

Determinants of Life and Funeral Insurance Penetration and Density in South Africa

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Declaration

I, Nsika Chenzira Sibusiso Mutasa, declare that the entire body of work contained in this research assignment is my own, original work; that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

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Abstract

As the life and funeral insurance premiums have increased significantly between 2001 and 2013 in South Africa, it was important to assess the determinants, macroeconomic or demographic, that influenced this trajectory. Although there is significant literature and empirical findings on the determinants of life insurance demand, there are few studies that have explored the determinants of microinsurance in general or funeral insurance in South Africa. In our research, we were also interested to find whether the determinants of life insurance penetration and density were similar to those of funeral insurance penetration and whether macroeconomic factors had a greater influence than demographic factors on the demand for life and funeral insurance. The factors used in the data analysis were identified through a review of previous empirical studies, after which they were collected from various sources and prepared for analysis. We assessed descriptive statistics to determine the nature of all variables and basic relationship between them. Then we performed multiple linear regression analysis using an Ordinary Least Squares Estimation (OLS) in order to ascertain the main factors that drove the increase in life and funeral insurance. Finally, we conducted Johansen cointegration and Granger causality in order to determine whether a causal relationship between income and life insurance existed. Although we expected income per capita to be a significant determinant across all dependent variables, it was not as strong as envisioned. It was only significant and positive for the life and funeral insurance density models. This was the same result for life expectancy at birth. The young age dependency ratio had a positive effect on life insurance consumption but not on funeral insurance consumption. Unemployment had a negative effect on funeral insurance consumption but it was interesting to note that the level of grants or social welfare provided had a positive impact on funeral insurance penetration. This was in contrast to life insurance penetration where a negative impact was observed. We found that demographic factors had a larger explanatory power than macroeconomic factors but that a combination of both types of factors resulted in more optimal regression models. Finally we found that a unidirectional causal relationship between income and life insurance penetration and density existed running from life insurance penetration and density to income with no feedback effects.

Key words

Determinants

Demand, consumption, penetration, density

Life insurance

Life risk insurance

Funeral insurance

Table of Contents

Declaration.....	i
Acknowledgements.....	ii
Abstract	iii
Table of Contents.....	iv
List of figures	vi
List of tables.....	vii
CHAPTER 1.....	1
INTRODUCTION	1
1.1 INTRODUCTION	1
1.2 PROBLEM DESCRIPTION.....	1
1.3 RESEARCH QUESTION AND OBJECTIVES.....	2
1.4 RESEARCH METHOD	2
1.5 CONTRIBUTION OF THIS STUDY.....	2
1.6 ORIENTATION	3
CHAPTER 2.....	4
LIFE INSURANCE	4
2.1 INTRODUCTION	4
2.2 TRADITIONAL INSURANCE	5
2.3 MICROINSURANCE.....	5
2.4 FUNERAL INSURANCE	6
2.5 CONCLUSION.....	8
CHAPTER 3.....	9
DETERMINANTS OF INSURANCE PENETRATION AND DENSITY	9
3.1 INTRODUCTION	9
3.2 DETERMINANTS OF LIFE INSURANCE PENETRATION AND DENSITY.....	9
3.2.1 Income	10
3.2.2 Literacy and Education Level	11
3.2.3 Inflation	11
3.2.4 Financial or Banking Sector Development.....	12
3.2.5 Old and Young Age Dependency Ratio	12
3.2.6 Other Factors	12
3.3 CONCLUSION.....	14
CHAPTER FOUR.....	16
RESEARCH METHODOLOGY	16
4.1 INTRODUCTION	16
4.2 RESEARCH DESIGN	16
4.2.1 Problem Statement & Research Objectives.....	16
4.2.2 Secondary Data	16

4.2.3	Overview of Data Collection Process.....	20
4.3	DATA ANALYSIS.....	21
4.3.1	Descriptive Statistics	21
4.3.2	Linear Regression Analysis	21
4.3.3	Causality between Income and Life Insurance Penetration and Density.....	24
4.3.3.1	Unit Root.....	24
4.3.3.2	Cointegration	25
4.3.3.3	Granger Causality.....	25
4.4	CONCLUSION.....	26
CHAPTER FIVE.....		27
RESULTS		27
5.1	INTRODUCTION	27
5.2	DESCRIPTIVE STATISTICS	29
5.3	LINEAR REGRESSION ANALYSIS.....	33
5.3.1	Introduction	33
5.3.2	Macroeconomic Linear Regression Models.....	33
5.3.3	Demographic Linear Regression Models.....	35
5.3.4	Combined Linear Regression Models.....	36
5.3.5	Conclusion – Regression Analysis	37
5.4	CAUSALITY BETWEEN INCOME AND INSURANCE PENETRATION AND DENSITY .	39
5.4.1	Unit Root	39
5.4.2	Cointegration.....	40
5.4.3	Granger Causality	41
5.5	CONCLUSION.....	43
5.5.1	Descriptive Statistics	43
5.5.2	Regression Analysis.....	43
5.5.3	Causality Analysis	43
5.5.4	Summary.....	44
CHAPTER SIX.....		45
CONCLUSION.....		45
6.1	CONCLUSIONS	45
6.2	RECOMMENDATIONS.....	45
6.3	LIMITATIONS AND AREAS FOR FUTURE RESEARCH	46
6.4	RECONCILIATION OF OBJECTIVES	46
6.5	SUMMARY	47
REFERENCES		48
APPENDIX.....		51

List of figures

- Figure 2.4.1 Funeral Insurance Penetration by LSM
- Figure 2.4.2 Funeral Insurance Composition – Formal vs. Informal Sector
- Figure 3.2.1 Economic and Demographic Factors Driving Life Insurance Demand
- Figure 3.3.1 Summary Table – Predicted Signs for Life and Funeral Insurance Consumption
- Figure 5.1.1 Total Life Insurance GWP
- Figure 5.1.2 Life Risk & Funeral Insurance NWP
- Figure 5.1.3 Life Risk & Funeral Insurance NWP Growth Index
- Figure 5.1.4 Life Insurance Penetration
- Figure 5.1.5 Life Risk & Funeral Insurance Penetration
- Figure 5.1.6 Life Insurance Density
- Figure 5.1.7 Life Risk & Funeral Insurance Density

List of tables

Table 4.2.1	Secondary Data Descriptions and Sources
Table 5.2.1	Descriptive Statistics
Table 5.2.2	Correlation Matrix – Dependent Variables
Table 5.2.3	Correlation Matrix – Independent Variables
Table 5.2.4	Autocorrelation of Independent Variables
Table 5.3.1	Macroeconomic Regression Models
Table 5.3.2	Demographic Regression Models
Table 5.3.3	Combined Regression Models
Table 5.3.4	Summary of Regression Analysis
Table 5.4.1	Augmented Dickey-Fuller Unit Root Tests
Table 5.4.2	Phillips-Perron Unit Root Test
Table 5.4.3	Johansen Tests for Cointegration
Table 5.4.4	Long-run Causality Analysis – Vector Error Correction Model
Table 5.4.5	Granger Causality Functions
Table 5.4.6	Post estimation Tests for Granger Causality
Appendix A1	Regression Analysis Data
Appendix A2	Causality Analysis Data

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

In this chapter, we describe the problem statement and define the research question and objectives of this study. Then, a brief review of the methodology used for conduct this research is presented. We have identified three areas in which this study contributes to existing literature. Finally, the layout of the research paper is outlined in the final section of this chapter.

1.2 PROBLEM DESCRIPTION

Considerable research has been done on the nature of the microinsurance sector and the reality of servicing low-income individuals (Roth 2000, Patel 2002, Bester et al 2005, Roth, McCord and Liber 2007, Churchill 2007, De Bock and Gelade 2012, Ramsay and Arcila 2013, Matul, Dalal, De Bock and Gelade 2013, Cimon, Harnasch, Gross and Fonseca 2013). Many studies have also explored the factors that influence the level of life insurance penetration, with limited microinsurance focus, within developed and developing countries (Browne and Kim 1993, Outreville 1996, Beck and Webb 2003, Elango and Jones 2011, Feyen, Lester and Rocha 2011, Arun, Bendig and Arun 2012, Kjoseveski 2012). Although there have been recent studies done by Atokey, Osei and Gemegah (2011) on the determinants of insurance penetration in Ghana and by Deus and Josephine (2014) and Olaosebikan (2013) on the factors influencing the performance of insurance companies in Tanzania and Nigeria respectively, there has been limited research completed on the determinants of funeral insurance penetration in South Africa.

Of the studies mentioned above, most of them identified income, life expectancy, dependency, inflation and financial literacy as significant factors for insurance penetration. Arena (2008) went further and found a causal relationship between income and insurance consumption. With regards to other factors, Beck et al (2003) and Outreville (1996) highlight the development of the financial sector as another catalyst for insurance penetration. Their studies establish a positive, but not causal, link between the level of financial or banking sector development and insurance penetration.

As the anticipated launch of new microinsurance legislation draws nearer and drives the informal provision of funeral insurance to become more formalised and as formal funeral insurance becomes more affordable due to more favourable capital reserving requirements, the formal funeral insurance sector in South Africa should see greater financial inclusion and penetration, especially in the low-income segment. Although the funeral insurance market has seen significant growth over the last decade, the increased penetration of the low-income segment market going forward will largely depend on the ability of current formal funeral insurance providers to adapt to the dynamics of this segment or innovation from new entrants such as existing informal providers, mobile operators or

retailers. It is clear that there is significant opportunity for further growth in the funeral insurance market in South Africa, as well as the life insurance market, if we understand what drove the growth in life and funeral insurance consumption over the last decade.

1.3 RESEARCH QUESTION AND OBJECTIVES

By conducting this research, we intend to answer the following research question:

- What were the factors that influenced life insurance and funeral insurance penetration and density (i.e. consumption) in South Africa?

The following research objectives will guide the research:

- To identify the main determinants of life and funeral insurance penetration and density in South Africa;
- To establish whether there is a causal relationship between income and life insurance penetration and density; and
- To compare whether there is a difference in the determinants between life insurance and funeral insurance penetration and density

1.4 RESEARCH METHOD

The analysis in this research report makes use of secondary data for life and funeral insurance penetration and density and macroeconomic and demographic factors. The factors were identified after an extensive review of factors used in existing literature. After the factors were identified, the data collection and preparation process followed. Data was collected for two periods, namely from 2001 to 2013 and from 1980 to 2014.

Three types of data analysis were conducted namely, the interpretation of descriptive statistics for all input variables; using an Ordinary Least Squared Estimation to assess the linear relationship between the dependent variables of funeral and life insurance penetration and density and the macroeconomic and demographic independent variables; and finally conducting Johansen cointegration and Granger causality in order to determine whether a causal relationship between income and life insurance penetration and density exists.

1.5 CONTRIBUTION OF THIS STUDY

This research contributes to existing literature in three ways. Firstly, it adds to the vast body of literature on the determinants of life insurance penetration and density. It also adds to the existing microinsurance literature (Atokey et al, 2011 and Arun et al, 2012) by analysing the determinants of funeral insurance in South Africa. Secondly, it establishes whether there is a causal relationship between income and life insurance consumption, thereby adding to studies conducted by Ward and Zurbruegg (2000), Arena (2008) and Kugler and Ofoghi (2005) (adding new to Atokey and Arun)

2001 to 2013 in South Africa. Thirdly, the variables that drove life insurance and funeral insurance consumption are compared and we determine whether macroeconomic or demographic variables had a more significant role in the increase in life and funeral insurance consumption

1.6 ORIENTATION

The research report has six chapters outlined in the following order:

- Chapter Two Insurance provides an introduction into the insurance product and market and defines traditional life insurance, microinsurance and funeral insurance as a subset of microinsurance.
- Chapter Three Determinants of Life Insurance Penetration and Density presents a review of existing empirical literature on factors influencing life insurance penetration and density and postulates various hypotheses to be explored in the research
- Chapter Four Research Methodology discusses the data identification, collection, and preparation process and explores the data analysis techniques used to conduct this research
- Chapter Five Results displays the results of the data analysis, interprets them and compares against the hypotheses formulated in Chapter Three
- Finally, Chapter Six Conclusion presents the conclusions of the research and suggests recommendations. It also explores limitations of the study and highlights areas for future research

CHAPTER 2

LIFE INSURANCE

2.1 INTRODUCTION

Individuals are exposed to uncertainties and risks during their life that may negatively impact their financial security, income, the value and use of their physical assets and limit their ability to conduct revenue-generating activities. These uncertainties include death, illness or disability, loss of employment and asset damage, partial or total loss, from accidents or natural disasters. These risks can be transferred or reduced through the purchase of insurance products that provide a pre-determined cash sum or replacement of lost asset value (indemnity) at the occurrence of an insured event in the future. In exchange for regular premium payments, an insurance company will promise to cover insurable events, which are independent, measurable and occur infrequently across a population, by pooling the risk of a large number of lives. Businesses can also limit their exposure to risks borne from their sphere of operation or those risks that impact the macro environment such as natural disasters. Insurance is generally considered a grudge purchase as the perceived value or benefit obtained from purchasing it is not tangible or immediately conceived.

The types of insurance products can be classified under two broad categories, namely life which is generally long-term in nature and linked to the mortality of an individual and non-life which is short term in nature (Swiss Re, 2013). The most common forms of life insurance are whole life and term assurance policies which associate a value to the life of an individual and pay beneficiaries a pre-determined benefit on their death, should it occur over one's life term or a fixed period respectively. Examples of other forms of life insurance include cover for severe illness, disability and dread diseases. It is also common for life insurance policies to include an investment component. Non-life insurance is typically asset-linked (e.g. vehicle or property) and provides the owner of an asset certainty of its usage and value.

Other financial products such as savings and credit can be used to reduce the impact of adverse risk events. Although savings can be considered as a form of self-insurance, it usually involves forgoing immediate consumption or investment in revenue-generating activities in anticipation of future uncertain adverse events. The occurrence of these events earlier than expected would pose a significant risk to the individual as their savings would not have had the time to build up. Access to credit may allow an individual the ability to smooth and better manage their financial shocks. However, the ability to access credit when the need arises may depend on the credit-worthiness of an individual at that time and can also create indebtedness between an individual and the credit lender, in some cases scrupulous moneylenders. Therefore savings or credit may not be as effective as insurance at smoothing severe fluctuations in income that may arise from financial setbacks (Patel 2002, De Bock and Gelade 2012).

