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FISCAL POLICY AND INSURANCE GROWTH IN AFRICA

BY

LARTEY, WILHELMINA

(10514770)

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DECLARATION

I, **LARTEY, WILHELMINA,** declare that this thesis is my original work and therefore, has not been submitted by me or any other party to this university or elsewhere for another degree. All materials used therein has been acknowledged duly.

.... 12/10/2022 ....

LARTEY, WILHELMINA DATE

CERTIFICATION

This is to certify that this thesis has been supervised with the laid down principles for thesis writing at the University.

……………………………… ……12/10/2022………

PROF. CHARLES ANDOH **DATE**

(SUPERVISOR)

……………………………… ……12/10/2022………

PROF. LORD MENSAH **DATE**

(SUPERVISOR)

ABSTRACT

Most literature have established the existence or not of the relationship between insurance growth and economic growth. With some studies concluding that, whether or not economic growth causes insurance growth depends solely on the country under study and its prevailing economic conditions. Although in some countries, it has been established that economic growth does cause insurance growth, there may be specific factors within the economic growth that affect growth in the insurance sector as well. Amongst such determinants of economic growth are fiscal and monetary policy. This study examines the relationship between fiscal policy and insurance growth in Africa using panel data with a total of 30 African countries and a time interval of 20 years (thus from 1997 to 2017). The data for the study were obtained from the Global Financial Development Database and World Bank Development Indicators. The determinants of insurance growth in Africa are studied using a cointegration analysis. Investigation on a bi-causal relationship between fiscal policy and insurance growth is carried out using the Toda Yamamoto bi-causality test procedure. The results suggest that there is a long run relationship between insurance penetration (whether life or non-life), government expenditure, gross domestic product (GDP) growth, life expectancy, population growth and inflation. Also, the results of the bi-causality test show that insurance growth; measured by insurance penetration causes government expenditure but government expenditure does not cause insurance growth. The study informs policy makers in the African countries under study on the direction in which fiscal policy should go in order to enhance the growth of the insurance sector in these countries.

Keywords and phrases: government expenditure, fiscal policy, life insurance penetration, non-life insurance penetration tax revenue, Toda-Yamamoto bi-causality

DEDICATION

This thesis is dedicated to the Almighty God and my family, who have provided me with the necessary cash and resources to fulfill this journey. This piece is dedicated to my nieces and nephews in particular. With this small step, I aim to inspire them to greater accomplishments in the future.

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CHAPTER ONE

INTRODUCTION

1.1 Introduction

This chapter entails the background to the study, problem statement, the purpose of the study, objectives of the study, research questions, significance of the study, limitations of the study and organization of the study.

1.2 Background to the study

The relationship between fiscal policy and insurance growth may seem quite obsolete and daunting but when probed into, reveals a bottomless well of valuable knowledge to industry players, policy makers and most importantly, individuals and households. Weinstock (2021) described fiscal policy as the changes in government spending behavior and also revenue behavior in a bid to influence economic outcomes.

Ultimately, fiscal policy is the manipulation of government expenditure, revenue and taxes in order to achieve certain macroeconomic and microeconomic targets such as price stability, economic stability, optimum allocation of resources, employment, encouraging investment and capital formation, accelerating economic development and growth.

Fiscal policy is also a powerful tool to most governments and can be dubbed a discretionary stabilization policy (Jansen, 2002). "The main aim of stabilization policy is to keep the level of output close to its potential (i.e., the economy is producing at full capacity) while inflation and current account deficits are at acceptable levels" (Jansen, 2002, p. 1-2). Full capacity means the economy is producing maximum amount of goods and services that can be produced when the economy is most efficient. There are two types of stabilization policy; discretionary and automatic**.** Discretionary stabilization policies are intentional actions taken by authorities in order to maintain a healthy level of economic growth and also keep prices as low as possible whereas automatic stabilization policies do not require the intervention of policy makers.

While fiscal policy has remained a very important tool to most policy makers in governments for economic planning, its relationship with the insurance industry and its growth is a subject that needs to be investigated. Fiscal policy can either be contractionary or expansionary. Contractionary fiscal policy is when a government decides to reduce spending, reduce transfers or increase taxes or does a combination of the three altogether. Whereas expansionary fiscal policy is when government decides to increase spending, increase transfers and or reduce taxes. Contractionary fiscal policy is embraced more during an economic boom and less during a recession whereas expansionary fiscal policy is considered more appropriate in an economic downturn (International Monetary Fund, 2003).

Expansionary fiscal policy is very helpful during a recession as it may take the form of more government spending or a reduction in taxes. The benefit of expansionary fiscal policy comes in when private sector spending increases by additional buying of goods and services and individuals are able to spend more due to the availability of fund transfers from the government. For instance, the novel Covid-19 pandemic which has affected a myriad of world economies if not all, triggered an economic downturn which highlighted the importance and the role of national fiscal policies in raising the people's standard of living, boosting levels of employment, maintaining social equity and economic development (Cottarelli, Gerson & Senhadji, 2014). According to Chen, Shi, Zhang and Ding (2021), "each country needs to adopt fiscal policies which are appropriate to its unique contexts and circumstances." The variation in fiscal policy worldwide is due to the differences in economies, a difference in their fiscal capacity and their institutional capacity as well (Chen, Shi, Zhang & Ding, 2021, p. 263).

For instance, countries like the US and Japan carried out unprecedented and expansive fiscal actions to curb the economic downturn caused by the pandemic while countries like Cambodia, Cameroon and Venezuela took to very limited fiscal responses related to the pandemic. However, it was expected that countries would react to the Covid-19 pandemic with a more expansionary than contractionary form of fiscal policy (Chen, Shi, Zhang & Ding, 2021).

Although fiscal policy is a powerful and important tool to policy makers and most governments, it can sometimes cause more harm than good. Usually, governments use fiscal policy to counter the effects of the business cycle in which the economy finds itself. For example, increase government spending and reduce taxes during a recession. This is called counter-cyclical fiscal policy. However, there are times when fiscal policy becomes pro-cyclical. Thus, encouraging or enhancing whichever cycle is existing at any point in time; be it an economic boom or a recession (International Monetary Fund, 2003).

Pro-cyclicality, basically, is increasing government expenditure and reducing taxes during an economic expansion thereby enhancing the expansion. It could also be reducing the level of government expenditure and increasing taxes during a recession thereby worsening the consequences of the recession. It is important to run counter-cyclical fiscal policy in most situations because it helps to stabilize policy by reducing the volatility in output and keeping growth on a steady non-fluctuating path.

The insurance industry is a very important aspect of the economy in that it provides a readily accessible pool of funds for government's investment projects such as roads, schools and hospitals. Aside indemnifying individuals and businesses after financial loss due to an insured risk, the insurance industry contributes greatly to the economy by providing stability to business functioning and generating long term financial resources for the industrial projects. Also, the industry provides/generates employment for millions of people and encourages individuals to save.

Africa serves as home to about 17% of the world's population yet, "despite the obvious benefits of the insurance business to an economy, insurance penetration among African countries still remains very low" (Alhassan & Fiador, 2014, p. 83). The most important benefit of insurance indisputably, is indemnity, where the insured is restored back to their initial state before the occurrence of loss. Other benefits include: risk transfer, creation of employment, financial stability and helps in managing a sustainable economy. There is very little education about the importance or the benefits of insurance to individuals (Balcilar, Gupta, Lee & Olasehinde-Williams, 2020).

Insurance penetration in Africa is relatively low compared to global figures both in the past and in more recent years. For instance, in 2016, average insurance penetration in Africa was 2.8% below a world average of 6.1% (Africa Insurance Organization, 2016). Similarly, in 2018, overall insurance penetration stood at 2.78% compared to a global average of 7.23% (Balcilara, Guptad and Lee, 2018). There was a reduction in Africa's insurance penetration from 2.78% in 2018 to 2.76%; representing a 0.02% decrease (Africa Insurance Pulse, 2020).

Insurance penetration and insurance density are the proxies used to measure the influence of insurance in a country and also, the growth of insurance in a country.

Surprising as it may seem, the rate of growth of insurance in Africa has been on a yearly rise since 2015 (KPMG, 2015). The burgeoning growth of insurance on the continent since 2015 is quite surprising and commendable. Although the rate of insurance growth in Africa is high, this is only a resultant effect of economic growth within certain, specific countries on the continent; countries such as South Africa and Mauritius inclusive.

This growth, though significant and far outweighing growth levels in other countries worldwide, stems only from a few countries on the continent. Despite the positives, Africa's insurance markets remain diverse and fragmented, with only 10 African nations providing 92% of the total premiums - based on 2014 estimates, with South Africa alone responsible for 87% and 40% of life and non-life premiums, respectively (Africa Insurance Organization, 2016). As a result, whilst the growth rate of insurance in Africa has been showing upward trends each year, the insurance penetration on the continent has been on the low side. This means that the insurance industry in Africa has been recording tremendous growth financially, yet the number of people purchasing insurance is few in Africa as compared to other continents. This is a major strength of the insurance sector in Africa (KPMG, 2015). That is to say, there is more room for improvement.

The poor performance of the insurance markets across the continent is attributed to a number of factors, including a lack of highly qualified insurance professionals, low salaries, and a lack of public understanding of insurance advantages (Balcilar et al., 2018).

Many studies have investigated the relationship between insurance growth and economic growth. Some researchers have studied the relationship between financial markets and economic growth as well as the bidirectional relationship between economic growth and certain financial markets (Al-Yousif, 2002; Kugler & Ofoghi, 2005; Wolde-Rufael, 2009). Although some relationships have been established between insurance growth and economic growth, no substantial literature exists for the relationship between insurance growth and the key factors that influence economic growth such as fiscal policy and monetary policy. This paper focuses on the bi-directional relationship between fiscal policy and insurance growth in Africa.

Baker, Bloom and Davis (2013) identified the following factors as the main causes of economic policy uncertainty while constructing the economic policy uncertainty index; uncertainty about fiscal matters, uncertainty about entitlement programmes, uncertainty about healthcare policy and concerns about sovereign debt and currency risks. To elucidate the importance of policy (fiscal policy inclusive) to insurance growth, Balcilar et al. (2020) stated that in theory, policy-related uncertainty may be reduced by making wise political and economic choices. Thus, these uncertainties can be avoided by the kind of economic policies a government chooses to pursue. Although risk aversion is at the core of the demand for insurance by individuals, it provides a poor framework from the corporate finance point of view (Outreville, 2011). This study will take into account both life and non-life insurance demand and how fiscal policies implemented can affect this demand. Also, the impact that insurance development has on fiscal policy will be investigated. Thus, we seek to analyze the bidirectional relationship that exists between insurance growth and fiscal policy.

This study is important in a sense that when a country engages in fiscal stimulus, the government either increases spending or decreases tax revenue. In order to spend more, the government borrows, increasing the budget deficit. In theory, engaging in fiscal stimulus can cause a rise in interest rates (Weinstock, 20121). This is because the demand for loanable funds increases without a corresponding increase in the supply of these funds hence the price of loanable funds (interest rate), tends to go up. Premiums collected for policy covers are invested and so when fiscal policy choices affect the interest rates, it will probably affect investments made on premiums. This will probably affect the premiums charged by insurance companies and also the sum insured on each given policy.

1.3 Problem statement

The literature on the effect of fiscal policy on economic growth is very limited. Many developing countries have considered locally amalgamated insurance institutions an indispensable element of their political and economic independence. Today, most developing countries have dominant domestic insurance industries. Notwithstanding, in many developing nations, there is still a low demand for insurance services. (Beck & Webb, 2003). It will be good to test and establish a causal relationship between fiscal policy and insurance growth. This would help governments know the kind of policies most suitable to increase growth in the insurance sector.

Growth in the insurance industry is important because, the industry readily provides an accessible pool of funds for government investment projects such as roads, schools and hospitals. It also contributes greatly to the economy by providing stability to business functioning and generating long term financial resources for industrial projects. Also, not only does the industry help indemnify individuals and businesses after incurring financial loss due to an insured risk but also the industry generates employment for millions of people and encourages them to save. For these reasons, studying the determinants of insurance growth and probing further into the variables that could cause insurance growth in Africa is a very essential initiative.

Balcilar et al. (2018) confirm that, low incomes, a lack of understanding of insurance benefits by the populace and a shortage of skilled insurance professionals constitute some of the reasons why there is poor performance of the insurance markets recorded across the continent. Another factor that may be affecting insurance growth in Africa could be fiscal policy.

The level of financial development and insurance market degree of competition appear to help increase the sales in life insurance products (Li et al., 2007). Therefore, there may be some policies that support financial development and hence aid in development of insurance markets.

The relationship between financial development and economic growth has been well acknowledged and accentuated in the field of economic development as very important (Outreville, 2011).

1.4 Purpose of the study

The results of this study will help major players in the insurance industry in formulating products that are suitable to the kind of fiscal policy being pursued by government. It will also provide information on the current fiscal policy regime and how it is going to affect their industry.

1.5 Objectives of the study

i. Examine the determinants of insurance growth in Africa.

ii. Investigate whether there is a bi-causal relationship between fiscal policy and insurance growth in Africa.

1.6 Research questions

i. Is there a bi-causal relationship between fiscal policy and insurance growth in Africa?

ii. What are the determinants of insurance growth in Africa?

