# Determinants of Life Insurance Demand in Ethiopia

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# Declaration

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any other university and that all sources of materials used for the thesis have been dully acknowledged.

**Declared by**:

Name: Amrot Yilma Redi

Signature;_____

Date: MAY**, 2014**

# Certification

This is to certify that **Amrot Yilma Redi** has carried out her research work on the topic entitled **"Determinants of Life insurance demand in Ethiopia"** under my supervision. This work is original in nature and it is suitable for submission for the award of degree for **Masters of MBA in Finance.**

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Place and date of Submission: **ADDIS ABABA UNIVERSITY,** MAY**, 2014**

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## *Abstract*

Determinants of life insurance demand in Ethiopia

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*The study is intended to investigate the major determinants of life insurance demand in Ethiopia. The study focuses on the relationship of life insurance with six selected independent variables (income, inflation, real interest rate, level of education, life expectance and dependence ratio). The researcher used a time series data from 1983-2012. The approach for this study is quantitative research approach. To find the major determinant factors for life insurance demand, the researcher adapted a log linear model. The adjusted R squared for the model is 0.9656 which indicates that about 96.56 percent of demand for life insurance is explained by the selected six factors. The t-statistics and p-value show that explanatory variables such as GDP per capita, inflation, real interest rate, level of education and life expectance are statistically significant at 10 percent significance level. GDP per capita, real interest rate, level of education and life expectance are positively related with life insurance demand whereas inflation is negatively related with life insurance demand. Dependence ratio does not have a statistically significant relationship with life insurance. GDP per capita is the most important factor that influences demand for life insurance followed by life expectance and level of Education. Inflation is the least important factor in influence demand for life insurance.*



**Key words**: Life insurance, log linear model, Ethiopia

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## ACRONYMS

**CEE**: Central and Eastern Europe

**CIS**: Commonwealth of Independent States

**CPI:** consumer price index

**CLRM:** Classical Linear Regression Model

**DR**: Dependence Ratio

**EDU:** level of Education

**EPF**: Employees' Provident Fund

**GDP**: Gross domestic product

**JB**: Jarque-Bera

**LEXP**: Life Expectancy

**LIP**: Life insurance premium per capital

**NBE:** National Bank of Ethiopia

**OECD:** Organization for Economic Cooperation and Development

**OLS:** Ordinary Least Squares

**PI**: Price of insurance

**RIR:** Real interest rate

**UNIC:** United Insurance Company

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background of the Study

Life insurance is a contract between a policy owner and the insurer, where the insurer agrees to pay a designated sum of money upon the occurrence of the policy owner‘s disability due to accident or aging, death or other events, and the policy owner agrees to pay a fixed amount to the insurer at designated interval. While the main objective of insurance companies is to mitigate insurable risks, in tandem they also play an important role in development of the financial sector. They mobilize savings which can be channelled for long term investments which help economic growth and development.

Life is full of uncertainties. Unexpected events can lower people‘s well-being; an important mechanism that protects against risk is purchasing insurance to guarantee the benefit in the event of certain loss. Beck and Webb, (2002) on their study on determinants of life insurance consumption described that life insurance products are important vehicle that encourage long-term savings that could be channelled to investment in both private and public sector projects. Because life insurance products offer a means of disciplined contractual saving, they have become effective as instrument for encouraging substantial amounts of savings, competing with other forms of saving (like bank deposits, securities, and other contractual savings) in the market in many countries around the world.

According to Munir and Khan (2012), Life insurance provides individuals and the economy as a whole with a number of important financial services. In the face of increasing urbanization, mobility of the population, and formalization of economic relationships between individuals, families, and communities, life insurance has taken increasing importance as a way for individuals and families to manage income risk. Also, life insurance

products encourage long-term savings and the re-investment of substantial sums in private and public sector projects. Because life insurance products offer a means of disciplined contractual saving, they have become effective as instrument for encouraging substantial amounts of savings in many countries around the world. Leveraging their role as financial intermediaries, life insurers have become a key source of long-term finance.

Different studies suggests that several factors such income, inflation, real interest rate, banking sector development, savings, unemployment, pension, price of insurance education, life expectance, dependency ratio and age are considered important factors that determine life insurance demand.

## 1.2 Life Insurance in Ethiopia

The life insurance market in Ethiopia is very small as the number of life insurance companies has remained relatively stable. In 2012 the sole life only company, Ethio-Life became composite and is now known as Ethio-Life and general insurance. Also in 2012, a non-life company, Oromia insurance company obtained a life licence and became a composite insurer. There are now a total of nine companies (EIC, Awash, United, Nile, Nyala, Nib, Africa, Ethio-Life and Oromia ) licensed to underwrite life insurance; all of them are composite underwriters. The state owned insurer EIC, the monopolist insurer under the communist regime, remains the largest insurer in the country, with a 47.76% share of the market as at 2011. AXCO (2013).

**Table 1.1: Current Status of Life Insurance Companies**

| Insurance companies | Written premiums ETB mill 2010 | Written premiums ETB mill 2011 | Growth in % | Market share in % |
|---|---|---|---|---|
| EIC | 58.33 | 76.7 | 31.49% | 47.76% |
| Nyala | 12.97 | 20.74 | 59.90% | 12.91% |
| Nile | 11.15 | 12.73 | 14.15% | 7.93% |
| Africa | 11.27 | 12.33 | 9.38% | 7.68% |
| UNIC | 5.94 | 12.01 | 102.34% | 7.48% |
| Awash | 6.88 | 11.59 | 68.54% | 7.22% |
| Nib | 5.19 | 9.92 | 91.04% | 6.18% |
| E-life | 3.01 | 4.58 | 52.01% | 2.85% |
| Other | 0.00 | 0.00 | N/A | N/A |
| Market total | 114.74 | 160.6 | 39.97% | 100% |

Source: AXCO Global Statistics

## 1.3 Statement of the problem

The most important function of life insurance is to provide financial security to individuals and families. The loss of income following the premature death of the main income earner of a family may result in terrible financial consequences to the surviving family members. Life insurance allows potential financial loss resulting from the death of the insured to be alleviated through the payment of specified benefits. Thus, life insurance plays an important role in the financial planning of an individual and family since it can be used as a hedge against financial uncertainty resulting from the mortality risks faced by individuals.

Developed countries view insurance companies as an important provider of financial services. Many developing economies are experiencing very low levels of life insurance penetration (Beck and Webb, 2003). An investigation of the factors that motivate life insurance purchase will provide new insights into developing, marketing, and the formulation

of policy relating to insurance products and insurance business. Through new initiatives, numerous benefits of insurance are expected to reach a larger segment of the population.

The Ethiopian insurance business has been persistently expanding ever since the sector was opened for private investment. This is testified by the fact that the number of insurers reached more than 15 at present compared to a single state-owned insurance company back in 1994. Change has also been witnessed in terms of diversity of insurance products.

Life insurance gives individuals and the economy many financial services. In the phase of urbanization, population mobility and formulization of economic links among individuals, families and communities, it has been taken as an important element for individuals and families to overcome risk attached with income. Also, life insurance items enhance long-term savings and the re-investment in private and public sector projects Munir and Khan (2012). The importance of life insurance for economic and financial development directs the researcher to investigate which economic and socio-demographic factors give rise to a vibrant life insurance market.