2.2 TRADITIONAL INSURANCE

Total global insurance premiums in 2013 were estimated at USD\$2.5 trillion and USD\$2 trillion for life and non-life respectively, representing approximately six percent of the global GDP which is a measure of insurance penetration and an average premium per capita of approximately USD\$625 which measures insurance density respectively (Swiss Re, 2013). Advanced countries account for roughly 84 percent of the total global insurance premiums, with the African continent only accounting for about two percent. In addition, insurance premiums represent approximately eight percent of GDP and USD\$3579 per capita in advanced economies as opposed to about three percent of GDP and USD\$64 per capita in Africa (Swiss Re, 2013). South Africa, which represents over 70 percent of the total insurance premiums in Africa, has a high insurance penetration of about 15 percent of GDP as a result of a mature life insurance market and a medium insurance density of USD\$977 which illustrates poor insurance coverage across the total population. Therefore, with the exception of South Africa, insurance penetration and density remains significantly poor across Sub-Saharan Africa.

The advanced countries, which typically have above average income per capita and well-developed financial service industries, have a higher level of traditional insurance penetration and density than developing countries. This is not surprising as many empirical studies identified income as a significant positive determinant of life insurance demand and consumption (Arun et al 2012, Atokey et al 2011, Beck et al 2003, Browne and Kim 1993, Elango and Jones 2011, Hussels 2005, Kjoseveski 2012, Liebenberg 2012). The low level of penetration and density of traditional insurance in developing countries is as a result of the reluctance of traditional insurance providers to provide products to low-income populations due to high transaction and underwriting costs, information asymmetry and inappropriate and inadequate distribution networks associated with servicing the poor (Armendariz and Morduch, 2010, Biener and Eling, 2012).

2.3 MICROINSURANCE

Roth, McCord and Liber (2007) and Churchill (2007) define microinsurance as the provision of insurance to low-income people. More generally, microfinance is the provision of a broad set of financial products and services such as savings, loans, payment systems, money transfer and insurance to the low-income population (Armendariz et al, 2010). Therefore, microinsurance is a subset of microfinance. Microinsurance covers a wide range of the risks already covered by traditional insurance (Biener et al 2012). It is termed micro as it relates to low-income individuals and not because of the size of the microinsurance provider or the perceived size of the risk exposure (Churchill, 2006). Low-income individuals earn small and irregular incomes, rarely participate in revenue-generating activities and exhibit poor savings abilities as most only have enough money to provide for the basic needs of their families. As a result, they are more prone to economic shocks, the death or illness of a family member, livestock diseases and natural disasters that can destroy

their subsistence crop and impact their food security (Churchill, 2006). Therefore, it is not surprising that the most common microinsurance products are life policies (credit life and funeral), health insurance (illness and disability) and agricultural insurance (Biener et al 2012).

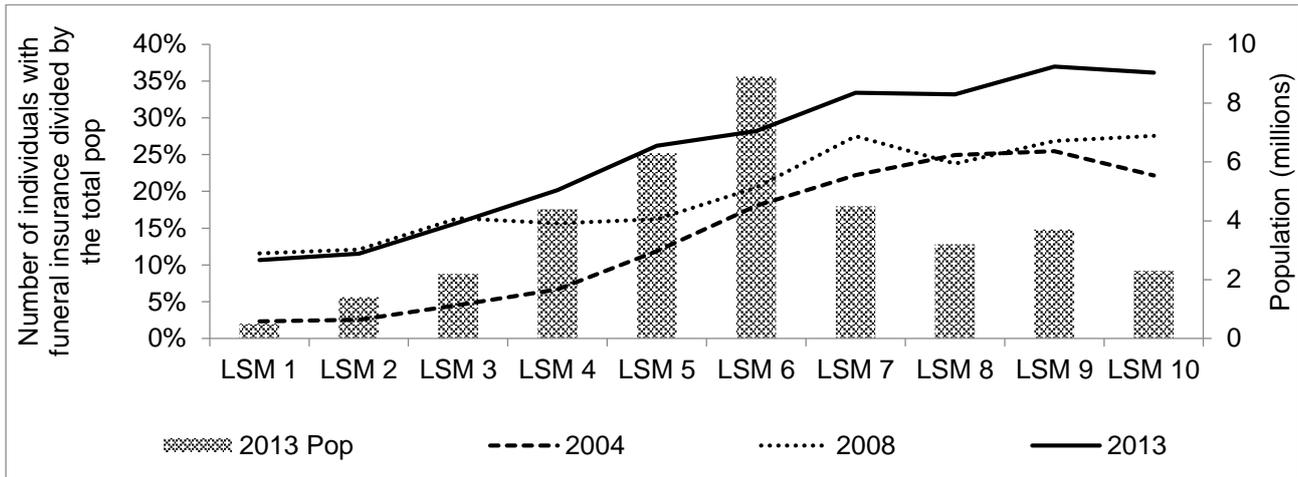
As with traditional insurance, microinsurance also involves the pooling of a large number of low-income individual risks. In some countries, microinsurance can also be sold through group-based structures where group members, through peer monitoring, take a more active role in managing adverse selection, moral hazard and premium collection (Armendariz et al, 2010). Microinsurance can either be used for the social protection of the poor population where the establishment of a formal social assistance programme is poor or as a financial tool that encourages low-income individuals to increase their risk appetite and participate in revenue-generating activities (Churchill, 2006). For example, a subsistence farmer who is interested in taking credit to expand his subsistence farming activities and become a small-scale farmer would require surety that he would reap enough of a crop yield to meet his loan principal and interest repayment obligations. Given the unpredictability of subsistence crop yields due to climate change, a microcredit financier would take more comfort if the farmer purchases crop insurance in order to mitigate the risk of a poor crop yield. Therefore microinsurance can be used to complement other microfinance products.

Biener et al (2012) highlighted that although the microinsurance industry has grown by 10 percent in recent years; the level of penetration is still very low.

2.4 FUNERAL INSURANCE

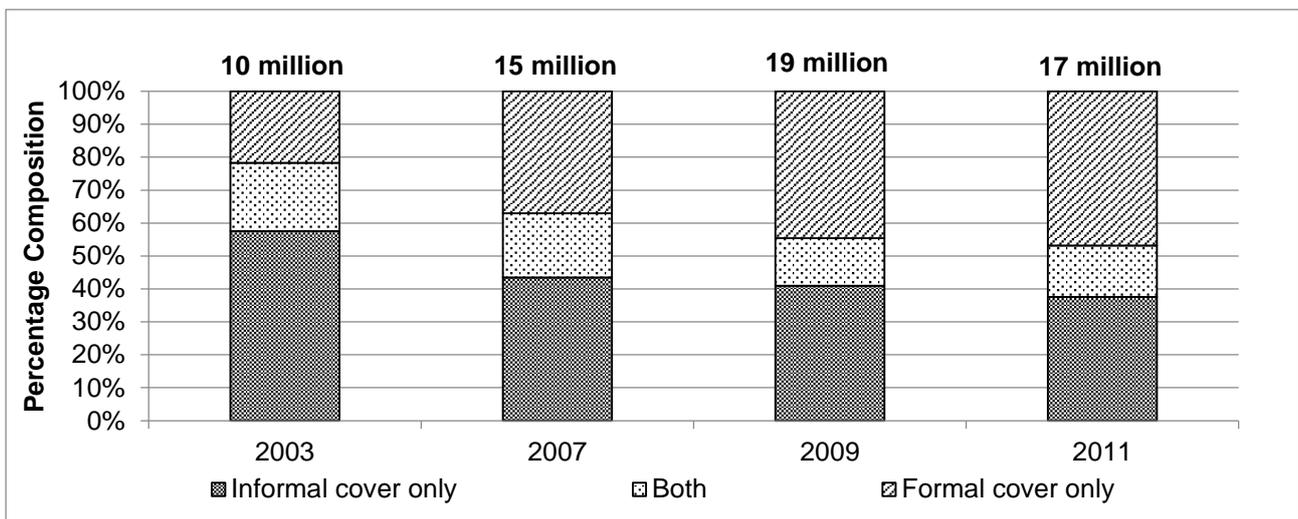
In South Africa, the majority of microinsurance is in the form of funeral insurance (Cenfri 2014) as many households are conscious of being able to provide their loved ones with a funeral and uphold the dignity of the deceased and the family in the eyes of the community (Bester, Chamberlain, Short and Walker 2005). The biggest risk to the income and livelihood of South African households, particularly low-income ones, is the death of a family member, particularly the primary income earner (Bester et al 2005). In most cases funeral cover, as opposed to credit or savings, is the most popular choice to mitigate against this risk (FinScope 2012). Unlike traditional insurance, Bester et al (2005) argue that funeral insurance is not a grudge purchase but rather a proactive decision. Without proper and adequate provision, a funeral can cost between four times and 15 times of a household's monthly income (Roth 2000, Ramsay and Arcila 2013) and significantly impact the livelihood and financial stability of the family, driving them deeper into poverty (Guha-Khasnobis et al 2004). Therefore, Patel (2002) and De Bock et al (2012) conclude that funeral insurance has the potential to alleviate poverty by reducing the impact of unexpected financial disruptions and stabilising a household's or individual's cash flows.

Figure 2.4.1 Funeral Insurance Penetration by LSM



Source: AMPS, various years

Figure 2.4.2 Funeral Insurance Composition – Formal vs. Informal Sector



Source: Finscope, various years

Although funeral insurance penetration per capita, measured by dividing the number of individuals with funeral insurance by the total population, has increased over the period from 2004 to 2013, the level of formal insurance penetration remains low at 24 percent of the population (AMPS 2014), with the figure significantly dropping for lower income individuals (LSM 1 to 5) as evidenced in the Figure 2.4.1 above. These low-income individuals, with average monthly incomes lower than R3000, are more commonly serviced through informal channels, such as community burial societies, funeral parlours, undertakers, churches and stokvels (FinScope 2012). Whilst there appears to be a consumer shift from the informal sector to the formal sector between 2003 and 2011, the funeral insurance market has contracted between 2009 and 2011 as illustrated in Figure 2.4.2. Informal channels have been attractive for low-income individuals as they are community-based, easily accessible and often cater for the irregularity of income and liquidity constraints of these individuals (Bester et al 2005, Roth 2000, Patel 2002, Churchill 2007) but informal funeral insurance penetration has decreased. The informal sector has significant challenges namely poor risk management

practices, misuse of member funds and poor administrative capacities and is prone to abusive and unscrupulous business practices due to its unregulated nature (Thomson and Posel 2002, Cenfri 2013, Roth 2000, Churchill 2007). Recent microinsurance regulation discussions propose the formalisation of the informal sector in order to drive further growth and penetration (IAIS 2012, National Treasury of South Africa 2011).

2.5 CONCLUSION

In Chapter two, we presented an introduction to the insurance product class and highlighted how insurance may be more effective than savings and credit in smoothing adverse financial shocks associated with mortality, disability and illness and asset loss. Then we gave a brief overview of traditional insurance penetration and density globally, on the African continent and in South Africa. We introduced microinsurance as an emerging insurance product class and identified that funeral insurance is the main type of microinsurance in South Africa. We concluded by exploring the dynamics and growth of the funeral insurance market. In the next section, Chapter Three, a review of empirical and theoretical literature on the determinants of life insurance demand or consumption are explored.

CHAPTER 3

DETERMINANTS OF INSURANCE PENETRATION AND DENSITY

3.1 INTRODUCTION

Most literature on the determinants of insurance consumption, referred to as demand, penetration and/or density, cites Yaari (1965) as the introductory paper on establishing the demand for life insurance. He argues that an individual's demand for life insurance is largely dependent on his life-cycle, risk aversion and their desire to maximise their expected lifetime utility. As individuals become older and more risk averse their demand for life insurance, at a reasonable price, is expected to increase as they want to safeguard their income and livelihood, and those of their dependents, even after retirement (i.e. a desire to bequest). Whereas Yaari (1965) focussed on the individual's demand for life insurance, Lewis (1989) extended this theory by introducing the notion that life insurance demand is also a function of the preferences of the main policyholder's household dependents as they expect their standard of living to be maintained after the passing of the primary income earner, thereby maximising their expected lifetime utility.

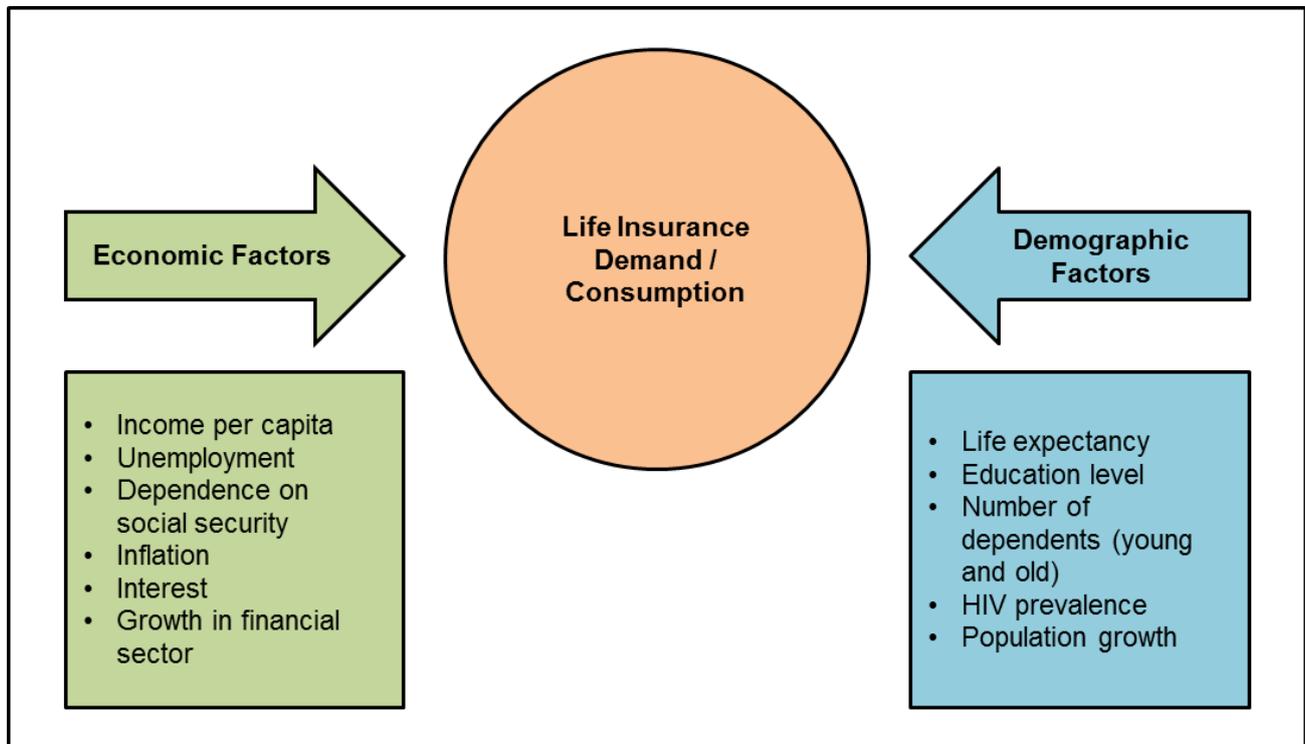
In establishing the drivers for life insurance demand, most research investigates the following factors namely an individual's income and their preference for consumption or saving, which is driven by the short-term and long-term interest rates, and the expected lifetime of the insured individual (life expectancy). In their research, Browne and Kim (1993) introduced other factors such as the dependency ratio, measuring the number of dependents per individual or household, which is an iteration of Yaari's lifecycle hypothesis in relation to the desire to bequest wealth; social welfare provision which may act as a substitute for long-term savings and private life insurance; inflation; the price of insurance and religion. Many researchers find these factors to be significant in determining the demand for life insurance. As inflation, interest rates and the provision of financial products such as life insurance are dependent on the development of the financial sector, Outreville (1996) included financial sector development as a factor in his investigation. Beck and Webb (2003) expanded Outreville's investigation as they focus specifically on the banking sector development. Most of the studies completed up until the early 2000s mainly focus on the traditional life insurance demand in developed and developing countries and make use of available secondary quantitative data at the macro level. Studies done on the demand for microinsurance at the individual level have mostly involved the usage of questionnaires.