1.7 Significance of the study

Most works have focused on the relationship between insurance growth and economic growth (Al-Yousif, 2002; Kugler and Ofoghi, 2005; Wolde-Rufael, 2009). However, there are so many nitty gritty that go into the calculation of economic growth. This study focuses on one of these fundamental components of economic growth; thus, fiscal policy and its impact on insurance growth. The results obtained from this study would inform policy makers on the direction in which fiscal policy should go in order to enhance the growth of the insurance sector in these

African countries under study. Also, major players in the insurance industry including insurance companies would be well informed on the effects of the fiscal policy chosen by government on the performance of the industry.

1.8 Scope and limitations of the study

This study focuses only on African countries. Data on some African countries were not available. There were other countries whose available data was not enough, therefore, they were excluded from the study.

1.9 Organization of the study

The rest of the study is organized as follows: Chapter two focuses on literature about insurance growth in Africa and fiscal policy. It consists of theoretical literature review and empirical literature review. More emphasis is placed on insurance penetration in Africa and on some of the reasons why insurance penetration is low in Africa.

Chapter three centers on the research methodology. The chapter entails data sources and scope of study, model specification, model estimation strategy, explanations to the variables adopted for the study a panel data regression model and a Toda Yamamoto model.

Chapter four consists of the presentation of results and also a descriptive analysis, results from the Toda Yamamoto model and a discussion of the regression results. Chapter five consists of the summary of findings, conclusion, recommendations, scope and limitation of the study and direction for further research.

1.10 Chapter summary

In this chapter, a brief overview of the topic is given. Explanations why the topic is a necessary field/aspect of research are clearly given and why it is important to carry out this study. The chapter gives insight into the basic underpinnings of this study. The background of the study, statement of the problem; research questions and objectives as well as the justification of the study have been given more light. In conclusion, it is justified to say that, although there have been yearly improvements in insurance growth on the continent more work needs to be done to improve the insurance penetration. Hence the crux of this study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter provides a conceptual review of the available information regarding the topic under study. This provides an abstract of concepts or ideas based on analyzing available information on fiscal policy and insurance growth. The next session provides a theoretical review of concepts relating to the topic followed by an empirical review of available literature relating to fiscal policy and insurance growth in Africa.

2.2 Conceptual review

Fiscal Policy

Fiscal policy basically is the manipulation of both government expenditure, taxes and revenue in order to achieve certain desirable economic outcomes such as price stability, economic stability, encouraging investment and capital formation, optimum allocation of resources, employment, accelerating economic development and growth.

Government Expenditure

This is a term used for all of a government's transfer payments, investments and consumption. For instance, how much a government spends on the construction of schools and hospitals, payment of government employees, construction of roads etc., can be termed as government expenditure.

Revenue

Government revenue is money that a government receives from both taxable and non-taxable sources. This is the money used for government expenditures.

Insurance Penetration

Insurance penetration (IP) is defined as the ratio of underwritten premium in a given year to the Gross Domestic Product (GDP). Mathematically,

$$IP = \frac{Premium}{GDP} \qquad (\mathbf{2.1})$$

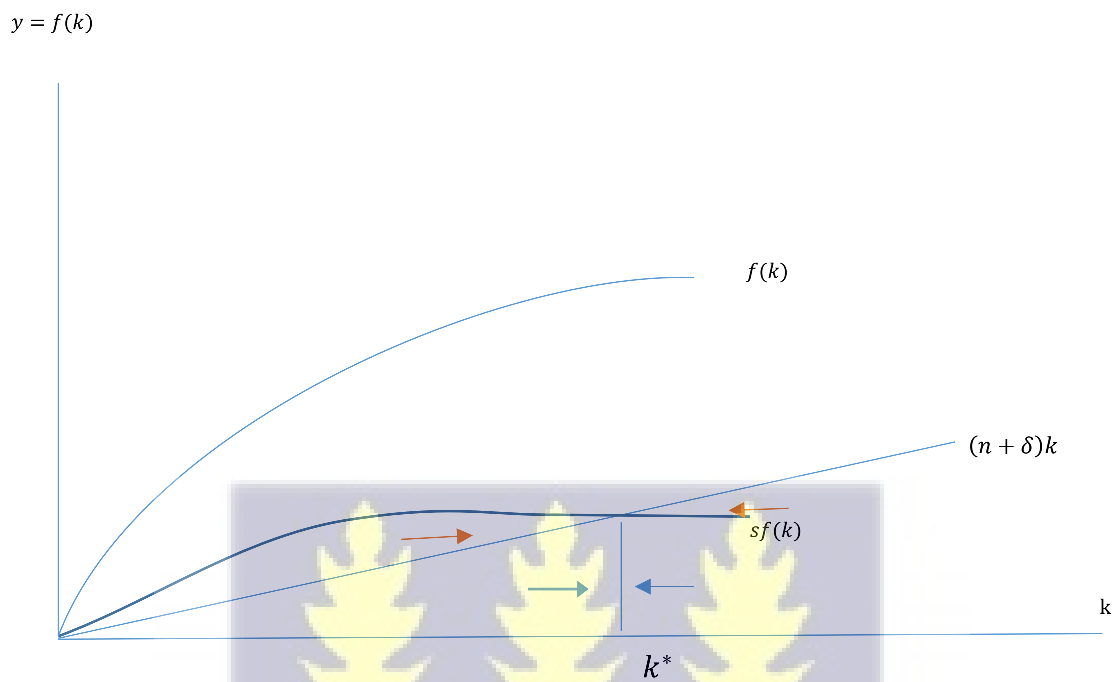
Insurance penetration ((IP)) is used as a proxy for insurance growth.

2.3 Theoretical literature review

Growth theories date back to the early post World War II stages. Starting from classical growth models such as the Malthus- Ricardo model and the Harrod- Domar Model. Thomas Malthus was a British philosopher and economist from the 18th century who is best known for the Malthusian growth model, which is essentially an exponential formula for predicting population rise. Malthus stated specifically that human population expands geometrically while food production grows arithmetically, implying that people will someday be unable to produce enough food to maintain themselves. Later, this theory was debunked. The Harrod–Domar model explains an economy's growth rate in terms of saving and capital accumulation. It suggests that the economy cannot have a balanced growth without manipulation. Many authors have acclaimed the "Solow Neoclassical Growth Model" as the best amongst other growth models (Todaro & Smith, 2010).

The model proposes that an economy's capital stock is in existence as a result of previous investment yet investment alone does not sustain economic growth. That is to say, there is a depreciation of the capital stock. An increase in savings or productivity can cause growth for some years.

Figure 2. 1: Equilibrium Solow growth model



Source: (Todaro & Smith, 2010)

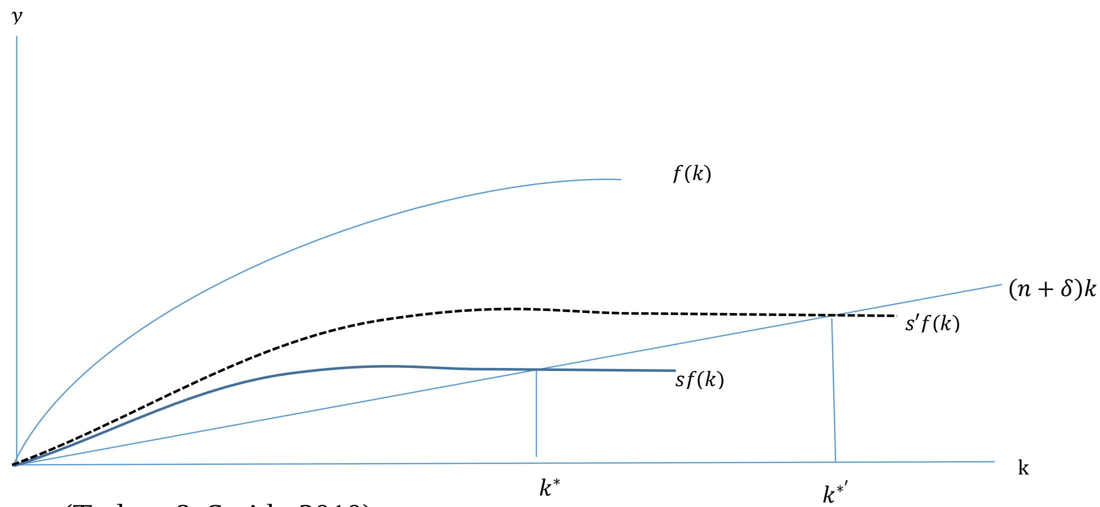
Using the production function, $y = Ak^{\alpha}$; where everything is measured in quantities per worker, the above graph models the Solow growth model when output $f(k)$ is constant and capital per worker is no longer changing. In such a state, $\triangle k = sf(k) - (\delta + n)k$ which is referred to as the growth of capital to labour ratio. Also known as the fundamental equation of the Solow model. The ratio is positive if savings $sf(k)$ is more than depreciation $((\delta + n)k)$. Given the assumption that labour productivity growth rate, (A), remains constant, then, there will be a state in which output $f(k)$ and capital per worker k is no more changing; known as the steady state.

If A rises, there will come a moment where the capital per effective worker will no longer change. As a result, the number of effective workers increase with A. Thus, it is as though there are new workers when the A is increased for the same number of workers because a higher productivity is recorded. In the case where A remains constant, the expectation is that, there would be a state in which output and capital per worker are no more changing and this is known as the steady state; where $\triangle k = 0$. Thus, $f(k) - (\delta + n)k = 0$; this is known as the steady state where $sf(k^*) = (\delta + n)k^*$ and k^* is the k that makes $\triangle k = 0$. k^* is called the steady state level of capital as shown in figure 2.1

The arrows in figure 2.1 indicate that when k less than k^* and savings is greater than depreciation, the level of k eventually moves towards the equilibrium k^* and when k is greater than k^* and savings is less than depreciation, the economy moves back to the equilibrium point where $k = k^*$ and savings equals depreciation.

Unlike the Harrod Domar model, an increase in savings in the Solow model does not lead to an increase in the growth rate of output, rather, it leads to an increase in the equilibrium k^* thus, the steady state level of capital per worker. In the short run though, an increase in savings will cause a temporary increase in the level of output and k returns to the original k^* . This is shown in fig 2.2 below:

Figure 2. 2: The long run effect of changing the savings rate in the Solow model



Source: (Todaro & Smith, 2010)

In a similar manner, Nektarios (2010) propounded an economic growth theory for the insurance industry where output in the insurance industry was represented by "incurred losses" which was a function of "invested assets" and "other labour and nonlabour inputs." The labour and nonlabour inputs have a growth rate of "n" which is a proxy for the growth rate of insurance expenses. The steady state growth path eventually attained by the insurance industry is characterized by the assets-input ratio "r". "The adjustment process takes place through the assets-losses ratio, v, which is affected by the insurance leverage, loss ratio, and the insurance exposure of the insurance industry. An insurance industry that has reached a steady state will have its output growing at a rate $n + pi$, where pi is the growth rate of average productivity." To determine a definite steady state growth path, the incremental reserve ratio, "s" is used. Increasing or decreasing "s" may move the insurance industry either to a higher or lower growth path. This study was proposed as a way to provide a more theoretical framework for evaluating dynamic occurrences in the insurance sector.

Also prevalent in most literature concerning insurance growth and economic growth is the "supply leading", "demand-following" and the "feedback" hypothesis which are used to explain the transmission mechanism between finance and growth. The supply leading hypothesis posits that financial growth will lead to economic growth. "Supply-leading" hypothesis argues that well developed financial markets provide avenue for efficient utilization of funds from surplus spending units to deficit spending units to propel growth (Patrick,1966). To put it another way, financial growth boosts economic growth by increasing the pace of capital accumulation and improving the efficiency with which the economy utilizes capital (King & Levine, 1993).

However, the demand following hypothesis posits that, an increase in economic growth would cause a corresponding upsurge in the demand for financial services. The 'demand-following' hypothesis conjectures that growth in the real economy acts as catalyst for the demand for financial services (Robinson, 1952; Romer, 1990). "That is, as real incomes rise, households and firms demand for financial services increases" (Galebotswe, Otisile & Sekwati, 2018, p. 845).

For the "feedback" hypothesis, it basically talks about the fact that, economic growth stimulates demand for financial services which in turn enhances growth thereby resulting in the feedback causality.

In 1967, Karl Borch wrote a paper on the economic theory of insurance in which he emphasized the points made by Von Neu-mann and Morgenstern that, basic mathematical armory may have helped in modeling phenomena in quantum physics and other fields in the sciences but there is the high possibility that methods like linear programming which have proved essential in diverse fields may not be suitable for modelling insurance problems and for that matter, all social sciences. However, Borch (1967) came to the conclusion that if, there are no salient points/factors lost in the estimation of the model, then mathematical methods such as linear programming may be used.

Borch 1967 used the *Principle of Equivalence* to estimate the amount of premiums that should be charged per person out of "n"number of individuals being insured. In his model, he defined the following parameters:

$X = P + InC(n(x))$;

X is the premium amount charged

$n(x)$ –number of insurance contracts

$C(n)$- Cost involved in selling and managing a portfolio of n contracts

He further stated that, $n(x)$ would determine the demand for insurance and that there would then have to be some elements of economics explaining this model satisfactorily. Elements or factors such as the price elasticity of the premium being high or low, which then would affect the demand for insurance and also have certain possible impacts on the company.

