured as a dummy variable in the model, assigned the value 1 for foreign ownership, and 0 otherwise. Although the demand for reinsurance is expected to be influenced by the form of ownership, the demand is higher for locally-owned insurance companies. Thus, literature has linked ownership structure to performance, arguing that foreign firm are more efficient and profitable than domestic firms (Barnor & Odonkor, 2013), hence a greater demand for reinsurance is expected for locally-owned insurance companies relative to foreign-owned insurance firms all things being equal.

3.3.3.5 Number of Years of Operations (NY) since 2006

This variable captures the years the firm has been in active operation since the passing of the Insurance Act, 2006 (Act724). The variable represents the level of experience of a firm where firms that existed before the passing of the Insurance Act and still active business are considered

more experienced than firms that commenced insurance business in later years (i.e. from the year 2010). As a firm stays longer in the industry, it is expected to amass greater experience and advance in its strategic practices and might have devised efficient ways of risk diversification over the years. With this, high premium retention is expected, hence less demand for reinsurance (Chang & Jeng, 2012).

3.3.3.6 Growth of Gross Premiums (GP)

Growth of gross premium measures the percentage increase or decrease in insurance premiums over a period of time, usually computed within an accounting period. In insurance, growth in premium is an indication of increases in new businesses. Black and Skipper (1994) submitted that growth in gross premiums resulting from new businesses can influence the demand for reinsurance. They posit that to prevent loss of future growth opportunities that could result from excess risks, insurance firm lowers liabilities in order to curtail risk undertakings. Thus, growth in gross premium will result in increased demand for reinsurance. An alternative argument is that growth of premium could negatively impact on reinsurance demand. Thus, growth of gross premium could be an indication of a more proactive, innovative, and strategic business orientation by the insurance company which implicitly depicts effective management, hence higher retention expected. Growth of gross premium in this study is measured following Cummins and Nini (2002) as the percentage change in gross premium over two-time periods (i.e. year t and year t-1 say between successive years (2001 and 2000)).

Growth of gross premium imply increased underwriting activities which imply increased risk, hence, increased demand for reinsurance. The study therefore expects a positive relationship between growth in gross premium and reinsurance demand.

3.3.3.7 Underwriting Risk (UR)

Underwriting risk as applied in insurance refer to the risk of loss associated with underwriting activities. It is the risks related to the writing of insurance policy and measures the possibility of insurance premiums charged falling short of claims. Curak et al. (2014) advanced that reinsurance is one of the key approaches of managing underwriting risks. According to them, it helps in the stabilization of loss experiences of insurance companies. Hence, to ensure stability in the face of high underwriting risks, insurance firms' demand for reinsurance increases (Sommer, 1996). Hence a positive relationship is expected between underwriting risks and reinsurance demand. This study refers to the approach developed by Adams and Buckle (2003) measure underwriting risk by dividing annual claims paid by premiums earned in a year (Burca & Batrinca, 2014).

3.3.3.8 Business Concentration and Diversification (BCD)

This is a function of the number of firms and their respective shares of the total production in the market. Mayer and Smith (1988) argues that there is high possibility of accurate prediction of insurance policy losses in times of higher business concentration. This increases the likelihood of insurance retention. On the other hand, higher business concentration imply high risks which negatively impacts on the insurer's retention as a way of mitigating possible bankruptcy costs or avoiding undue losses. Concentration is measured following from Mayers and Smith (1990) by

employing the Herfindahl index. This is calculated by taking the sum of squares of the individual line-of-business premiums to gross premiums.

The effect of this variable relates to that of competition on the insurance market or industry. Competition affects all firms irrespective of size. It is an industry-specific variable that play a major role in the strategic alignment of firms. According to OECD (1998), increasing competition gradually results in high risk due to its effect on premiums. Competition may lead to falling premiums over time which eventually reaches a point where risks of failure is high. Implicitly, increasing competition will result in higher demand for reinsurance by all firms irrespective of size. For firms to stay relevant in the insurance business and withstand increasing competition, one of the strategic approaches is to continue with its insurance contract by signing more contracts and subsequently reinsure them with the reinsurance companies. However, Akotey and Abor (2013) revealed that the insurance sector in Ghana is seen to be proactive in the management of risks and rather manage risk in reactive response to regulatory directives. Siding with Bannor and Odonkor (2013), the damaging effect of competition owing to the increment in the number of insurance companies has resulted in undercutting, unethical underwriting and marketing practices in order to cope with the competition hence it can be argued that insurance companies may retain more premiums than to be ceded to reinsurers in an attempt to make profit thereby demanding less of reinsurance.

3.3.3.9 Insurance Leverage (LEV)

Insurance leverage measures the extent to which owner's equity can absorb risks, and also shows the firm's capacity in the undertaking of pricing risks. Technically, financial leverage is measured

as the ratio of debt to equity. In insurance, it defines the ratio of deferred liabilities to equity. Higher leverage ratio is an indication of higher insurance liabilities relative to equity, hence, the lower the extent of risk absorbable by owner's equity. This is an indication of higher risks relative to equity capacity, hence lower insurer retention. Therefore, a positive relationship is expected for leverage on reinsurance demand. Insurance leverage in this study is computed as the ratio of net premiums to surplus (Klenin et al., 2002).

3.3.3.10 Liquidity Ratio (LIQ)

The extent to which an insurer is able to absorb debt obligations to its creditors and policyholder is termed as the liquidity. Liquidity ratio is employed as an indicator of financial soundness of the firm. Higher liquidity implies availability of sufficient funds to meet short term debts obligations or risks. This means that higher liquidity will reduce demand for reinsurance since insurance companies will be in a better position to handles its own risks. Following from Chen and Wong (2004) the study measure liquidity as the ratio of stated liabilities to liquidity assets.

3.3.3.11 Solvency Margin (SM)

Solvency margin is the excess of assets over liabilities and other comparable commitments of an insurance company at fair values. It is usually employed as a buffer against risky investments and other risks related to insurance projects. It is that amount of capital of an insurer against probable claims. The higher the margin, the greater the ability of insurers to meet their claim obligations, hence the higher the level of retention. Thus, higher solvency margin is negatively related to reinsurance demand all thing being equal. This is because with higher solvency margin, an

insurance company is better positioned to assume more risk by itself, hence, have less demand for reinsurance.

3.3.3.12 Inflation Rates (INF)

Inflation defines the persistent and continuous rise in the general price level of some basket of goods and services over a period of time. Inflation in this study is captured by the changes in the consumer price index (CPI) as computed in the Bank of Ghana (BoG) database. Higher and unanticipated inflation is expected to erode the profitability of insurers or insurance companies by increasing claims costs. Hence, insurance companies in anticipation of increases in inflation will increase their reinsurance in order to mitigate the risk of profitability loss by sharing risks. Browne and Hoyt (1995) posit that due to the loss in profit margin resulting from periods of high inflation, insurers will have insufficient premium to match losses which increases the probability of insolvency. Inflation is expected to reduce retained premiums and increase reinsurance demand by the insurance companies.

3.3.3.13 Interest Rate Changes (IN)

Similar to the effect of inflation of the profit margin of insurance companies, changes in the interest rate also affects the profitability of insurance firms through the net effect on liabilities and assets. According to Maverick (2015), decreases in interest rate affects both liabilities and assets of insurers. The positive effect results from a reduction in insurer's future obligations to its policyholders hence, reducing its liabilities. On the other hand, however, lower interest rates can lower the insurer's premium income by reducing the attractiveness of their products, hence experiencing lower sales. Hence the effect of interest rate changes on demand for reinsurance is

uncertain due to the indeterminacy of interest rate changes on the profitability or riskiness of insurance firms. The situation is however different for period of high interest rates where the overall trend of firm profitability according to Browne and Hoyt (1995) and Maverick (2015) has been historically proven to increase. The study in measuring interest rate changes adopted the bank prime rate as employed by Browne, Foster, Norton, and Naschold. (2001).

3.3.3.14 Annual Economic Growth Rates (AGR)

Economic growth rate measures the rate of change in key economic variables over a period of time. There is growth in the economy if the economy experiences real changes (positive) changes in key growth indicators such as GDP or income over a given time period. In the context of insurance, the rate of growth of an economy is an indication of risks of economic volatility. According to Grace and Hotchkiss (1995), insurance premiums experience short-term increases with increases in economic growth. Annual economic growth is measured as changes in the Gross Domestic product (GDP) over a given period of time (Lin, 2010).

3.4 Econometric Technique

To address the first objective of this current study, the researcher employed a separate line plot on the demand for reinsurance (REIN) for the 16-insurance company over the 7 years period (2007-2013) under study. The line graph is plotted with years on the x-axis and the reinsurance demand (REIN) on the y-axis. Also, a mean table is computed to determine the average demand for reinsurance by the sampled insurance companies over the period to show how the overall average differs from one company to another.

The second objective of the study which propose to examine the key determinants of reinsurance demand by the insurance companies will be addressed using the panel regression model. It focuses on how demand for reinsurance is determined by insurance–specific factors and macroeconomic variables. This will be undertaken using a single model as shown in equation (4) below. The panel regression model was used in analysing the determinants of demand for reinsurance in the insurance industry. The model below is a modification of Burca and Batrinca (2014) and Werner (2014) models to suit the Ghanaian insurance industry. It is given by:

$$REIN_{i,t} = \beta_i + \alpha_1 ROA_{i,t} + \alpha_2 Size_{i,t} + \alpha_3 OS_{i,t} + \alpha_4 NY_{i,t} + \alpha_5 GP_{i,t} + \alpha_6 UR_{i,t} + \alpha_7 BCD_{i,t} + \alpha_8 LEV_{i,t} + \alpha_9 LIQ_{i,t} + \alpha_{10} SM_{i,t} + \alpha_{12} INF_{i,t} + \alpha_{12} IN_{i,t} + \alpha_{13} AGR_{i,t} + w_t + \mu_{i,t} \quad \ldots\ldots (4)$$

where REIN, ROA, SIZE, OS, NY, GP, UR, BCD, LEV, LIQ, SM, INF, IN, and AGR are earlier defined.