As stated on Roman (2011), In Ethiopia, the life insurance market is undeveloped, uncompetitive and there exist lack of information on the kind of life insurance that is currently provided. The current practice of insurance coverage in Ethiopia focuses mainly on general insurance with a very limited coverage to life insurance.

A review of literature also indicates that studies related to life insurance demand have been mainly conducted in the USA, Malaysia, China and some European countries. Although such studies have contributed substantially to the literature on life insurance demand, their findings may not be applicable to other countries, like Ethiopia due to differences in cultural, economic and legal environments. This study is expected to fill the gap in literature by identifying basic economic and socio-demographic factors that determines life insurance demand in Ethiopia.

In addition, to the best of the researcher‘s knowledge, there are only two previous research works in Ethiopia concerning the life insurance demand. The first project is conducted by Roman (2011) she makes her major concern on only general economic factors that determine life insurance demand. Since there are also demographic and institutional determinants that must be explored, this study would fill this gap by studying the remaining variables. The second research is conducted by Aderaw (2013) examined the determinants of life insurance for a time series data for the period 1991-2010. His work focus on the relationship of life insurance and on only some selected independent variables (income, real interest rate, dependency ratios and life expectancy for males). Therefore this work doesn‘t have seen other factors that determine life insurance demand in Ethiopia. Generally this research work would fill the gap of previous studies and explore the remaining variables which are not yet been touched.

Hence, understanding of the factors that determine life insurance demand in this country is important for the industry actors to exert more effort on working on these factors to expand their knowledge. In addition to filling this knowledge gap, it will provide important information to those who want to do similar studies at a larger scale. Therefore the result of this paper would have great contribution to the body of knowledge.

## 1.4 Objective of the study

### 1.4.1 General objective

The major objective of the study is to investigate the major determinant of life insurance demand in Ethiopia.

### 1.4.2 Specific objectives

In order to achieve the general objective of the study, the researchers have identified the following specific objectives;

- To explore how income affect life insurance demand.
- To test to what extent inflation influence life insurance demand.
- To explore the influence of real interest rate on life insurance demand.
- To find out the impact of level of education on life insurance demand.
- To identify the effect of life expectance on life insurance demand
- To examine the effect of dependence ratio on life insurance demand.

## 1.5 Hypothesis

**Income**: The level of income is the prominent variable which affects the demand for life insurance. Previous studies mostly show that there is significant and positive relationship between level of income and demand for life insurance (Dickinson, Khajuria (1986), Truett and Truett (1990), Browne and Kim (1993), and Outreville (1996), Celik and Kayali (2009), Aderaw (2013). Following the previous studies the researcher formulated hypothesis one as follows;

**$H_1$**: *There is positive and statistically significant relationship between income level and demand for life insurance.*

**Inflation**: In the literature, it is observed that inflation affects demand for life insurance in negative way (Beck and Webb (2003), Li et.al (2007), Nesterova (2008), Çelik and Kayali (2009), Ibiwoye et.al (2010)). The researcher hypothesis is as follows:

**$H_2$**: *There is negative and statistically significant relationship between inflation and demand for life insurance*.

**Real interest rate:** life insurance demand is positively influenced by real interest rate Beck and Webb (2003), Aderaw (2013). The researcher hypothesis is as follows

**$H_3$**: *There is positive and statistically significant relationship between real interest rate and demand for life insurance.*

**Level of Education**: In previous studies, it is found that there is statistically significant and positive relationship between level of education and demand for life insurance (Truett and Truett (1990) and Browne and Kim (1993), Li et.al (2007), Kakar and Shukla (2010), Mahdzan & Victorian (2013) explain that if education level is high, people are aware of types of life insurance and they try to protect themselves and dependents by using it. So, the researcher hypothesis regarding education level is as follows:

**$H_4$**: *There is positive and statistically significant relationship between level of education and demand for life insurance.*

**Life expectance:** Nesterova (2008), Redzuan (2011), Aderaw (2013) identified that life expectance have a significant and positive impact on the demand for life insurance. So, the researcher's hypothesis regarding age is as follows:

**$H_5$**: *There is positive and statistically significant relationship between life expectance and demand for life insurance.*

**Dependency ratio:** Empirical studies have shown that dependency ratio is positively related to the demand for life insurance (Brown & Kim, 1993; Curak & Gaspic, 2011); so, the researcher hypothesis regarding age is as follows:

**$H_6$**: *There is positive and statistically significant relationship between Dependency ratio and demand for life insurance.*

## 1.6 Significance of the study

The study helps insurance companies in formulating appropriate strategies for reaching and attracting customers, by doing so the insurance companies would increase their income from life insurance. Secondly, it would serve other researchers who wish to make a study on the same title, organization or both could as a springboard. Thirdly it gives the researcher the opportunity to gain deep knowledge in the area of life insurance.

## 1.7 Scope of the study

Although there are other determinants of life insurance demand, due to constraint of data the study assess the demand for life insurance with respect to the major economic and socio-demographic factors. The study focus on the factors determining the life insurance demand and the relationship of life insurance on six selected independent variables (income, inflation, real interest rate, level of education, life expectance and dependence ratio). The study uses a time series data from 1983-2012.

## 1.8 Limitation of the study

One of the limitations of this research is small number of insurance data set. The life insurance data prior to 1983 were not available, thus, restricting the annual sample size to 30 (from 1983-2012). Because the time is not substantially long, the question of whether the results suffer from small sample bias may arise. Another main problem in this study has been inconsistent of data from different institutions. Even data arises from the annual reports of the National bank of Ethiopia shows different figures for the same year. Moreover, Lack of previously conducted studies on similar topic and accessibility of sufficient current literature on the subject of life insurance in the Ethiopian context makes this study difficult.

## 1.9 Organization of the Paper

This paper is organized in five chapters. Following this introductory chapter, the second chapter comes, which provides a theoretical and empirical review on the determinants of life insurance demand. Chapter three deals with methodology of the study and the fourth chapter describes the findings of both descriptive and econometric analyses. Finally chapter five contains conclusions, Recommendations and Recommendations for future research.

# CHAPTER TWO

# LITERATURE REVIEW

In this section the researcher first presents about life insurance density. Secondly theoretical review is presented i.e. the different theories regarding life insurance demand. The theoretical frameworks are usually followed by the empirical review. The empirical review presents different empirical researches done in the area of determinants of life insurance demand and highlight the most relevant findings in the field of life insurance demand and finally the researcher develop conceptual framework of the study.

## 2.1 Life Insurance Density/ Per Capita

Insurance density rates measure the premium volume in relation to the country‘s population i.e. how much money per capita is annually spent on insurance products. It shows how important is insurance spending for the citizen of a country and how this spending has been changed during a certain period of time. Sharku &Bajrami(2006).