There is also the utility theory of insurance in which a decision maker is said to attach a certain level of utility to their wealth, thus $u(w)$. The decision maker decides between random losses and by comparing the expected utility that arises from Subtracting the loss from his/her wealth and chooses the one with the highest utility. Thus, suppose there are two random losses M and N, expected utility of M will be given by: $E[u(w - M)]$ and expected utility of N will be $E[u(w - N)]$. By solving the equilibrium equation:

$$E[u(w - X)] = u(w - P),$$

the individual is able to decide the maximum premium P^+ that they are willing to pay for a particular random loss, say X. At equilibrium, the utility obtained from incurring the loss is the same as paying premium to insure this loss. The insurer also determines their utility in this manner but this time around, it includes other expenses. They determine P^- the minimum premium they would be willing to charge. If the maximum premium of the insured is greater than the insurer's minimum premium, then both parties increase their utility if the premium charged is between P^+ and P^- (Kaas et al., 2008).

2.4 Empirical Literature Review

In trying to know the exact relationship that exists between fiscal policy and insurance growth, it would be very necessary to investigate the relationship between various aspects of fiscal policy and their interaction with the insurance industry. It is a popular notion that higher taxes tend to discourage enterprise risk-taking (Streeten,1953). Conclusions in economic theory in this regard have somewhat been different. Musgrave in his book and Tobin in his much celebrated "Liquidity Preference as a Behavior Toward Risk" concluded that increasing the proportional tax rate will, "with full loss offset", lead to an increase in the holding of the risky asset in a portfolio of a given size. Knowing very well that premiums are invested by insurance companies on behalf of their policy holders, a tax increase or decrease may affect the insurance industry in one way or the other especially in terms of how premiums are invested and what returns they may bring; the direction of which this study seeks to determine. After an analysis of the no-loss-offset case, Musgrave came to the conclusion that the direction of the effect is quite indeterminate.

A tax increases the investor's need for higher yield (raising "the marginal utility of income") and decreases his resistance to taking on more risk (decreasing "the marginal disutility of risk") because it lowers both the yield and the "risk" of all assets, according to the study. The market risk-yield rate of transformation is unaltered if the tax reduces the yield and risk of every investment in the same proportion (as occurs with the yield and risk measures taken into consideration by prior writers). Investor demand for riskier and higher-yielding investments rises as a result. (Feldstein, 1969).

Spending by the government on products, services or other things is referred to as government expenditure. It includes operational costs and investments in public services such as defense, social protection, education and healthcare, among others. Government expenditure is significant since it is thought to contribute to economic expansion as a whole despite the fact that some academics dispute the impact of government spending on economic growth (Miron, 2010).

According to Wagner's law, "government spending leads to higher levels of economic development" (Akpan, 2005, p. 51). Existing empirical research supports this law (Kolluri, Panik, and Wahab, 2000), but empirical studies of this law in several African nations either contradicted it or had inconclusive results (Akpan, 2005; Maingi, 2017). The existence of unchecked corruption among the many African nations has primarily been blamed for the strange results from the continent (DelMonte & Pennachio 2020, Jaikowicz & Drobiszová 2015, Mauro 1996, Mauro 1998, Nguyen & Bui 2022, Wu, Li, Nie & Chen 2017).

There are very few empirical research on the growth of insurance and government spending. While existing studies (Hannsgen 2012; Butler 2002) concentrate on the relationship between government spending and the various insurance industry facets, such as health insurance and unemployment insurance, attention is not given to the relationship between government spending and overall insurance growth.

Although insurance growth is of great importance, much of the extant literature focuses on developed countries. See for example, Ward and Zurbruegg (2002); Haiss and Sumegi (2008); Olayungbo and Akinlo (2016). Even so, there is no consistency in the findings of these works and the lack of consistency in these findings which are meant mostly for developed countries has certain implications on policy making especially for developed countries which have very scanty literature on this topic. The uncertainty would also cause mayhem for policy makers in developing countries who need examples and case studies for assurance in making decisions best suitable for their countries (Oitsile, Galebotswe & Sekwati, 2018).

Most studies have investigated the relationship between insurance growth and economic growth but not much of this work has focused on the relationship between insurance growth and the factors that influence economic growth; fiscal policy inclusive. It is important to know how these factors that influence economic growth are related to insurance growth also. This would help establish an all-round collective and unopposed relationship between insurance growth and economic growth.

For instance, Ward and Zurbruegg (2000) observed that in some countries, the insurance industry Granger causes economic growth and in other countries, the reverse is true thus, economic growth Granger causes growth in the insurance industry. They concluded that whether the insurance industry Granger causes economic growth or the reverse, depends on the country specific factors. That is to say that the different economic and financial conditions existing in each country affects it growth.

Apanisile and Akinlo (2014) showed that premiums contribute to economic growth in Sub-Saharan Africa, implying that a well-developed insurance industry is required for economic development, as it provides long-term investments for economic growth while also boosting risk-taking abilities.

In the causal relationship between financial development and economic growth, two different patterns may co-occur (Patrick, 1966). The absence of financial growth in the first, referred to as "demand following," is an indicative of a lack of demand for financial services. As the actual economy grows, there is a desire for new and diverse financial services (Jung,1986). Financial development generates economic growth, and the development of the financial system heralds demand for its services in the second, "supply-leading" model (Outreville, 2011). The importance of the insurance industry cannot be emphasized enough especially in terms of investment in financial markets.

Ward and Zurbruegg (2000) found out that, in some countries, the insurance industry Granger causes economic growth, whilst in other countries, the reverse is true. Moreover, the results of their study indicated that whether growth in the insurance industry Granger causes economic growth or the reverse is true, depends mostly on country specific factors and a number of national circumstances.

It is therefore important to study the relationship between fiscal policy and insurance growth because, if it has been established that economic growth, influences insurance growth in some instances, then it would be very important to know which specific factors in economic growth can influence insurance growth.

In studying the determinants of life insurance consumption in OECD countries, Li, Mashiran, Nguyen and Wee (2007) realized that insurance demand decreases with social security expenditure and life expectancy increases with the level of education and the number of dependents. Bellettini and Berti Ceroni (2000) discovered that whenever there was a statistically significant association between social security expenditure and growth, the sign of the association was positive. Hence, if a variable like social security expenditure can be linked to insurance demand and also linked to economic growth, then there may exist other variables of interest that affect economic growth and also affect insurance growth. The undeniable significance of insurance ranging from individual indemnity to economic benefits makes the enquiry into its demand and factors that influence this demand worthwhile (Li, Mashiran, Nguyen & Wee, 2007).

Not only does insurance increase spending on expensive assets such as automobiles and real estate but also, it encourages risky but highly profitable innovations as well (Ward & Zurbruegg, 2000). Due to the availability of insurance, individuals are willing to purchase goods considered otherwise luxurious and businesses are willing to go into more dangerous and risky ventures because they are aware and conscious of the fact that, in case of any damage or default, their insurance is going to cover their potential loss.

Another angle which is of major importance to this argument is the interest rate aspect of the whole situation. Interest rates are typically pivotal in explaining the relationship that may exist between fiscal policy and insurance growth. According to Felsenfeld (1968), in simplest terms, the function of interest rate in consumer transactions is that, it is the compensation paid by the borrower to the lender for the use of money. Felsenfeld (1968) also gave some classic definitions of interest which include: The term "reward for parting with money" is defined as "the lender's return over his charges; a measure of the unwillingness of those who own money to part with their liquid control over it (thus, the ability to spend money as and when they would like to). These definitions, Felsenfeld (1968) terms as economist's definitions of interest rate. For this reason, the approach of most small-loan laws and the supposedly uniform small loan law has been to disregard the economist's definition of interest and embrace a different approach: any costs to the borrower imposed by the lender are considered interest.

In truth, when it comes to interest rates and insurance, interest rate risk is a critical factor in determining insurance company profitability. The term "reward for parting with money" is defined as the lender's return over his charges; a measure of the unwillingness of those who own money to part with their liquid control over it (thus, the ability to spend money as and when they would like to) (Maverik, 2020).

Bonds and interest rates are inextricably linked. When interest rates drop, the value of a bond or other fixed-income investment drops as well. This is because, in comparison to alternative investments, the opportunity cost of keeping a bond with a lower interest rate over time is currently quite significant. Long-term bonds are likely to be held by insurance companies. As a result, interest rates and insurance rates are inextricably intertwined. As a result, each change in interest rates has a significant impact on the insurance industry's profitability in a variety of ways. According to Maverik (2020) there is an analysis that shows historically that the overall trend in the insurance sector, is to intensify profitability where there are escalating interest rates.

Ozdagli and Wang (2019) argue that, decreases in interest rates can also reduce the liabilities of an insurance firm by reducing the number of future payments to policyholders. This means that in the event of prevailing low interest rates, an insurance company promises lower sum insured to policy holders than they would during a time of prevailing high interest rates. This in turn would then mean that, the company would have to pay lower claims in the future, that is, a future in which interest rates are now high and investments on premiums may have earned more than projected during the time of prevailing low interest rates.

However, lower interest rates may also make the insurance company's products less appealing, leading to a decline in sales and, consequently, a reduction in the amount of premium money available for investment. Additionally, if analysts ultimately believe that the company may struggle to meet future financial obligations, as an equity investment, lower interest rates could have a negative influence on the company's risk profile. Lower equity investment levels often translate to lower asset levels for insurers (Ozdagli & Wang, 2019).

Again, Ozdagli and Wang (2019) emphasized on the fact that although the specific outcome of interest rate changes on a particular insurance company is not known, it is historically proven that the general inclination is for the insurance sector to increase profitability in an environment of rising interest rates. They also stated that the stocks of insurance companies increase in overall price-to-earnings (P/E) ratios.

2.5 Conceptual Framework

Figure 2.3: Conceptual framework of the relationship between government expenditure and insurance growth.

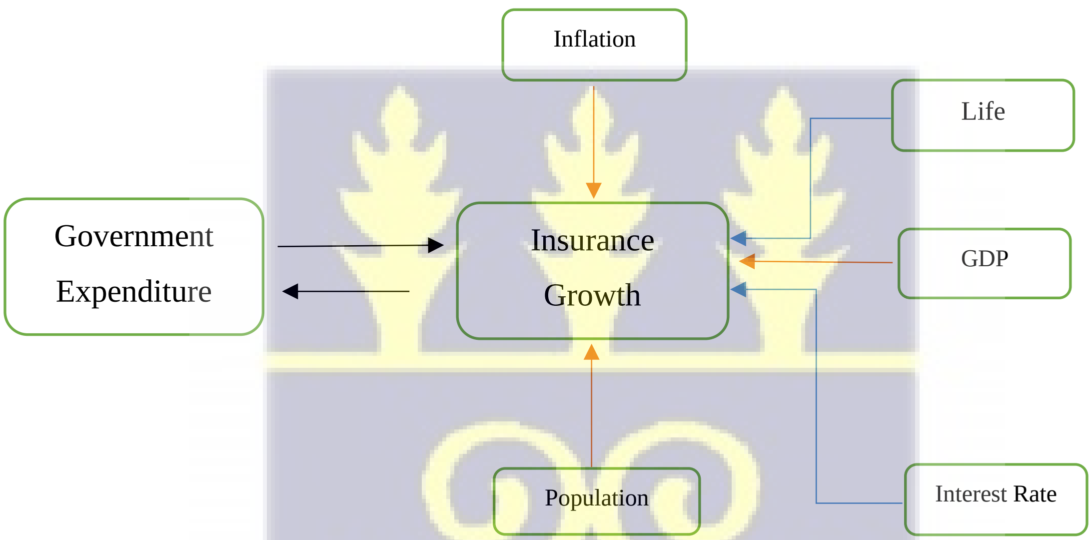
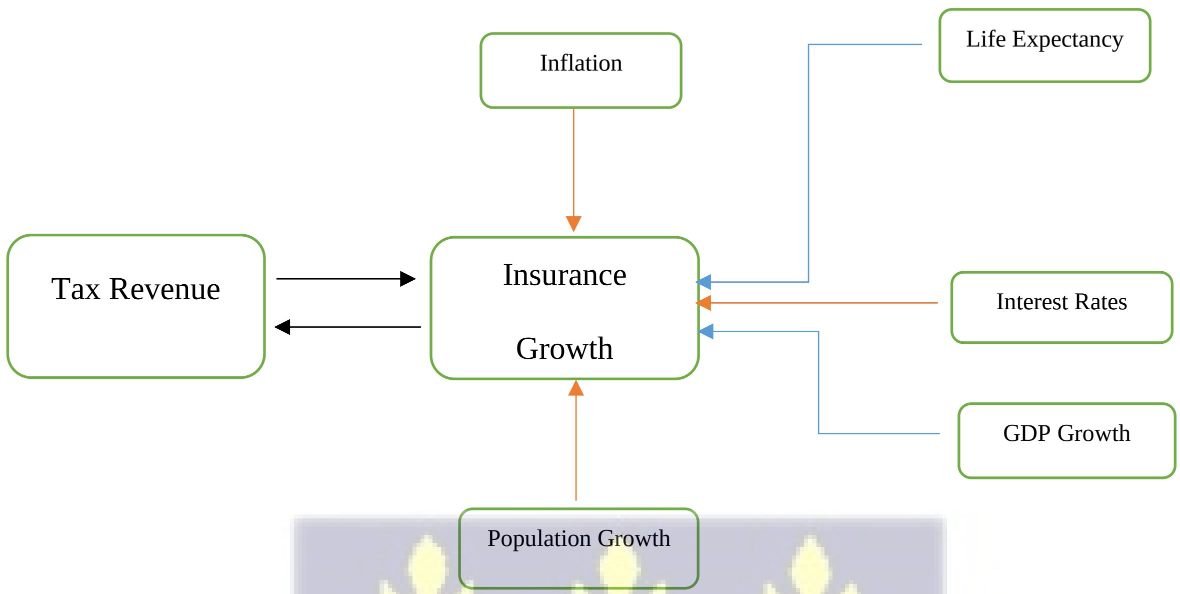


Figure 2.4: Conceptual review of the relationship between tax revenue and insurance growth.