α_i, i = 0, 1, 2, ..., 13, are the parameters to be estimated for the model. α_0 represents the constant, $\alpha_1, \alpha_2, \ldots\ldots\ldots\ldots \alpha_{12}$ *represent the* coefficients of the various regressors of the model, and μ_{it} represents the error term.

Estimation of the empirical model using panel data analysis entails the use of three main panel data estimation models; the Pooled Ordinary Least Square model (Pooled OLS), the Fixed Effects (FE) Model, and the Random Effects (RE) Models. However, the study will require the use of the appropriate model possible in ensuring that the best parameter estimates are attained. This will require the use of model selection or appropriateness tests.

In panel data analysis, two main tests are employed in selecting between the Pooled OLS, FE, and RE models. This are the Hausman Test (HT) and the Breusch Pagan LM Test (BPT). The Hausman test is first employed to test for model appropriateness between the fixed effect and the random effects models, while the Breusch Pagan LM test examines between the random and Pooled OLS for the best model.

Also, a correlation matrix is undertaken to examine the presence of multicollinearity in the dataset. This examine the correlation among predictor variables. The presence of multicollinearity will be cross-examined by computing the Variance Inflation Factors (VIF) to examine the variable that suffers from multicollinearity (Allison, 2012). The presence of multicollinearity will result in an unstable and unreliable regression estimates, hence, correlated for by dropping the variables or one of the variables that are highly correlated.

3.4.1 Model Selection Tests

The model selection test in panel analysis is conducted to examine the appropriateness between the three independent approaches to panel data analysis of pooled panels, fixed effect models, and random effect models (Maddala, 2001). These three models have unique assumptions that require the test to determine which panel analysis will be best to employ given its independent assumptions. With the pooled OLS, the individuals within the measurement set have no unique attribute and possesses no universal time effect. For the fixed effect models, although there exist unique attributes of individuals, these attributes are time-invariant. In the random effect models however, there are unique and time constant attribute. For the fixed effect models, there may or may not exist correlation between the individual attributes and the various regressors (independent

variables), the same cannot be said of the random effect models that has its attribute uncorrelated with the individual regressors (Hsiao, 2003).

Again, while the Pooled model can produce unbiased and consistent parameter estimates even in the presence of time constant attributes, the random effects is more efficient and produces the best linear unbiased estimates (Gujarati, 2003). Also, while the fixed effect model is a feasible generalised least squares approach and it is considered more efficient than the Pooled effects model in the presence of time constant attributes, the random effect models make adjustments to the serial correlation that is usually induced by unobserved time constant attributes. It is therefore important to undertake the panel model specification test to examine which model of the three is appropriate in a panel study.

3.4.1.1 Hausman Specification Test

According to Hausman (1998), the test for model appropriateness between the FE and RE models is undertaken under the following hypothesis:

Null Hypothesis (H_0): Random Effect (RE) regression model is appropriate

Alternative Hypothesis (H_1): Fixed Effect (FE) regression model is appropriate

The rationale behind the Hausman test is to identify whether random-effect or fixed-effect model is most appropriate under the assumption that the unobservable individual effects (i, u) are uncorrelated with one or more of the explanatory variables (Xi_i). The decision rule for the selection of the model under the Hausman model selection test is that, we reject H_0 that RE is appropriate if the probability value for the chi-square is less than 5% (i.e. Prob. $X^2 < 0.05$). The reverse applies

for acceptance of RE, thus, we accept H_0 if the chi-squared probability is greater than 5% (i.e. Prob. $X^2 > 0.05$).

The failure to reject (acceptance) the null hypothesis implies the appropriateness of the RE model while the reverse applies for FE appropriateness over the RE (Gujarati, 2003). If FE is shown to be appropriate over the RE, we employ the FE as the final model of estimation. However, the acceptance of RE under the Hausman specification will require that a further test (BPT) is undertaken to select between RE and Pooled OLS.

3.4.1.2 Breusch Pagan LM Test (BPT)

The BPT which examines the best regression model between RE and Pooled OLS is conducted under the following hypothesis.

Null Hypothesis (H_0): Pooled OLS regression model is appropriate

Alternative Hypothesis (H_1): Random Effect (RE) regression model is appropriate

The decision rule is that, we reject the appropriateness of the Pooled OLS if the chi-squared probability is less than 5% (i.e. Prob. $X^2 < 0.05$) and accept the appropriateness of the Pooled OLS (in other words reject RE regression model) if otherwise (i.e. Prob. $X^2 > 0.05$).

3.5 Summary

This section of the study has discussed the methodological underpinnings to the study by explaining the type of data employed, the methodological framework, the empirical model, and the proposed method of data analysis. The next chapter analyses data from the study, presents findings and discusses results in relation to reviewed literature.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter focuses on data analysis, presentation of results and discussion. It presents results from data analysis and discusses findings from study in relation to reviewed literature. The section is divided into three key parts; description of data with the aid of summary statistics, trend analysis of reinsurance demand by the sampled insurance companies, and a panel regression analysis showing the determinants of reinsurance demand by insurance companies using the best appropriate panel data regression model possible.

4.2 Descriptive Statistics of Data

This section of the data analysis provides summary statistics of study variables over the period under study (2007 to 2013). The main statistics employed are the number of observations, the mean, standard deviations, minimum and maximum statistics. Table 4.1 below presents the summary statistics of variables employed in the study. Apart from the macroeconomic variables which had 112 observations, the insurance-specific variables showed 97 observations for each of the variables. The unbalance nature of the panel data employed for this study is clearly evident. For 16 insurance companies for 7 years, a balance panel dataset should consist of 112 observations (16 * 7 = 112). 97 observations for the insurance data imply that not all companies had data covering the entire 7 years under consideration.

Reinsurance Demand (REIN) show a mean of approximately 2.10, a standard deviation of 7.45 and with minimum and maximum values of 0.03 and 71.74 respectively. This shows greater deviation of demand for reinsurance on the average for all firms. Comparing this figure with the average for individual insurers, it is evident that, apart from LCAPI and LGLICO, the general

mean of 2.10 is not far from that for the other firms. However, a mean of 2.10 (210%) for REIN shows how insurance companies value reinsurance given the importance of reinsurance to the security of finances of policyholders and the financial stability of insurer (insurance companies). Return on Assets (ROA) also reported a mean, standard deviation, minimum and maximum values of approximately 1.08, 4.06, 0.02, and 38.03 in Ghana cedis respectively. The statistics for number of years of operation of life insurance show a minimum of 2 years and a maximum of 8 years for the sampled insurance companies with a mean of approximately 6 years. The summary statistics of the study variables are presented in table 4.1 below.

Table 4.1: Summary Statistics of Study Variables

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
REIN	97	2.09841	7.44737	0.03039	71.7415
ROA	97	1.08108	4.06701	0.01545	38.0266
SIZE	97	7.1046	0.62039	5.00574	8.39702
NY	97	5.91753	0.62367	2	8
GP	97	144.509	1136.94	0.00719	11047.8
UR	97	3.09401	26.7113	0.00038	263.433
BCD	97	0.68813	0.59264	0.00653	2.78583
LEV	97	0.85629	1.02995	0.00042	8.38636
LIQ	97	10.6405	24.4208	0.35896	153.133
SM	97	0.63714	0.994022	0	9.50425
INF	112	12.32857	3.573127	8.58	18.1
IN	112	16.40714	4.253959	11.3	22.9
AGR	97	5.64455	11.509	0	65.4592

Source: Author's Computation from Data (Stata Version 14.1)

4.3 Trend Analysis of Reinsurance Demand

The trend analysis for reinsurance demand by the various insurance companies is presented in figure 4.1. The horizontal axis reads the years under consideration while the vertical axis denotes

the demand for reinsurance. Evidently, Capital Express Assurance (GH) Ltd (CAPI) had data from 2010 to 2013, showing an initial value of 11.85 which experienced a fall to 4.75 in 2012 after which it increased again. Donewell Insurance Company (LDONE) also had data starting from 2008, showing an initial fluctuation between 2008 and 2010 after which it experienced a decreasing trend throughout the remaining years. Enterprise Life Assurance Company Ltd (LENTE) showed similar trend as LDONE, fluctuating in the first three years (2007 and 2009), and following a decreasing trend over time. Starting with reinsurance data for 2009, LEXPR showed initial increase for the first 2 years and a falling trend in the last two years.

LPHOE, LPROV, LQUAL, and LGUAC showed similar trend over the period with an initial increase in reinsurance demand for the year 2007/08, and a decrease for the remaining years. Unique Life Assurance Company (LULAC) also experience increases and decreasing in their demand for reinsurance in the early periods (2007 and 2009), experiencing negative trends throughout 2010 to 2013. LGLIC also portrayed a similar trend for the period as LDONE and LULAC. Glico Life Insurance Company (LGLICO) on the other hand experienced negative trends in reinsurance demand from 1 in 2007 to approximately 0.11 in 2012 after which it increases to an incredible of 71.74 which happens to be the industry's highest over the period under consideration.

Demand for reinsurance on the average seems to be falling for all insurance firms for the greater part of the years under consideration. On average, LGLICO recorded the highest in insurance demand with a mean REIN of 10.66. This is followed by LCAPI with 7.88, LGUAC (3.25), LULAC (3.09), LEXPR (1.89), and LPHOE (1.46) in that order with LSIC with the least demand for reinsurance. This is evident that the firms with the least reinsurance demand on average are

more pronounced, like LSIC, LSTAR, LENTE, LVANG, and LGLIC, as well as LMETRO. This is shown in table 4.2 below.