It indicates how much each inhabitant of the country spends on average on insurance in real international dollars. To calculate these ratios, we first convert the premium volume into international dollars. We then divide the premium volume in international dollars by the population size. Beck and Web (2003)

## 2.2 Theoretical Review

Theoretical models for the life insurance demand have been established by Yaari (1965), Fischer (1973), Pissarides (1980), Campbell (1980), Karni and Zilcha (1985, 1986), Lewis (1989), and Bernheim (1991) were of the view that life insurance was the way by which risk in the household's income, linked to the expected premature death of a household's primary wage earner, was decreased.

The issue of life insurance demand is not new for researchers and was brought to light beginning from Yaari (1965) was the first to develop a theoretical framework to explain the

demand for life insurance. Within Yaari (1965) framework, the demand for life insurance is attributed to a person's desire to bequeath funds to dependents and provide income for retirement. This framework posits the demand for life insurance to be a function of wealth, expected income over an individual's lifetime, the level of interest rates, the cost of life insurance policies (administrative costs), and the assumed subjective discount rate for current over future consumption.

Simple models of insurance demand were proposed by Mossin (1968) and Smith (1968) considering a risk averse decision maker endowed with an initial wealth level. The results indicate that demand for life insurance varies inversely with the amount of wealth an individual possesses. Hakansson (1969) examined bequest motive in considerable detail using a discrete-time model of demand for financial assets in general and life insurance purchase in particular. Pissarides (1980) extended Yaari‘s work to prove that life insurance was theoretically capable of absorbing all fluctuations in lifetime income.

Karni and Zilcha (1985) developed a methodology towards measuring individuals‘ risk perceptions (risk averse or otherwise) and how such perceptions affect insurance demand. An important observation made by Mossin (1968) was regarding insurance coverage as an inferior good. However, Hoy and Robson (1981) presented a theoretical explanation and later Briys etal. (1989) generalised the results showing insurance to be a _Giffen‘ good.

Lewis (1989**)** extends this framework by explicitly incorporating the preferences of the dependents and beneficiaries into the model. Specifically, he derives the demand for life insurance as a maximization problem of the beneficiaries, the spouse and the offspring of the life insurance policyholder. Deriving utility maximization by both spouse and offspring separately and assuming no bequest by the policyholder and an isoelastic utility function.

Fortune (1973) analysed the empirical implications of expected utility hypothesis of choice under uncertainty for demand for life insurance and concluded that demand depends on income, non-human wealth and the rate of discount.

Jeff Madura (2010) on his book on financial markets and institutions stated that Life insurance companies compensate the beneficiary of a policy up on the policyholder‘s death. They charge policyholders a premium that should reflect the probability of making a payment to the beneficiary as well as the size and timing of the payment. Life insurance companies also commonly offer employees of a corporation a group life policy.

In short, the theoretical review yields variables like income, rate of interest, current consumption and accumulated savings in wealth form as variables influencing insurance consumption. Demographic and social variables were also incorporated in theoretical models and their potential impact on an individual‘s life insurance consumption decision was investigated. Life insurance consumption increases with the breadwinner‘s probability of death, the present level of family‘s consumption and the degree of risk aversion. In the next section, I explore selected empirical studies to highlight those variables which were significant in affecting life insurance demand.

### 2.3 Empirical Review

Truett and Truett (1990) on their comparative study on the demand for life insurance in Mexico and the United States identified that age, education, and level of income affect the demand for life insurance and that the income elasticity of demand for life insurance is much higher in Mexico than in the United States.

Based on a cross-sectional analysis of 45 developing countries, Outreville (1996) analysed the demand for life insurance for the period 1986. The study considered variables like agricultural status of the country in terms of percentage of agricultural labour force in total labour force; health status of the country in terms of amenities like percentage of population

with access to safe drinking water; percentage of labour force with higher education and the level of financial development. Two dummy variables were used to reflect competition in the domestic market and foreign insurer participation. Their result shows that personal disposable income and level of financial development significantly relates to insurance development. Since the political philosophy regarding market openness varies from country to country, market structure dummy appeared to be significant.

Beck and Webb (2003) conducted a comprehensive research over 68 countries of the world, paying attention to the question what causes the variance in life insurance consumption between different countries. Four different measures of life insurance consumption and incorporate various economic, demographic and institutional factors used in their research. As a result, they found that countries with higher income per capita level, more developed banking sector and lower inflation tend to consume larger amounts of life insurance. In addition, life insurance consumption is observed to be positively influenced by private savings rate and real interest rate. Such demographic factors as education, life expectancy, young dependency ratio does not have any robust influence on the life insurance consumption.

As to the world bank economic review (2003) the economic indicators such as inflation, income per capital and banking sector development- the religious and institutional indicators are the most robust predictors of the use of life insurance. Education, life expectancy, the young dependency ratio and size of the social security system appear to have no robust association with life insurance consumption.

Lim and Haberman (2003) on their work identified that the savings deposits rate and price change in insurance are two important macroeconomic variables associated with the demand for life insurance in Malaysia. However, the finding on the savings deposits rate fails to show the expected negative sign. They recommended as further research is needed in this respect in

order to confirm the relationship between these two variables. A change in the price of insurance has a significant negative relationship with the demand for life insurance.

Li et.al (2007) they analyzed the determinants of aggregate life insurance demand on a cross-section of developed economies. They found that income plays a major role in the consumption of life insurance products. An increase of 1 percent in aggregate income can be expected to induce at least a 0.6 percent increase in aggregate life insurance demand. In particular, the demand for life insurance decreases with the average life expectancy (lower probability of death) and increases with the dependency ratio (number of dependents). Education level is positively related to life insurance demand, whereas the influence of social security expenditure is significantly negative. On the other hand, inflation significantly decreases the demand for life insurance. High real interest rates do not persuade households to purchase more insurance, but actually stimulate them to reduce their purchase either because of higher expected benefits for the same invested amount or because of higher preference for immediate consumption relative to deferred consumption

Based on panel data analysis for 14 selected CIS and CEE countries over the period 1996-2006 Nesterova (2008) found that countries with higher life expectancy at birth, income level, old dependency ratio and countries-members of the European Union have higher levels of life insurance consumption, while financial development indicator, inflation and real interest rate reduce the demand for life insurance across countries.

Celik and Kayali (2009) investigated the determinants of demand for life insurance in cross section of 31 European countries. They found that income is the central variable which affects life insurance consumption. In addition, while the impact of population and income on demand for life insurance is positive, education level and inflation affect life insurance consumption in negative way.

Kakar and Shukla(2010) on their research on determinants of demand for life insurance in an emerging economy -India using logistic regression has confirmed that insured households tend to be more prosperous, more educated and more optimistic about future security than non-insured households. Both the level of education and occupation of the chief earner of a household are major determinants of life insurance participation, apart from asset-ownership. Further, households that are more optimistic about the adequacy of future income and savings show higher levels of participation.

Wang (2010) A study on the life insurance demand in a heterogeneous-agent life cycle economy suggest that the most important determinants of life insurance demand are financial vulnerability, the amount of financial support needed and life insurance premium. And the peak of life insurance demand for single-parent households is well before couple households. Moreover, increasing the number of children attributes a large increase of life insurance demand in single-parent households, but has no significant effect on couple households.