Source: Author

This study hypothesizes that, there is a bi-causal relationship between fiscal policy and insurance growth. Hence, the double arrows between government expenditure and insurance growth in figure 2.3 and the double arrows between tax revenue and insurance growth in figure 2.2. There are other factors that could affect insurance growth and could in turn influence the relationship between fiscal policy and insurance growth. Such factors may include: inflation, population growth, life expectancy, interest rates and GDP growth. These factors are shown in figures 2.3 and 2.4.

2.6 Chapter summary

This chapter looked at the essential works in literature related to this topic and illustrated the knowledge they provided in a cohesive manner. The relationship between fiscal policy and insurance growth is an untouched area in extant literature. Establishing such a relationship would aid in making informed decisions in terms of policy making for African governments and African insurance companies.

CHAPTER THREE

DATA AND METHODOLOGY

3.1 Introduction

In this chapter, the approach, techniques, and data used in the study are all addressed. More emphasis is placed on the research design, demographics and sample, data source, data analysis method, and data presentation methods. In order to answer the research questions, the approach is chosen in accordance with the study objectives. The statistical and economic tools that were utilized to analyze the data are discussed in this chapter.

3.2 Study population

This study will use data on Insurance Penetration from the Global Financial Development Database for sub-Saharan African Countries and Egypt, data on population, Inflation. Life expectancy, Government Spending, Tax rates, Tax Revenue for Sub-Saharan African countries and Egypt are obtained from the World Development Indicators; a primary collection of world indicators accumulated by the World Bank from officially recognized international sources. The countries included in the analysis are: Angola, Benin, Burkina Faso, Cameroon, Central African Republic, Democratic Republic of Congo, Congo Republic, Cote d'Ivoire, Djibouti, Egypt Arab Republic, Eritrea, Gabon, Gambia, Ghana, Guinea, Kenya, Madagascar, Malawi, Mauritania, Mozambique, Niger, Nigeria, Rwanda, Senegal, Seychelles, Sierra Leone, South Africa, Tanzania, Togo and Zambia. A total of 30 African countries will be used.

3.3 Data

The proxies used for fiscal policy are government expenditure and tax revenue. This is based on the definition of fiscal policy as “the changes to government spending and revenue behavior in an effort to influence economic outcomes" (Weinstock, 2021, p.1).

In a bid to measure insurance growth, the proxies of insurance penetration and insurance density are chosen. Studies such as Alhassan and Fiador (2014) and Outreville (2011) make use of either of these proxies for insurance growth.

3.4 Conceptual model

This study uses a panel data analysis to analyze the relationship between insurance growth and fiscal policy. Panel data analysis according to Matyas and Blundell (1992), has quite a number of attractive features including the fact that it is easier to explore time series or temporal analysis without the woes of aggregation bias which is quite common in macroeconomic studies when using panel data.

Aggregation bias basically talks about extrapolating the results of a group data analysis on individual data. Thus, extending the conclusion from a group assuming that existing trends from the group might work the same way on the individual too. Thus, producing more correct predictions for individual outcomes by pooling data (Hsiao 2013).

Other benefits of panel data include: more accurate inference of model parameters, greater ability to capture the intricacies of human behavior than single cross-section or time series data, and the ability to construct and test more complex behavioral hypotheses, regulate the impact of omitted variables, reveal dynamic relationships, and develop more accurate individual outcome forecasts by pooling data rather than spawning individual outcome predictions.

The "representative agent" idea is commonly used in aggregate data analysis to give micro foundations for aggregate data analysis. The time series features of aggregate data might, however, differ dramatically from those of disaggregate data if micro units are diverse (e.g., Hylleberg, Engle, & Granger (1990); Lewbel (1992); Im, Pesaran, & Shin (2003)), yet evaluating policies based on aggregate statistics might be quite deceptive. As a result, panel data can be used to detect changes in micro units. Again, panel data makes available, multiple observations of a given individual at a given time which helps reduce measurement errors which will in turn, help avoid under-identification.

3.5 Analytical model

A cointegration test will be performed to test the existence of a long run relationship between insurance growth and some variables such as rural population, interest rates, level of education, government expenditure, inflation, life expectancy, and GDP growth in order to answer the research question pertaining to the first objective, "What are the determinants of insurance growth in Africa?" This is followed by a cointegration regression using the panel dynamic ordinary least squares method (POLS).

These variables may affect insurance growth either directly or indirectly in specific countries. For instance, people in rural areas may purchase less insurance than those in urban areas and for countries with high rural population, they may experience a low patronage of insurance. Countries where the level of education of the populace is low may not have citizens being aware of certain insurance policies and their benefits hence there may be a low patronage of insurance as compared to that of a country whose populace have a high level of education and probably a better understanding of insurance products and how they work. Inflation and interest rate levels may affect investments made on premiums and GDP growth may also affect the economic conditions under which the insurance industry operates in different countries.

To answer the research question on the second objective; “is there a causal relationship between fiscal policy and insurance growth in Arica?”, a stochastic model is used. This is based on the hypothesis that government final consumption expenditure in current US dollars ($) causes insurance growth and also, that insurance growth causes government final consumption expenditure. Again, the hypothesis that taxes on goods and services (Current LCU) cause insurance growth and that insurance growth also causes tax on goods and services would be tested.

The following equation is used to model the co integration test:

$$Ins_{it} = \beta_0 + \beta_1 GOV_{it} + \sum_{i,j}^{n} \delta_j X_{j,it} + \varepsilon_{it} \qquad \mathbf{(3.1)}$$

where:

- Ins – Insurance Growth
- GOV - Fiscal Policy (either Government spending/Tax rates/Tax revenue)
- $\sum_{j}^{n} \delta_J X_{it}\,; i = 1,2,3,..,n\,;\ j = 2,3,\ldots,n$ - summation of the control variables which include:
- PG – Population growth
- I - Inflation
- LET - Life expectancy (total)
- $GGDP$ - GDP growth rate
- ε_{it} – Error term for country "i" at time "t"

ε_{it} can be decomposed into $V_t + \omega_i + \epsilon_{it}$ where:

- V_t is the time specific effect
- ω_i is the state specific effect
- ϵ_{it} is the error term.

In order to test for the bi-directional causality between fiscal policy and insurance growth, this study uses annual data from 1997 to 2017 on insurance density, insurance penetration and selected fiscal policy indicators which include government spending and taxes on goods and services to test using the method of bivariate causality testing which is based on Granger non-causality. This is done by testing for causality from insurance density to fiscal policy and from fiscal Policy to Insurance density. Using a Toda-Yamamoto approach, (Toda &Yamamoto, 1995); which according to some authors involves the estimation of a vector-autoregressive model (VAR) in levels, as done by ta-Avram, Gavriletea, San and Sanu (2018).

Using the Toda Yamamoto approach will help reduce the dangers linked with improper identification of the order of integration of the individual time series. Also, it helps to lessen the risks accompanying cointegration among selected variables to be used in the model. More specifically, an application of the Toda Yamamoto long run causality approach will artificially increase the correct order of VAR, lag length, k by the maximum order of integration, $dmax,$ and guarantees that for Granger non-causality, the usual statistics have the standard asymptotic distribution.

In order to apply the Toda-Yamamoto approach of the Granger non-causality test, we summarize the GOV-INS model in a VAR system similar to that of Salisu (2015) motivated by Toda and Yamamoto (1995).

We estimate the GOV-INS model as done in the ASI-TBR model example by Salisu (2015):

$$GOV_t = a_0 + \sum_{i=1}^{k} a_{1i}\, GOV_{t-i} \sum_{j=k+1}^{k+dmax} a_{2j}\, GOV_{t-j} + \sum_{i=1}^{k} \phi_{1i}\, INS_{t-i} \sum_{j=k+1}^{k+dmax} \phi_{2j}\, INS_{t-J} + \varepsilon_{1t}$$

(3.2)

$$INS_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i}\, GOV_{t-i} + \sum_{j=k+1}^{k+dmax} \beta_{2j}\, GOV_{t-j} + \sum_{i=1}^{k} \varphi_{1i}\, INS_{t-i} + \sum_{j=k+1}^{k+dmax} \varphi_{2j}\, INS_{t-J} + \varepsilon_{2t}$$

(3.3)

This model is deliberated if the two series are of different orders of integration (say I (0) and I (1) series).

Definition of Relevant Terms

- k denotes the optimal lag length. This is determined by the usual information criteria such as AIC and SIC.
- $dmax$ is the maximum order of integration; for example, if GOV is I (0) and INS is $I(2)$; then, the maximum order, $dmax$ is 2.
- GOV_t - General government final consumption expenditure (in US$)
- GOV_{t-i} - Lag of general government final consumption expenditure (in US$); $i = 1,2,3, \dots, k$
- GOV_{t-j} - Lag of general government final consumption expenditure (in US$) $j = k + 1, \dots, k$
- INS_t - Insurance density at time t.
- INS_{t-i} - Lag of Insurance Density for $i = 1,2,3, \dots, k$
- INS_{t-j} - Lag of Insurance Density for $j = k + 1, \dots, k + dmax$
- $\alpha_0, \alpha_{1i}, \alpha_{2j,} \beta_0, \beta_{1i}, \beta_{2j}, \phi_{1i}, \phi_{2j}, \varphi_{1i}, \varphi_{2j}$ -Coefficients with $i = 1,2,3, \dots, k$ and $j = k + 1, \dots, k + dmax$
- ε_{1t} - Error term 1
- ε_{2t} - Error term 2

In order to incorporate the control variables in the bi-causality test, another set of equations is estimated in appendix A2. In these equations, the bi-causality test is done using the control variables and the main variables contemporaneously.

3.6 Description and source of variables

General Government Final Consumption Expenditure (in US$)

Based on the definition of fiscal policy in chapter one; a description of the "changes to government spending and revenue behavior in an effort to influence economic outcomes" (Weinstock, 2021). It is quite obvious that general government final consumption expenditure should be a good measure of government spending, hence, a fiscal policy proxy.

Insurance Penetration

The ratio of underwritten premium to GDP in a given year is known as insurance penetration. Insurance penetration (IP) is a metric that is used to measure insurance growth. That is:

$$IP = \frac{Premium}{GDP} \qquad (\mathbf{3.4})$$

Insurance Density

The insurance density, $ID,$ is the ratio of underwritten premium in a given year to the total number of population (Vimala & Alamelu, 2018).

$$ID = \frac{Premium}{Population} \qquad (\mathbf{3.5})$$

Insurance penetration and insurance density are the two main indicators of country level insurance growth in the literature. Insurance penetration is preferred less to insurance density. The reason, according to Beck and Webb (2003) is that, insurance penetration less measures the individual consumption of insurance than insurance density. Thus, how much insurance each person within the population consumes. This is because unlike penetration which measures growth with respect to GDP, insurance density measures growth with respect to income. Measuring consumption using quantity and price is not a perfect measure of consumption as there may be other factors affecting consumption such as a difference in the combination of mortality rates, a larger premium volume may reflect larger quantity, a higher price, etc (Beck & Webb, 2003).

The data for both insurance penetration and insurance density is sourced from the Global Financial Development Database. The countries taken into consideration are the Sub-Saharan African countries and Egypt due to the unavailability of data for all other African Countries.

3.7 Estimation technique

Toda-Yamamoto is a substitute method to the usual causality test which is grounded on revised Granger non-causality test. This procedure was proposed by Toda and Yamamoto (1995) in order to overcome the short comings of the conventional Granger causality test.

The conventional Granger causality test as we all know, is based on F-statistics which tails a standard normal distribution, meaning that when variables are integrated, the Granger causality test becomes insubstantial and may not be able to spawn robust results since the resulting test statistic do not follow the standard normal distribution. So, Toda and Yamamoto (1995) in order to overcome these challenges proposed the estimation of an augmented VAR, $k + dmax$ which generates the asymptotic Wald statistic in the form of Chi-squared distribution.

3.8 Limitation to methodology

In order to conduct a bi-causality test using the Toda -Yamamoto (1995) approach, the series must be of different orders of integration. In instances where more years of data are added on and unit root tests for all series show stationarity at level, then the Toda Yamamoto test will not work for bi-causality testing.