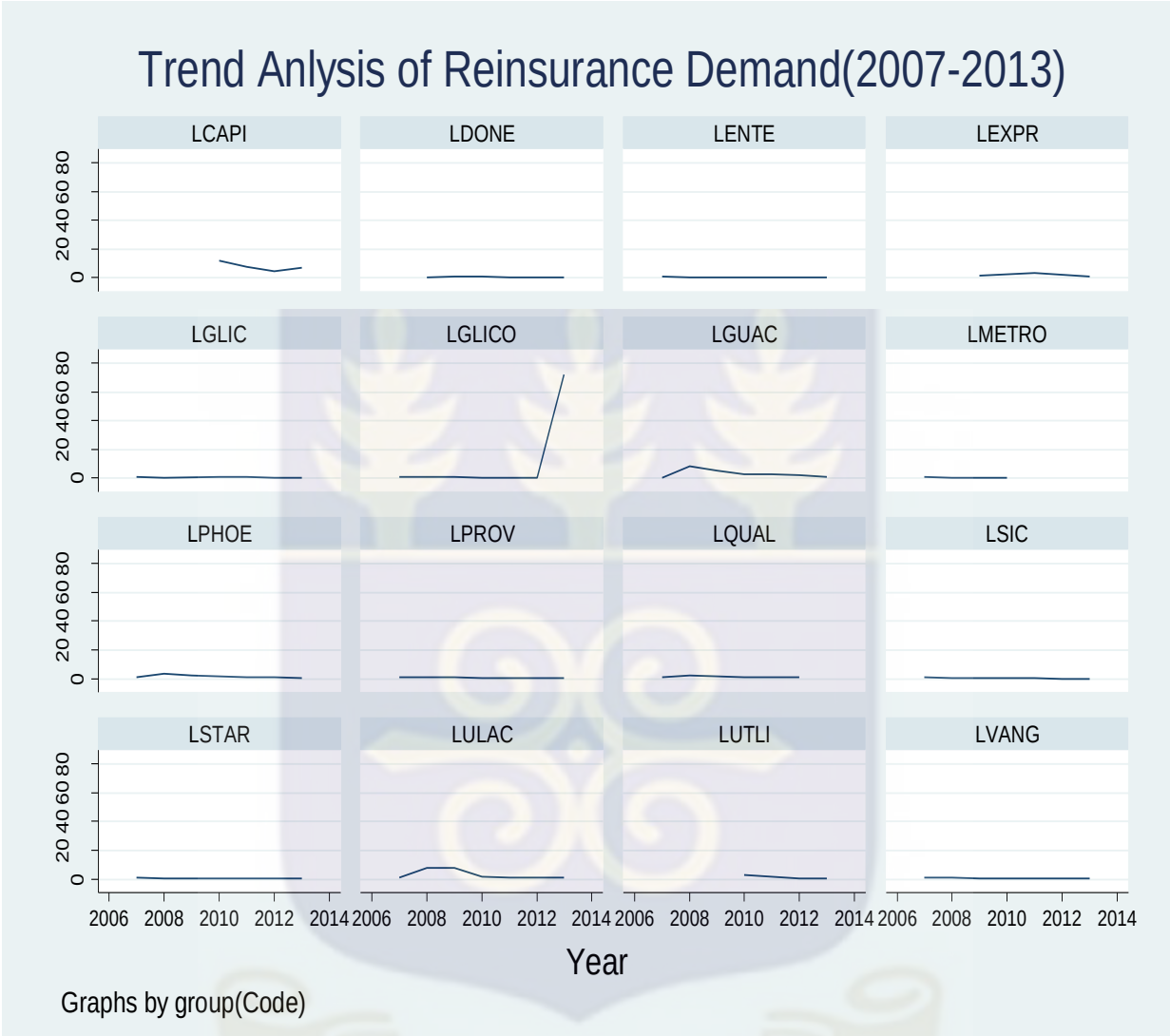

Figure 4.1: Reinsurance Demands by Insurance Firms (2007-2013)
Source: Author's Construction from Data (Stata Version 14.1)

Table 4.2: Reinsurance Demand (Average) for all Firms (2007-2013)

Insurance Firm	REIN
Capital Express Assurance (Gh) Ltd. (LCAPI)	7.88
Donewell Life Insurance Company (LDONE)	0.59
Enterprise Life Assurance Company Ltd. (LENTE)	0.24
Express Life Insurance Company Ltd. (LEXPR)	1.89
Ghana Life Insurance Company (LGLIC)	0.63

Glico Life Insurance Company (LGLICO)	10.66
Ghana Union Assurance Life Company (LGUA)	3.25
Metropolitan Life Insurance Ghana Ltd. (LMETRO)	0.63
Phoenix Life Assurance Company (LPHOE)	1.46
Provident Life Assurance Company Ltd. (LPROV)	0.60
Quality Life Assurance Company (LQUAL)	1.23
SIC Life Company Ltd. (LSIC)	0.21
Star Life Assurance Company (LSTAR)	0.29
Unique Life Assurance Company (LULAC)	3.09
UT Life Insurance Company (LUTLI)	1.32
Vanguard Life Assurance Company Ltd. LVANG)	0.48

Source: Author's Computation from Data (Stata Version 14.1)

4.4 Correlation Analysis

To explore the relationship between the independent variables of the model, a correlation matrix is employed. The results showing the relationship between the explanatory variables of model is presented in table 4.3. Firm size and return on assets show a positive correlation of 0.67 which means that larger firms are expected to make greater return on their assets. Thus, the larger the insurance company, the greater investment it is able to make, hence, the greater the returns. The correlation coefficient between firm size and return on asset is regarded as not problematic in this study. The reason being that correlation coefficients lie between +1 and -1, hence, the absolute value of a correlation (in terms of limit) is 1. Hence in absolute terms, a correlation of 0.5 is logically the average or normal level of association between two independent variables. Hence for a correlation coefficient to be regarded as low or high, to the best of researcher's knowledge and intuitive deductions, it should be between (0.5 and 1).

This means that a correlation coefficient that gravitates towards 1 (i.e. ≥ 0.75) is considered to be considerably high. Likewise, a coefficient that gravitates towards 0 (i.e. ≤ 0.5) is considered to be

relatively low. Implicitly, the correlation coefficient of 0.65 between SIZE and ROA is considered not to be problematic in this study. Also, a correlation matrix was found for the variables in table 4.3 including the dependent variables (see appendix Gc). The resulting matrix produced a correlation coefficient less than 0.5 for the independent variables, albeit with different signs for some of the correlation pairs. The dependent variable (REIN) is shown to have a negative association with SIZE, OS, GP, BCD, LEV, LIQ, IN, & AGR and a positive association with the other variables. Nonetheless, REIN and UR reported a high positive correlation of approximately 0.96 (appendix Gc).

Table 4.3: Correlation Matrix for Independent Variables

e(V)	ROA	SIZE	OS	NY	GP	UR	BCD	LEV	LIQ	SM	INF	IN	AGR
ROA	1												
SIZE	0.67	1											
OS	0.06	0.13	1										
NY	0.12	0.21	0.03	1									
GP	0.00	-0.06	0.01	0.00	1								
UR	-0.12	-0.19	0.01	-0.01	0.15	1							
BCD	-0.37	-0.26	0.06	-0.11	-0.14	-0.01	1						
LEV	0.05	0.17	-0.01	0.28	0.00	0.05	-0.10	1					
LIQ	-0.14	-0.08	0.13	-0.08	-0.07	0.02	0.51	-0.08	1				
SM	0.02	0.20	0.02	0.01	-0.04	-0.04	0.03	0.13	0.05	1			
INF	0.15	0.21	0.04	0.09	0.00	-0.10	0.24	-0.06	-0.07	-0.06	1		
IN	-0.30	-0.21	-0.03	-0.14	0.11	0.09	0.05	0.12	0.03	0.09	-0.41	1	
AGR	-0.13	-0.25	-0.05	-0.12	0.01	0.07	0.10	0.01	0.03	0.01	0.01	0.01	1

Source: Author's Computation from Data (Stata 14.1 Version)

The result from the VIF as shown in table 4.4 produces a mean VIF of 15.90 which is an indication that the present level of correlation is not problematic. The VIF for SIZE and NY which reported the highest were 81.38 and 71.62 respectively. Upon dropping the SIZE variable however, and re-estimating the correlation coefficient, the result produced correlation coefficients less than 0.60

(see appendix Gb). The corresponding result for the VIF test produced a mean VIF of 6.43 which is considerably low with the VIF value for number of year of operation (NY) dropping considerably to 25.70 (appendix Gb)[2]. We then proceed to estimate the model by running the panel regression model using the original equation and variables (including variable for frim size). According to Snee and Marquardt (1984), the issue of the threshold value for acceptable VIF is debatable. A VIF value of 10 or as low as 4 (equivalent to a tolerance value of 0.10 or 0.25) has been argued as the rule of thumb as an indication of serious multicollinearity (Goldberger, 1999). However, O'Brien (2007) posited that the use of VIF threshold for multicollinearity might compel researcher to eliminate one or more variable although the absence of multicollinearity does not by themselves necessarily discount the results of regression analysis.