Ibiwoye et.al (2010) on their study examined the determinant of life insurance consumption in Nigeria during the period 1970 – 2005 within an error correction framework. They found that real gross domestic product and structural adjustment policy positively and significantly influence Life Insurance consumption in Nigeria while indigenization policy and domestic interest rate are statistically significant but inversely related to Life Insurance consumption. On the other hand, they discovered that return on investment, inflation rate, openness of the economy and political instability are insignificant predictors of Life Insurance consumption in Nigeria

Redzuan (2011) identified that income is the key determinant in the consumption of life insurance both in the long- and short-run. Evidence also suggests that income has a significant influence on family tactful consumption in the long-run, but its effect is less obvious in the short-run. The number of dependents, level of education, savings in the

Employees' Provident Fund (EPF), life expectancy and price of insurance are among the other factors that have a significant impact on the demand for life insurance and family tactful.

Loke and Goh (2011) on their study on demand for life insurance in Malaysia identified that socio-economic factors such as age, income, education, occupation, marital status and risk aversion play significant roles in the demand for life insurance. However, gender and number of dependents are found to have no significant influence on the demand for life insurance

Gustina and Abdullah (2012) found that, three variables that significantly influence the demand for life insurance, namely GDP per capita, saving and religion. The study reveals that, there are two factors that negatively influence the demand for family takaful i.e. Customer Price Index and Saving. Meanwhile, age, saving and religion are the three factors which give negative influence on life insurance.

Kjosevski (2012) found that GDP per capita, inflation, health expenditure, level of education and rule of law are the most robust predictors of the use of life insurance. Real interest rates, ratio of quasi-money, young dependency ratio, old dependency ratio control of corruption and government effectiveness do not appear to be robustly associated with life insurance demand.

Munir and Khan (2012) on their study on impacts of macroeconomic & demographic variables on the demand of life insurance in Pakistan identified that financial development, gross savings, income level are directly linked to life insurance demand while, price of insurance are inversely linked with life insurance demand and the demographic variables of crude birth rate, crude death rate, old age dependency ratio, urbanization are positively related with life insurance demand for Pakistan.

Curak et.al (2013) on their study on the effect of social and demographic factors on life insurance demand in croatia identified that age, education and employment impact life

insurance demand of household in Croatia while gender, marital status and number of family members do not have statistically significant influence.

Mahdzan & Victorian (2013) investigated the determinants of life insurance demand among life insurance policyholders of five major life insurance companies in Kuala Lumpur, Malaysia their results reveals that demographic variables and saving motives were significantly related to life insurance demand. Financial literacy, however, was found to be insignificant in determining life insurance demand. They showed that education level is significantly related to life insurance demand, where individuals with higher levels of education have higher life insurance demand.

Aderaw (2013) on his article on determinants of life insurance in Ethiopia examined the determinants of life insurance by a time series data for the period 1991-2010. He identified that life insurance is determined by per capita income, life expectancy, real interest rate and inflation. It is suggested that life insurance industry in Ethiopia seriously consider these factors to bring growth in the insurance industry.

### 2.3.1 Economic determinants

Based on the empirical review the researcher identified eight main economic determinants of life insurance demand. This includes income, inflation, real interest rate, banking sector development, savings, unemployment, pension and price of insurance.

**Income:** As stated on the work of Beck and Webb (2003), Nesterova (2008),Li et.al(2007) Çelik and Kayali (2009), Redzuan (2011), Loke and Goh(2012), Aderaw (2013) income is the key determinant in the consumption of life insurance both in the long- and short-run Life insurance consumption should rise with the level of income, for several reasons and income has a significant influence on family takaful consumption in the long-run, but its effect is less obvious in the short-run. First, an individual‘s consumption and human capital typically increase along with income, creating a greater demand for insurance (mortality coverage) to

safeguard the income potential of the insured and the expected consumption of his/her dependents. Second, life insurance may be a luxury good, in as much as increasing income may explain an increasing ability to direct a higher share of income towards retirement and investment-related life insurance products

Dickinson, Khajuria (1986), Truett and Truett (1990), Browne and Kim (1993), and Outreville (1996), Çelik and Kayali (2009), Aderaw (2013) have all shown that the use of life insurance is positively related to income, using both aggregate national account data and individual household data.

The expected correlation of the income distribution of a country with life insurance consumption is ambiguous. Beenstock, Dickinson, Khajuria (1986) reason that wealthy sections of the population do not need insurance protection while poorer sections have a limited demand because they operate under income budget constraints. A more equal income distribution with a larger middle class might therefore result in a higher demand for life insurance. On the other hand, while the middle-class may have the greatest demand for life insurance savings products, there may be a minimum level of income at which these policies become affordable. Accordingly, a large middle class in a poor country may result in less individuals being able to purchase life insurance than a less equal distribution with a larger and/or wealthier upper class. The resulting relation of income distribution with life insurance consumption is thus ambiguous.

**Inflation:** Beck and Webb (2003), Li et.al (2007), Nesterova (2008), Çelik and Kayali (2009), Ibiwoye et.al (2010) have all shown that inflation reduce the demand for life insurance. *Inflation* and its *volatility* have a negative relationship with life insurance consumption. As life insurance savings products typically provide monetary benefits over the long term, monetary uncertainty has a substantial negative impact on these products‘ expected returns. Inflation can also have a disruptive effect on the life insurance industry

when interest rate cycles spur disintermediation. These dynamics make inflation an additional encumbrance to the product pricing decisions of life insurers, thus possibly reducing supply in times of high inflation. The above stated articles have all shown that the use of life insurance is negatively related to inflation.

**Real interest rate:** Beck and Webb (2003), Aderaw (2013) life insurance demand is positively influenced by real interest rate. In addition to the inflation rate and its standard deviation, relationship between life insurance consumption and the *real interest rate*, defined as the difference between the nominal interest rate and inflation. Theory predicts a positive relation; a higher real interest rate increases life insurer‘s investment returns and so profitability, in turn offering improved profitability of financial relative to real investments for potential purchasers of life insurance policies.

**Banking Sector Development:** As identified by Outreville (1996), Beck and Webb (2003) life insurance demand is significantly influenced by the banking sector development. It is expected that banking sector development to be positively correlated with life insurance consumption. Well-functioning banks may increase the confidence consumers have in other financial institutions, e.g. life insurers. They also provide life insurers with an efficient payment system. The efficient development of the entire financial system - as might be reflected in the absence of interest rate ceilings and other distortionary policies – is thought to help life insurers invest more efficiently. However, a vibrant insurance sector might also foster the development of the banking sector, so that a positive relation between the two variables cannot necessarily be interpreted as evidence for causality. Outreville (1996) finds a significantly positive relationship between financial sector development and life insurance penetration. The total claims of deposit money banks on domestic nonfinancial sectors as share of GDP as indicator of banking sector development.