3.2 DETERMINANTS OF LIFE INSURANCE PENETRATION AND DENSITY

In the study conducted by Beck and Webb (2003), they highlighted three broad categories by which to segment the factors driving life insurance demand namely economic, demographic and institutional. A conceptual diagram of economic and demographic variables is presented below in

Figure 3.2.1. These variables are discussed in detail below. Institutional factors have not been included as they are usually more relevant in a cross-sectional or panel analysis.

Figure 3.2.1 Economic and Demographic Factors Driving Life Insurance Demand



3.2.1 Income

Most of the empirical literature identified income as a significant determinant of life insurance demand which has a positive relationship with life insurance consumption (Beck et al 2003, Browne and Kim 1993, Elango and Jones 2011, Hussels 2005, Kjoseveski 2012, Liebenberg 2012). This implies that as the level of income per capita increases, there should be an increase in the demand for life insurance. Atokey et al (2011) and Arun et al (2012) highlighted similar conclusions for microinsurance demand on studies done on Ghana and Sri Lanka respectively. In most studies, income is most commonly measured by dividing the Gross National Income (GNI) by the population size or using real GDP per capita.

In their cross-country panel analysis of 9 OECD countries, Ward and Zurbruegg (2000) established that a causal relationship between real GDP and real insurance premiums existed. For Canada, the causal nature of the relationship was unidirectional running from real premium growth to real GDP growth while for France the causality ran in the opposite direction. Results for Italy and France showed a bidirectional relationship whereas there was no causality for the UK, the US, Austria and Switzerland. Kugler and Ofoghi (2005) however argued that the analysis done by Ward et al (2000) for the UK may have been affected by the use of aggregate insurance premium data and found that a causal relationship did exist. Both studies looked at real GDP. Arena (2008) explored the causal relationship between real GDP per capita and total premiums, life premiums and non-life premiums.

He found a positive and significant causal relationship for all three premium data sets running from premium growth to growth in real GDP per capita.

In this study, we expect to find that income is a key determinant, if not the most significant, of life and funeral insurance consumption in South Africa. We also expect to find that there is a causal relationship between income and life insurance consumption.

3.2.2 Literacy and Education Level

The level of education or literacy is used a factor in most of the regression studies mentioned above and is expected to have a positive relationship with life insurance demand because individuals with higher levels of education are expected to earn higher incomes and have a certain level of proficiency in financial literacy. Earlier studies by Browne and Kim (1993), Outreville (1996) and Beck and Webb (2003) found the level of education to have a positive correlation to insurance demand but this factor was not significant, which was surprising as one would expect the factor to be significant. Interestingly, Arun et al (2012) established that households with lower levels of education are more likely to be consumers of micro-life insurance as those with higher levels of education have access to traditional life insurance. Therefore in this study, it will be interesting to observe which theory holds true for life and funeral insurance consumption. Another factor which has been used by Atokey et al (2011) is the level of insurance knowledge and they have established that this factor has a significant positive impact on insurance demand. Their reasoning is that the demand for insurance is not driven by the level of formal education received but rather by an individual's ability to comprehend the benefits of risk-pooling and mitigating against the risk of unexpected future cash outflows which may leave the individual financially vulnerable. This finding by Atokey et al (2011) may explain the reason why many researchers have found the level of education to be insignificant. We expect to find that the level of education has a positive but insignificant relationship with life and funeral insurance consumption at a macro level.

3.2.3 Inflation

Studies completed by Browne and Kim (1993), Outreville (1996), Beck et al (2003), Hussels et al (2005), Elango et al (2011), Feyen et al (2011), Kjoseveski (2012) found the level of inflation or price stability to be a significant negative driver of life insurance consumption as higher inflation rates lead to a relatively higher consumption in the short term. The effect of high inflation appears to be harsher for low-income individuals as their incomes, which are usually generated through irregular and informal means, take longer to adjust to fluctuations in the inflation rate thus eroding their real purchasing power. As higher prices for necessities take up a significantly higher proportion of their disposable incomes, less money is available for the purchase of a funeral insurance policy. Therefore, this phenomenon is expected to negatively impact the formal funeral insurance market, potentially forcing low-income individuals to use informal channels to provide for their insurance needs.

3.2.4 Financial or Banking Sector Development

The theory of banking sector development influencing the demand for insurance stems from a highly topical theoretical framework that financial sector development drives economic growth. A few studies by Outreville (1996), Beck et al (2003) and Hussels et al (2005) have been conducted on the impact the level of banking or financial sector development has on life insurance demand. All three found that there is a significant positive association between the two but it is inconclusive whether the relationship is causal. Beck et al (2003) argued that a developed and well-functioning banking sector drives consumer trust and confidence in the other financial service providers in the market such as insurance companies and acts as an efficient intermediary for premium collection. Beck et al (2003) measured banking sector development as the “total claims of deposit money banks on domestic nonfinancial sectors as a share of GDP” and Outreville (1996) calculated financial sector development by subtracting M1 which is the money supply including cash and cheque deposits from M2 which is the money supply that includes M1 plus savings deposits, money market deposits and other deposits, divided by M2. We expect to find that this factor is significant and positive relationship with the consumption of life and funeral insurance.

3.2.5 Old and Young Age Dependency Ratio

Browne et al (1993), Beck et al (2003), Hussels et al (2005), Elango et al (2011) and Kjoseveski (2012) assessed the relationship between insurance demand and the dependency ratio with some of the studies splitting this further to old age dependency and young age dependency. Most of the researchers found the relationship to be positive with some finding a significant relationship. This finding is interesting as one would expect young age dependency to be significant for life insurance consumption but not old age dependency. It is expected that the higher the number of dependents per individual, the higher the requirement for life and funeral insurance in order to mitigate the financial vulnerability that comes with the loss of a primary income earner. We expect to find that this factor has more significance on life insurance consumption than on funeral insurance consumption as low-income individuals are likely to consume more on basic needs such as food and education as the number of dependents increase. We do not foresee old age dependency being a significant factor for life insurance consumption but it may be a significant factor for funeral insurance consumption as first-generation young and educated workers purchase funeral insurance for their parents in order to limit the financial impact on their income in the event of the death of one or both parents.

3.2.6 Other Factors

Other factors which have been included in previous studies include life expectancy, unemployment, interest rates, population growth, HIV prevalence and the level of social security provision. Outreville (1996) determined that life expectancy has a positive and significant relationship with insurance demand in developing countries as the price, and hence affordability of insurance cover is derived

from mortality expectations. However, Beck et al (2003), Hussels (2005), Elango et al (2011) Kjoseveski (2012) do not find life expectancy to be significant as it is highly correlated to other factors such as income which have more impact on life insurance demand. It will be interesting to observe whether this positive relationship between life expectancy and life insurance demand exists for funeral insurance penetration. It is plausible that young to middle-aged low-income earners with high life expectancy will delay or forgo the purchase of funeral insurance.

Liebenberg (2012) and Outreville (1996) included employment as a variable in their empirical research, and only Liebenberg found a positive relationship between employment and life insurance demand. Employment is an important factor in determining one's ability to provide for basic needs and the purchase of financial products such as life and funeral insurance. The likelihood of an insurance policy lapsing after the loss of income is expected to be high. Therefore unemployment should have a negative relationship with life and funeral insurance consumption. The impact of the unemployment variable may be significantly diluted as it is expected to have a high correlation with the income variable. Therefore we do not expect for it to be a significant factor.

Browne et al (1993), Outreville (1996), Beck et al (2003), Elango et al (2011) and Kjoseveski (2012) analysed the relationship between real interest rates and life insurance demand. It is argued that higher real interest rates should lead to an increase in life insurance demand as high investment returns are driven by high real interest rates. This theory is most likely to hold true for life insurance policies embedded with investment features but not for life insurance policies with only a risk benefit. Only Elango et al (2011) found real interest rates to have a significant and positive relationship with life insurance density. Most of the other researchers found the factor to be insignificant and ambiguous in its relationship with life insurance demand.

Population growth is a factor not considered in many of the research on determinants of life insurance demand. Elango et al (2011) and Outreville (1996) included population growth in their analysis but did not find any significant relationship between it and life insurance demand.

None of the empirical studies explored the relationship between HIV prevalence and life insurance demand but it is a factor worth considering for a South African analysis due to the high prevalence of HIV. HIV is likely to have a negative relationship with life insurance consumption but a positive relationship with funeral insurance consumption as a result of strict underwriting for life insurance.

Finally, the low-income population in South Africa is highly dependent on social welfare. Browne et al (1993), Beck et al (2003) and Feyen et al (2011) explore the effect of social welfare provision on the penetration and growth of the life insurance and indicate that they expect the relationship to be negative as social security replaces the need for private insurance and savings. We intend to ascertain whether the provision of social grants in South Africa, one of the largest social security programmes globally, has an adverse relationship with the penetration in life and the funeral insurance market.

3.3 CONCLUSION

From the above empirical findings, the following hypotheses could be postulated:

- Hypothesis 1: Macroeconomic factors are able to explain the variation in life and funeral insurance consumption better than demographic factors
- Hypothesis 2: Income per capita is a significant and positive determinant of both life and funeral insurance consumption
- Sub-hypothesis 2a: A long-run causal relationship exists between income and life insurance consumption
- Hypothesis 3: Apart from income per capita, the factors that drove life insurance consumption are different to those that drove funeral insurance consumption. We expect to find that demographic factors play a larger role in determining funeral insurance consumption

The nature and significance of the relationships between the factors identified in section 3.2 and life and funeral insurance consumption are predicted and illustrated below in Figure 3.3.1.

Figure 3.3.1 Summary Table – Predicted Signs for Life and Funeral Insurance Consumption

		<u>Life Insurance (risk only)</u>		<u>Funeral Insurance</u>			
Nature of Relationship	+	<i>Population growth</i> <i>Education level</i>	<i>Income</i> <i>Banking sector development</i> <i>Young dependency</i>	<i>Young dependency</i> <i>Banking sector development</i> <i>Education level</i> <i>Old dependency</i>	<i>Income</i> <i>HIV incidence</i>		
	-	<i>Life expectancy</i> <i>Interest rates</i> <i>Employment</i>	<i>Inflation</i>	<i>Population growth</i> <i>Employment</i>	<i>Grant</i> <i>Inflation</i> <i>Life expectancy</i>		
		Low	Significance of Impact	High	Low	Significance of Impact	High

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 INTRODUCTION

In this chapter, we discuss the research design and data analysis methodology. With regards to research design, we restate the problem statement, research objectives and questions presented in Chapter One; provide an overview of the data collection process; and describe the secondary data used. In the data analysis section (4.3), we highlight the data analysis methods that will be used in order to ascertain which factors or variables drove the penetration and density rates of life and funeral insurance (i.e. consumption) over the period from 2001 to 2013. In this light, the assessment of descriptive statistics for the dependent and independent variables and the use of linear regression analysis to establish the relationship between dependent and independent variables is explored. In order to determine the strength of the income variable on insurance penetration and density and vice versa (i.e. the causal nature of the relationship), we describe the causality analysis in section 4.3.3 below.

4.2 RESEARCH DESIGN

4.2.1 Problem Statement & Research Objectives

As mentioned in the first chapter, there has been a significant increase in the consumption of life and funeral insurance between 2001 and 2013. This trend has been present for life insurance since the 1980s. In this study, we wanted to determine which factors, macroeconomic and/or demographic, drove this increase for life and funeral insurance. We also wanted to assess whether the factors that drove life insurance consumption are similar to those that drove funeral insurance consumption. As identified in the literature review, income is found to be a significant factor in driving insurance consumption so we aimed to observe its relationship to life insurance consumption of a longer period of time in an attempt to determine whether the relationship is a causal one. Therefore we required data for the macroeconomic and demographic variables identified in chapter three as well as penetration and density rates for life and funeral insurance for the period from 2001 to 2013. In order to run the causality analysis, we require data for income, life insurance penetration and density for a longer period of time.

4.2.2 Secondary Data

For our analysis, only secondary data from various sources was used. Table 4.1 below describes the data obtained. The dependent variables for the regression analysis were calculated from life insurance data obtained from the Financial Services Board (FSB). The data is reported in the annual financial reports, the first publication being in the year 2000 and the last being in 2013, of the FSB at a gross written premium level for the total life insurance and short-term insurance market. The

total life insurance market is comprised of six businesses namely assistance business, disability business, fund business, health business, life business and sinking fund business. The premiums for the different life insurance business are reported at a net written premium level only, derived as the gross written premium subtracted by any reinsurance premiums paid to a reinsurer. For our analysis we considered only the net written premiums of the life business, which is the risk component of life insurance policies (i.e. death), and the premiums of the assistance business, which we used as a proxy for funeral insurance. The reason that we only take into consideration the risk portion of life insurance policies is because we wanted to exclude any savings or investment element within our analysis. Assistance business has a sum assured or benefit upper limit of thirty thousand rands (R30 000) and the benefits of most funeral insurance policies fall under this amount; albeit there are funeral insurance policies with up to R50 000, therefore assistance business is a large subset of funeral business. Nonetheless, assistance business gives us a good approximation of the nature and experience of funeral insurance consumption. It is worth noting that some of the variability of the assistance business may be attributed to a change in the upper limit over the period from 2001 to 2013, however these changes seem to be in line with inflationary factors. For the data analysis, the risk portion of life insurance (i.e. life business) is referred to as life risk insurance and the assistance business is referred to as funeral insurance.

The net written premiums of life risk insurance and funeral insurance are used to derive four dependent variables which measure life and funeral insurance consumption namely:

- life risk insurance density (LD) which is calculated by dividing the life risk insurance net premiums by the total population;
- life risk insurance penetration (LP) which is calculated by dividing the life risk insurance net premiums by nominal gross domestic product (GDP);
- funeral insurance density (FD) which is calculated by dividing the funeral insurance net premiums by the total population; and
- funeral insurance penetration (FD) which is calculated by dividing the funeral insurance net premiums by nominal GDP.