Table 4.4: Result for Variance Inflation factor (VIF)

Variable	VIF	1/VIF
SIZE	81.38	0.012289
NY	71.62	0.013963
IN	20.89	0.047868
INF	17.44	0.057348
BCD	3.82	0.261602
LEV	1.89	0.527871
LIQ	1.64	0.608266
ROA	1.52	0.657743
SM	1.52	0.658762
OS	1.47	0.681078
AGR	1.32	0.755510
GP	1.07	0.938530
UR	1.06	0.942601
Mean VIF	**15.90**	

Source: Author's Computation from Data (Stata 14.1 Version)

Because the correlation between SIZE and ROA was shown not to be a problem in the model, and the test proved the absence of multicollinearity, we proceed to the panel regression analysis. This, however, begun by selecting the best model of estimation using the appropriateness test for panel regression models.

[2] The Size variable when excluded in running the VIF produced a mean VIF of 6.43 which is an indication of no multicollinearity

4.5 Empirical Analysis of Data

4.5.1 Selection of Appropriate Panel Model

As explained in the previous chapter, it is prudent that the appropriate panel model estimation technique is employed in examining the determinants of reinsurance demand by insurance companies in Ghana. The possible panel regression technique applicable to this study were the Pooled Ordinary Least Square (Pooled OLS), the fixed effect (FE), and the random effect (RE) models. The Hausman specification test and Breusch Pagan LM tests are estimated to check the appropriate method of estimation (see appendix F).

In determining the model appropriateness between the fixed effect and the random effect models, the Hausman specification test was employed. The results which showed a chi-squared probability value of 0.8965 which is greater than 0.05 (5%) is evident that the random effect model is the best. We therefore fail to reject the null hypothesis for the Hausman test that RE regression approach is appropriate.

We then examined the RE against the Pooled OLS for model appropriateness using the Breusch Pagan LM Test. The test produced a chi-squared probability value of 0.0009 which is less than 0.05 (5%). This is a justification of the appropriateness of the RE model over the Pooled OLS model. Hence, we reject H_0 and conclude that the RE regression model is appropriate and proceed to estimate the model with the RE model. The next section presents and discusses the study results.

4.5.2 Panel Regression Results (Random Effects Model)

Table 4.5 presents the regression results from the Panel Random Effects model estimation. First, the results report a Wald chi-squared probability of 0.0000 which is an indication of model

significance. The probability value of 0.0000 (less than 5%) imply a strong model and that the entire model is highly significant at 1%. Implicitly, the independent variables of the model jointly explain reinsurance demand. The results also show 97 as number of observations and a total of 16 insurance firm employed in the study. The results also produced an overall R-squared of approximately 0.96, meaning almost 96% of any variations in reinsurance demand is explained by the predictors. Using the formula $Adj.R^2 = 1 - (1 - R^2)\frac{n-1}{n-p-1}$, where n is sample size = 16 and p is the number of predictors = 13, Adjusted R-squared is 0.6101. This means that the predictor variables explain approximately 66% of the variations in reinsurance demand.

Examination of the probability values for each variable show that ownership structure (OS) number of years of operation (NY), growth in premiums (GP), business concentration and diversification (BCD), liquidity (LIQ), inflation (INF), interest rates (IN), and annual growth rate (AGR) are not significant in explaining reinsurance demand by insurance firms in Ghana. OS, NY, GP, and BCD produced the expected signs, albeit insignificant.

However, firm size (SIZE), underwriting risk (UR), insurance leverage (LEV), profitability and solvency margin (SM) are shown to have significant effect on reinsurance demand (REIN). SIZE, UR, and LEV are shown to be highly significant in the model (1%) with probability values of 0.000, 0.000, and 0.009; which is less than 1%. SM and ROA are also significant at a significant level of 5% with probability of 0.027 and 0.031 respectively.

The SIZE variable is found to be statistically significant at 1% and have negative influence on reinsurance demand. Implicitly, smaller insurance firms demand reinsurance more than larger

firms who can increase their efficiency in their loss adjustment and underwriting activities and also take advantage of economies of scale (Adams, 1995). Smaller size indicate greater diversification opportunities which can lower risk. In other words, smaller insurance firms are relatively smaller in strength and in their ability to manage or reduce unexpected bankruptcy costs or handle financial distress, hence, the possibility of seeking reinsurance relative to larger insurance companies who have a greater number of their units exposed to risk, a situation that reduces the dispersion of actual losses from expected losses.

This finding follows from theory (apriori expectations) and also confirmed by existing literature. The results comply with studies by Adams (1996), Mayers and Smith (1990), Powell and Sommer (2002), Garven and Tennant (2003), Reissaus and Wambach (2005), and Lei and Schmit (2008) among others. Interestingly, Curak et al. (2014) found firm size to be insignificant on demand for reinsurance by insurance companies in Croatia, his findings was in consonance with Carneiro & Sherris (2005) who also had a similar result among insurance companies in Australia.

Contrary to study findings however, Burca and Batrinca (2014) found reinsurance demand to be higher for larger firms than smaller-sized insurance firm for both random and fixed effect models in the Romanian insurance market. They concluded that larger insurance firms could overrate or highly appreciate the liquidity component relative to smaller firm, leading to higher demand for reinsurance.

Findings for underwriting show statistical positive significant effect on reinsurance demand at a level of 1%. The positive effect of underwriting risk on reinsurance demand follows from theory

and confirms the study expectation. The positive sign means that insurance firms with higher underwriting risks will seek reinsurance or increase their demand for reinsurance all things being equal. Due to the uncertain cash flows associated with risky undertakings, firms with higher underwriting risks purchase more reinsurance than insurers with lower underwriting risks (Altuntas et al., 2015). Reinsurance provides insurers (insurance companies) with the capacity to increase underwriting activities and hedge against catastrophic losses, as well as the stabilization of loss experience (Curak et al., 2014). Curak et al. (2014) concluded that in transferring underwriting risk, insurance companies should take cognizance of the product range. This finding also agrees with Niehaus and Mann (1992) who advanced that reinsurance improves insurer's liquidity and fulfils the demand for immediacy related to expected losses.

With a probability value of 0.009 (less than 1%), insurance leverage in the data also shows to be highly statistically significant in determining reinsurance purchase by insurance companies at 1% level. A negative sign for leverage indicates that insurance companies with higher leverage, and hence higher risk exposure, interestingly demand less reinsurance relative to companies with lower leverage. This finding is in consonance with Burca and Batrinca (2014) who found negative effect of leverage on reinsurance demand in Romania.

This finding however, contradicts theory and it is in contrast with plethora of empirical evidence that showed positive nexus between leverage and demand for reinsurance (Powell and Sommer, 2002; Garven and Tennant, 2003; Carneiro and Sherris, 2005; Lei and Schmit, 2008). Other recent studies that found contrary results to current study findings include Curak et al. (2014).

Table 4.5: Result of Random Effect Regression Model (REIN = Indp. Variable)

Dep. Variables	Coeff.	Std. Err.	P-Values	[95% Conf. Interval]	
				Lower Bound.	Upper Bound
ROA	-0.1128479	0.0522554	**0.031****	-0.2152666	-0.0104291
SIZE	-2.387851	0.4875061	**0.000*****	-3.343345	-1.432356
OS	0.8524059	0.6655738	0.200	-0.4520948	2.156907
NY	-0.0919121	0.2490647	0.712	-0.5800699	0.3962458
GP	0.0000538	0.0001311	0.682	-0.0002032	0.0003107
UR	0.2740705	0.0055729	**0.000*****	0.2631479	0.2849932
BCD	0.1974983	0.3566081	0.580	-0.5014407	0.8964373
LEV	-0.4010952	0.1527791	**0.009*****	-0.7005368	-0.1016536
LIQ	-0.0026382	0.0074906	0.725	-0.0173194	0.0120431
SM	-0.3322865	0.1500486	**0.027****	-0.6263763	-0.0381967
INF	0.0667215	0.0477503	0.162	-0.0268674	0.1603103
IN	-0.0098696	0.0372314	0.791	-0.0828419	0.0631027
AGR	-0.0117591	0.0145065	0.418	-0.0401913	0.0166731
_cons.	18.5241	4.117809	0.000	10.45335	26.59486
R-Squared: Within = 0.9744			# of Obs. = 97 (# Groups = 16)		
Between = 0.8047			Ward Chi-squared (10) = 2568.44		
Overall = 0.9549			**Prob. > Chi-squared = 0.0000**		
Adj R-Squared:=0.6618					

Source: Author's Estimation in Stata (Version 14.1)

, **, & * denotes significance at 10%, 5% & 1% respectively*

Solvency Margin (SM) also reported a coefficient of -0.33 and a probability value of 0.027 indicating a significant negative relationship between solvency margin of insurance firms and the demand for reinsurance at 5%. The implication is that firms with high solvency margins have greater accessibility to adequate capital to meet its obligations on insurance claims, hence will prefer to retain than to reinsure. Differently put, firms with higher buffer against risk investment will be in the position to assume risk of insured contracts, hence have less demand for reinsurance. This finding follows from theory and supports empirical findings. Contrary to Burca and Batrinca (2014) who found insignificant influence of solvency on reinsurance demand, this study finds

solvency margin to significantly impact on insurer demand for reinsurance and with the expected directional effect.

With a coefficient of -0.11 and a probability of 0.031(5% level of significance), a negative coefficient for ROA implies that higher profits firms will be in the position to absorb unexpected huge losses and are less likely to face underinvestment problems hence, have low tendency to reinvest.

4.6 Summary

This section of the study employed the panel data regression model to examine the determinants of reinsurance demand by insurance companies in Ghana. The analysis employed a sample of 16 insurance companies for a 7 years period (2007-2013). Findings from the study suggests that firm size, underwriting risk, leverage, profitability and SM have significant influence on reinsurance demand. Macroeconomic factors were found not to play any significant role in the demand for reinsurance by Ghanaian insurance companies.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The study which sought to examine the determinants of reinsurance in Ghana and the nature of reinsurance demand is concluded in this chapter. The focus of this chapter of the study is to conclude the study by providing a summary of findings and making constructive recommendations based on the study findings. The section is divided into four; a summary of findings, conclusion, recommendations, and study limitation and areas for further studies.