**Price of Insurance:** The relationship between price of insurance and life insurance demand has been studied in the past by (Depamphills, 1975; Outreville, 1996, Ward & Zurbruegg, (2002), Hwang & Greenford, (2005); Sen & Madheswaran,(2007). However, the indicator of price of life insurance is not available in the most of the studies because it is difficult to determine the price of insurance with the various customised nature of policies (Outreville, 1996; Savvides, 2006). The findings of these studies indicates that price of insurance is positively related to life insurance demand (Mantis & Farmer, 1969; Depamphills, 1975; Ward & Zurbruegg, 2002); the price of insurance variable is positive and statistically insignificant in the fixed effects model and is found negatively and statistically insignificant in the pooled cross sectional model (Hwang & Greenford, 2005).This is because the longer life expectancy which is used to proxy the price of insurance has a positive effect on life insurance demand by resulting in a reduction in the price of insurance which leads the people to use life insurance (Outreville, 1996); the researcher suggested that the lower the price of insurance, it is expected to encourage more life insurance demand (Hwang & Greenford, 2005).Other empirical results showed that price of insurance are negatively related to life insurance demand (Outreville, 1990; Brown & Kim, 1993); whereas another study concluded that price situation does not affect life insurance demand at all (Sen & Madheswaran, 2007).

**Savings**: The impact of savings on life insurance demand has been studied in the past (Beck & Webb, 2003; Sen, 2008; Ibiwoye, Ideji, Oke, 2010). Evidence from literature suggests that savings has a negative impact on life insurance demand (Beck & Webb, 2003; Savvides, 2006; Redzuan, Abdul Rahman & S. H. Aidid, 2009). Consumers prefer to consider other alternatives of saving if the effective return within an insurance policy is lower compared to those offered by other saving instruments (Redzuan, Abdul Rahman & S. H. Aidid, 2009); there is a wealth-replacement effect which means that higher private savings displace life insurance and the higher the savings that an individual has, the less would be the motive to

buy life insurance to supplement these financial resources in order to reach a targeted level of wealth for retirement or for bequeaths (Savvides, 2006). Other results show that saving variable has a positive relationship with life insurance demand (Sen & Madheswaran, 2007; Sen, 2008) and suggested that an increase in saving activity will enhance life insurance demand by increasing per capita insurance expenditure. Another result provided an ambiguous priority in the effect of personal savings rate on life insurance sales because an individual may have other investment alternatives besides the demand for life insurance (Chang, 1995).

**Unemployment:** Unemployment rate is defined as an indicator of income uncertainty and is also viewed as an uncertainty variable. A few studies have been carried out to explain the relationship between the demand for life insurance and unemployment rate (Mantis & Farmer, 1968; Savvides, 2006). Results from the studies suggest that unemployment rate has a negative impact on life insurance demand (Mantis &Farmer, 1968; Lenten & Rulli, 2006 and Savvides, 2006).

**Pensions:** Pension is a source of financing retirement and is considered as an alternative to private provisions. The growth of pensions has contributed to the decline in labour force participation at older ages (Samwick, 1998). Having adequate old-age pensions helps to encourage workers to retire earlier (Savvides, 2006).The existence of both private pensions as well as social security appears to have a negative effect on individual savings (King &Mireaux, 1981).The estimated coefficients positive with regard to pensions variable, but in most models, they are not statistically significant (Savvides, 2006).

### 2.3.2 Socio-Demographic determinants

Based on the empirical review the researcher identified four main socio-demographic determinants of life insurance demand. This includes level of education, life expectance, dependency ratio and age.

**Level of Education*:*** Truett and Truett (1990) and Browne and Kim (1993), Li et.al (2007), Kakar and Shukla (2010), Mahdzan & Victorian (2013) find a positive relation between life insurance consumption and the level of education. Mahdzan & Victorian (2013) on their study showed that education level is significantly related to life insurance demand, where individuals with higher levels of education have higher life insurance demand. Because people who are more educated are more aware of the benefits of life insurance, and may possibly have easier access to life insurance through banks and financial intermediaries as opposed to those with low levels of education. Hence, life insurance companies should increase marketing efforts targeted to those less educated and increase penetration of insurance among these individuals.

It is expected that a higher level of *education* in a population will be positively correlated with the demand for any type of life insurance product. A higher level of a person's education may raise his/her ability to understand the benefits of risk management and long-term savings, therefore increasing an individual‘s level of risk aversion. Education may also increase the demand for pure death protection by lengthening the period of dependency, as well as increasing the human capital of, and so the value to be protected in, the primary wage earner. However, a positive relation between education and life insurance might also indicate that better access to long-tem savings and insurance instruments encourages access to higher education.

**Life Expectancies:** Nesterova (2008), Redzuan (2011), Aderaw (2013) identified that life expectance have a significant impact on the demand for life insurance. And previous authors Beenstock, Dickinson, Khajuria (1986) and Outreville (1996) have also found life expectancy to be positively related to *Life Insurance Penetration*. Societies with longer *life expectancies* should have higher savings through life insurance vehicles and more demand for annuities.

This would imply life expectance have a positive correlation with the demand for life insurance products.

**Dependency Ratio:** The dependency ratio is described as the demographic structure of the average household in terms of the number of family members dependent on the main source of income (Lenten & Rulli, 2006). Empirical studies have shown that the dependency ratio is positively related to the demand for life insurance (Brown & Kim, 1993; Curak & Gaspic, 2011); and it has been found that the dependency ratio has a positive impact on foreign life insurance participation (Ye, Li, Chen & Moshirian, 2009).The increasing number of dependents shows that the person needs to buy more life insurance

In line with this, findings of past studies have indicated that young dependency ratio is negatively related to life insurance demand (Beck & Webb, 2003; Sen & Madheswaran, 2007).It is expected that a young dependency ratio will increase the demand for mortality coverage and decrease the demand for savings through life insurance and annuities (Beck & Webb, 2003).Whereas, an old dependency ratio is found to be positively related to the demand for life insurance (Beck & Webb, 2003; Sen, 2008). This can be explained as the older population grows, there will be a higher demand for savings (Nesterova 2008 Beck & Webb, 2003).

**Age:** (Truet & Truet, 1990; Yusof, Gbadamosi & Hamadu, 2009; Liebenberg, Carson & Hoyt, 2010) identified that age is positively related to life insurance demand. This is because an increase in age indicates a higher positive attitude toward insurance and people who are towards the end of an active life are more conscious of life after retirement (Yusof, Gbadamosi & Hamadu, 2009). But, it was disclosed that when people grow up they have a greater awareness on the need of life insurance but the need of life insurance will decline as the people reach beyond a certain age. Evidence supports that age was found to have negative impact on life insurance demand (Goldsmith, 1983; Chen, Wong & Lee, 2001; Savvides,

2006; Liebenberg, James & Randy, 2010). This can perhaps be explained as people are more likely to purchase life insurance for morbidity as well as for retirement purposes which vary with their affordability and not age (Chen, Wong & Lee, 2001); as the average age of people increased the cost of obtaining coverage also increased and this can reduce the desirability of purchasing life insurance (Goldsmith, 1983); and for older people they are less likely to become involved in long-range planning (Savvides, 2006).