3.9 Chapter summary

This chapter has described the methods and tools that would be used in carrying out the study. The analytical and conceptual models have been described in detail as well as the data type and data analysis tool to be used stated. The source of data and justification for the variables chosen, estimation technique and the limitation to the methodology complete the chapter.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

The data analysis and outcomes are reported in this chapter. The findings of the numerous preliminary tests are presented after a brief discussion of the summary statistics of the variables. The results of the empirical models are presented first, followed by a discussion of these findings, and then a summary of all the findings.

4.2 Winsorization

By removing outliers or changing their values, the desire for robust statistics and for measures insensitive to outliers was satisfied (Ghosh & Vogt, 2012). Most authors tend to delete outliers from their dataset. This practice according to Nyitirai and Virág, (2018) is not the best solution because it is similar to ignoring reality. It is important, especially when observations are limited to keep outliers as part of the data set.Winsorization in time series involves substituting the value considered an outlier with the observation closest to it within the time sereis (Nyitrai & Virág, 2018)

4.3 Descriptive statistics

Table 4. 1: Descriptive statistics

The data is winsorized by taking the 80th percentile form the top. This resulted in the descriptive statistics be:

Descriptive/ Variable	**NLIP_W** (%)	**LIP_W** (%)	**GOV$$** (billions of US $)	**GGDP_W** (annual %)	**I_W** (years)	**LET** (annual %)	**PG** (annual %)
Mean	0.566948	0.189209	49.61771	3.847898	6.968628	56.17093	2.704039
Median	0.557508	0.155921	1.304069	4.559991	6.522349	56.66850	2.719520
Maximum	0.865338	0.407520	3938.100	6.878533	15.24938	71.65600	8.117928
Minimum	0.019087	0.000744	0.042640	-9.783030	-16.76108	37.49600	-0.058520
Std. Dev.	0.226119	0.148579	300.0847	3.266636	6.352474	6.377573	0.706014
Skewness	-0.242488	0.303386	8.715529	-1.668505	-0.595491	-0.105592	1.186737
Kurtosis	2.224608	1.619923	88.65874	6.327199	3.929298	2.768222	14.67680
Jarque-Bera	17.70454	45.92917	179888.0	532.9413	55.33928	2.408820	3443.038
Probability	0.000143	0.000000	0.000000	0.000000	0.000000	0.299869	0.000000
Sum	288.0097	91.76624	28034.01	2216.390	4055.742	33028.51	1573.751
Sum Sq. Dev.	25.92273	10.68466	50788656	6135.773	23445.63	23875.31	289.6028
Observations	508	485	565	576	582	588	582

Winsorizing the various observations using the 80th percentile from the top reduced the maximum value significantly from 14.72 to 0.8653 for NLIP, from 15.38 to 0.407520 for LIP, from 2630.12 to 15.24938 for I making them closer to their respective means. The descriptive statitstics for the unwinsorized data set can be found in table A1 in the appendix.

Table 4.1 above gives a brief description of the measures of central tendency and dispersion of the individual variables under consideration in this study over time. Here,

- NLIP – Non- life insurance penetration
- LIP - Life insurance penetration
- GOV$$ - Government expenditure
- GGDP – GDP growth
- I - Inflation
- LET - Life expectancy (Total)
- PG - Population growth

The variables of most interest here are NLIP, LIP and GOV$$. On average, NLIP is approximately 0.6% and is measured in premium volume to GDP (%); meaning that out of the 30 countries under consideration, the average country has about 0.6% of its population consuming Non-life insurance products. Amongst the 30 countries under consideration, Angola recorded the highest non-life insurance penetration with a record of 0.87%, almost 9% of nonlife insurance penetration in 1998 using the winsorized data set. Also, the least non-life insurance penetration within the dataset is 0.019% approximately 0.2% which was recorded by Guinea in the year 2010.

The kurtosis of 2.22 is less than 3 meaning that the NLIP data set has most observations below the mean and is mesokurtic. A skewness of -0.24 shows that the NLIP data set is fairly symmetrical. A Jarque-Bera statistic of 17.7 > 0.05 implies that NLIP does not follows normal distribution.

LIP also measured in premium volume to GDP (%) had a highest percentage of 0.4075% recorded by South Africa in the year 2000. A minimum of 0.0007% of life insurance penetration recorded by Guinea in the year 2008. Hence, from the data, Guinea recorded the least penetration in terms of both life and non-life insurance penetration. This tends to mean that overall insurance penetration in that country is extremely low almost zero. Amongst the 30 countries under consideration life insurance penetration had a mean of 0.1892% approximately 0.2%. Meaning most countries within the data set have a life insurance penetration close to or around 0.19%.

It is quite trivial to notice from the values presented for maximum and minimum life insurance penetration within the original unwinsorized data set that there are some outliers and this is made quite clear with the large values obtained for the skewness and kurtosis (4.76 and 24.6 respectively) as shown in table A1 of the appendix. Thus, there are some countries with extremely low life insurance penetration such as Congo Democratic Republic with a 0.0006% of life insurance penetration in the unwinsorized data. From the Jarque-Bera Statistic of 45.93, we fail reject the null hypothesis of normality and conclude that the available data for life insurance penetration for the 30 African countries under study follows a normal distribution using the winsorized data set.

Certain countries have reported extraordinarily low and exceptionally high levels of non-life insurance penetration within the data set. This can be attributed to the level of development in each of these countries, in that, countries with low level of development tend to have low penetration and those with high level of development also tend to have high level of penetration

Using the unwinsorized data set in table A1 of the appendix, government expenditure (GOV$$) which is measured in billions of US$ was on an average of $49.62 billion dollars over the time period with some countries having tremendously high expenditures in certain years and others having awfully low expenditures in particular years. For instance, a country like Egypt Arab Republic spent as high as $3,938.10 billion in 2017 and consistently was the highest spender amongst all 30 African countries within the data set; regularly toping the expenditure data set from 1997 through to 2017, thus, the entire time period under consideration. This high level of government expenditure in Egypt may be due to high investment expenditures, high capital expenditure, rising domestic interest obligations, increased net lending, changes in the wage bill, changes in the level of aggregate demand, cyclical and structural factors and/or exogenous factors including policy changes (Alba, Al-Shawarby, & Iqbal, 2004).

Also, there were countries with extremely low government expenditure which can be attributed to the very low level of development in these countries and also the population size. For instance, in table A1 of the appendix containing the original data set, a country like Gambia that had the lowest level of government expenditure of $0.043billion in 2003 had a population size of about 1.45million people whereas Egypt had a population size of about 72.83 million people. Fast forward to 2017, Egypt recorded a population size of 96.44 million whereas Gambia recorded 2.214 million people. Thus, constantly, the number of people in Egypt far outweighs that of The Gambia.

The other variables used in the study which include: GDP growth, inflation, life expectancy and population growth also had outliers. Thus, some extreme values which were way above or below their means.

Looking at the high standard deviation and differences between the maximum value and means of NLIP, LIP, I and GGDP in the original data, there seem to be outliers in the data set. In controlling for these outliers, the data for NLIP, LIP, I and GGDP are winsorized in such a way that the maximum values are made closer to the mean. The original data is found in appendix A1 and all regressions and analysis made in this chapter are redone with the unwinsorized data set as shown in appendix A1.

4.3 Unit root test results

Table 4. 2: Augmented Dicky Fuller test; H_0: Unit Root

Variable	Level	First Difference
LIP _w	0.0517	0.0000***
NLIP _w	0.0025***	
GOV$$	0.0000***	
GGDP _w	0.0000***	
I _w	0.0000***	
LET	0.0000***	
PG	0.0000***	

Source: Author's computation

The results of the ADF unit root test on the variables of consideration in this study (thus, LIP, NLIP, GOV$$, GGDP, I, LET, and PG) are shown in table 4.2. With the exception of LIP_w, all variables are statistically significant at the 1%, 5%, and 10% levels when evaluated at levels. As a result, at the 5% level of significance, the null hypothesis of the presence of Unit root is rejected, and we can conclude that all variables are stable at levels and first difference.

4.4 Cointegration test results

Table 4. 3: Pedroni cointegration test on life insurance penetration

Pedroni Residual Co integration Test					
Series: LIP GGDP GOV$$ I LET PG					
Sample: 1997 2017					
Null Hypothesis: No co integration					
Alternative hypothesis: common AR coefs. (within-dimension)					
				Weighted	
		Statistic	Prob.	Statistic	Prob.
Panel PP-Statistic		-35.08991	0.0000	-7.603591	0.0000***
Panel ADF-Statistic		-16.44806	0.0000	-5.637868	0.0000***
Alternative hypothesis: individual AR coefs. (between-dimension)					
		Statistic	Prob.		
Group PP-Statistic		-9.383574	0.0000***		
Group ADF-Statistic		-4.521236	0.0000***		

source: Author's computation

After establishing the stationarity of the series, it is important to test for the existence of a long run relationship between and amongst these series. The results of the cointegration test for the variables under consideration (here, life insurance penetration, GDP growth, government expenditure, inflation, life expectancy and population growth is in Table 4.3 as seen above.

Pedroni suggests several cointegration tests that take into account heterogeneous intercepts and trend coefficients across cross-sections. In panel data regression analysis, the Pedroni cointegration test is the most commonly utilized because it takes care of cross-sectional dependence, especially where the countries have the same outlook (either economical, socially, political etc) by allowing considerable heterogeneity.

Using the Pedroni cointegration test, the results of the panel PP and ADF -Statistics show a $P-value$ of $0.00 < 0.05$ hence, leading to the rejection of the null hypothesis of no cointegration. That is to say that, there does exist a long run relationship amongst these variables. These results were significant at the 1%, 5% and 10% levels.

Table 4. 4: Pedroni cointegration test using non-life insurance penetration

Pedroni Residual Co integration Test					
Series: NLIP GOV$$ GGDP I LET PG					
Sample: 1997 2017					
Null Hypothesis: No co integration					
Alternative hypothesis: common AR coefs. (within-dimension)					
				Weighted	
		Statistic	Prob.	Statistic	Prob.
Panel PP-Statistic		-0.615015	0.2693	-2.44296	0.0073***
Panel ADF-Statistic		-0.93197	0.1757	-2.814811	0.0024***
Alternative hypothesis: individual AR coefs. (between-dimension)					
		Statistic	Prob.		
Group PP-Statistic		-1.945654	0.0258**		
Group ADF-Statistic		-3.203997	0.0007***		

Source: Author’s computation

The same Pedroni cointegration test was conducted on the non-life insurance penetration, GDP growth, government expenditure, life expectancy, inflation and population growth as shown in Table 4.4 above. Pedroni suggests a number of cointegration tests that allow for different intercepts and trend coefficients across cross-sections. The findings suggest that there is a long-term link between these variables. This conclusion is based on the $p - value$ of the above Panel PP and ADF – statistics of $0.0073 < 0.05$ *and* $0.0024 < 0.05$ respectively which allows us to reject the null of no cointegration. The results of this test was significant at 5% and 10% levels of significance.

Table 4. 5: Cointegration regression using life insurance penetration

Dependent Variable: LIP				
Method: Panel Dynamic Least Squares (DOLS)				
Sample (adjusted): 1999 2016				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
GOV$$	0.137001	0.011022	12.43027	0.0000***
GGDP	-0.025219	0.004867	-5.182111	0.0000***
I	-0.000462	0.001417	-0.326251	0.7457
LET	0.000762	0.004571	0.166677	0.8684
R-squared	0.999353	Mean dependent var		0.872644
Adjusted R-squared	0.995413	S.D. dependent var		2.607689
S.E. of regression	0.176609	Sum squared resid		1.403578
Long-run variance	0.001737			

Source: Author's Computation

On to the cointegration regression with life insurance as the dependent variable, the following table 4.6 summarizes the results of the regression in table 4.5:

Table 4. 6: Summary of LIP cointegration results

Variable	**Relationship With Dependent Variable**	**Statistical Significance**
GOV$$	Positive	Significant
GGDP	Negative	Significant
I	Negative	Not Significant
LET	Positive	Not Significant
PG	Positive	Not Significant

Source: Author's computation

Thus, government expenditure life expectancy and population growth, were found to be having a positive long run relationship with life insurance penetration. Meanwhile, GDP growth and inflation were found to have a negative long run relationship with life insurance penetration.

Table 4. 7: Cointegration regression using non-life insurance penetration

Dependent Variable: NLIP				
Method: Panel Dynamic Least Squares (DOLS)				
Sample (adjusted): 1999 2016				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
GGDP	-0.017	0.007	-2.642	0.0111***
GOV$$	0.026	0.003	9.608	0.0000***
I	-0.003	0.001	-2.290	0.0264**
LET	0.006	0.004	1.259	0.214
PG	0.202	0.100	2.021	0.0488**
R-squared	0.995	Mean dependent var		0.713
Adjusted R-squared	0.963	S.D. dependent var		0.456
S.E. of regression	0.087	Sum squared resid		0.366
Long-run variance	0.000555			

Source: Author’s Computation

Table 4. 8: Summary of NLIP cointegration results

Variable	Relationship with Dependent variable	Statistical significance
GOV$$	Positive	Significant
GGDP	Negative	Significant
I	Negative	significant
LET	Positive	Not significant
PG	Positive	significant

Source: Author's computation

All other things being equal:

A unit increase in GDP growth (1% increase) is expected to reduce non-life insurance penetration by 0.017% in the long run.

A unit increase in government expenditure ($1 billion) is expected to result in a 0.026% increase in non-life insurance penetration in the long run.