5.2 Summary of Findings

The specific objective of this current study as posited in section 1.3 in chapter one was to examine the nature or trend of reinsurance demand and also examine the significant determinants of reinsurance in Ghana. The study made interesting findings as summarized below.

The trend in reinsurance demand indicated that bigger and quite renowned insurance companies demanded relatively less reinsurance on average compared to smaller firms. Thus, bigger firms like Donewell Insurance Company, Enterprise life Assurance Company Ltd., Provident Life Assurance Company Ltd., Star Life Assurance Company, and Vanguard Life Assurance Company Ltd., demanded relatively lower reinsurance than their smaller counterparts.

Based on a panel analysis of data for 16 insurance companies over a 7-year period (2007-2013), revealed the appropriateness of random effects over the fixed and pooled OLS regression model.

The entire model was found to be statistically significant at 1% indicating a good model. Result from the random effect regression imply that insurance companies in Ghana make reinsurance decisions based mostly on their size, leverage, underwriting risk, and solvency margin.

Interestingly leverage produced a negative result, a contradiction to theory. This implies that the debt appetite of insurance companies in Ghana is on the high side. Companies that are highly leveraged have the possibility of running bankrupt. However, leverage can also mean borrowing capital to increase returns on investment hence leverage can be concluded not to be always bad. It can increase the shareholders' return on their investment and make good use of the tax advantages associated with borrowing (Kaguri, 2013). Contrary to expectations, macroeconomic variables turned out to be insignificant in the model and were found to have no significant impact on reinsurance demand.

Following from theory and empirical studies, firms' size was found to significantly impact on the demand for reinsurance at 1% and provide the appropriate sign. Thus, smaller firms demanded high reinsurance than bigger firms.

Underwriting risk produced significant results despite the contrary directional effects on reinsurance demand. Companies with greater or high levels of underwriting risks were found to increase retention (demand lower insurance) relative to those with lower underwriting risk.

Firm with higher leverage demanded were also found to demand less reinsurance. Insurance leverage was highly significant at 1% and reported a coefficient of approximately -0.40.

Insurance companies with sufficient funds in their vaults to absorb risks or claims deem themselves financially stable enough to handle or manage their own risk hence reduced demand for reinsurance. Conversely, insurance firms with low solvency demanded high reinsurance in order to negotiate or share risks that are likely not to be met by available funds in their vaults.

5.3 Conclusion

Reinsurance is one of the mechanism available to insurance companies in ensuring financial stability and survival of their businesses. A considerable level of reinsurance can be attributed to the existence and functioning of the insurance market given the nature of the Ghanaian financial system. It enables primary insurance companies to mitigate the risk of financial distress and possibility of bankruptcy in the event of high losses resulting from unanticipated catastrophes.

The study on the trend of reinsurance in Ghana have shown insurance companies in Ghana demand considerable level of reinsurance. The average demand for reinsurance imply that bigger insurance companies in Ghana generally demand relatively less reinsurance compared to the smaller firms.

In Ghana, bigger firms are able to better manage their risk portfolios and seek relatively less reinsurance compared to their smaller counterparts who are keen to risk diversification in order to allow them underwrite more contracts and stay relevant in the industry.

Though in transferring of underwriting risk, it is suggested that insurance companies should take cognizance of product range; and given the high level of concentration in the insurance industry, especially in the life sector, BCD turned out to not impact on reinsurance demand in Ghana. Results

of ownership structure though insignificant, revealed the seriousness of foreign firms attach to reinsurance than locally owned firms in terms of demand.

Implicitly, the insurance companies in Ghana focus more on internal and controllable factors in their reinsurance decision than on external macroeconomic conditions. This is, however, risky given the plausible effect of macroeconomic shocks on the insurance activities.

5.4 Recommendations

Following from the findings from this study, the following constructive suggestions are made:

- Reinsurance is an important area of focus that should be given more attention by primary insurers. Especially insurance companies operating with low level of reinsurance are advised to pay critical attention to reinsurance in optimizing their investment decisions.
- Small companies have less power than large ones and may find it difficult to compete with the large firms in this competitive environment hence smaller companies may want to consider increasing company assets.
- The importance of the effect of underwriting risk is the ability of reinsurance to increase the capacity of risk that insurance companies can absorb; therefore, it is in order for regulatory authorities to enforce measures that will mandate insurance companies to cede a minimum amount relative to the kind of risk.
- Great attention should be paid to leverage since companies that are highly leveraged may be at risk of bankruptcy if they are unable to make payments on their debts.

- Finally, a more profitable firm will be in a good position to absorb more risk, hence, much awareness should be created on the importance of insurance to increase the insurance penetration in the country and in effect increase the premiums received.
- It is also important that risk analysts, policy makers, shareholders and regulators within the insurance industry pay ample attention in evaluating bankruptcy problems and financial pressure of insurers.
- Despite the insignificance of macroeconomic variables in determining reinsurance demand, insurance companies in Ghana should not underrate the possible contribution of macroeconomic shock to the reinsurance market.

5.5 Study Limitations and Areas for Further Studies

The current study which focused on examining the factors that influence reinsurance was limited in data sample and scope. Lack of data on insurance-specific variables limited the study sample. Thus, the annual reports for most insurance companies were not accessible, while others have data for only two or three years. This limited the years under consideration for the study. A longer time dimension, say ten or more years would have been preferable. Study data for insurance companies also limited the explanatory ability for the time trend and the behaviour of reinsurance demand for the variables reinsurance companies over the years.

Further study should however consider either general insurance (non-life) or both life and non-life in order to better access the demand for reinsurance in Ghana. Also, study could look at the effect of reinsurance on the performance of insurance companies in Ghana in other to rationalize their demand for reinsurance.

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APPENDIX

Appendix A: Summary Statistics of Study Variables

a.) Summary Statistics for Entire Sample (16 Insurance Companies)

```
. sum REIN ROA SIZE NY GP UR BCD LEV LIQ SM INF IN AGR
```

Variable	Obs	Mean	Std. Dev.	Min	Max
REIN	97	2.09841	7.447368	.0303907	71.74154
ROA	97	1.081083	4.067008	.0154458	38.02663
SIZE	97	7.104595	.6203874	5.005738	8.397016
NY	97	5.917526	.623667	2	8
GP	97	144.5091	1136.935	.0071891	11047.79
UR	97	3.094011	26.71131	.0003758	263.4333
BCD	97	.6881339	.5926372	.0065303	2.785826
LEV	97	.8562929	1.029952	.0004228	8.386355
LIQ	97	10.64048	24.4208	.35896	153.1331
SM	97	.6371354	.9940229	0	9.504246
INF	112	12.32857	3.573127	8.58	18.1
IN	112	16.40714	4.253959	11.3	22.9
AGR	97	5.644551	11.50901	0	65.45915

b.) Summary Statistics by Insurance Companies

```
-> Code = LVANG
```

Variable	Obs	Mean	Std. Dev.	Min	Max
REIN	7	.4798543	.2818216	.234998	1.020408
ROA	7	.2672259	.1525293	.1579954	.5431137
SIZE	7	7.208972	.2131634	6.850935	7.387181
NY	7	6	0	6	6
GP	7	6.372972	2.581368	3.415125	10.69626
UR	7	.4915891	.1062271	.2970576	.5937164
BCD	7	.5167259	.3791948	.0609156	.8451483
LEV	7	1.058929	.8417723	.5196543	2.922529
LIQ	7	5.591824	6.448069	1.183224	16.41616
COMP	7	.9733773	.4519865	.4288814	1.536642
SM	7	.5361994	.2185993	.2640119	.8178798
INF	7	12.32857	3.84215	8.58	18.1
IN	7	16.40714	4.574242	11.3	22.9
AGR	7	14.75339	13.17149	0	33.32161

```
. by Code, sort: sum REIN ROA SIZE NY GP UR BCD LEV LIQ COMP SM INF IN AGR
```

-> Code = LCAPI

Variable	Obs	Mean	Std. Dev.	Min	Max
REIN	4	7.878762	2.958502	4.745034	11.8544
ROA	4	2.094656	.9744383	1.233823	3.087142
SIZE	4	6.302785	.2126977	6.096269	6.494573
NY	4	6	0	6	6
GP	4	20.65168	14.30462	2.200231	33.60051
UR	4	.1265648	.0750562	.0212339	.1865952
BCD	4	.5151882	.2640806	.3636422	.9107034
LEV	4	.3165815	.1248455	.1992548	.4929115
LIQ	4	2.233842	.76393	1.098052	2.749956
COMP	4	2.434987	1.107486	1.521183	4.014052
SM	4	.6060123	.1751458	.356108	.7284068
INF	7	12.32857	3.84215	8.58	18.1
IN	7	16.40714	4.574242	11.3	22.9
AGR	4	.210992	.2671726	.0514528	.6098762

-> Code = LDONE

Variable	Obs	Mean	Std. Dev.	Min	Max
REIN	6	.5931917	.1360914	.4746767	.8568014
ROA	6	.2629858	.055244	.1799249	.3249385
SIZE	6	7.174493	.0965744	7.074025	7.330735
NY	6	6	0	6	6
GP	6	7.154688	3.971064	2.578145	12.48757
UR	6	.3640345	.1279727	.1451444	.4494576
BCD	6	.9883143	.770456	.0065303	1.620694
LEV	6	.6018478	.2768433	.3558912	1.082865
LIQ	6	43.89366	68.47883	.6170198	153.1331
COMP	6	1.147595	.4607234	.4040896	1.601678
SM	6	.487642	.1423605	.2110225	.6040717
INF	7	12.32857	3.84215	8.58	18.1
IN	7	16.40714	4.574242	11.3	22.9
AGR	6	.1823978	.1501399	.0663576	.4725418