### 2.4 Conceptual framework of the study

The conceptual framework of this study is developed based on the two main determinants of insurance demand which are stated in most studies. These are economic and socio-demographic. Different studies suggests that several factors such income, inflation, real interest rate, banking sector development, savings, unemployment, pension, price of insurance education, life expectance, dependency ratio and age are considered important factors that determine life insurance demand. However due to constraints of data, the researcher selected six main determinants to test empirically in Ethiopian context. These are income/ GDP per capital, inflation, real interest rate, level of education, life expectance and dependency ratio. So by taking this work and clusters as a base, and to test in the Ethiopian context, the researcher developed the following conceptual framework.

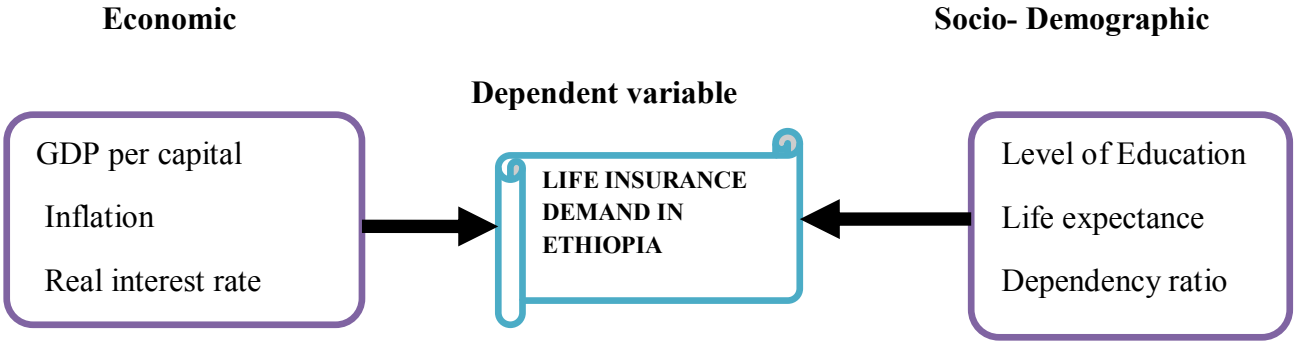



Fig 2.1 Conceptual framework of the Study

# CHAPTER THREE

# METHODOLOGY

## 3.1 Research Approach

The approach for this study is quantitative research approach. In order to achieve the objectives stated in the preceding section, considering the nature of research problem and the research perspective, this study mainly employ quantitative research approach on the determinants of life insurance demand in Ethiopia over the period of 1983-2012. The research design of this study is explanatory research design.

## 3.2 Data Type and Source

This study fully relies on secondary data. Data were collected from annual reports and publications of National Bank of Ethiopia (NBE) and Ethiopian Central Statistics Authority (CSA). Annual time series data from 1983 to 2012 was used to analyze the relationship between life insurance demand and its determinants. As well as classifying data as being time series or cross-sectional type, we could also distinguish it as being either continuous or discrete, exactly as their labels would suggest. For this study the researcher uses continuous data i.e. Data can take on any value and are not confined to take specific numbers.

**Table 3.1: Data source**

| | |
|---|---|
| NBE | Annual life insurance premium, GDP,CPI,RIR |
| CSA | EDU, LEXP, DR, Number of total population |

## 3.3 Variables and Measurement

### 3.3.1 Dependent Variable: Life Insurance Demand

The dependent variable in this study is life insurance demand. The variable used in examining the determinants of the demand for life insurance is life insurance density or Premium per capita. It is measured by dividing total premium in life insurance to total population i.e. how much money per capita is annually spent on life insurance.

### 3.3.2 Independent Variables

The independent variables were divided into two main components which are economic, socio-demographic variables.

- **Economic variables**

The economic variables included on the study are income, inflation, and real interest rate.

**Income**: income has been found to be an important factor in explaining demand for life insurance as stated on the work of Dickinson, Khajuria (1986), Truett and Truett (1990), Browne and Kim (1993), and Outreville (1996), Celik and Kayali (2009), Aderaw (2013).etc. confirmed the significant positive relationship of income and demand for life insurance. Income per capita is used as a proxy for permanent income and it is measured as the GDP at market price divided by the number of population that represents disposable personal income. In line with this, this study uses the ratio of GDP to the population to represent income per capita.

**Inflation**: High inflation tends to cause the purchasing of life insurance to be less attractive because of the rising cost of living. In the literature, it is observed that inflation affects demand for life insurance in negative way (Beck and Webb (2003), Li et.al (2007), Nesterova (2008), Çelik and Kayali (2009), Ibiwoye et.al (2010)). Inflation is measured by change in CPI.

**Real interest rate**: The relationship between demand for life insurance and interest rate has been studied by many researchers. Life insurance demand is positively influenced by real interest rate Beck and Webb (2003), Aderaw (2013). It is expressed by deposit interest rate minus inflation.

- **Socio-Demographic variables**

The socio-demographic variables included on the study are level of Education, life expectance and dependence ratio

**Level of Education**: if education level is high, people are aware of types of life insurance and they try to protect themselves and their dependents by using life insurance. Previous studies found that a statistically significant and positive relationship between level of education and demand for life insurance (Truett and Truett (1990) and Browne and Kim (1993), Li et.al (2007), Kakar and Shukla (2010), Mahdzan & Victorian (2013). This study measures the level of education by the number of students who are learning in higher learning institutions both public and private.

**Life expectance:** Nesterova (2008), Redzuan (2011), Aderaw (2013) identified that life expectance have a significant and positive impact on the demand for life insurance. Life expectance is measured by the number of years the average individual in a country is expected to live.

**Dependence ratio:** studies have shown that dependency ratio is positively related to the demand for life insurance (Brown & Kim, 1993; Curak & Gaspic, 2011). Dependence ratio is measured by the Number of family members dependent on the main source of income.

Table 3.2: Independent Variables, Their measurement and Expected sign

| No | Variables | Measurement | Notation | Expected sign |
|---|---|---|---|---|
| **1** | Income | GDP per capital | GDP | + |
| **2** | Inflation | CPI | CPI | - |
| **3** | Real interest rate | Deposit interest rate minus inflation | RIR | + |
| **4** | Level of Education | Quantified by the number of students in higher Learning institutions | EDU | + |
| **5** | Life expectance | The number of years the average individual in a country is expected to live | LEXP | + |
| **6** | Dependence ratio | The percentage of family members dependent on the main source of income | DR | + |

### 3.4 Model specification

To find the determinant factors for life insurance demand, the researcher adapted the following log linear model from Browne and Kim (1993), Li et al (2007) and celik (2009). The following regression model used in estimating the parameters for the variables in this study. Inflation and real interest rate are not specified in log form following Li et al. (2007) and it is not possible to make them log since there are negative values.

$$logLIP = \alpha + \beta 1\ logGDP\ + \beta 2\ CPI + \beta 3\ RIR\ + \beta 4\ logEDU\ + \beta 5\ logLEXP + \beta 6\ logDR\ + \mathcal{E}$$

**Where**

LIP - Life insurance premium per capital

GDP – GDP per capital

CPI – inflation

RIR – Real interest rate

EDU – level Education

LEXP – life Expectancy

DR- Dependence Ratio

**Ɛ -** error term

### 3.5 Method of Data Analysis

Descriptive as well as Econometric methods are employed to discuss and analyze different issues in this study. Descriptive analysis is employed by using different types of tables and figures. An econometric analysis were used to analyze the determinants of life insurance demand based on a time series data from 1983-2012, in doing so Eviews6 software was used. To test whether a series is stationary or not Unit root tests is used. Using Eviews6 the basic OLS assumption were tested, summary of descriptive statistics for basic variables also presented, correlation analysis among basic variables also disclosed and detailed discussion of the regression were performed.