A unit increase in inflation (here by 1%) is expected to result in a 0.030% fall in non-life insurance penetration in the long run.

An R^2 of 0.995 implies that 99% of the variations in the non-life insurance penetration are explained by the independent variables in the model.

To establish a threshold inflation that governments must work towards, we estimate the regression equation with all the control variables. We then include the squared of inflation in the model, take the first partial derivatives with respect to inflation as done in Table A11 of the appendix. The same steps were repeated for Tables A12 and A13 where the regression was run with only the I-SQUARE (the square of inflation) parameter and with only the I (inflation) parameter respectively.

The results of the regression as shown in Tables A11, A12 and A13 suggest that countries with high inflation should keep on reducing inflation to its barest possible minimum. This is because, the Adjusted r-squared of the linear equation is higher than that of all the non-linear equations. Hence, the best model that fits the data is the linear model in Appendix A13. Also due to the nature of the slope (negative) of the linear equation, it means we have a monotonically decreasing function.

4.5 Optimal Lag Selection and lag selection criteria for the bi-causality test

Table 4. 9: Optimal lag selection using life insurance penetration

VAR Lag Order Selection Criteria

Endogenous variables: LIP_W GOV$$

Sample: 1 588

Included observations: 243

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1686.464	NA	3718.471	13.89682	13.92557	13.90840
1	-682.1043	1983.920	0.987734	5.663410	5.749658	5.698150
2	-646.2410	70.25073	0.759889	5.401160	5.544908	5.459060
3	-629.2225	33.05642	0.682693	5.294012	5.495259	5.375073
4	-620.7208	16.37361	0.657885	5.256962	5.515707	5.361182
5	-561.2332	113.5895	0.416713	4.800274	5.116518	4.927654
6	-476.5510	160.3038	0.214525	4.136222	4.509965	4.286762
7	-355.3967	227.3513	0.081802	3.171989	3.603232*	3.345690*
8	-349.5221	10.92732*	0.080561*	3.156560*	3.645301	3.353420

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Source: Author's computation

Choosing a number of 8 lags, LR, FPE and AIC found 8 lags to be the optimum number of lags to be chosen for this test whilst SC and HQ found 7 lags to be optimum. Since 3 of the lag selection criteria chose 8 lags to be optimum, the choice of an optimum lag length of 8 is made. Hence: $k = 8$; d$max = 1$; $k +$ d$max = 8 + 1$ =9. Hence, a lag length of 9 is used for the bi-causality test between non-life insurance penetration and government expenditure.

Table 4. 10: Optimal lag selection using non-life insurance penetration

VAR Lag Order Selection Criteria

Endogenous variables: NLIP_W GOV$$

Sample: 1 588

Included observations: 257

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1862.168	NA	6845.770	14.50714	14.53476	14.51825
1	-931.2445	1840.112	5.042890	7.293731	7.376589	7.327053
2	-892.3585	76.25890	3.843951	7.022245	7.160341	7.077781
3	-871.7887	40.01904	3.378967	6.893297	7.086632	6.971047
4	-870.6287	2.238795	3.454582	6.915398	7.163972	7.015362
5	-807.3054	121.2260	2.177307	6.453738	6.757550	6.575916
6	-722.6313	160.7818	1.162233	5.825925	6.184975	5.970317
7	-585.8024	257.6855	0.413436	4.792237	5.206526*	4.958843
8	-577.8394	14.87252*	0.400929*	4.761396*	5.230924	4.950217*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

For the endogenous variables: LIP AND GOV$$, using a number of 8 lags, LR, FPE, AIC and HQ gave 8 lags as their optimum whilst SC chose 7 lags as the optimum. Since the majority of the lag selection criteria chose 8 lags as optimum, the optimal number of lags chosen for this study using NLIP was 8 lags. Hence: $k = 8$; $\mathrm{d}max = 1$; $k + \mathrm{d}max = 8 + 1 = 9$. Hence, a lag length of 9 is used for the bi-causality test between life insurance penetration and government expenditure. *(Find the lag selection criteria for unwinsorized data set in tables A3 and A5 of the appendix)*

4.6 Bi-causality test

Table 4. 11: Toda Yamamoto bi-causality test between life insurance penetration and government expenditure

VAR Granger Causality/Block Exogeneity Wald Tests

Sample: 1 588

Included observations: 220

Dependent variable: LIP_W

Excluded	Chi-sq	Df	Prob.
GOV$$	15.86610	8	0.0443
All	15.86610	8	0.0443

Dependent variable: GOV$$

Excluded	Chi-sq	Df	Prob.
LIP_W	3.537698	8	0.8962
All	3.537698	8	0.8962

Source: Author's computation

The results of the bi-causality test are in two parts. The first part tests whether government expenditure causes life insurance penetration and the second part tests whether life insurance penetration causes government expenditure.

Using the,Pvalue the results of the test in the first part indicates that government expenditure causes life insurance penetration. This is because the Pvalue of $0.0443<0.05$ hence we fail to reject the null of causality.

However, the results of the second test imply that life insurance penetration does not cause government expenditure. This implication is based on the probability value of the chi-square distribution which is $0.8962>0.05$.

Comparing this result to table A 4 in the appendix, the original unwinsorized data set gives a different result where it is realized that government expenditure does not cause life insurance penetration but rather, life insurance penetration causes government expenditure.

Table 4. 12: Toda Yamamoto bi-causality test between non-life insurance penetration and government expenditure.

VAR Granger Causality/Block Exogeneity Wald Tests

Sample: 1 588

Included observations: 232

Dependent variable: NLIP_W

Excluded	Chi-sq	Df	Prob.
GOV$$	3.618928	8	0.8898
All	3.618928	8	0.8898

Dependent variable: GOV$$

Excluded	Chi-sq	Df	Prob.
NLIP_W	12.70892	8	0.1223
All	12.70892	8	0.1223

Source: Author's computation

Now, using the same bi-causality test for non-life insurance penetration and government expenditure, the above results were obtained in table 4.12.

Based on the probability value of the chi-square distribution in the first part of the table, the conclusion that government expenditure does not cause non-life insurance penetration is drawn because 0.8898>0.05. Again, from the probability value of the chi-square distribution in the second part, the conclusion that non-life insurance penetration does not cause government expenditure is drawn. Using the original data set yields different results (See table A6 in appendix).

4.7 Chapter summary

Chapter four of this study entails all the estimations, tests and analysis carried out in fulfilment of the objectives of this study which include: first, examining the determinants of insurance growth in Africa and secondly, investigating the existence of a bi-causal relationship between fiscal policy and insurance growth in Africa.

For the first objective, a cointegration test was carried out between life insurance penetration, government expenditure, GDP growth rate, population growth rate, inflation and life expectancy. The same test was done using non-life insurance penetration and then a cointegration regression was run for both life and non-life insurance penetration. These cointegration test were done in order to help establish the existence of a long run relationship between insurance growth and the variables: government expenditure, GDP growth rate, population growth rate, inflation and life expectancy. Before running the cointegration tests and analysis, unit roots tests were conducted for each and every single variable under study in order to determine the order of integration for each of them.

To answer to the second objective, before carrying out the Toda Yamamoto bi- causality test, there was the need to first carry out unit root tests on each of the variables to be used for the bi-causality test. Here, Life insurance penetration and government expenditure for one and non-life insurance penetration and government expenditure on the other hand. Although necessary to run, these could be referenced from the earlier unit root test conducted for the cointegration tests. This helped in determining the maximum order of integration.

The lag selection criteria were then used to determine the optimal lag to be used for the Toda Yamamoto bi-causality test and then the Toda Yamamoto bi-causality test itself was conducted.

These steps were followed individually/separately for life insurance penetration and non-life insurance penetration.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The entire investigation is summarized and conclusions are drawn in this chapter. The study's findings, some policy recommendations, and ultimately, research directions are also presented.

5.2 Summary of the study

What drives insurance growth in an economy is an important question to insurance industry players. It has already been established in various studies that economic growth influences insurance growth in certain economies. The disconcerting question however, is whether there could be certain factors of economic growth such as fiscal and monetary policy that also cause insurance growth? This study sought to answer this question by investigating the major factors that influence non-life and life insurance penetration in Africa using panel data from 1997 to 2017 on 30 African countries. Also, to test whether fiscal policy causes insurance growth and vice versa, a bi-causality test was performed on both government expenditure and insurance penetration (an index for measuring insurance growth).

The study relied heavily on secondary data from the World Bank's Development Indicators (WDI) and the Global Financial Development database for its findings. To offer a description of the data used for the empirical studies, charts and tables were created. The data's stochastic qualities were next examined. Unit root tests utilizing the Levin Lin Chu (2002) test reveal that certain variables have stationarity at levels and others have stationarity at first difference, implying that the variables under discussion were integrated with a mixed order of one and zero. Pedroni's (1999) Cointegration test demonstrated a long-run link between life insurance penetration and the other variables under investigation. It also indicated a long-term link between non-life insurance penetration and all of the other variables studied (GDP growth rate, life expectancy, inflation, population growth rate and government expenditure).

The study found that government expenditure, GDP growth and inflation significantly impact non-life insurance penetration in the long run. Also, the results indicate that government expenditure and GDP growth affect life insurance penetration in the long run.

Also, the results of the bi-causality test showed that using an optimal lag length of 8 (thus $k = 8$) and d$max = 1$ (thus, the maximum order of integration), $k +$ d$max = 9$, government expenditure causes life insurance penetration but life insurance penetration does not cause government expenditure. Hence, a bi-causality does not hold between life insurance penetration and government expenditure.

Again, using and optimal lag length of 8 (thus $k = 8$) and $dmax = 1$, $k + dmax = 9$. The result of the bi-causality test between non-life insurance penetration and government expenditure showed that, government expenditure does not cause non-life insurance penetration neither does non-life insurance penetration cause government expenditure. Hence, a bi-causality does not hold between non-life insurance penetration and government expenditure.

5.3 Conclusion

This paper analyzed the causal effect between fiscal policy and insurance growth in Africa using the Toda Yamamoto bi causality test. The study reports that in Africa, GDP growth enhances non-life insurance growth but impedes on life insurance growth. This may be due to the fact that whenever a country’s economy experiences high GDP growth it is accompanied with a lot of personal expenditure on the part of the citizens hence, there is not enough money to save for life insurance products during that period of high GDP growth. Also, inflation and government expenditure were found to negatively impact non-life insurance growth whilst for life insurance growth, government expenditure positively impacted life insurance growth and inflation still negatively impacted life insurance growth.

Again, the results of the bi-causality tests showed that there is no bi-causality between insurance growth and fiscal policy; using government expenditure to represent fiscal policy here; yet, life insurance growth and non-life insurance growth causes government expenditure which means that growth in the insurance sector is bound to cause more government spending in African countries. This is a very essential discovery that would contribute to policy and decision making in the insurance industry.

5.4 Policy recommendations

Maintaining a high level of inflation leads to limited insurance penetration in the long run, according to the cointegration results in tables 4.6 and 4.7. As a result, this study suggests that African governments should strive to keep inflation low or moderate in order to maintain continuous insurance growth in their insurance industries.

Causality data aids in forecasting the future. African governments seeking to improve life insurance growth in their insurance industry should focus on improving their economy through increased government spending. Because the insurance industry is such a big element of an economy's financial sector, increasing government spending helps to open up the economy and has a favorable impact on the financial sector, as well as the insurance industry.

Although the bi-causality test shows a causal relationship between government spending and life insurance penetration, the cointegration results in tables 4.6 and 4.7 show that this can be harmful in the long run since government expenditure is a major component of GDP growth which was found to have a negative relationship with both life and non-life insurance penetration. As a result, boosting government spending should be done in spurts rather than on a regular basis.

5.5 Limitations of the study

The sample population may be too small to represent the whole of Africa. Thus, not all African countries could be used in the study due to the unavailability of data. Secondly, there are two components of fiscal policy; government expenditure and tax revenue, yet only one of these was used in the study. This was due to the lack of the availability of tax data for most African countries in times past.

Because the initial data set appeared to contain outliers, it had to be winsorized to produce more reliable results. The study includes an appendix (A1) that contains descriptive statistics as well as the results of some of the tests performed on the unwinsorized dataset. The Toda-Yamamoto control variables test was performed in the appendix utilizing control variables at the same time. The results of the test utilizing the original unwinsorized data, which can be found in Appendix A2, did not change. Concurrently conducting the test with the control variables can be considered an addition to the existing research, and future studies should look into it further.

5.6 Directions for further research

Other factors of economic growth, such as monetary policy and interest rates, and how they interact with insurance growth, should be explored in future research. Future research may benefit from the usage of a larger data collection. In the future, it may be more beneficial to add more countries and years of data, as this will result in higher degrees of freedom, which will lead to more accurate results.

The results of the study contends that a high level of inflation leads to limited insurance penetration in the long run and that African governments should strive to keep inflation low or moderate in order to maintain continuous insurance growth in their insurance industries. It would therefore be imperative for future studies in this field to establish the exact threshold inflation that governments must work towards.

5.7 Chapter summary

This chapter provided a summary and synthesis of the entire research. The study's findings were clarified and finalized in this chapter, along with some policy and further research recommendations. The study's weaknesses were also examined.