-> Code = LENTE

Variable	Obs	Mean	Std. Dev.	Min	Max
REIN	7	.2396589	.3524761	.0314984	1.01904
ROA	7	.1635802	.2461924	.017024	.7087426
SIZE	7	7.749683	.4276725	7.155887	8.354766
NY	7	5.714286	.7559289	4	6
GP	7	48.89328	110.0947	2.143036	298.3677
UR	7	.186433	.0399751	.1324752	.2633614
BCD	7	.7622667	.0901541	.6590722	.9492984
LEV	7	1.778845	2.9142	.560623	8.386355
LIQ	7	1.32597	.1401358	1.053409	1.517285
COMP	7	.5405159	.2894362	0	.9548014
SM	7	.3485514	.1882237	0	.6346608
INF	7	12.32857	3.84215	8.58	18.1
IN	7	16.40714	4.574242	11.3	22.9
AGR	7	21.11323	21.26163	1.262223	52.06082

-> Code = LEXPR

Variable	Obs	Mean	Std. Dev.	Min	Max
REIN	4	1.88541	1.11939	.7168784	3.309788
ROA	4	1.743131	1.71433	.3282089	3.837764
SIZE	4	6.57576	.5562903	6.001748	7.069675
NY	4	6	0	6	6
GP	4	16.03445	3.081923	13.38686	19.76202
UR	4	.0673691	.0803123	.0004557	.1835255
BCD	4	.7681954	.4566089	.349566	1.269962
LEV	4	1.417714	1.648232	.1516757	3.838706
LIQ	4	1.755988	1.036015	.7874254	2.86069
COMP	4	1.737288	1.652468	.1397372	4.056437
SM	4	.6798364	.2651139	.3972363	1.035803
INF	7	12.32857	3.84215	8.58	18.1
IN	7	16.40714	4.574242	11.3	22.9
AGR	4	1.194318	1.785158	.1887388	3.863115

-> Code = LGLIC

Variable	Obs	Mean	Std. Dev.	Min	Max
REIN	6	.6282573	.3039846	.3198187	1.00202
ROA	6	6.803218	15.30363	.2249492	38.02663
SIZE	6	6.589089	.8609985	5.005738	7.233741
NY	6	6	0	6	6
GP	6	337.6618	810.3348	1.349344	1991.698
UR	6	1.05767	1.097203	.0020845	2.818164
BCD	6	1.19508	1.216648	.0439215	2.501846
LEV	6	1.458971	.7028719	.4926803	2.500094
LIQ	6	7.41938	9.213942	.3997049	22.76788
COMP	6	.5265708	.595155	0	1.432972
SM	6	.3384498	.2229359	0	.5338695
INF	7	12.32857	3.84215	8.58	18.1
IN	7	16.40714	4.574242	11.3	22.9
AGR	6	6.941112	9.610491	.3655884	26.3134

-> Code = LGLICO

Variable	Obs	Mean	Std. Dev.	Min	Max
REIN	7	10.66132	26.93623	.1071237	71.74154
ROA	7	.1445381	.2011119	.0299116	.5933667
SIZE	7	7.721873	.3046772	7.254272	8.109986
NY	7	6.142857	.3779645	6	7
GP	7	1583.272	4173.462	.0071891	11047.79
UR	7	38.09526	99.36553	.0003758	263.4333
BCD	7	.3883882	.3539499	.0949814	1.043358
LEV	7	.5842539	.4121712	.0004228	1.113428
LIQ	7	5.583945	4.481168	.9584438	10.52837
COMP	7	238.033	623.9873	.1062963	1653.1
SM	7	.5707018	.2281721	.0630727	.7156083
INF	7	12.32857	3.84215	8.58	18.1
IN	7	16.40714	4.574242	11.3	22.9
AGR	7	1.439774	.9309805	.0025382	2.474864

-> Code = LGUAC

Variable	Obs	Mean	Std. Dev.	Min	Max
REIN	7	3.253211	2.791823	.1275001	8.415517
ROA	7	1.588071	1.037704	.079392	3.372139
SIZE	7	6.449778	.2996225	6.05792	6.99785
NY	7	5.714286	.7559289	4	6
GP	7	4.480965	2.876937	1.612178	10.31305
UR	7	.3124252	.2291899	.120267	.7395641
BCD	7	.4490584	.2037796	.0400221	.6458902
LEV	7	1.093996	1.457334	.2882527	4.353755
LIQ	7	5.292431	8.694526	1.548251	24.9862
COMP	7	1.086607	1.070403	.2306498	3.393042
SM	7	.4937277	.256582	.2005247	.9140256
INF	7	12.32857	3.84215	8.58	18.1
IN	7	16.40714	4.574242	11.3	22.9
AGR	7	9.489079	24.68122	.0377838	65.45915

-> Code = LMETRO

Variable	Obs	Mean	Std. Dev.	Min	Max
REIN	4	.6262455	.279596	.3617384	1.020408
ROA	4	.2749257	.153418	.1125526	.471532
SIZE	4	7.227433	.231155	7.009536	7.534471
NY	4	6.5	1	6	8
GP	4	3.212492	.5741274	2.46296	3.662785
UR	4	.3525215	.0429877	.3033515	.4045859
BCD	4	.7365249	.4196578	.1166453	1.011546
LEV	4	.4452041	.1112656	.3148592	.5467216
LIQ	4	2.943487	3.754007	.9885854	8.572997
COMP	4	1.628784	.4926419	.8934645	1.941951
SM	4	.6973189	.2954958	.3427878	.9798674
INF	7	12.32857	3.84215	8.58	18.1
IN	7	16.40714	4.574242	11.3	22.9
AGR	4	4.628399	.7248858	3.966546	5.501834

-> Code = LPHOE

Variable	Obs	Mean	Std. Dev.	Min	Max
REIN	7	1.459645	.9335941	.5590189	3.19805
ROA	7	2.44745	4.699392	.0674233	13.03681
SIZE	7	6.63423	.5854121	5.470654	7.187706
NY	7	5.428571	1.511858	2	6
GP	7	7.840107	3.06387	4.054036	12.0087
UR	7	.3481512	.1717668	.1086956	.5542406
BCD	7	.5415097	.4013892	.1093257	1.160503
LEV	7	.6221393	.2823534	.0887707	.9017623
LIQ	7	3.692763	3.418035	.8616956	9.146977
COMP	7	1.94583	2.696393	.4406265	7.918505
SM	7	1.019293	1.27881	.3610328	3.880128
INF	7	12.32857	3.84215	8.58	18.1
IN	7	16.40714	4.574242	11.3	22.9
AGR	7	.4312017	.2267611	.2227511	.9126573

-> Code = LPROV

Variable	Obs	Mean	Std. Dev.	Min	Max
REIN	7	.5995556	.3911726	.2409539	1.071355
ROA	7	.2469275	.1950941	.0623095	.553854
SIZE	7	7.241062	.3031799	6.842431	7.655429
NY	7	5.571429	1.133893	3	6
GP	7	4.919349	2.269651	2.84452	9.489252
UR	7	.326337	.2174965	.0859567	.7235423
BCD	7	.5317455	.6012141	.0202426	1.256607
LEV	7	.8575711	.8515418	.0831738	2.704013
LIQ	7	16.014	18.47566	.7957935	49.40074
COMP	7	2.034047	2.681631	.2609879	7.996494
SM	7	.5027904	.2313194	.154154	.8066706
INF	7	12.32857	3.84215	8.58	18.1
IN	7	16.40714	4.574242	11.3	22.9
AGR	7	1.912631	1.153001	.1207365	3.425766

-> Code = LQUAL

Variable	Obs	Mean	Std. Dev.	Min	Max
REIN	6	1.233893	.5891236	.6585581	2.27826
ROA	6	.4130495	.2549568	.0697352	.7840138
SIZE	6	6.99519	.2260653	6.691502	7.276223
NY	6	6	0	6	6
GP	6	3.377848	.6691742	2.405146	4.160531
UR	6	.2985026	.1598507	.16	.5219302
BCD	6	.4598141	.4510884	.0110431	.8887861
LEV	6	.370344	.1393891	.0913911	.4572262
LIQ	6	21.9707	35.16458	1.12513	90.55431
COMP	6	2.584269	2.165557	1.299027	6.968313
SM	6	.62157	.1056292	.4859365	.7340573
INF	7	12.32857	3.84215	8.58	18.1
IN	7	16.40714	4.574242	11.3	22.9
AGR	6	.0657204	.0063671	.0587093	.0750019

-> Code = LSIC

Variable	Obs	Mean	Std. Dev.	Min	Max
REIN	7	.2094624	.3552509	.0303907	1.010101
ROA	7	.1686461	.347738	.0154458	.9562525
SIZE	7	7.962978	.3498181	7.346148	8.397016
NY	7	6	0	6	6
GP	7	7.424588	2.506161	4.178965	10.24269
UR	7	.3877977	.1651973	.2270809	.59
BCD	7	.4327794	.4969667	.0088904	.9729189
LEV	7	.7488374	.1553661	.5755731	.9988286
LIQ	7	27.74127	39.82451	1.027835	112.4807
COMP	7	.7805506	.1698209	.4753283	1.052545
SM	7	.4217759	.0331971	.3890646	.4792499
INF	7	12.32857	3.84215	8.58	18.1
IN	7	16.40714	4.574242	11.3	22.9
AGR	7	2.64994	.3102218	2.38278	3.155369