# CHAPTER FOUR

## DATA ANALYSIS and INTERPRETATION

In general, in this fourth chapter of the research, the data set defined in chapter three are tested for presence of econometric problems, presented and analyzed. Besides, in each sub-section brief interpretations are enclosed to explain the results obtained. The chapter, therefore, deals with; firstly the tests for unit root, fulfilment of basic OLS assumptions, secondly, the discussion of the summary of descriptive statistics results of all variables, thirdly the illustration and discussion of the correlation analysis among basic variables, and finally detail discussions on the regression results of various determinants of life insurance demand would be presented.

### 4.1 Unit Root Test Results

Unit root tests are used to test whether a series is stationary or not. If a series is not stationary, it is said to have a unit root. For a series to be stationary, its mean and variance have to be constant over time. According to Gujarati (2004), a study on the stationarity of variables is relevant for the reason that it incorporates important behaviour for these variables. A time series is required to be stationarity to make easier the study of the behaviour of variables in the long run. If a time series is nonstationary, the behaviour of the series can be studied only for the time period under consideration. Each set of time series data will therefore be for a particular episode. As a consequence, it is not possible to generalize it to other time periods. Therefore, for the purpose of forecasting, nonstationary time series are of little practical value. These call for the need to test for stationarity of the series prior to detail analysis of the variables.

In order to examine the presence of unit roots in the sample data this study employed Eview6 (Augmented Dickey- Fuller, 1979) test on both at level and at first difference of all variables. For this test, intercept and trend variables are included in the regression model to capture

other excluded factors that play a major role in determining life insurance demand. The null hypothesis is that variable is not stationary (has a unit root). On this test even if we add intercept and trend parameters at the right hand side of the equation the null hypothesis remains the same. The null hypothesis of a unit root will be rejected if the calculated t-statistics associated with the estimated coefficient is lower than the tabulated critical value of the test at pre-determined significance level.

Decision rule:

If t* > ADF critical value, ==> not reject null hypothesis, i.e., unit root exists.

If t* < ADF critical value, ==> reject null hypothesis, i.e., unit root does not exist

The table below indicates, the computed ADF test-statistic value is smaller than the critical values at 10%, 5%, 1% significant level, respectively), therefore we can reject $H_o$ that variables have unit root. It means the GDP, CPI, RIR, EDU, LEXP and DR series do not have unit root problem and the series are stationary at 1%, 10% and 5% significant level

**Table 4.1 Augmented Dickey-Fuller unit root test statistic of independent variables**

| Variables | With Intercept | | With Trend and Intercept | |
|---|---|---|---|---|
| | **At Level** | **At 1st difference** | **At Level** | **At 1st difference** |
| **GDP** | -4.071339*** | -8.509317*** | -5.032121*** | -8.369269*** |
| **CPI** | -4.888655*** | -5.236499*** | -5.201168*** | -5.155400*** |
| **RIR** | -4.291908*** | -5.153711*** | -4.753250*** | -5.099652*** |
| **EDU** | -1.991169 | -4.280125*** | -2.301050 | -4.171048** |
| **LEXP** | -4.407920*** | -0.482563 | -3.269034* | 2.380533 |
| **DR** | -7.503785*** | -2.026160 | -3.691202* | -4.280015** |

*, ** and *** indicates the rejection of the null hypothesis (unit root) at 10%, 5% and 1% respectively.

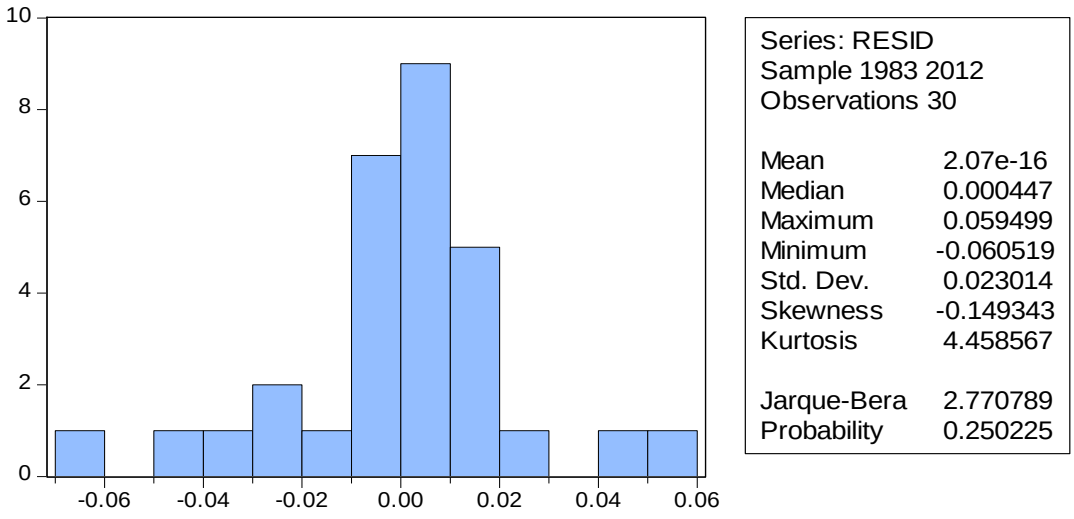
Source: Generated from Eviews6

### 4.2 Tests for the CLRM Assumptions

Different tests were run to make the data ready for analysis and to get reliable output from the research. The tests are intended to check whether classical linear regression model (CLRM) assumptions, i.e. the OLS assumptions, are fulfilled or not when the independent variables are regressed against the dependent variables. The implication of the test, decision rules therein, test results and their discussion are discussed in the upcoming sub sections.

#### 4.2.1 Test of Normality

Normality test of data is applied to determine whether a data is well-modeled by a normal distribution or not, and to compute how likely an underlying random variable is to be normally distributed. A normal distribution is not skewed and is defined to have a coefficient of kurtosis 3. The Bera-Jarque probability statistics is also not expected to be significant (Brook, 2008). The normality test for this study shown in figure 4.1 shows the Bera-Jarque statistic *p*-value was found to be 0.250225 which is greater than 0.05 not reject the null hypothesis that indicates the residual values is normally distributed.