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APPENDICES

Appendix A1: Analysis with unwinsorized data set

Table A 1: Unwinsorized data set

DECRIPTIVE/ VARIABLE	NLIP (%)	LIP (%)	GOV$$ (billions of US$)	GGDP (annual %)	I (annual %)	LET (years)	PG (annual %)
Mean	0.708149	0.677437	49.61771	4.260426	17.11959	56.17093	2.704039
Median	0.557508	0.155921	1.304069	4.559991	6.522349	56.66850	2.719520
Maximum	14.72260	15.38100	3938.100	26.41732	2630.123	71.65600	8.117928
Minimum	0.003498	0.000431	0.042640	-36.39198	-21.16523	37.49600	-0.058520
Std. Dev.	0.874358	2.276567	300.0847	4.433615	114.9208	6.377573	0.706014
Skewness	10.93987	4.758004	8.715529	-1.691119	20.60532	-0.105592	1.186737
Kurtosis	159.2038	24.62411	88.65874	18.26623	462.2692	2.768222	14.67680
Jarque-Bera	526591.8	11279.41	179888.0	5867.936	5156192.	2.408820	3443.038
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.299869	0.000000
Sum	359.7395	328.5568	28034.01	2454.006	9963.602	33028.51	1573.751
Sum Sq. Dev.	387.6023	2508.454	50788656	11302.74	7673139.	23875.31	289.6028
Observations	508	485	565	576	582	588	582

Winsorizing the various observations using the 80th percentile from the top reduced the maximum value significantly from 14.72 to 0.8653 for NLIP, from 15.38 to 0.407520 for LIP, from 2630.12 to 15.24938 for I making them closer to their respective means.

Table A 2: Unit root test results for unwinsorized data set

Variable	Level	First Difference
LIP	0.1790	0.0000***
NLIP	0.0000***	
GOV$$	0.9999	0.0000***
GGDP	0.0000***	
I	0.0000***	
LET	0.0000***	
PG	0.0000***	

The above table 4.2 shows the results of the ADF unit root test on the variables under consideration in this study (thus, LIP, NLIP, GOV$$, GGDP, I, LET and PG). All the variables are statistically significant at the 1%, 5% and 10% levels with the exception of government expenditure (GOV$$) and Non-life insurance penetration when tested at levels. Hence, the null hypothesis of the existence of Unit root is rejected at the 5% level of significance, and then we can conclude that all the variables are stationary at levels and first difference.

Table A 3: Unwinsorized lag selection criteria with LIP

VAR Lag Order Selection Criteria

Endogenous variables: LIP GOV$$

Exogenous variables: C

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-960.1403	NA	2147537.	20.25558	20.30935	20.27731
1	-415.5285	1054.827	24.49752	8.874284	9.035582	8.939460
2	-368.2823	89.51910	9.857954	7.963838	8.232667	8.072465
3	-352.3621	29.49432	7.672687	7.712886	8.089247	7.864964
4	-322.5234	54.02377	4.456210	7.168913	7.652805	7.364442
5	-251.5707	125.4743	1.089495	5.759382	6.350806	5.998362
6	-188.6013	108.7050	0.315254	4.517923	5.216878	4.800353
7	-167.8262	34.98974	0.221870	4.164761	4.971249	4.490643
8	-155.4600	20.30654	0.186499	3.988632	4.902651*	4.357964
9	-151.9640	5.593574	0.189081	3.999242	5.020793	4.412026
10	-149.4832	3.864821	0.195991	4.031226	5.160308	4.487460
11	-131.8147	26.78180*	0.147685*	3.743467*	4.980081	4.243152*
12	-129.2431	3.789683	0.153071	3.773539	5.117685	4.316675
13	-128.4324	1.160550	0.164822	3.840683	5.292360	4.427269

14	-127.7147	0.997196	0.178036	3.909784	5.468993	4.539821
15	-123.4090	5.801400	0.178553	3.903348	5.570088	4.576836

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

Source: Author's computation

For the endogenous variables: LIP AND GOV$$, using a number of 15lags, LR, FPE, AIC and HQ gave 11 lags as their optimum whilst SC chose 8 lags as the optimum. Since the majority of the lag selection criteria chose 11 lags as optimum, the optimal number of lags chosen for this study using LIP was 11 lags. Hence: $k = 11$; $\mathrm{d}max = 1$; $k + \mathrm{d}max = 11 + 1 = 12$. Hence, a lag length of 12 is used for the bi-causality test between life insurance penetration and government expenditure.

Table A 4: Unwinsorized Toda- Yamamoto results with LIP

VAR Granger Causality/Block Exogeneity Wald Tests
Sample: 1997 2017

Included observations: 132

Dependent variable: LIP

Excluded	Chi-sq	df	Prob.
GOV$$	9.976014	11	0.5325
All	9.976014	11	0.5325

Dependent variable: GOV$$

Excluded	Chi-sq	df	Prob.
LIP	121.9721	11	0.0000
All	121.9721	11	0.0000

Source: Author’s computation

Using the $p - value,$ the results of the test in the first part indicates that government expenditure does not cause life insurance penetration. This is because the $p - value\ of\ 0.5325 > 0.05$ hence we reject the null of causality.

However, the results of the second test imply that life insurance penetration causes government expenditure. This implication is based on the probability value of the chi-square distribution which is $0.00 < 0.05$.

Table A 5: Unwinsorized lag selection criteria with NLIP

VAR Lag Order Selection Criteria

Endogenous variables:

NLIPGOV$$

Sample: 1997 2016

Included observations:97

Lag	LogL	LR	FPE	AIC	SIC	HQ
0	-829.2270	NA	95125.13	17.13870	17.19179	17.16017
1	-463.0447	709.7142	54.34268	9.671025	9.830285	9.735422
2	-443.8442	36.42153	39.72741	9.357613	9.623047	9.464941
3	-432.4170	21.20512	34.09746	9.204474	9.576082	9.354734
4	-431.5739	1.529770	36.41137	9.269565	9.747346	9.462756
5	-373.3197	103.2960	11.90701	8.150922	8.734877	8.387045
6	-303.0692	121.6711	3.041715	6.784931	7.475060	7.063985
7	-282.5573	34.67976	2.167837	6.444481	7.240784	6.766467
8	-278.4123	6.837148	2.166363	6.441491	7.343967	6.806408
9	-276.9592	2.336980	2.289899	6.494004	7.502654	6.901853
10	-260.3846	25.97258	1.773408	6.234734	7.349557	6.685514
11	-253.5059	10.49541	1.678707	6.175378	7.396375	6.669090
12	-232.2817	31.50795	1.183256	5.820242	7.147413	6.356885
13	-218.6688	19.64758	0.976728	5.622037	7.055381*	6.201611
14	-209.8251	12.39943*	0.890550	5.522166	7.061684	6.144672
15	-203.0265	9.251639	0.847988*	5.464464*	7.110156	6.129901*

Choosing a number of 15 lags, FPE, AIC and HQ found 15 lags to be the optimum number of lags to be chosen for this test whilst SC found 13 lags and LR found 14 lags to be optimum. Since 3 of the lag selection criteria chose 15 lags to be optimum, the choice of the optimum lag length for the endogenous variables: NLIP and GOV$$. Hence: $k = 15$; d$max = 1$; $k +$ d$max = 15 + 1 = 16$. Hence, a lag length of 16 is used for the bi-causality test between non - life insurance penetration and government expenditure.

Table A6: Unwinsorized Toda-Yamamoto bi-causality test with NLIP

VAR Granger Causality/Block Exogeneity Wald Tests

Sample: 1997 2017

Included observations: 85

Dependent variable: NLIP

Excluded	Chi-sq	Df	Prob.
GOV$$	16.54003	15	0.3471
All	16.54003	15	0.3471

Dependent variable: GOV$$

Excluded	Chi-sq	Df	Prob.
NLIP	61.63879	15	0.0000
All	61.63879	15	0.0000

Source: Author

Now, using the same bi-causality test for non-life insurance penetration and government expenditure, the above results were obtained in table 4.12.

Based on the probability value of the chi-square distribution in the first part of the table, the conclusion that government expenditure does not cause non-life insurance penetration is drawn because $0.34 > 0.05$. Again, from the probability value of the chi-square distribution in the second part, the conclusion that non-life insurance penetration causes government expenditure is drawn.

A2.1: Gov-Insurance VAR model with control variables

There is adequate possibility of there being other variables that also determine fiscal policy and insurance growth. Therefore, in trying to control for these variables, equations **(A2.1)** and **(A2.2)** is estimated:

$$GOV_t = \alpha_0 + \sum_{i=1}^{K} \alpha_{1i}\, GOV_{t-i} + \sum_{j=k+1}^{K+dmax} \alpha_{2j}\, GOV_{t-j} +$$

$$\sum_{i=1}^{K} \phi_{1i}\, INS_{t-i} + \sum_{j=K+1}^{K+dmax} \phi_{2j}\, INS_{t-j} + \sum_{i=1}^{K} \gamma_{1i}\, I_{t-i} + \sum_{i=1}^{K} \gamma_{2j}\, I_{t-j} +$$

$$\sum_{i=1}^{K} \theta_{1i}\, LET_{t-i} + \sum_{i=1}^{K+dmax} \theta_{2j}\, LET_{t-j} + \sum_{i=1}^{K} \rho_{1i}\, PG_{t-i} +$$

$$\sum_{j=1}^{K+dmax} \rho_{2j}\, PG_{t-j} + \sum_{i=1}^{K} \nu_{1i}\, GGDP_{t-i} + \sum_{i=1}^{K+dmax} \nu_{2j}\, GGDP_{t-j} + \varepsilon_{2t}$$

--- (A2.1)

$$INS_t = \beta_0 + \sum_{i=1}^{K} \beta_{1i}\, GOV_{t-i} + \sum_{j=k+1}^{K+dmax} \beta_{2j}\, GOV_{t-j} + \sum_{i=1}^{K} \varphi_{1i}\, INS_{t-i} +$$

$$\sum_{j=K+1}^{K+dmax} \varphi_{2j}\, INS_{t-j} + \sum_{i=1}^{K} \sigma_{1i}\, I_{t-i} + \sum_{i=1}^{K} \sigma_{2j}\, I_{t-j} + \sum_{i=1}^{K} \tau_{1i}\, LET_{t-i} +$$

$$\sum_{i=1}^{K} \tau_{2j}\, LET_{t-j} + \sum_{i=1}^{K} \omega_{1i}\, PG_{t-i} + \sum_{i=1}^{K} \omega_{2j}\, PG_{t-j} + \sum_{i=1}^{K} \nu_{1i}\, GGDP_{t-i} +$$

$$\sum_{i=1}^{K+dmax} \nu_{2j}\, GGDP_{t-j} + \varepsilon_{2t}$$

--- (A2.2)

The main focus here should be on government expenditure and Insurance growth, otherwise, there would be the existence of other equations like:

$$I_t = \lambda_0 + \sum_{i=1}^{K} \lambda_{1i} GOV_{t-i} + \sum_{j=k+1}^{K+dmax} \lambda_{2j} GOV_{t-j} + \sum_{i=1}^{K} \vartheta_{1i} INS_{t-i} + \sum_{j=K+1}^{K+dmax} \vartheta_{2j} INS_{t-j}$$

$$+ \sum_{i=1}^{K} \partial_{1i} I_{t-i}$$

$$+ \sum_{j=1}^{K} \partial_{2j} I_{t-j} + \sum_{i=1}^{K} \Lambda_{1i} LET_{t-i} + \sum_{j=1}^{K} \Lambda_{2j} LET_{t-j} + \sum_{i=1}^{K} \psi_{1i} PG_{t-i}$$

$$+ \sum_{j=1}^{K} \psi_{2j} PG_{t-j} + \sum_{i=1}^{K} \zeta_{1i} GGDP_{t-i} + \sum_{j=1}^{K+dmax} \zeta_{2j} GGDP_{t-j}$$

$$+ \varepsilon_{2t} \qquad \_\_\_(\mathbf{A2.3})$$

.

.

$$INS_t = \epsilon_0 + \sum_{i=1}^{K} \epsilon_{1i} GOV_{t-i} + \sum_{j=k+1}^{K+dmax} \epsilon_{2j} GOV_{t-j} + \sum_{i=1}^{K} \zeta_{1i} INS_{t-i} +$$

$$\sum_{j=K+1}^{K+dmax} \zeta_{2j} INS_{t-j} + \sum_{i=1}^{K} \psi_{1i} I_{t-i} + \sum_{i=1}^{K} \psi_{2j} I_{t-j} + \sum_{i=1}^{K} \varsigma_{1i} LET_{t-i} +$$

$$\sum_{i=1}^{K} \varsigma_{2j}\, LET_{t-j} + \sum_{i=1}^{K} \varkappa_{1i}\, PG_{t-i} + \sum_{i=1}^{K} \varkappa_{2j}\, PG_{t-j} + \sum_{i=1}^{K} \eta_{1i}\, GGDP_{t-i} +$$

$$\sum_{j=1}^{K+dmax} \eta_{2j}\, GGDP_{t-j} + \varepsilon_{2t} \quad \text{--- (A2.7)}$$

Table A7: Lag selection criteria for VAR model with LIP and control variables

VAR Lag Order Selection Criteria

Endogenous variables: LIP GOV$$ I LET PG GGDP

Sample: 1997 2017

Included observations: 181

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-3429.362	NA	1.23e+09	37.95980	38.06582	38.00278
1	-1479.528	3748.851	0.806893	16.81247	17.55466	17.11337
2	-870.4111	1130.737	0.001436	10.47968	11.85804	11.03850
3	-441.2688	768.1884	1.87e-05	6.135567	8.150090	6.952297
4	-298.0765	246.8287	5.75e-06	4.951122	7.601810	6.025767
5	-202.1752	158.9525	3.00e-06	4.289228	7.576082*	5.621789
6	-147.7568	86.58829	2.48e-06	4.085711	8.008729	5.676187
7	-92.42954	84.36649	2.05e-06	3.872150	8.431333	5.720540
8	36.73979	188.4017	7.51e-07	2.842654	8.038003	4.948960
9	100.8570	89.26817	5.71e-07	2.531967	8.363481	4.896187
10	161.0451	79.80747*	4.57e-07*	2.264695*	8.732374	4.886830*

* indicates lag order selected by the criterion

"LR: sequential modified LR test statistic (each test at 5% level)"

" FPE: Final prediction error"

"AIC: Akaike information criterion"

"SC: Schwarz information criterion"

"HQ: Hannan-Quinn information criterion"

For the bi-causality test involving control variables with life insurance penetration, the lag selection criteria propose an optimal lag of 10 from a total number of ten lags.