-> Code = LSTAR

Variable	Obs	Mean	Std. Dev.	Min	Max
REIN	7	.2892	.258662	.0724143	.8040103
ROA	7	.1236009	.0791129	.0333363	.2436629
SIZE	7	7.606462	.2877078	7.273918	8.062908
NY	7	6	0	6	6
GP	7	8.106772	2.60744	5.45498	13.31315
UR	7	.2450658	.0913635	.0561318	.3274423
BCD	7	.7201669	.6630556	.0295107	1.53006
LEV	7	.8491132	.1806311	.544283	1.098026
LIQ	7	13.62162	16.24061	.6535691	33.88601
COMP	7	1.140812	.2959025	.6895377	1.548381
SM	7	.536209	.1145065	.378231	.6638271
INF	7	12.32857	3.84215	8.58	18.1
IN	7	16.40714	4.574242	11.3	22.9
AGR	7	15.93541	7.96018	7.252338	29.05153

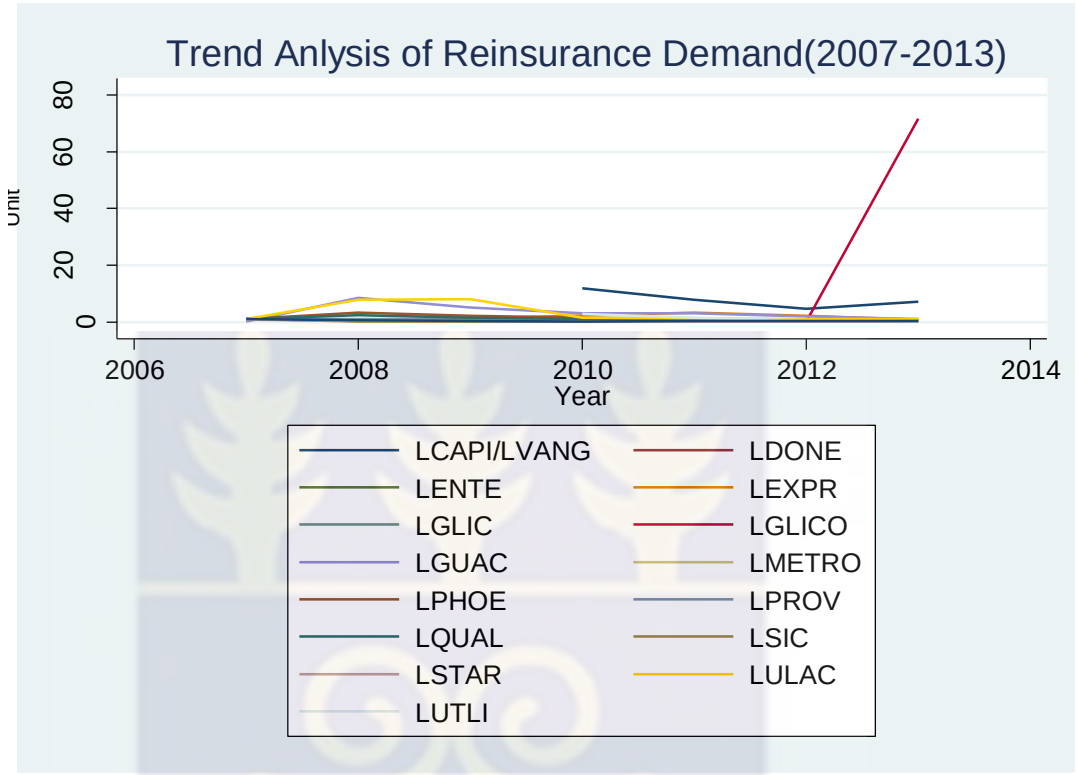
-> Code = LULAC

Variable	Obs	Mean	Std. Dev.	Min	Max
REIN	7	3.087858	3.296813	1.01403	7.924601
ROA	7	.8117093	.5039118	.2527619	1.837041
SIZE	7	6.586422	.2830201	6.08642	6.881206
NY	7	6	0	6	6
GP	7	3.852635	2.353114	.9248275	7.338945
UR	7	.3973818	.1754174	.201258	.6443578
BCD	7	.7772945	.2311011	.4624618	1.06544
LEV	7	.4067764	.2233353	.1330758	.6473327
LIQ	7	1.399352	.4539023	.9385791	2.162341
COMP	7	6.90336	13.92473	.0979863	38.1291
SM	7	1.682715	3.456537	.0601714	9.504246
INF	7	12.32857	3.84215	8.58	18.1
IN	7	16.40714	4.574242	11.3	22.9
AGR	7	.6229284	.7331552	.058157	1.930985

-> Code = LUTLI

Variable	Obs	Mean	Std. Dev.	Min	Max
REIN	4	1.323428	1.105663	.3375822	2.780961
ROA	4	.451609	.2747159	.1473604	.7217975
SIZE	4	7.009728	.3218913	6.72741	7.417445
NY	4	6	0	6	6
GP	4	10.6208	4.104485	5.544556	15.22061
UR	4	.5197254	.2638565	.2427692	.8187948
BCD	4	1.742638	.8883295	.8452659	2.785826
LEV	4	.9380526	.1448665	.7583905	1.096234
LIQ	4	.712086	.3760955	.35896	1.18306
COMP	4	1.56796	.4111044	1.114552	1.930021
SM	4	.599937	.1237679	.5009362	.7793999
INF	7	12.32857	3.84215	8.58	18.1
IN	7	16.40714	4.574242	11.3	22.9
AGR	4	.4545358	.4263263	.0845024	1.031116

Appendix B: Trend Analysis of Reinsurance Demand (Stacked Graph) for selected Insurance companies



Appendix C: Results for Pooled OLS Regression Model

```
. xtreg REIN ROA SIZE i.OS NY GP UR BCD LEV LIQ SM INF IN AGR

Random-effects GLS regression                   Number of obs     =         97
Group variable: firm                            Number of groups  =         16

R-sq:                                           Obs per group:
     within  = 0.9744                                         min =          4
     between = 0.8047                                         avg =        6.1
     overall = 0.9549                                         max =          7

                                                Wald chi2(13)     =    2568.44
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000
```

REIN	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ROA	-.1128479	.0522554	-2.16	0.031	-.2152666	-.0104291
SIZE	-2.387851	.4875061	-4.90	0.000	-3.343345	-1.432356
1.OS	.8524059	.6655738	1.28	0.200	-.4520948	2.156907
NY	-.0919121	.2490647	-0.37	0.712	-.5800699	.3962458
GP	.0000538	.0001311	0.41	0.682	-.0002032	.0003107
UR	.2740705	.0055729	49.18	0.000	.2631479	.2849932
BCD	.1974983	.3566081	0.55	0.580	-.5014407	.8964373
LEV	-.4010952	.1527791	-2.63	0.009	-.7005368	-.1016536
LIQ	-.0026382	.0074906	-0.35	0.725	-.0173194	.0120431
SM	-.3322865	.1500486	-2.21	0.027	-.6263763	-.0381967
INF	.0667215	.0477503	1.40	0.162	-.0268674	.1603103
IN	-.0098696	.0372314	-0.27	0.791	-.0828419	.0631027
AGR	-.0117591	.0145065	-0.81	0.418	-.0401913	.0166731
_cons	18.5241	4.117809	4.50	0.000	10.45335	26.59486
sigma_u	1.0292393					
sigma_e	1.2875535					
rho	.38987258	(fraction of variance due to u_i)				

Appendix D: Results for Fixed Effects (FE) Regression Model

```
. xtreg REIN ROA SIZE i.OS NY GP UR BCD LEV LIQ SM INF IN AGR, fe
note: 1.OS omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =        97
Group variable: firm                            Number of groups   =        16

R-sq:                                           Obs per group:
     within  = 0.9746                                         min =         4
     between = 0.7564                                         avg =       6.1
     overall = 0.9512                                         max =         7

                                                F(12,69)           =    220.96
corr(u_i, Xb)  = 0.0228                         Prob > F           =    0.0000
```

REIN	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ROA	-.0909094	.0594733	-1.53	0.131	-.2095554	.0277365
SIZE	-2.044536	.6574963	-3.11	0.003	-3.356205	-.7328669
1.OS	0	(omitted)				
NY	-.0520439	.2539557	-0.20	0.838	-.5586718	.4545839
GP	.0000375	.0001303	0.29	0.774	-.0002223	.0002974
UR	.273036	.0055151	49.51	0.000	.2620337	.2840383
BCD	.3429344	.38485	0.89	0.376	-.4248202	1.110689
LEV	-.3510646	.155125	-2.26	0.027	-.6605304	-.0415988
LIQ	-.0005165	.0076519	-0.07	0.946	-.0157815	.0147486
SM	-.3121339	.1478064	-2.11	0.038	-.6069995	-.0172682
INF	.0931408	.0481496	1.93	0.057	-.002915	.1891966
IN	-.0163192	.0369596	-0.44	0.660	-.0900516	.0574133
AGR	-.0122201	.0147509	-0.83	0.410	-.0416474	.0172071
_cons	15.6576	5.399122	2.90	0.005	4.886644	26.42855
sigma_u	1.4729648					
sigma_e	1.2875535					
rho	.56686376	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(15, 69) = 5.10                     Prob > F = 0.0000
```

Appendix E: Results for Random Effects (RE) Regression Model

```
. xtreg REIN ROA SIZE i.OS NY GP UR BCD LEV LIQ SM INF IN AGR, re

Random-effects GLS regression                   Number of obs     =         97
Group variable: firm                            Number of groups  =         16

R-sq:                                           Obs per group:
     within  = 0.9744                                         min =          4
     between = 0.8047                                         avg =        6.1
     overall = 0.9549                                         max =          7