The data for these dependent variables has 13 time observations. We also develop two additional variables which have 35 time observations from 1980 to 2014, namely life insurance penetration (*ip*) and life insurance density (*id*) by dividing the total life insurance gross written premiums (Swiss Re, 2015) by nominal GDP and the total population respectively.

There are 12 independent variables, listed below, identified from previous empirical literature and used in the data analysis, for the time period from 2001 to 2013 unless otherwise stated.

- Income is measured as real GDP per capita at 2010 ZAR (South African Rand) prices and sourced from Business Monitor International (BMI) for the period 2001 to 2013. However as BMI only has data going back to 1990, we used real GDP per capita data

from the World Bank Development Indicators for the variable *gdppercapita* which is calculated at constant 2005 USD dollars and is available from 1980.

- Population growth rate (Pop) is measured by calculating the yearly growth in total population and is sourced from BMI.
- Inflation (Inf), measured as the yearly change in the consumer price index and real interest rates (Int), measured as the nominal lending rate minus inflation are sourced from Statistics South Africa and the South African Reserve Bank (SARB) respectively.
- Financial sector development (FM) is calculated by subtracting the M1 from M2, divided by M2 (i.e. $(M2 - M1)/M2$). We have chosen the factor used by Outreville (1996) instead of Beck and Webb (2003) due to data availability. M1 and M2 are obtained from SARB.
- The unemployment rate (Emp), measured by dividing number of unemployed individuals by the total labour force, is sourced from Statistics South Africa.
- Life expectancy at birth (LifeExp) is obtained from the World Bank Development Indicators.
- The level of education (Sch), measured as the mean schooling years, is published by the United Nations Development Programme (UNDP). Only 12 time observations were available, from 2001 to 2012.
- The level of dependence on social security, welfare or grants (Grant) is calculated by dividing the total transfers to households, published in the annual reports of the National Treasury Department of South Africa, by nominal GDP.
- The old age and young age dependency ratios (Old and Yng) are sourced from BMI and measured by dividing the population above the age of 65 and the population under the age of 15 respectively by the total population.
- The HIV incidence rate (HIV), from UNAIDS, is measured by dividing the number of new adults (aged 15 to 49) infected with HIV by the total population aged between 15 and 49.

Table 4.2.1: Secondary Data Descriptions and Sources

Variable	Type of Variable	Description	Source	Period
Life Risk Insurance Premiums	Input	Life Risk Business Net Written Premiums	FSB	2001 to 2013
Funeral Insurance Premiums	Input	Assistance Business Net Written Premiums	FSB	2001 to 2013
Total Life Insurance Premiums	Input	Total Life Insurance Gross Written Premiums	Swiss Re	1980 to 2014
Real GDP	Input	Real GDP	BMI	2001 to 2013
Nominal GDP	Input	Nominal GDP	World Bank	2001 to 2013
Population	Input	Population	BMI	2001 to 2013
Regression Variables				
Life Risk Insurance Density	Dependent	Life risk business premiums divided by population	FSB/BMI	2001 to 2013
Funeral Insurance Density	Dependent	Assistance business premiums divided by population	FSB/BMI	2001 to 2013
Life Risk Insurance Penetration	Dependent	Life risk business premiums divided by nominal GDP	FSB/BMI	2001 to 2013
Funeral Insurance Penetration	Dependent	Assistance business premiums divided by nominal GDP	FSB/BMI	2001 to 2013
Income	Independent	Real GDP per capita	BMI	2001 to 2013
Population growth	Independent	Population growth rate	BMI	2001 to 2013
Inflation	Independent	Consumer price inflation, % y-o-y, eop	Statistics SA	2001 to 2013
Real Interest Rate	Independent	Real lending rate, %, eop	SARB/BMI	2001 to 2013
Banking Sector Development	Independent	$(M2 - M1)/M2$	SARB	2001 to 2013
Unemployment Rate	Independent	Unemployment rate (% of labour force)	Statistics SA	2001 to 2013
Life Expectancy	Independent	Life expectancy at birth	World Bank	2001 to 2013
Schooling	Independent	Mean schooling years	UNDP	2001 to 2012
Social Security Dependence	Independent	Transfers to households (social grants) divided by GDP	National Treasury SA	2001 to 2013
Old Dependency Ratio	Independent	Population above 65 as a % of total pop.	BMI	2001 to 2013
Young Dependency Ratio	Independent	Population below 15 as a % of total pop.	BMI	2001 to 2013
HIV Incidence Rate	Independent	Incidence rate %	UNAIDS	2001 to 2013
Causality Analysis Variables				
Life Insurance Penetration (<i>ip</i>)		Life insurance premiums divided by nominal GDP	Author's calculations	1980 to 2014
Life Insurance Density (<i>id</i>)		Life insurance premiums divided by population	Author's calculations	1980 to 2014
Income (<i>gdppercapita</i>)		Real GDP per capita	World Bank	1980 to 2014

4.2.3 Overview of Data Collection Process

The data collection process involved four explicit steps which are mentioned below.

Identification

After an extensive review of theoretical and empirical literature, dependent variables for insurance density and penetration were identified for life risk insurance, funeral insurance and total life insurance. These variables have been noted above in section 4.2.2.

Data Collection

The secondary data was obtained from various data sources as illustrated in Table 4.1 above. Data was sourced through the Business Monitor International (BMI) database, which is accessible through the University of Stellenbosch library portal; and the public data from the FSB, Statistics South Africa, the National Treasury of South Africa, the South African Reserve Bank (SARB), the World Bank Development Indicators, the United Nations Development Programme (UNDP) and UNAIDS. The data collection period was during the months of July and August 2015.

As the net premiums data for life risk insurance and funeral insurance was only available from 2001 to 2013, we limited our dataset time period for the macroeconomic and demographic variables to the same period. The frequency of the data is yearly as the net premiums data is published yearly.

Although there may be different calculations of insurance penetration with some researchers using real GDP as the denominator, we used the method employed by Swiss Re, that of using nominal GDP to calculate insurance penetration. Similarly, banking sector development has been defined differently by Beck and Webb (2003) but data was readily available for the calculation used in this study by Outreville (1996); the level of education can be measured by looking at the literacy rate or the primary, secondary and tertiary enrolment rates but this data was not available for the full period; the HIV prevalence can be measured by dividing the population infected with HIV by the total population but we preferred the rate that emphasised the number of new infections instead.

Data Manipulation

Six variables for the regression analysis were calculated (LD, LP, FD, FP, BM and Grant) and one was transformed, namely population to population growth rate. For the causality variables, only real GDP per capita was not calculated. These calculations are discussed in the preceding section (4.2.2). All calculations were performed in Microsoft Excel.

Data Preparation

All data was collected and arranged in Microsoft Excel in preparation for imputation into the data analysis and statistical software package called Stata.

4.3 DATA ANALYSIS

The data analysis is split into three sections namely descriptive statistics, linear regression analysis and causality analysis. Within descriptive statistics, we have explored the nature of the data and basic relationships between the variables. Data for the period from 2001 to 2013 and for the period from 1980 to 2014 is used. We also explore the nature of the relationships between the dependent and independent variables in the linear regression analysis section. For this analysis, only data for the period from 2001 to 2013 is used. Finally we conduct a causality analysis between income and life insurance penetration and density to establish whether a long-run and/or short-run causal relationship exists and make use of the data for the period from 1980 to 2014. All data analysis was conducted in the statistics software package, Stata 11.

4.3.1 Descriptive Statistics

Before presenting the descriptive statistics, the trends of the total life insurance, life risk insurance and funeral insurance premiums as well as the corresponding penetration and density rates are presented visually.

Descriptive statistics such as the mean, standard deviation, skewness and kurtosis of all dependent and independent variables are presented in the results section. The standard deviation highlights the extent of variability around the mean, the skewness measures the symmetry of the distribution and kurtosis measures the closeness or clustering of observations around the mean. Analysis of these statistics assisted us to understand the characteristics of the data better.

Pairwise correlations were performed between the independent variables and the dependent variables. A similar analysis was performed between independent variables as well. These correlations give us an indication of the nature of relationships between variables. We also conducted a test for autocorrelation for each of the independent variables. Many macroeconomic variables exhibit autocorrelation over time, meaning that observations in the past have an influence on observations in the future. The presence of autocorrelation tends to over-emphasise the last observation's influence over the next observation. In some cases, the presence of autocorrelation is not a concern but the inclusion of lagged variables may assist in removing autocorrelation.

4.3.2 Linear Regression Analysis

The purpose of the linear regression analysis is to establish whether a linear relationship exists between dependent and independent variables as well as to ascertain which combination of independent variables best explain the variability in the dependent variables. As mentioned in section 4.3, the data for the period 2001 to 2013 is used for the linear regression analysis. The first part of the regression analysis explored the relationship between macroeconomic variables namely income, banking sector development (BM), inflation (Inf), interest rates (Int), unemployment (Emp) and the

level of dependence on grants (Grant), with four dependent variables, namely LD, LP, FD and FP, yielding four equations:

$$LD (eco)_t = \alpha_{1t} + \beta_{11}Income + \beta_{12}BM + \beta_{13}Inf + \beta_{14}Int + \beta_{15}Emp + \beta_{16}Grant + \varepsilon_{1t}$$

$$LP (eco)_t = \alpha_{2t} + \beta_{21}Income + \beta_{22}BM + \beta_{23}Inf + \beta_{24}Int + \beta_{25}Emp + \beta_{26}Grant + \varepsilon_{2t}$$

$$FD (eco)_t = \alpha_{3t} + \beta_{31}Income + \beta_{32}BM + \beta_{33}Inf + \beta_{34}Int + \beta_{35}Emp + \beta_{36}Grant + \varepsilon_{3t}$$

$$FP (eco)_t = \alpha_{4t} + \beta_{41}Income + \beta_{42}BM + \beta_{43}Inf + \beta_{44}Int + \beta_{45}Emp + \beta_{46}Grant + \varepsilon_{4t}$$

where α_t is the constant term, β is the coefficient term and ε_t is the standard errors generated by the regression.

We analysed the coefficients and the significance of the independent variables. The second part of the analysis regressed demographic variables, life expectancy (LifeExp), population growth rate (Pop), mean schooling years (Sch), old and young age dependency ratio (Old and Yng) and the HIV incidence rate (HIV) against the same dependent variables yielding another four equations:

$$LD (demo)_t = \gamma_{1t} + \theta_{11}LifeExp + \theta_{12}Pop + \theta_{13}Sch + \theta_{14}Old + \theta_{15}Yng + \theta_{16}HIV + u_{1t}$$

$$LP (demo)_t = \gamma_{2t} + \theta_{21}LifeExp + \theta_{22}Pop + \theta_{23}Sch + \theta_{24}Old + \theta_{25}Yng + \theta_{26}HIV + u_{2t}$$

$$FD (demo)_t = \gamma_{3t} + \theta_{31}LifeExp + \theta_{32}Pop + \theta_{33}Sch + \theta_{34}Old + \theta_{35}Yng + \theta_{36}HIV + u_{3t}$$

$$FP (demo)_t = \gamma_{4t} + \theta_{41}LifeExp + \theta_{42}Pop + \theta_{43}Sch + \theta_{44}Old + \theta_{45}Yng + \theta_{46}HIV + u_{4t}$$

where γ_t is the constant term, θ is the coefficient term and u_t is the standard errors generated by the regression. Then we compared whether the macroeconomic regression models have a higher explanatory power of the variation in the dependent variables than the demographic ones by analysing the adjusted R-squared.

Finally, we ran a set of regression models that use both macroeconomic and demographic variables against the dependent variables, as a combination of macroeconomic and demographic variables may have greater explanatory power of the variability in the dependent variables. Cognisant of the limited time series dataset, we restricted the number of independent variables included in the models to a maximum of five. Therefore variables are included one by one according to the ability to explain the variation in the dependent variables and their significance. This process is continued until there are a maximum of five variables included. The equations for the combined regression models are listed below:

$$LD_t = \mu_{1t} + \rho_{11}LifeExp + \rho_{12}Pop + \rho_{13}Sch + \rho_{14}Old + \rho_{15}Yng + \rho_{16}HIV + \rho_{17}Income + \rho_{18}BM + \rho_{19}Inf + \rho_{110}Int + \rho_{111}Emp + \rho_{112}Grant + v_{1t}$$

$$LP_t = \mu_{2t} + \rho_{21}LifeExp + \rho_{22}Pop + \rho_{23}Sch + \rho_{24}Old + \rho_{25}Yng + \rho_{26}HIV + \rho_{27}Income + \rho_{28}BM + \rho_{29}Inf + \rho_{210}Int + \rho_{211}Emp + \rho_{212}Grant + v_{2t}$$

$$FD_t = \mu_{3t} + \rho_{31}LifeExp + \rho_{32}Pop + \rho_{33}Sch + \rho_{34}Old + \rho_{35}Yng + \rho_{36}HIV + \rho_{37}Income + \rho_{38}BM \\ + \rho_{39}Inf + \rho_{310}Int + \rho_{311}Emp + \rho_{312}Grant + v_{3t}$$

$$FP_t = \mu_{4t} + \rho_{41}LifeExp + \rho_{42}Pop + \rho_{43}Sch + \rho_{44}Old + \rho_{45}Yng + \rho_{46}HIV + \rho_{47}Income + \rho_{48}BM \\ + \rho_{49}Inf + \rho_{410}Int + \rho_{411}Emp + \rho_{412}Grant + v_{4t}$$

where μ_t is the constant term, ρ is the coefficient term and v_t is the standard errors generated by the regression.

All regressions are estimated using Ordinary Least Squares (OLS). The models are analysed for goodness of fit and reliability by observing the adjusted R-squared and the F-statistic respectively. In order to ensure that the least squared estimators are the best linear unbiased estimator of the parameters, we also test the standard error terms to ensure that they are normally distributed, homoscedastic and are not serially correlated.

The normality of the standard error terms is done by observing their distribution, looking particularly at their skewness and kurtosis of the distribution. The Cameron and Trivedi decomposition of IM-test is used for this analysis. This test is also used along with Breusch-Pagan / Cook-Weisberg test (Breusch-Pagan) and Engle's Lagrange multiplier (LM) test for autoregressive conditional heteroscedasticity (ARCH) to test for heteroscedasticity which tests that the standard errors have a constant variance over time and are not correlated with the parameters. Breusch-Pagan tests that the null hypothesis that standard errors have constant variance while the ARCHLM tests as its null hypothesis that there are no ARCH (i.e. autoregressive) effects in the standard errors. All three tests for heteroscedasticity were conducted for all regressions. In cases where the presence of heteroscedasticity is high, the standard errors were estimated robustly.