Table A 8: Toda-Yamamoto bi-causality test with LIP and control variables

VAR Granger Causality/Block Exogeneity Wald Tests

Sample: 1997 2017

Included observations: 158

Dependent variable: LIP

Excluded	Chi-sq	df	Prob.
GOV$$	4.181257	10	0.9388
I	5.800808	10	0.8317
LET	8.154200	10	0.6138
PG	2.270579	10	0.9938
GGDP	7.593258	10	0.6685
All	25.90588	50	0.9981

Dependent variable: GOV$$

Excluded	Chi-sq	df	Prob.
LIP	81.28632	10	0.0000

I	10.66219	10	0.3844
LET	13.73076	10	0.1856
PG	11.21918	10	0.3407
GGDP	15.66431	10	0.1097
All	156.0633	50	0.0000

Dependent variable: I

Excluded	Chi-sq	df	Prob.
LIP	4.866902	10	0.8999
GOV$$	6.388651	10	0.7816
LET	7.402460	10	0.6870
PG	8.534336	10	0.5768
GGDP	6.184527	10	0.7995
All	32.84131	50	0.9710

Dependent variable: LET

Excluded	Chi-sq	df	Prob.
LIP	21.43014	10	0.0183
GOV$$	7.792751	10	0.6491
I	13.44148	10	0.2000
PG	16.47819	10	0.0867
GGDP	10.24672	10	0.4191
All	85.35583	50	0.0014

Dependent variable: PG

Excluded	Chi-sq	df	Prob.
LIP	3.978210	10	0.9483
GOV$$	5.519371	10	0.8539
I	20.24459	10	0.0270
LET	12.73399	10	0.2389
GGDP	15.46194	10	0.1161
All	65.75842	50	0.0667

Dependent variable: GGDP

Excluded	Chi-sq	df	Prob.
LIP	11.08483	10	0.3509
GOV$$	12.20986	10	0.2713
I	7.280230	10	0.6988
LET	12.74521	10	0.2383
PG	61.11115	10	0.0000
All	97.89062	50	0.0001

The main focus of this research is the bi-causal relationship that exists between fiscal policy and insurance growth in Africa. There may be other variables that influence insurance growth that may have not been captured in our model. Controlling for some of these variables and not all due to scarcity of data, focus first on the first part of the results generated in table A9. Where, LIP is the dependent variable, based on the $p - value$ of the chi-square, the results indicate that, government expenditure, inflation, life expectancy(total), population growth, and GDP growth do not cause life insurance penetration.

In the second part of the table based on the chi-squared value and using the $p - value$, it can be concluded that life insurance penetration causes government expenditure just as in the original specification without the control variables. From the same second part of the table, the results indicate that inflation, life expectancy(total), population growth and GDP growth do not cause government expenditure.

Table A 9: Lag selection criteria for var model with NLIP and control variables

VAR Lag Order Selection Criteria

Endogenous variables: NLIP GOV$$ GGDP I LET PG

Exogenous variables: C

Date: 11/13/21 Time: 14:13

Sample: 1997 2017

Included observations: 191

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-3321.062	NA	54357186	34.83835	34.94051	34.87973
1	-1448.633	3607.613	0.242115	15.60872	16.32388	15.89839
2	-804.3322	1200.896	0.000415	9.239080	10.56723	9.777044
3	-353.2226	812.4696	5.39e-06	4.892383	6.833531	5.678639
4	-204.2894	258.8786	1.66e-06	3.709837	6.263978*	4.744383*
5	-163.8551	67.74333	1.60e-06	3.663404	6.830540	4.946242
6	-126.0989	60.88442	1.59e-06	3.645014	7.425144	5.176143
7	-84.36162	64.68183	1.52e-06	3.584938	7.978062	5.364358
8	-7.760776	113.8986	1.02e-06	3.159799	8.165916	5.187509
9	59.74892	96.13946*	7.55e-07*	2.829854*	8.448965	5.105856
10	80.63656	28.43344	9.19e-07	2.988099	9.220204	5.512391

* indicates lag order selected by the criterion

"LR: sequential modified LR test statistic (each test at 5% level)"

"FPE: Final prediction error"

"AIC: Akaike information criterion"

" SC: Schwarz information criterion"

"HQ: Hannan-Quinn information criterion"

Source: Author

Out of a total of ten lags, the optimal lag chosen is a lag of 9

Table A10: Toda -Yamamoto bi-causality test with NLIP and control variables

VAR Granger Causality/Block Exogeneity Wald Tests

Sample: 1997 2017

Included observations: 217

Dependent variable: NLIP

Excluded	Chi-sq	Df	Prob.
GOV$$	12.91437	8	0.1148
GGDP	17.00139	8	0.0301
I	7.567121	8	0.4769
LET	12.40285	8	0.1341
PG	11.87691	8	0.1568
All	54.42100	40	0.0638

Dependent variable: GOV$$

Excluded	Chi-sq	Df	Prob.

NLIP	19.09184	8	0.0144
GGDP	12.88494	8	0.1159
I	3.293176	8	0.9146
LET	18.82853	8	0.0158
PG	2.417690	8	0.9655
All	65.19625	40	0.0072

Dependent variable: GGDP

Excluded	Chi-sq	Df	Prob.
NLIP	2.696634	8	0.9519
GOV$$	13.80952	8	0.0869
I	5.832331	8	0.6660
LET	8.182524	8	0.4158
PG	37.50361	8	0.0000
All	70.88649	40	0.0019

Dependent variable: I

Excluded	Chi-sq	Df	Prob.
NLIP	19.67934	8	0.0116
GOV$$	5.617723	8	0.6900
GGDP	8.625138	8	0.3749
LET	3.840824	8	0.8712
PG	4.633714	8	0.7959
All	40.36335	40	0.4542

Dependent variable: LET

Excluded	Chi-sq	Df	Prob.
NLIP	2.680749	8	0.9528
GOV$$	8.612838	8	0.3760
GGDP	2.618402	8	0.9560
I	11.42611	8	0.1787
PG	14.62319	8	0.0669
All	54.87145	40	0.0588

Dependent variable: PG

Excluded	Chi-sq	Df	Prob.
NLIP	12.43758	8	0.1327
GOV$$	7.635007	8	0.4699
GGDP	14.72249	8	0.0648
I	8.935125	8	0.3478
LET	15.85872	8	0.0444
All	68.64117	40	0.0032

Source:Author

In the first part of the table where, NLIP is the dependent variable, based on the $p-value$ of the chi-square, the results indicate that, government expenditure, inflation, life expectancy(total) and population growth do not cause non- life insurance penetration yet GDP growth does cause non-life insurance penetration.

In the second part of the table based on the chi-squared value and using the $p - value$, it can be concluded that non-life insurance penetration causes government expenditure just as in the original specification without the control variables. Also, life expectancy (total) causes non-life insurance penetration.

Table A11: Regression with Inflation and the Squared Inflation

Dependent Variable: LIP
Method: Panel Least Squares
Sample: 1997 2017
Total panel (unbalanced) observations: 457

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GOV$$	-0.001609	0.000826	-1.946838	0.0522
PG	-1.820964	0.167518	-10.87026	0.0000
I	-0.000318	0.006346	-0.050143	0.9600
I_SQUARE	3.24E-08	2.42E-06	0.013385	0.9893
LET	0.035123	0.018744	1.873799	0.0616
GGDP	0.015395	0.022726	0.677432	0.4985
C	3.607029	1.117934	3.226514	0.0013

Root MSE	2.072263	R-squared	0.215728
Mean dependent var	0.702943	Adjusted R-squared	0.205271
S.D. dependent var	2.342541	S.E. of regression	2.088319
Akaike info criterion	4.325794	Sum squared resid	1962.483
Schwarz criterion	4.388973	Log likelihood	-981.4440
Hannan-Quinn criter.	4.350680	F-statistic	20.63012
Durbin-Watson stat	0.038941	Prob(F-statistic)	0.000000

Given the earlier specification,

$$Ins_{it} = \beta_0 + \beta_1 GOV_{it} + \sum_{i,j}^{n} \delta_j X_{j,it} + \varepsilon_{it} \qquad \textbf{(3.1)}$$

Including all the controls,

$$Ins_{it} = \beta_0 + \beta_1 GOV_{it} + \delta_1 PG + \delta_2 I + \delta_3 LET + \delta_4 GGDP + \varepsilon_{it} \qquad \textbf{(A11.1)}$$

Adding the square of inflation,

$$Ins_{it} = \beta_0 + \beta_1 GOV_{it} + \delta_1 PG + \delta_2 I + \delta_3 LET + \delta_4 GGDP + \delta_5 I^2 + \varepsilon_{it} \qquad \textbf{(A11.2)}$$

Taking the first derivative gives:

$$\frac{\partial(Ins_{it})}{\partial I} = \delta_2 + 2\delta_5 I$$

At the turning point,

$$\frac{\partial(Ins_{it})}{\partial I} = 0$$

Thus,

$$\delta_2 + 2\delta_5 I = 0$$

$$2\delta_5 I = -\delta_2$$

$$I = \frac{-\delta_2}{2\delta_5}$$

Table A 12: Regression with only the Squared Inflation

Dependent Variable: LIP
Method: Panel Least Squares
Sample: 1997 2017

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GOV$$	-0.001612	0.000823	-1.957955	0.0509
PG	-1.821423	0.167082	-10.90134	0.0000
I_SQUARE	-8.81E-08	3.05E-07	-0.289316	0.7725
LET	0.035288	0.018432	1.914557	0.0562
GGDP	0.015347	0.022680	0.676657	0.4990
C	3.596210	1.095700	3.282113	0.0011

Root MSE	2.072269	R-squared	0.215724
Mean dependent var	0.702943	Adjusted R-squared	0.207029
S.D. dependent var	2.342541	S.E. of regression	2.086008
Akaike info criterion	4.321423	Sum squared resid	1962.494
Schwarz criterion	4.375577	Log likelihood	-981.4453
Hannan-Quinn criter.	4.342754	F-statistic	24.81051
Durbin-Watson stat	0.038969	Prob(F-statistic)	0.000000

Given:

$$Ins_{it} = \beta_0 + \beta_1 GOV_{it} + \delta_1 PG + \delta_3 LET + \delta_4 GGDP + \delta_5 I^2 + \varepsilon_{it} \qquad (A\ 12.1)$$

$$\frac{\partial(Ins_{it})}{\partial I} = 2\delta_5 I$$

At the turning point,

$$\frac{\partial(Ins_{it})}{\partial I} = 0$$

Thus,

$$2\delta_5 I = 0$$

Hence,

$$I = 0$$

This would be an inflexion point.

Table A 13: Regression with only Inflation

Dependent Variable: LIP
Method: Panel Least Squares
Sample: 1997 2017

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GOV$$	-0.001610	0.000823	-1.955048	0.0512
PG	-1.821081	0.167105	-10.89785	0.0000
I	-0.000234	0.000797	-0.293333	0.7694
LET	0.035165	0.018460	1.904925	0.0574
GGDP	0.015378	0.022663	0.678540	0.4978
C	3.604282	1.097722	3.283419	0.0011

Root MSE	2.072264	R-squared	0.215728
Mean dependent var	0.702943	Adjusted R-squared	0.207033
S.D. dependent var	2.342541	S.E. of regression	2.086002
Akaike info criterion	4.321418	Sum squared resid	1962.484
Schwarz criterion	4.375572	Log likelihood	-981.4441
Hannan-Quinn criter.	4.342749	F-statistic	24.81111
Durbin-Watson stat	0.038947	Prob(F-statistic)	0.000000

Given:

$$Ins_{it} = \beta_0 + \beta_1 GOV_{it} + \delta_1 PG + \delta_2 I + \delta_3 LET + \delta_4 GGDP + \varepsilon_{it} \qquad \textbf{(A 13.1)}$$

$$\frac{\partial(Ins_{it})}{\partial I} = \delta_2$$

Since this is a linear equation, there will be no turning point. From the regression results in table A13, this is a monotonically decreasing function because δ_2 is negative.