                                                Wald chi2(13)     =    2568.44
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000
```

REIN	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ROA	-.1128479	.0522554	-2.16	0.031	-.2152666	-.0104291
SIZE	-2.387851	.4875061	-4.90	0.000	-3.343345	-1.432356
1.OS	.8524059	.6655738	1.28	0.200	-.4520948	2.156907
NY	-.0919121	.2490647	-0.37	0.712	-.5800699	.3962458
GP	.0000538	.0001311	0.41	0.682	-.0002032	.0003107
UR	.2740705	.0055729	49.18	0.000	.2631479	.2849932
BCD	.1974983	.3566081	0.55	0.580	-.5014407	.8964373
LEV	-.4010952	.1527791	-2.63	0.009	-.7005368	-.1016536
LIQ	-.0026382	.0074906	-0.35	0.725	-.0173194	.0120431
SM	-.3322865	.1500486	-2.21	0.027	-.6263763	-.0381967
INF	.0667215	.0477503	1.40	0.162	-.0268674	.1603103
IN	-.0098696	.0372314	-0.27	0.791	-.0828419	.0631027
AGR	-.0117591	.0145065	-0.81	0.418	-.0401913	.0166731
_cons	18.5241	4.117809	4.50	0.000	10.45335	26.59486
sigma_u	1.0292393					
sigma_e	1.2875535					
rho	.38987258	(fraction of variance due to u_i)				

Appendix F: Model Specification Test Results

a.) Hausman Specification Test Results (FE versus RE)

```
. hausman fe re

Note: the rank of the differenced variance matrix (11) does not equal the number of coefficients being tested (12); be sure this is what you expect, or there may be problems computing the test.  Examine
      the output of your estimators for anything unexpected and possibly consider scaling your variables so that the coefficients are on a similar scale.
```

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
ROA	-.0909094	-.1128479	.0219384	.028398
SIZE	-2.044536	-2.387851	.3433146	.4411794
NY	-.0520439	-.0919121	.0398681	.0496013
GP	.0000375	.0000538	-.0000162	.
UR	.273036	.2740705	-.0010345	.
BCD	.3429344	.1974983	.1454362	.1447072
LEV	-.3510646	-.4010952	.0500306	.0268754
LIQ	-.0005165	-.0026382	.0021217	.0015628
SM	-.3121339	-.3322865	.0201526	.
INF	.0931408	.0667215	.0264193	.0061883
IN	-.0163192	-.0098696	-.0064495	.
AGR	-.0122201	-.0117591	-.000461	.0026741

```
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg

  Test:  Ho:  difference in coefficients not systematic

              chi2(11) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                       =        0.31
            Prob>chi2 =      1.0000
            (V_b-V_B is not positive definite)
```

b.) Breusch Pagan LM Test Results (Pooled OLS versus RE)

```
. quietly xtreg REIN ROA SIZE i.OS NY GP UR BCD LEV LIQ SM INF IN AGR, re

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        REIN[firm,t] = Xb + u[firm] + e[firm,t]

        Estimated results:
                             |       Var     sd = sqrt(Var)
                -------------+------------------------------
                        REIN |    55.46329        7.447368
                           e |    1.657794        1.287553
                           u |    1.059333        1.029239

        Test:   Var(u) = 0
                                 chibar2(01) =     17.34
                              Prob > chibar2 =    0.0000
```

Appendix G: Multicollinearity Test Result

a.) Including all Independent Variables

```
. quietly xtreg REIN ROA SIZE OS NY GP UR BCD LEV LIQ SM INF IN AGR

. vif, uncentered
```

Variable	VIF	1/VIF
SIZE	81.38	0.012289
NY	71.62	0.013963
IN	20.89	0.047868
INF	17.44	0.057348
BCD	3.82	0.261602
LEV	1.89	0.527871
LIQ	1.64	0.608266
ROA	1.52	0.657743
SM	1.52	0.658762
OS	1.47	0.681078
AGR	1.32	0.755510
GP	1.07	0.938530
UR	1.06	0.942601
Mean VIF	15.90	

```
. vce,corr
```

Correlation matrix of coefficients of xtreg model

e(V)	ROA	SIZE	OS	NY	GP	UR	BCD	LEV	LIQ	SM	INF	IN	AGR	_cons
ROA	1.0000													
SIZE	0.6734	1.0000												
OS	0.0572	0.1260	1.0000											
NY	0.1220	0.2132	0.0273	1.0000										
GP	0.0006	-0.0634	0.0124	0.0014	1.0000									
UR	-0.1201	-0.1878	0.0066	-0.0055	0.1539	1.0000								
BCD	-0.3667	-0.2579	0.0617	-0.1125	-0.1365	-0.0052	1.0000							
LEV	0.0495	0.1703	-0.0098	0.2838	-0.0045	0.0527	-0.1006	1.0000						
LIQ	-0.1383	-0.0761	0.1339	-0.0801	-0.0673	0.0163	0.5084	-0.0795	1.0000					
SM	0.0223	0.1955	0.0220	0.0056	-0.0418	-0.0402	0.0290	0.1277	0.0520	1.0000				
INF	0.1524	0.2108	0.0350	0.0875	0.0014	-0.1012	0.2395	-0.0584	-0.0675	-0.0585	1.0000			
IN	-0.2998	-0.2086	-0.0264	-0.1429	0.1097	0.0928	0.0503	0.1175	0.0284	0.0881	-0.4108	1.0000		
AGR	-0.1343	-0.2454	-0.0465	-0.1213	0.0145	0.0676	0.1003	0.0083	0.0311	-0.0009	0.0009	0.0131	1.0000	
_cons	-0.5756	-0.9153	-0.1714	-0.5301	0.0412	0.1546	0.1477	-0.2811	0.0442	-0.2016	-0.3006	0.1304	0.2253	1.0000

b.) Excluding Firm Size (SIZE)

```
. quietly xtreg REIN ROA OS NY GP UR BCD LEV LIQ SM INF IN AGR

. vif, uncentered
```

Variable	VIF	1/VIF
NY	25.70	0.038916
IN	19.87	0.050321
INF	17.01	0.058784
BCD	3.59	0.278392
LEV	1.79	0.560199
LIQ	1.63	0.614131
SM	1.51	0.661153
OS	1.47	0.681640
AGR	1.29	0.773198
ROA	1.22	0.821386
GP	1.05	0.950310
UR	1.04	0.965134
Mean VIF	6.43	

```
. vce, corr
```

Correlation matrix of coefficients of xtreg model

e(V)	ROA	OS	NY	GP	UR	BCD	LEV	LIQ	SM	INF	IN	AGR	_cons
ROA	1.0000												
OS	-0.0283	1.0000											
NY	-0.0313	-0.0016	1.0000										
GP	0.0654	0.0120	0.0213	1.0000									
UR	0.0121	0.0200	0.0417	0.1647	1.0000								
BCD	-0.2773	0.0732	-0.0566	-0.1786	-0.0737	1.0000							
LEV	-0.0847	-0.0224	0.2550	0.0081	0.0882	-0.0551	1.0000						
LIQ	-0.1302	0.1044	-0.0656	-0.0901	-0.0129	0.5255	-0.0729	1.0000					
SM	-0.1545	-0.0013	-0.0397	-0.0346	-0.0078	0.0861	0.0912	0.0665	1.0000				
INF	0.0116	0.0070	0.0484	0.0110	-0.0662	0.3119	-0.0925	-0.0460	-0.1021	1.0000			
IN	-0.2222	0.0004	-0.1041	0.0985	0.0572	-0.0033	0.1578	0.0142	0.1352	-0.3840	1.0000		
AGR	0.0433	-0.0113	-0.0709	-0.0043	0.0193	0.0341	0.0758	-0.0003	0.0417	0.0617	-0.0413	1.0000	
_cons	0.1385	-0.1843	-0.8294	-0.0390	-0.0432	-0.2311	-0.3073	-0.0694	-0.0543	-0.2714	-0.1466	-0.0017	1.0000

c.) Correlation Matrix including Dependent Variable

```
. corr REIN ROA SIZE OS NY GP UR BCD LEV LIQ SM INF IN AGR
(obs=97)
```

	REIN	ROA	SIZE	OS	NY	GP	UR	BCD	LEV	LIQ	SM	INF	IN	AGR
REIN	1.0000													
ROA	0.0087	1.0000												
SIZE	-0.0005	-0.5374	1.0000											
OS	-0.0035	0.0381	-0.1361	1.0000										
NY	0.0227	0.0335	-0.0175	-0.0696	1.0000									
GP	-0.0316	-0.0300	0.1242	-0.0659	0.0159	1.0000								
UR	0.9586	-0.0223	0.1647	-0.0653	0.0143	-0.0148	1.0000							
BCD	-0.0490	0.2456	0.0082	-0.0271	0.0591	0.1077	-0.0210	1.0000						
LEV	-0.1300	0.0822	-0.0610	0.0741	-0.2767	0.0106	-0.0855	0.0627	1.0000					
LIQ	-0.0631	-0.0612	0.0558	-0.2048	0.0285	-0.0487	-0.0379	-0.4414	-0.0042	1.0000				
SM	0.0196	0.0876	-0.2538	0.0222	0.0337	0.0008	0.0056	-0.0506	-0.1263	-0.0504	1.0000			
INF	0.0637	-0.0255	-0.0921	-0.0031	-0.0220	-0.1145	0.0396	-0.4095	0.0275	0.2547	0.0806	1.0000		
IN	-0.0122	0.1666	-0.0261	0.0047	0.1270	-0.1396	-0.0154	-0.1172	-0.1325	0.0937	-0.0494	0.3851	1.0000	
AGR	-0.1112	-0.0597	0.2542	0.0573	0.0599	-0.0300	-0.0519	-0.0242	0.0656	-0.0610	-0.1063	-0.0116	0.0287	1.0000