Finally we tested that the standard errors were not serially correlated by running three post estimation tests namely the Breusch-Godfrey test (bgodfrey), Durbin's alternative test (durbinalt) and the Durbin-Watson d statistic (dwatson). The first two tests do not require the independent variables to be strictly exogenous whereas the dwatson test does (Stata, 2015). The null hypothesis for bgodfrey and durbinalt is that there is no serial correlation in the standard errors. A p-value of less than five percent leads us to reject the null hypothesis and conclude that serial correlation exists. With the dwatson test, values of the d statistic close to two exhibit no serial correlation whereas those significantly less than two exhibit positive serial correlation and those significantly above two exhibit negative serial correlation. The presence of serial correlation, if significant, can be addressed by including lagged variables of the suspected cause of the serial correlation.

The linear regression analysis section is concluded by providing a summary table of the significant variables and the nature of their influence on the dependent variables LD, LP, FD, and FP.

4.3.3 Causality between Income and Life Insurance Penetration and Density

In Chapter Three, we explored which determinants in previous empirical studies had a significant influence on the level of life insurance penetration and density. Income was the most significant factor and appeared to have the largest impact, implying a causal relationship. According to literature, there are four theories in terms of causal relationships that may exist namely (Iyke 2015):

- no causal relationship or neutrality exists;
- one-directional causality exists running from insurance penetration or insurance density to income with no feedback effects;
- one-directional causality exists running from income to insurance penetration or insurance density with no feedback effects; and
- bidirectional causality exists running from insurance penetration or insurance density to income and from income to insurance penetration or insurance density.

The presence of a causal relationship has potential implications for policy formulation in relation to the consumption and provision of life and funeral insurance. Although it would be interesting to see whether income has a causal relationship with the life risk insurance or the funeral insurance; the few number of data observations (13) pose a challenge in running a causality analysis as more observations are preferable in order to remove bias associated with a small sample. Therefore we ran the causality analysis on the dataset from 1980 to 2014, for total life insurance consumption. As life risk insurance and funeral insurance are subsets of total life insurance consumption, we may be able to infer, cautiously, the results from this analysis for life risk and funeral insurance. We use the following variables, life insurance penetration (*ip*), life insurance density (*id*) and income (*gdppercapita*) to examine the nature of the causal relationship in the short-term and long-term.

In order to determine causality between the variables mentioned above, we test whether the data series for the input variables follow a unit root process; establish whether cointegrating functions exist between the variables; and establish the nature and direction of the causal relationship between the variables, should one exist.

4.3.3.1 Unit Root

When performing tests for cointegration and Granger causality, it is important to ensure that the input series are stationary, therefore they do not follow a unit root process. Two tests are performed to determine the stationarity of the data series namely the Augmented Dickey-Fuller and the Phillips-Perron tests for unit roots. Although both tests are conducted, we have paid more emphasis on interpreting the Phillips-Perron test because it “uses Newey–West (1987) standard errors to account for serial correlation, whereas the augmented Dickey–Fuller test uses additional lags of the first-differenced variable” (Stata, 2015). After transforming the time series data, we conducted the cointegration analysis.

4.3.3.2 Cointegration

In order to establish the nature and direction of a causal relationship, we first have to determine whether a linear cointegrating function exists (i.e. that a causal relationship exists). We have used the Johansen test in order to determine if cointegrating functions exist. The framework used by Lyke (2015) was used and is specified as follows:

$$ip_t = \sum_{i=1}^n \alpha_i ip_{t-i} + \beta gdppercapita_t + \varepsilon_t$$

$$gdppercapita_t = \sum_{i=1}^n \gamma_i gdppercapita_{t-i} + \delta ip_t + u_t$$

$$id_t = \sum_{i=1}^n \theta_i id_{t-i} + \rho gdppercapita_t + v_t$$

$$gdppercapita_t = \sum_{i=1}^n \vartheta_i gdppercapita_{t-i} + \mu id_t + w_t$$

where ip_t , id_t , $gdppercapita_t$ are the non-stationary series for life insurance penetration, life insurance density and income; α, γ, θ and ϑ are the coefficients of the lagged variables of dependent variable; β, δ, ρ and μ are the coefficients of the deterministic variable in each equation; and ε_t, u_t, v_t and w_t are the error terms. By analysing the trace test statistic and the maximum eigenvalue test statistic, we were able to establish whether any cointegrating functions existed. Once a cointegrating function is found, we can run Granger causality analysis in order to determine the direction of the causal relationship.

4.3.3.3 Granger Causality

A vector error-correction model (VECM) is used in order to determine whether a long-run causal relationship exists between life insurance penetration and income and life insurance density and income. The VECM also determines the direction and significance of the relationship. A similar framework to the one used by Lyke (2015) was used to run the analysis. The bivariate vector error-correction model is specified below:

$$\Delta \ln ip_t = \alpha_0 + \sum_{i=1}^n \alpha_{1t} \Delta \ln ip_{t-i} + \sum_{i=1}^n \alpha_{2t} \Delta \ln gdppercapita_{t-i} + \alpha_3 ECM_{t-1} + \varepsilon_t$$

$$\Delta \ln gdppercapita_t = \beta_0 + \sum_{i=1}^n \beta_{1t} \Delta \ln gdppercapita_{t-i} + \sum_{i=1}^n \beta_{2t} \Delta \ln ip_{t-i} + \beta_3 ECM_{t-1} + \omega_t$$

$$\Delta \ln id_t = \gamma_0 + \sum_{i=1}^n \gamma_{1t} \Delta \ln id_{t-i} + \sum_{i=1}^n \gamma_{2t} \Delta \ln gdppercapita_{t-i} + \gamma_3 ECM_{t-1} + u_t$$

$$\Delta \ln gdp_{percapita}_t = \delta_0 + \sum_{i=1}^n \delta_{1t} \Delta \ln gdp_{percapita}_{t-i} + \sum_{i=1}^n \delta_{2t} \Delta \ln id_{t-i} + \delta_3 ECM_{t-1} + v_t$$

where $\ln ip_t$, $\ln id_t$, $\ln gdp_{percapita}_t$ are the natural log series of where ip_t , id_t , $gdp_{percapita}_t$; α, β, γ and δ are the parameter terms; ECM_{t-1} is the lagged error-correction term; ε_t , ω_t , u_t and v_t are the residuals; and Δ is the first difference operator. By analysing the sign and t-statistic of the lagged error-correction term and the F-statistic on the independent variables, we can ascertain the direction of the causal relationship. In order to determine whether the causality also exists in the short-run, we test that the coefficients of the lagged differences are jointly equal to zero.

Finally we conducted post estimation tests to check for the presence of autocorrelation (Lagrange Multiplier test) and normality (Jarque-Bera test) in the residuals. We are satisfied with the causality results if no autocorrelation is observed and the distribution of the residuals is normal.

4.4 CONCLUSION

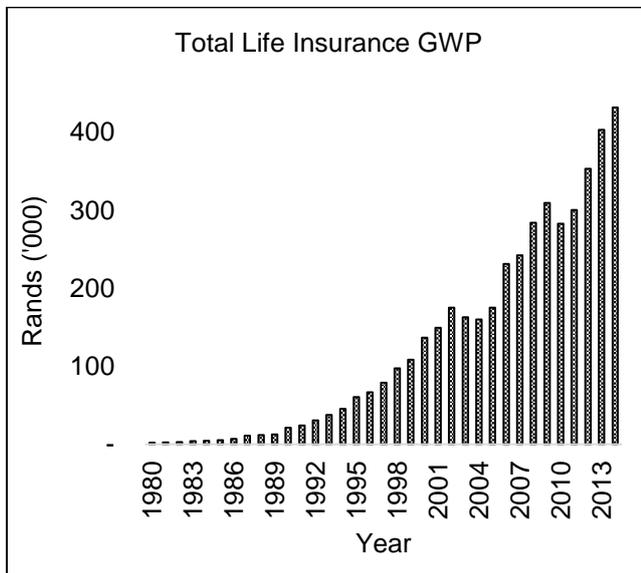
In this chapter, we reviewed the research objectives; described the identification, collection and preparation process of secondary data from various sources; and discussed the data analysis techniques employed in this study namely the analysis of descriptive statistics, linear regression modelling and causality analysis. The next chapter, Chapter Five, presents and discusses the results of the analysis.

CHAPTER FIVE RESULTS

5.1 INTRODUCTION

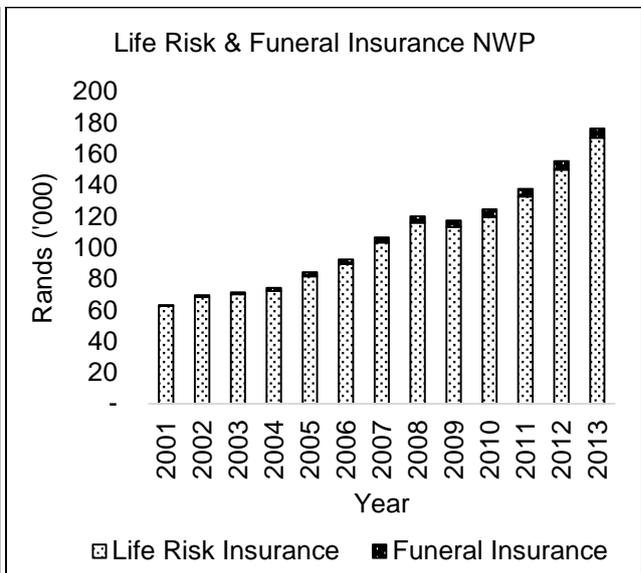
The total life insurance market in South Africa has grown steadily since 1980, reaching a high in 2014 of an estimated gross written premium of R432 billion. The life risk insurance and funeral insurance net written premiums have also increased from approximately R63 billion and R1 billion in 2001 to approximately R170 billion and R6 billion in 2013 respectively. Figures 5.1.1 and 5.1.2 below illustrate this growth trend. Net written premium is roughly 92 percent of gross written premium and the life risk insurance and the funeral insurance premiums represent approximately 45 percent of the total life insurance market.

Figure 5.1.1: Total Life Insurance GWP



Source: Swiss Re Sigma Explorer

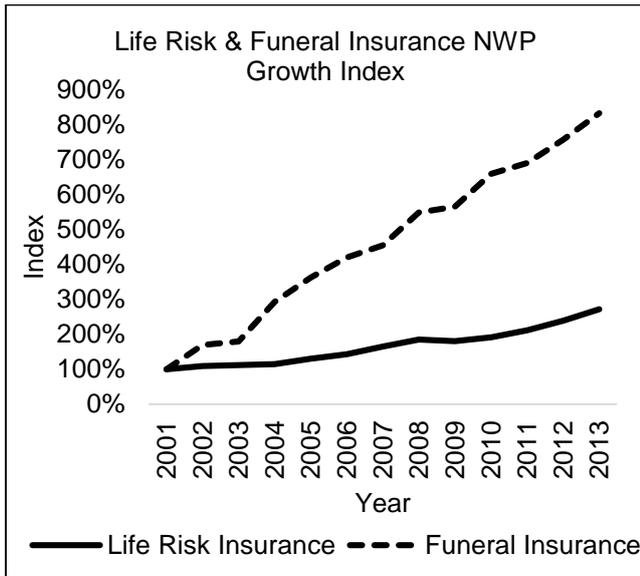
Figure 5.1.2 Life Risk & Funeral Insurance NWP



Source: FSB

Net written premiums for funeral insurance have grown markedly since 2001, exceeding the growth rate of the life risk insurance premiums by three times (Figure 5.1.3).

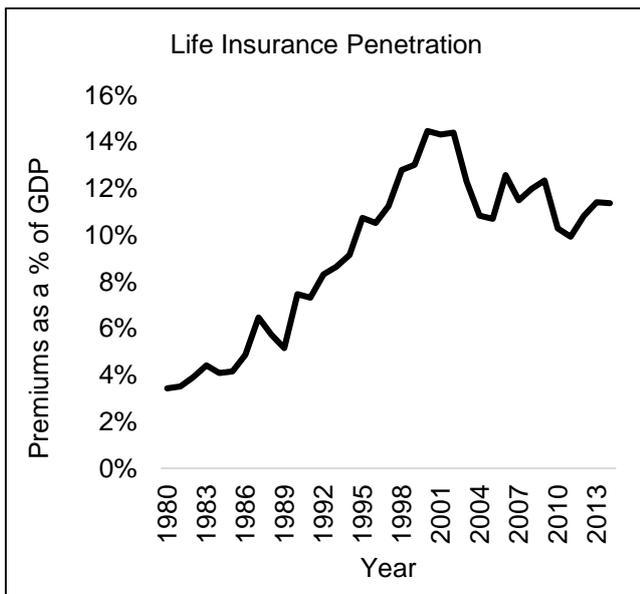
Figure 5.1.3 Life Risk & Funeral Insurance NWP Growth Index



Source: Author's calculations

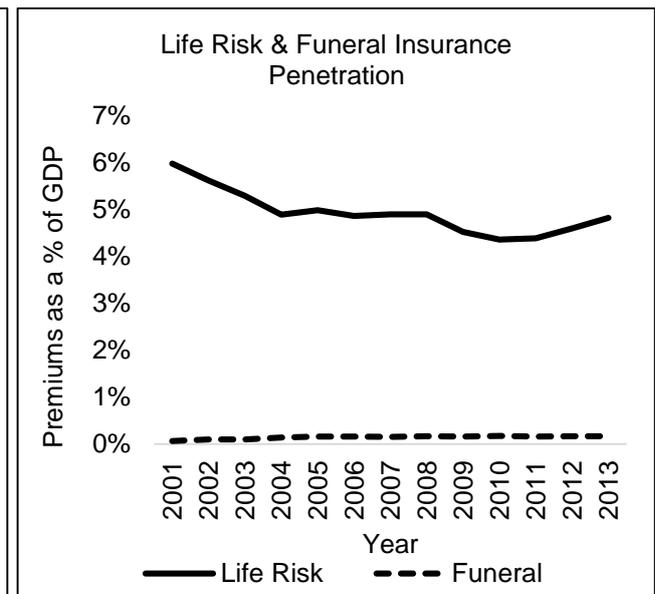
The penetration rate of the total life Insurance market peaked in the year 2000 at an estimated 15 percent of gross domestic product (Figure 5.1.4), coming off a steep increase from the year 1980. However, from 2001 both the total life insurance market and the life risk insurance penetration rates declined from approximately 14 percent and 6 percent to approximately 11 percent and 5 percent respectively. This is in contrast to the upward trajectory experienced by the funeral insurance penetration rate, which increased from an estimated 0.1 percent to 0.2 percent during the same period (Figure 5.1.5).

Figure 5.1.4 Life Insurance Penetration



Source: Swiss Re Sigma Explorer

Figure 5.1.5 Life Risk & Funeral Ins. Penetration



Source: Author's calculations

The density, as measured by premiums per capita, across the total life insurance market, life risk insurance and funeral insurance has increased markedly between 2001 and 2013, achieving an

annual growth rate of approximately 7 percent, 9 percent and 19 percent respectively (Table 5.1.6 and 5.1.7). It is evident that the global financial crisis of 2007/08 had a significant negative impact on all three insurance penetration and density rates.

Figure 5.1.6 Life Insurance Density

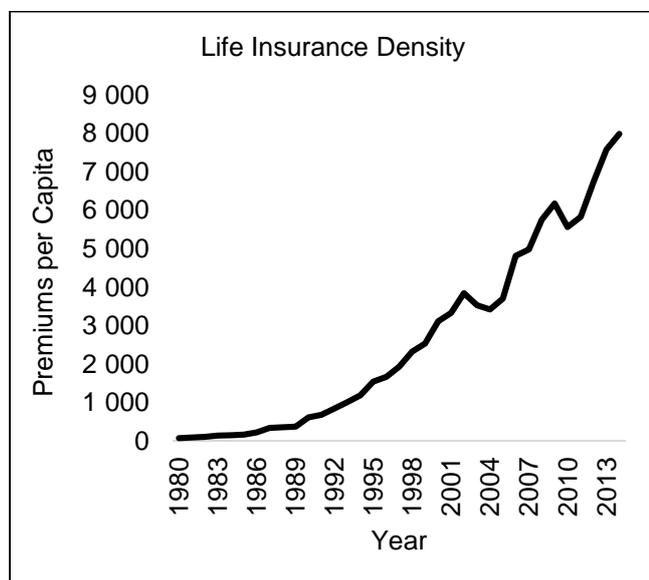
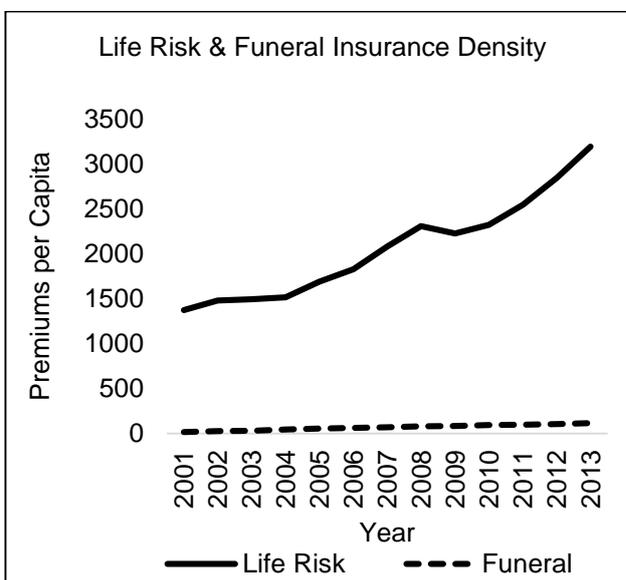


Figure 5.1.7 Life Risk & Funeral Insurance Density



Source: Author's calculations

Source: Author's calculations

The dataset containing 13 time periods from 2001 to 2003; four dependent variables namely LD, LP, FD and FP; and six macroeconomic and six demographic independent variables was used for the regression analysis. The dataset with 35 time periods from 1980 to 2014 and three variables, namely ip, id and gdppercapita was used to determine causality between income and life insurance penetration and density. Descriptive statistics for all variables are presented below.

5.2 DESCRIPTIVE STATISTICS

The mean, standard deviation, skewness, kurtosis, minimum value and maximum value for each variable is noted in the Table 5.2.1 below. Of all the dependent variables, funeral insurance density (FD) has the highest variance in comparison to its mean, indicating significant growth in the funeral insurance net written premiums against a low population annual growth rate of approximately 1.3 percent over the period of analysis. In contrast, the life risk insurance and funeral insurance penetration rates have not been as volatile in comparison to their corresponding density rates. There is a very strong positive correlation between life risk insurance density (LD) and funeral insurance density (FD), therefore they may be driven by similar factors (Table 5.2.2). The penetration rate for life risk insurance (LP) is negatively correlated with all the other dependent variables, further emphasising the observation made earlier regarding the decline in life risk insurance net written premiums between 2001 and 2013. The high correlation values between the dependent variables are not surprising as an economic shock or a random demographic shift will impact the whole life insurance market.

The dependent variables, life risk insurance density (LD) and funeral insurance density (FD) were strongly positively correlated with income (GDP), mean schooling years (Sch) and the old dependency ratio (Old) (Table 5.2.3). The level of grants (Grant) was also positively correlated with these variables. This implies that an increase in income, mean schooling years, old dependency ratio and the level of grants has a positive relationship on the density levels of life risk insurance and funeral insurance. The population growth rate (Pop), interest rates (Int), the young dependency ratio (Yng) and the HIV incidence rate (HIV) were all negatively correlated with the density variables.

The penetration rates of life risk insurance and funeral insurance were highly correlated to similar variables as their corresponding density rates. However, Grant had a very high negative correlation with life risk insurance penetration but positive one with funeral insurance penetration, implying that as grants are channelled to households, they may purchase funeral insurance policies but not life risk insurance policies. The inflation rate (Inf) was poorly correlated with the dependent variables. Financial sector development (FM) was also poorly correlated with the density variables, LD and FD. Among the independent variables, income (GDP), mean schooling years (Sch), level of grants (Grant), old and young dependency ratios (Old and Yng) were highly correlated. It is important to note this when analysing the output from the regression analysis, as including two or more highly correlated variables may understate the explanatory power of one of the variables.

Table 5.2.1: Descriptive Statistics

Variable	Variable Name	Mean	Standard Deviation	Skewness	Kurtosis	Min	Max	N
Regression Analysis								
<i>Independent Variables</i>								
Life Risk Insurance Density	<i>LD</i>	2067	570	0.560	-0.547	1372	3191	13
Funeral Insurance Density	<i>FD</i>	66	31	-0.183	-1.132	16	113	13
Life Risk Insurance Penetration	<i>LP</i>	4.93%	0.47%	1.023	0.907	4.36%	5.98%	13
Funeral Insurance Penetration	<i>FP</i>	0.15%	0.03%	-1.469	0.885	0.07%	0.17%	13
<i>Dependent Variables</i>								
Income	<i>GDP</i>	51460	4013	-0.615	-1.315	44710	55747	13
Population growth	<i>Pop</i>	1.34%	0.17%	-0.045	-1.971	1.14%	1.56%	13
Inflation	<i>Inf</i>	5.81%	3.10%	0.563	0.750	0.40%	12.40%	13
Real Interest Rate	<i>Int</i>	5.77%	2.41%	0.748	0.468	2.80%	11.10%	13
Financial Sector Development	<i>FM</i>	0.469	0.026	-0.271	0.120	0.420	0.517	13
Unemployment Rate	<i>Emp</i>	24.77%	1.97%	1.172	1.396	21.90%	29.30%	13
Life Expectancy	<i>LifeExp</i>	53.55	1.74	0.561	-0.897	51.56	56.74	13
Schooling	<i>Sch</i>	9.03	0.64	-1.047	1.988	7.50	9.90	12
Social Security Dependence	<i>Grant</i>	0.0437	0.0053	-1.492	1.608	0.0313	0.0490	13
Old Dependency Ratio	<i>Old</i>	4.72%	0.32%	-0.665	-0.728	4.10%	5.10%	13
Young Dependency Ratio	<i>Yng</i>	32.05%	1.43%	0.416	-0.797	30.00%	34.60%	13
HIV Incidence Rate	<i>HIV</i>	1.73%	0.26%	0.421	-0.230	1.32%	2.22%	13
Causality Analysis								
Life Insurance Density	<i>id</i>	9.26%	3.47%	-0.367	-1.155	3.43%	14.47%	35
Life Insurance Penetration	<i>ip</i>	2652	2451	0.678	-0.764	78	7995	35
Real GDP per capita	<i>gdppercapita</i>	48537	4283	0.375	-1.244	42731	55747	35

Source: Author's calculations

Table 5.2.2: Correlation Matrix – Dependent Variables

	LD	AD	LP	AP
LD	1.00			
AD	0.96	1.00		
LP	-0.68	-0.84	1.00	
AP	0.72	0.87	-0.91	1.00
GDP	0.90	0.96	-0.84	0.90
Pop	-0.88	-0.92	0.74	-0.78
Inf	0.11	0.06	0.11	0.07
Int	-0.79	-0.78	0.56	-0.62
BM	0.11	0.30	-0.60	0.61
Emp	-0.48	-0.57	0.43	-0.64
LifeExp	0.71	0.56	-0.18	0.10
Sch	0.88	0.92	-0.93	0.85
Grant	0.72	0.87	-0.96	0.95
Old	0.86	0.96	-0.93	0.91
Yng	-0.94	-0.99	0.88	-0.89
HIV	-0.94	-0.98	0.85	-0.89

Source: Author's calculations

Table 5.2.3: Correlation Matrix – Independent Variables

	GDP	Pop	Inf	Int	FM	Emp	LifeExp	Sch	Grant	Old	Yng	HIV
GDP	1.00											
Pop	-0.89	1.00										
Inf	0.16	-0.06	1.00									
Int	-0.73	0.67	-0.54	1.00								
FM	0.43	-0.27	0.07	0.03	1.00							
Emp	0.68	0.59	-0.28	0.48	-0.38	1.00						
LifeExp	0.38	-0.55	0.01	-0.60	-0.48	-0.07	1.00					
Sch	0.87	-0.78	0.02	-0.65	0.53	-0.28	0.30	1.00				
Grant	0.88	-0.75	-0.11	-0.53	0.64	-0.49	0.13	0.92	1.00			
Old	0.96	-0.86	0.06	-0.70	0.50	-0.56	0.37	0.94	0.94	1.00		
Yng	-0.97	0.90	-0.01	0.73	-0.35	0.54	-0.49	-0.94	-0.90	-0.97	1.00	
HIV	-0.96	0.88	-0.02	0.72	-0.35	0.53	-0.47	-0.95	-0.90	-0.94	0.99	1.00

Source: Author's calculations

In our dataset, only inflation (Inf) and interest rates (Int) exhibit significant signs of autocorrelation whereas population growth rate (Pop), financial sector development (FM), unemployment (Emp), mean schooling years (Sch) and the level of grant dependence (Grant) exhibit lower signs of autocorrelation (Table 5.2.4).

Table 5.2.4: Autocorrelation of Independent Variables

Variable	Presence of autocorrelation
<u>Regression Variables</u>	
Income	No autocorrelation or partial autocorrelation
Pop	Low autocorrelation but present at lags 5 to 7
Inf	Significant signs of autocorrelation
Int	Significant signs of autocorrelation
FM	Autocorrelation present
Emp	Autocorrelation present
LifeExp	No autocorrelation or partial autocorrelation
Sch	Autocorrelation present
Grant	Low autocorrelation but present at lags 5 to 7
Old	No autocorrelation or partial autocorrelation
Yng	No autocorrelation or partial autocorrelation
HIV	No autocorrelation or partial autocorrelation
<u>Causality Variables</u>	
GDP per capita	No autocorrelation or partial autocorrelation
ip	No autocorrelation or partial autocorrelation
id	No autocorrelation or partial autocorrelation

Source: Author's calculations

5.3 LINEAR REGRESSION ANALYSIS

5.3.1 Introduction

The linear regression analysis was completed in three sections, namely:

- regressing the macroeconomic independent variables against all dependent variables (i.e. LD, LP, FD, FP);
- regressing the demographic independent variables against all the dependent variables; and
- regressing a combination of a few macroeconomic and demographic independent variables against all dependent variables.

Tests for heteroscedasticity (Breusch-Pagan, Cameron & Trivedi, ARCHLM) and serial correlation (bgodfrey, durbinalt, dwatson) were also performed on the estimated standard errors to ensure that they are homoscedastic and not serially correlated.

5.3.2 Macroeconomic Linear Regression Models

The macroeconomic variables include income (GDP), financial sector development (FM), inflation (Inf), interest rates (Int), the level of grant dependence (Grant) and unemployment (Emp). The analysis output from regressing the macroeconomic variables against each dependent variable are illustrated in Table 5.3.1 below. All the models are significant as noted by the F-statistic; achieve

high model fitness as the adjusted R-squared for all models is above 90%; and the estimated errors are normally distributed, homoscedastic and not serially correlated. Although the standard errors generated by the LD (Eco) model appear to have heteroscedasticity under the Breusch-Pagan test, the Cameron & Trivedi and ARCHLM tests do not yield similar results, therefore we have chosen not to estimate the errors robustly. Model FD (Eco) does exhibit some negative serial correlation, at a 10% significance level, in the estimated standard errors therefore we interpret the results from this model cautiously.

Income is significant and positive in the density models, LD (Eco) and FD (Eco); inflation and interest are significant and negative only in the FD (Eco) model; and Grant is positive and significant in the FP (Eco) model. The positive relationship between real GDP per capita/income and LD and FD is consistent to existing literature and our hypothesis in chapter three. Similarly, our finding on Inflation and Interest is also consistent with our hypothesis. Although Outreville (1996) finds financial sector development to be a significant factor, we do not find a similar result in our macroeconomic regressions. Unemployment is also insignificant. The Grant variable is the only significant variable in the FP (Eco) model.

Table 5.3.1: Macroeconomic Regression Models

	LD (Eco)	LP (Eco)	FD (Eco)	FP (Eco)
Constant	-5624.84 (-2.10)*	0.10 (3.90)***	-239.78 (-2.99)**	7E-04 (0.46)
Income (GDP)	0.19 (4.36)***	-6.9E-08 (-0.17)	6.4E-03 (4.93)***	-1.74E-08 (-0.71)
Financial sector development (FM)	-485.51 (-0.11)	-0.05 (-1.29)	58.51 (0.44)	-9.4E-04 (-0.37)
Inflation (Inf)	-6077.55 (-1.84)	0.04 (1.32)	-313.76 (-3.17)**	1.6E-03 (0.88)
Grant	-61910.96 (-1.52)	-0.44 (-1.19)	-767.25 (-0.63)	0.07 (3.03)**
Unemployment (Emp)	7146.44 (1.79)	-0.03 (-0.69)	135.05 (1.13)	-4E-03 (-1.84)
Interest (Int)	-9748.66 (-1.61)	0.088 (1.59)	-594.46 (-3.28)**	1.67E-05 (0.00)
F-statistic	21.86***	17.32***	75.59***	24.42***
Adjusted R-squared	0.91	0.89	0.97	0.92
Observations	13	13	13	13
Breusch-Pagan	7.06***	1.88	3.70*	0.58
Cameron & Trivedi	13	13	13	13
ARCHLM	0.11	0.14	0.09	0.28
bgodfrey	0.10	0.04	4.62**	0.67
Durbin Alt	0.04	0.01	2.76*	0.27
Dwatson	1.68	1.82	2.62*	2.31
<i>Significance levels: * 10% level ** 5% level *** 1% level</i>				

5.3.3 Demographic Linear Regression Models

The demographic variables include life expectancy (LifeExp), old dependency ratio (Old), young dependency ratio (Yng), mean schooling years (Sch), HIV incidence rate (HIV) and population growth rate (Pop). All models are good fits as the F-statistic in each case is significant at the 1 percent significance level and the adjusted R-squared are all above 90 percent. LP (Demo), FD (Demo) and FP (Demo) all exhibit indications of negative serial correlation as the values for Durbin Watson D-statistic are above two but only significant at a 10 percent level. Similar to the FD (Eco) in the preceding section, we interpret the results with some caution. Other tests for normality and homoscedasticity yield satisfactory results.

It is evident that life expectancy is significant in all the models at the 5 percent significance level. All coefficients are positive except in the FP (Demo), which implies that as life expectancy at birth increases, there is an increase in the density of life risk insurance (LD) and funeral insurance (FD) and an increase in the penetration of the life risk insurance (LP). The young dependency ratio, mean schooling years and HIV incidence rate are significant in both life risk insurance models for density and penetration (LD and LP). The old dependency ratio is only significant in the LD (Demo) model. The positive coefficients for young dependency ratio and old dependency ratio indicate that an increase in the number of dependents, young or old, results in an increase in the density and penetration of life risk insurance.

Table 5.3.2: Demographic Regression Models

	LD (Demo)	LP (Demo)	FD (Demo)	FP (Demo)
Constant	-30341.28 (-2.92)**	-0.40 (-1.88)	-32.05 (-0.07)	0.013 (0.78)
Life Expectancy	161.42 (7.76)***	1.4E-03 (3.17)**	2.63 (2.85)**	-9E-05 (-2.67)**
Old dependency	144457.70 (2.87)**	1.114 (1.07)	3690.21 (1.66)	0.01 (0.11)
Young dependency	91188.03 (3.04)**	1.549 (2.50)**	-52.83 (-0.04)	-0.02 (-0.41)
Mean schooling years	-273.35 (-2.60)**	-5.7E-03 (-2.64)**	-6.10 (-1.31)	-2.86E-05 (-0.17)
HIV	-552399.30 (-4.69)***	-6.66 (-2.74)**	-7074.83 (-1.35)	-0.02 (-0.08)
Population growth	-16405.18 (-0.61)	-0.08 (-0.15)	-1641.39 (-1.39)	-0.029 (-0.68)
F-statistic	162.47***	24.82***	248.49***	21.02***
Adjusted R-squared	0.99	0.92	0.99	0.91
Observations	13	13	13	13
Breusch-Pagan	0.30	0.00	3.72*	2.18
Cameron & Trivedi	13	13	13	13
ARCHLM	0.264	0.157	0.786	0.809
Bgodfrey	0.874	3.071*	2.066	1.608
Durbin Alt	0.36	1.547	0.945	0.706
Dwatson	2.311	2.804*	2.706*	2.616*
<i>Significance levels: * 10% level ** 5% level *** 1% level</i>				

The coefficients for mean schooling years and HIV are negative which implies that an increase in mean schooling years and the HIV incidence rate yields a decrease in the density and penetration of life risk insurance. One would have thought that an increase in education results in an increase in financial literacy and employment, and thus the ability to purchase insurance. This does not appear to be the case in this instance which may indicate that although mean schooling years have increased, this has not translated to job creation and thus an increase in income. Individuals that have HIV struggle to obtain life or funeral insurance, due to strict underwriting against pre-existing conditions. Therefore it is plausible that a decrease in the HIV incidence rate will result in more individuals being able to obtain insurance, thereby increasing the density and penetration of life risk and funeral insurance.

It is interesting to observe that the demographic models have a higher explanatory power than the economic models. However, a combination of demographic and economic variables may yield better fitting models. This is explored in the next section.

5.3.4 Combined Linear Regression Models

Given the limited dataset, we have included five variables at most across both economic and demographic independent variables. The model for life risk insurance density model (LD) has four significant variables, namely income, life expectancy, young dependency ratio and HIV incidence rate; with all except the HIV incidence rate having positive coefficients. These findings are consistent with those discussed in the preceding two sections (5.3.2 and 5.3.3).

For the funeral insurance density model (FD), life expectancy and young dependency ratio are also significant, but the young dependency ratio has a negative coefficient implying that as an individual has more children as dependents, they consume less funeral insurance. This may be as a result of a low-income household allocating insurance expenditure to more urgent basic needs such as food and education for their children. Mean schooling years and unemployment are also significant factors and as expected the higher the schooling years and the lower the unemployment; the higher the penetration and density in funeral insurance. Only the FD model exhibits significant signs of serial correlation but we did not explore including lagged variables as at a one percent significant level, there is no serial correlation. Tests for heteroscedasticity for both LD and FD models yield no significant results, therefore all residuals are homoscedastic. Test for normality are satisfied for both models as well.

Only life expectancy and the level of grants are significant factors in the LP model. These factors both have negative coefficients implying that an increase in the life expectancy and level of grants yields a decrease in the penetration of life risk insurance. The inclusion of the income (GDP) variable results in a three-variable model that explains 93 percent of the variation in life risk insurance penetration. All post estimation test results of the LP model are satisfactory.

Table 5.3.3: Combined Regression Models

	LD (1)	LP (1)	FD (1)	FP (1)
Constant	-17560.83 (-5.99) ^{***}	0.10 (11.82) ^{***}	102.91 (0.70)	-3E-04 (-0.56)
GDP	0.07 (5.74) ^{***}	5.89E-07 (1.76)		
Life Expectancy	140.38 (15.80) ^{***}	-1.22 (-2.12) [*]	2.89 (6.80) ^{***}	
Old dependency				
Young dependency	41735.06 (4.82) ^{***}		-887.48 (-2.85) ^{**}	
Financial sector development				
Inflation				1.3E-03 (1.52)
Mean schooling years			19.23 (3.53) ^{***}	
HIV	-288261.70 (-7.26) ^{***}			
Grant		-0.55 (-2.74) ^{**}		5.6E-02 (10.61) ^{***}
Unemployment			332.45 (-4.69) ^{***}	-3.1E-03 (-2.10) ^{***}
Interest				
Population growth				
F-statistic	590.81 ^{***}	53.02 ^{***}	836.19 ^{***}	66.86 ^{***}
Adjusted R-squared	0.99	0.93	0.99	0.94
Observations	13	13	13	13
Breusch-Pagan	0.65	1.08	0.16	0.01
Cameron & Trivedi	13	10.49	13	5.91
ARCHLM	0.00	1.27	0.03	0.07
Bgodfrey	0.04	0.19	3.81 [*]	0.07
Durbin Alt	0.02	0.12	2.79 [*]	0.04
Dwatson	2.02	2.01	3.01 ^{**}	2.05

*Significance levels: * 10% level ** 5% level *** 1% level*

The significant variables in the FP model are the level of grants (positive) and unemployment (negative). As observed in the LP model, all post estimation test results are satisfactory.

5.3.5 Conclusion – Regression Analysis

The results from all the regressions are summarised in Table 5.3.4 below. Significant independent variables are highlighted by indicating the nature of the relationship (i.e. positive or negative) against the dependent variables. Only three variables, namely life expectancy, young dependency ratio and mean schooling years, were significant across most the regression models conducted.

Table 5.3.4: Summary of Regression Analysis¹

Independent variables	Life Risk Density		Life Risk Penetration		Funeral Density		Funeral Penetration	
	Obs.	Pred.	Obs.	Pred.	Obs.	Pred.	Obs.	Pred.
Income	+	+		+	+	+		+
Life expectancy	+		Ambiguous		+	-	-	-
Old age dependency	+							
Young age dependency	+	+	+	+	-			
Mean schooling years	-		-		+			
HIV incidence rate	-		-			+		+
Grant			-			-	+	-
Unemployment					-		-	
Inflation		-		-	-	-		-
Interest rates					-			
Financial Sector Development		+		+				
Population growth								

¹Note: Obs. represents observed values whereas Pred. represents predicted or hypothesised values; only significant results are noted in table

Five variables namely, income, HIV incidence rate, level of grants and unemployment were significant for two dependent variables. In table 5.3.4, we have highlighted the observed values versus the predicted or hypothesised values in Chapter Three. Observed values in red indicate factors where results of the data analysis are different from our predicted values. Life expectancy and old age dependency have a significant and positive relationship with life risk insurance density whereas mean schooling years and the HIV incidence rate have a negative relationship. With regards to life risk insurance penetration, life expectancy, mean schooling years and HIV also have significant relationships. In addition, Grant has a significant and negative relationship with life risk insurance density.

For funeral insurance density, life expectancy has a positive relationship which is not in line with our hypothesis, but it is in line for funeral insurance penetration. Grant seems to have a positive relationship for funeral insurance consumption against our initial hypothesis of a negative relationship. Young age dependency and unemployment have also been found to be highly significant in determining funeral insurance consumption, a result different from our hypothesis.

We expected income to be a much stronger indicator of density and penetration across life risk and funeral insurance as empirical literature suggests. The small sample of data may have an unsatisfactory impact on the explanatory power of income. Therefore, in section 5.4 below, we have conducted an analysis that looks at the causal nature of the relationship between income and life insurance penetration and density over a longer period of time.

5.4 CAUSALITY BETWEEN INCOME AND INSURANCE PENETRATION AND DENSITY

The analysis below seeks to determine whether a causal relationship between life insurance penetration and density and income exists over a large dataset; that is between 1980 and 2014. The causality analysis begins with testing the variables *ip*, *id* and *gdppercapita* for stationarity as this is a condition that needs to be satisfied in order to run the Johansen test for cointegration and Granger causality.

5.4.1 Unit Root

Augmented Dickey-Fuller Test for Unit Root

The results of the segmented Dickey-Fuller tests for unit roots is conducted in Table 5.3.1 below and found that the series of *ip*, *id* and *gdppercapita* follow a unit root process and therefore were non-stationary; the Test statistic is greater than the five percent critical value, as well as at the ten percent level. We expected this finding as it is evident from the figures 5.1.1, 5.1.4 and 5.1.6 that trend is present in the time series of life insurance penetration and density.

Table 5.4.1: Augmented Dickey-Fuller Unit Root Tests

Variable	Test Statistic	5% Critical Value
<i>ip</i>	-1.970	-2.989
<i>id</i>	3.540	
<i>Gdppercapita</i>	-0.778	

Phillips-Perron Test for Unit Root

All three series at levels (noted in bold characters in Table 5.3.2 below) confirm the presence of a unit root (i.e. non-stationarity) as found by the Dickey-Fuller test above. However, the differenced and differenced log of each of the series are stationary in nature as we reject the null hypothesis of the presence of a unit root. Therefore, the variables *DlnGDP*, *DlnIP* and *DlnID* are integrated of order one. By using these variables, we are able to interpret our results from the cointegration and Granger causality analysis below.

Table 5.4.2: Phillips-Perron Unit Root Test

Variable	Transformation on Root Variable	Z(rho) no trend	Z(rho) trend	Stationary Status
gdppercapita	N/A	-1.04	-2.15	Non-stationary
lnGDP	Ln	-1.23	-2.23	Non-stationary
DlnGDP	Differenced 1 lag, Ln	-21.96***	-26.95***	Stationary
DGDP	Differenced 1 lag	-22.91***	-28.01***	Stationary
ip	N/A	-2.60	-3.41	Non-stationary
lnIP	Ln	-2.66	-2.20	Non-stationary
DlnIP	Differenced 1 lag, Ln	-33.20***	-31.96***	Stationary
DIP	Differenced 1 lag	-32.54***	-32.09***	Stationary
id	N/A	1.95	-2.30	Non-stationary
lnID	Ln	-1.23***	-0.70	Stationary
DlnID	Differenced 1 lag, Ln	-31.99***	-31.75***	Stationary
DID	Differenced 1 lag	-24.19***	-25.77***	Stationary

*Significance levels: * 10% level ** 5% level *** 1% level*

5.4.2 Cointegration

Both cointegration Johansen tests for DlnIP and DlnGDP and DlnID and DlnGDP exhibit cointegration as the trace statistic at rank zero is more than the five percent critical value, therefore we reject the null hypothesis of no cointegration (Table 5.3.3). This means that there is at least one cointegrating function (i.e. causal relationship) for DlnIP and DlnGDP and DlnID and DlnGDP which enables us the ability to conduct a vector error correction model in order to determine the direction of the causal relationship between life insurance penetration (*ip*) and income (*gdppercapita*) or between life insurance density (*id*) and income (*gdppercapita*).

Table 5.4.3: Johansen Tests for Cointegration

No. of observations = 31; Lags = 3; Trend: constant Sample period: 1984 to 2014						
DlnIP & DlnGDP						
Maximum rank	LL	Eigenvalue	Trace statistic	5% critical value	Max statistic	5% critical value
0	94.76	.	21.95	15.41	16.71	14.07
1	103.11	0.42	5.24	3.76	5.24	3.76
2	105.73	0.16				
DlnID & DlnGDP						
Maximum rank	LL	Eigenvalue	Trace statistic	5% critical value	Max statistic	5% critical value
0	94.29	.	19.28	15.41	15.26	14.07
1	101.92	0.39	4.02	3.76	4.02	3.76
2	103.92	0.12				

5.4.3 Granger Causality

The results from four vector error correction models, namely life insurance penetration to income; income to life insurance penetration; life insurance density to income; and income to life insurance density are displayed below in Table 5.3.4.

Table 5.4.4: Long-run Causality Analysis – Vector Error Correction Model

Vector error correction models							
Insurance Penetration to GDP				GDP to Insurance Penetration			
	Coefficient	Z	P > Z		Coefficient	Z	P > Z
D_InIP				D_InGDP			
_ce1L1.	-0.14	-2.31	0.02**	_ce1L1.	0.04	2.23	0.03**
LnIP LD.	-0.17	-0.90	0.37	LnGDP LD.	0.29	1.41	0.16
LnIP L2D.	-0.28	-1.52	0.13	LnGDP L2D.	-0.21	-1.10	0.27
LnGDP LD.	-0.11	-0.10	0.92	LnIP LD.	3.96E-03	0.11	0.91
LnGDP L2D.	0.42	0.41	0.69	LnIP L2D.	-0.01	-0.39	0.70
_cons	2E-03	0.06	0.95	_cons	0.01	1.91	0.06
Insurance Density to GDP				GDP to Insurance Density			
	Coefficient	Z	P > Z		Coefficient	Z	P > Z
D_InIP				D_InGDP			
_ce1L1.	-0.06	-3.07	0.00***	_ce1L1.	0.01	1.85	0.07*
LnIP LD.	-0.17	-0.96	0.34	LnGDP LD.	0.31	1.56	0.12
LnIP L2D.	-0.27	-1.46	0.14	LnGDP L2D.	-0.19	-1.01	0.31
LnGDP LD.	0.07	0.06	0.95	LnIP LD.	9E-03	0.26	0.79
LnGDP L2D.	0.42	0.42	0.67	LnIP L2D.	-0.01	-0.33	0.74
_cons	2.7E-03	0.04	0.97	_cons	0.02	1.97	0.05

*Significance levels: * 10% level ** 5% level *** 1% level*

As noted in section 5.4.2, there exists at least one causality function between insurance penetration and income and between insurance density and income. In order to determine the direction of the causality, we include the lagged error-correction term within the relevant cointegrating functions. The coefficient of the error-correction term (-0.14) for the causal relationship between life insurance penetration and income is negative and significant at the five percent confidence level. The coefficient of the error-correction term (0.04) for the causal relationship between income and life insurance penetration, however is not negative implying that the causal relationship between life insurance penetration and income runs in a unidirectional manner from life insurance penetration to income in the long-run with no feedback effects. There exists no short-run causality between life insurance penetration and income, as evidenced in Table 5.3.5 below, as we fail to reject the null hypothesis that the coefficients of the lagged differences are jointly equal to zero.

We also find that there is a unidirectional causality that runs from life insurance density to income with no feedback effects running from income to life insurance density. In a similar manner as for life insurance penetration, the error-correction term of -0.06 is significant and negative for the causality analysis of insurance density and income but is positive in nature for the analysis of income and life insurance density. As illustrated in Table 5.3.5 below, there is no short-run causality between life insurance density and income.

Table 5.4.5: Granger Causality Functions

H0: Coefficients are zero	Test of coefficients	chi2	Prob. > chi2
IP to GDP	[D_InIP]LD.InGDP = 0 [D_InIP]L2D.InGDP = 0	0.17	0.92
GDP to IP	[D_InGDP]LD.InIP = 0 [D_InGDP]L2D.InIP = 0	0.18	0.91
ID to GDP	[D_InID]LD.InGDP = 0 [D_InID]L2D.InGDP = 0	0.20	0.90
GDP to ID	[D_InGDP]LD.InID = 0 [D_InGDP]L2D.InID = 0	0.20	0.91
<i>Significance levels: * 10% level ** 5% level *** 1% level</i>			

Therefore we have established that there exists a long-run unidirectional causal relationship running from life insurance penetration to income and from life insurance density to income. This implies that as the level of life insurance consumption increases, individual incomes will also increase in the long-run as income and wealth creation is shielded from financial setbacks associated with mortality as a result of life insurance protection. If this causal relationship were to hold true for funeral insurance; government may consider increasing the level of life insurance protection provided to all individuals through legislation or welfare.

Table 5.4.6: Post estimation Tests for Granger Causality

<i>(chi2)</i>	Lagrange		Jarque-Bera		
	Lag 1	Lag 2	D_In(1 st variable)	D_In(2 nd variable)	All
IP to GDP	2.76	1.43	1.11	1.55	2.65
GDP to IP	2.76	1.43	0.22	1.03	1.24
ID to GDP	3.73	1.85	0.45	1.34	1.79
GDP to ID	3.73	1.85	0.22	0.86	1.08
<i>Significance levels: * 10% level ** 5% level *** 1% level</i>					

Using the Lagrange-multiplier test and the Jarque-Bera test for all Granger functions (Table 5.3.6); we determine that there is no autocorrelation in the residuals and they are normally distributed respectively as we fail to reject the null hypothesis in both tests. Therefore we are satisfied with the results obtained from the causality analysis.

It is important to note that there may be many other powerful predictors of income (i.e. real GDP per capita) than life insurance penetration and density, such as employment; labour productivity; capital formation; the level of exports and imports; or foreign direct investment (FDI) flows. The analysis above assumes that there are only two factors that influence each other; that is life insurance penetration or density influences income and/or vice versa. This notion assumes that these factors influence each other in a vacuum which does not occur in reality. In this light, we should be careful not to be definitive in our conclusion that an increase in life insurance penetration or density will lead to an increase in income in the long-run.

5.5 CONCLUSION

5.5.1 Descriptive Statistics

We observed that there was a significant increase in the life risk and funeral insurance premiums between 2001 and 2013. The density rates of both life risk and funeral insurance increased as well. However, the life risk penetration decreased over the period while funeral insurance penetration increased. Our assumption that assistance insurance can be used as a proxy for funeral insurance may have understated the true experience of the funeral insurance and density rates over the period as the assistance insurance is a subset of funeral insurance. Therefore we should be careful when interpreting our results as assistance insurance is not an exact approximation of funeral insurance.

5.5.2 Regression Analysis

In section 5.3.5, we noted that:

- Income and life expectancy have a significant and positive relationship with life risk and funeral insurance density. Life expectancy is ambiguous for life risk insurance penetration but has a negative relationship with funeral insurance penetration
- Young and old age dependency have a significant and positive relationship with life risk insurance density and penetration, but the relationship is negative for young age dependency and funeral insurance
- Mean schooling years and the HIV incidence rate has a negative relationship with life risk insurance penetration and density
- The level of grants also has a negative relationship with the life risk insurance penetration but a positive relationship with funeral insurance penetration
- Unemployment, inflation and interest all have a negative relationship with funeral insurance density

The small data set of 13 observations encourages us to interpret our results from the regression analysis with caution.

5.5.3 Causality Analysis

We found a causal relationship between income (i.e. real GDP per capita) and life insurance penetration and density. The nature of the causal relationship is unidirectional running from life insurance penetration to income and from life insurance density to income. Again, we are careful with this finding as there may be stronger determinants of income as mentioned in section 5.4.3.

5.5.4 Summary

A summary of main hypotheses findings is presented below:

- Hypothesis 1: Demographic factors actually had a higher explanatory power on the dependent variables than macroeconomic factors. This result is different from our hypothesis
- Hypothesis 2: Income per capita was found to be a significant and positive determinant of both life and funeral insurance consumption. This result is consistent with our hypothesis
- Sub-hypothesis 2a: A long-run causal relationship was found between income and life insurance consumption. This result is consistent with our original hypothesis
- Hypothesis 3: Although there were different factors that were significant for life and funeral insurance consumption, some of the factors driving both dependent factors were similar. Therefore we cannot conclude that the factors driving life insurance consumption were significantly different from those driving funeral insurance consumption

The next chapter, Chapter Six, presents the conclusions, recommendations, limitations of the study and areas for further research are presented.

CHAPTER SIX

CONCLUSION

6.1 CONCLUSIONS

There was a significant increase in life and funeral insurance consumption from the year 2000 with funeral insurance penetration and density rising dramatically. An extensive literature review of existing literature on the determinants of insurance penetration and density led to the development of four dependent variables namely life insurance penetration and density (LP and LD) and funeral insurance penetration and density (FP and FD) and 12 independent variables, half being macroeconomic variables and the other half being demographic variables. Data was collected from various sources and prepared for data analysis. Three types of data analysis were conducted namely the interpretation of descriptive statistics for all variables; the use of an Ordinary Least Squared Estimation (OLS) to assess the linear relationship between the dependent variables and independent variables; and the performance of Johansen cointegration and Granger causality in order to determine whether a causal relationship between income and life insurance penetration and density exists.

We conclude that demographic factors have a higher explanatory power on dependent variables than macroeconomic factors. Income per capita was found to be a significant and positive determinant of both life and funeral insurance consumption. We also found that a long-run causal relationship existed between income and life insurance consumption. Finally we ascertained that the factors driving life insurance consumption were not significantly different from those driving funeral insurance consumption.

6.2 RECOMMENDATIONS

Given that income is a strong indicator of life insurance consumption, Government may consider looking at augmenting the current social welfare programme with compulsory life insurance or funeral insurance cover. A small premium may be deducted from the overall grant payment to cater for the insurance cover. Government intervention such as creating a competitive and fair market through legislation, ensuring that the insurance premiums are affordable for low-income individuals and driving financial inclusion and education efforts may help to drive the penetration and density of life and funeral insurance.

6.3 LIMITATIONS AND AREAS FOR FUTURE RESEARCH

The study has a few limitations but they do not significantly impact the interpretation of our findings. The limitations are as follows:

- The number of data observations for the linear regression analysis were few. The use of quarterly data for the period from 2001 to 2013 would have resulted in 52 observations which would have been preferable. Unfortunately, quarterly data was not available.
- Data explicitly for funeral insurance premiums was not available therefore we used assistance insurance premiums as a proxy.
- A study done at the macro level does not take into account important micro level factors such as the price of life and funeral insurance, the cost of providing life and funeral insurance and marketing expenditure of insurance providers to name a few. Therefore more significant determinants may be excluded from our research. A study done at the enterprise level or individual level may yield further insight into the determinants of life and funeral insurance penetration and density.

Future research may be considered in the following areas:

- The inclusion of banking development variables such as the amount of credit offered, the growth and penetration in unsecured credit or the access to banking services
- The causality analysis between income and the life risk insurance and funeral insurance consumption. This research would provide more insight into the strength of the causal relationship between income and life risk and funeral insurance consumption
- Primary research at the individual or household level through administering a questionnaire on the reasons why low-income and middle to high income individuals demand life and/or funeral insurance
- A supply-side study at the enterprise level looking at the factors, such as the price of insurance, marketing and advertising costs and management costs, that drive the supply of life and funeral insurance
- Primary research looking at the impact of a death on an individual's or household's income, wealth, financial security or formal and informal indebtedness after the death of a dependent or primary income earner respectively

6.4 RECONCILIATION OF OBJECTIVES

The hypotheses suggested in Chapter Three were reconciled at the end Chapter Five; the objectives of the study were accomplished and the research question was answered. Therefore the research achieved its goals.

6.5 SUMMARY

In this chapter, we highlighted the main conclusions of the study in relation to the determinants of life and funeral insurance consumption and suggested recommendations to continue to drive life and funeral penetration and density going forward. We addressed the limitations of the study and put forward areas for future research. Finally, we noted that the objectives of the study were accomplished and the research question was answered.

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APPENDIX

Appendix A1: Regression Analysis Data

Variable	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Life Business Net Written Premiums (ZAR bns)	62.6	68.4	70.2	72.2	81.7	89.5	103.3	116.0	113.4	119.8	132.7	150.0	170.4
Assistance Business Net Written Premiums (ZAR bns)	0.7	1.2	1.3	2.1	2.6	3.0	3.3	4.0	4.1	4.8	5.0	5.5	6.0
Real GDP (ZAR bns)	2008.2	2081.8	2143.2	2240.8	2359.1	2491.3	2624.8	2708.6	2666.9	2748.0	2836.3	2899.2	2963.4
Nominal GDP (ZAR bns)	1046.1	1217.3	1325.8	1476.6	1639.3	1839.4	2109.5	2369.1	2507.7	2748.0	3025.0	3262.5	3534.3
Population (millions)	45.6	46.3	47.0	47.7	48.4	49.0	49.7	50.3	51.0	51.6	52.2	52.8	53.4
Life Insurance Density (ZAR)	1372	1477	1493	1514	1688	1826	2079	2306	2223	2321	2543	2840	3191
Assistance Insurance Density (ZAR)	16	26	28	44	54	62	66	79	80	92	96	104	113
Life Insurance Penetration (%)	5.98%	5.62%	5.29%	4.89%	4.98%	4.87%	4.90%	4.90%	4.52%	4.36%	4.39%	4.60%	4.82%
Assistance Insurance Penetration (%)	0.07%	0.10%	0.10%	0.14%	0.16%	0.16%	0.16%	0.17%	0.16%	0.17%	0.16%	0.17%	0.17%
Real GDP per capita (ZAR)	44710	45716	46472	47964	49832	51911	53946	54892	53279	54103	55016	55391	55747
Population growth (%)	1.56%	1.54%	1.51%	1.49%	1.47%	1.24%	1.43%	1.21%	1.39%	1.18%	1.16%	1.15%	1.14%
Inflation (%)	4.50%	12.40%	0.40%	3.30%	3.60%	5.80%	9.00%	9.50%	6.30%	3.50%	6.10%	5.70%	5.40%
Real Interest Rate (%)	8.50%	4.60%	11.10%	7.70%	6.90%	6.70%	5.50%	5.50%	4.20%	5.50%	2.90%	2.80%	3.10%
Financial Sector Development	0.4200	0.4336	0.4713	0.4852	0.4778	0.4764	0.4712	0.5174	0.4924	0.4856	0.4732	0.4459	0.4479
Unemployment Rate (%)	24.60%	27.70%	29.30%	26.40%	24.20%	23.10%	23.60%	21.90%	24.30%	24.00%	23.90%	24.90%	24.10%
Life Expectancy (age)	54.57	53.44	52.52	51.87	51.56	51.61	52.00	52.64	53.47	54.39	55.30	56.10	56.74
Schooling (years)	7.50	8.50	8.80	8.80	8.90	8.90	9.10	9.20	9.50	9.60	9.70	9.90	
Social Security Dependence	0.0313	0.0350	0.0403	0.0426	0.0450	0.0454	0.0443	0.0456	0.0490	0.0481	0.0471	0.0475	0.0470
Old Dependency Ratio	4.10%	4.30%	4.40%	4.50%	4.60%	4.70%	4.80%	4.90%	5.00%	5.10%	5.00%	5.00%	5.00%
Young Dependency Ratio	34.60%	34.10%	33.50%	33.00%	32.50%	32.10%	31.80%	31.60%	31.30%	30.90%	30.80%	30.40%	30.00%
HIV Incidence Rate	2.22%	2.09%	1.98%	1.88%	1.79%	1.73%	1.68%	1.64%	1.62%	1.60%	1.54%	1.44%	1.32%

Appendix A2: Causality Analysis Data

Year	Life Insurance Penetration (IP)	Life Insurance Density (ID)	GDP per capita
1980	3.43%	78	50974
1981	3.51%	90	52417
1982	3.90%	111	50923
1983	4.41%	140	48718
1984	4.08%	148	49891
1985	4.15%	169	48023
1986	4.86%	226	46815
1987	6.47%	343	46620
1988	5.73%	356	47433
1989	5.16%	376	47496
1990	7.46%	615	46390
1991	7.32%	677	44981
1992	8.31%	844	43111
1993	8.65%	1013	42731
1994	9.15%	1186	43166
1995	10.75%	1549	43552
1996	10.52%	1669	44425
1997	11.25%	1933	44549
1998	12.80%	2327	43732
1999	13.01%	2531	43713
2000	14.47%	3111	44434
2001	14.31%	3334	44710
2002	14.40%	3848	45716
2003	12.29%	3533	46472
2004	10.84%	3425	47964
2005	10.71%	3707	49832
2006	12.57%	4818	51911
2007	11.50%	4987	53946
2008	11.99%	5758	54892
2009	12.34%	6184	53279
2010	10.29%	5569	54103
2011	9.94%	5833	55016
2012	10.83%	6748	55391
2013	11.41%	7587	55747
2014	11.37%	7995	55712