Source: Generated from Eviews6

**Figure 4.1**: **Histogram normally test.**

### 4.2.2 Test of Multicollinearity

One obstacle that presents difficulty in performing analysis is the existence of multicollinearity. Multicollinearity refers to the situation in which the independent variables are highly correlated. When independent variables are multi collinear, there is overlap or sharing of predictive power. This may lead to the paradoxical effect, whereby the regression model fits the data well, but none of the explanatory variables (individually) has a significant impact in predicting the dependent variable Gujarati (2004). This is because when predictor variables are highly correlated with one another, they share essentially the same information. Thus, together, they may explain a great deal of the dependent variable, but may not individually contribute significantly to the model. Thus, the impact of multicollinearity is to reduce any individual explanatory variable‘s predictive power by the extent to which it is associated with the other explanatory variables. That is, none of the predictor variables may contribute uniquely and significantly to the prediction model after the other independent variables is included. One of the standard statistical method for testing data for multicollinearity is analyzing the control variables` correlation coefficients.

**Table 4.2**: Correlation matrix

| | **GDP** | **CPI** | **RIR** | **EDU** | **LEXP** | **DR** |
|---|---|---|---|---|---|---|
| **GDP** | 1.000000 | | | | | |
| **CPI** | -0.114270 | 1.000000 | | | | |
| **RIR** | -0.385641 | -0.248707 | 1.000000 | | | |
| **EDU** | 0.144248 | 0.081842 | -0.428890 | 1.000000 | | |
| **LEXP** | -0.107051 | -0.264276 | -0.055854 | 0.077729 | 1.000000 | |
| **DR** | -0.692736 | -0.001806 | 0.535481 | -0.606199 | 0.072217 | 1.000000 |

Source: Generated from Eviews6

Table 4.2 presents the correlation matrix for all explanatory variables used in the analysis. Low inter correlations among the explanatory variables used in the regressions indicate no reason to suspect serious multicollinearity. According to Anderson W. (2010) multicollinearity is a potential problem if the absolute value of the sample correlation coefficient exceeds .7 for any two of the independent variables. There for the explanatory variables included in the study were not substantially correlated with each other.

### 4.2.3 Test of Heteroskedasticity

Another assumption of ordinary least square regression is that the variance of the residuals is homogeneous across levels of the predicted values, also known as homoscedasticity. If the variance of the residuals is not constant then the residual variance is said to be heteroscedastic.

Heteroskedasticity is a systematic pattern in the errors where the variances of the errors are not constant (Gujarati, 2003). Heteroskedasticity makes ordinary least square estimators not efficient because the estimated variances and covariance of the coefficients (βi) are biased and inconsistent. Thus, the tests of hypotheses are no longer valid. Heteroskedasticity can also arise as a result of the presence of outliers (Gujarati, 2004)**.** Outliers are extreme values as compared to the rest of the data and are defined by the size of the residual in an OLS regression where all of the observations are used.

Table 4.3: Heteroskedasticity Tests: White

| | | | |
|---|---|---|---|
| F-statistic | 1.587531 | Prob. F(26,3) | 0.3977 |
| Obs*R-squared | 27.96729 | Prob. Chi-Square(26) | 0.3601 |
| Scaled explained SS | 37.17580 | Prob. Chi-Square(26) | 0.0721 |

Source: Generated from Eviews6

White‘s test was applied to test the presence of hetroskedasticity. White‘s test tests the null hypothesis that the variance of the residuals is homogenous. If the p-value is very small, we would have to reject the null hypothesis. In this case, both the *F*- and $\chi 2$ of the test statistic give the same conclusion that there is no evidence for the presence of heteroscedasticity, since the *p*-values are considerably in excess of 0.05. The third version of the test statistic, ‗Scaled explained SS‘, which as the name suggests is based on a normalized version of the explained sum of squares from the auxiliary regression, similarly suggests in this case that there is evidence of no heteroscedasticity problem.

### 4.2.4 Autocorrelation

The autocorrelation assumption is made of the CLRM‘s disturbance terms is that the covariance between the error terms over time is zero; it assumed that the errors are uncorrelated with one another. Usually, Durbin-Watson (DW) test is used for first order autocorrelation. It tests a relationship between an error term and its immediately previous value. As we observe from table 4.4 the value of DW statistics is 1.806750.

Table 4.4: Durbin-Watson stat

| R-squared | Adjusted R-squared | Durbin-Watson stat |
|---|---|---|
| 0.970566 | 0.965660 | 1.806750 |

Source: Generated from Eviews6

As stated on (Brook, 2008). *DW* has 2 critical values: an upper critical value (*dU*) and a lower critical value (*dL* ), and there is also an intermediate region where the null hypothesis of no autocorrelation can neither be rejected nor not rejected. The null hypothesis is rejected and the existence of positive autocorrelation presumed if *DW* is less than the lower critical value; the null hypothesis is rejected and the existence of negative autocorrelation presumed if *DW*

is greater than 4 minus the lower critical value; the null hypothesis is not rejected and no significant residual autocorrelation is presumed if *DW* is between the upper and 4 minus the upper limits. The relevant critical values for the test are $dL = 0.88$, $dU = 1.61$, so $4 - dU = 3.12$ and $4 - dL = 2.39$. The test statistic (1.806750) clearly lies between the upper and 4 minus the upper limits and hence the null hypothesis of no autocorrelation is not rejected and it would be concluded that the residuals from the model appear to be not autocorrelated. Therefore, the analysis satisfies the assumption of independent of errors.

### 4.3 Descriptive Statistics

The following summary of descriptive statistics of all dependent and independent variables gives the general distribution of the data set to examine the determinants of life insurance demand in Ethiopia from 1983 to 2012. The table reports the mean, maximum, minimum, standard deviation, and the number of observations for life insurance per capita and six explanatory variables (abbreviated) for 30 observations.

The mean is the sum of the observations divided by the total number of observations. The standard deviation is the squared root of the variance. Indicates how close the data is to the mean. *Max* is the largest value in the variable. *Min* is the lowest value in the variable.

Table 4.5: Summary of descriptive statistics

| Descriptive statistics | | | | | | | |
|---|---|---|---|---|---|---|---|
| | LIP | GDP | CPI | RIR | EDU | LEXP | DR |
| Mean | 0.0576 | 207.55 | 9.2789 | -3.4693 | 99479.23 | 51.862 | 96.639 |
| Maximum | 0.1796 | 453.56 | 55.241 | 19.078 | 889,803. | 63.000 | 98.796 |
| Minimum | 0.0126 | 110.27 | -11.823 | -51.241 | 1568.000 | 43.868 | 87.537 |
| Std. Dev. | 0.0474 | 82.859 | 15.173 | 16.159 | 195,396 | 5.9037 | 2.8586 |
| Observations | 30 | 30 | 30 | 30 | 30 | 30 | 30 |

Source: Generated from Eviews6

The dependent variable in this study is life insurance demand. The variable used in examining the determinants of the demand for life insurance is life insurance density or Premium per capita. The table above shows that the average life insurance density is $0.057648. i.e. from the total population each individual on average spends $0.057648, a maximum of $0.179626 and a minimum of $0.012658 annually on life insurance. The standard deviation of life insurance per capita was 0.047415 percent, suggesting that LIP was not highly dispersed or not far from the mean value.

GDP per capita is used as a proxy for income and it is measured as the GDP at market price divided by the number of population that represents disposable personal income. The table above shows that the average GDP per capita for 30 years is $207.5578, the maximum amount of GDP per capita is $453.5690 and a minimum amount of GDP per capita is $110.2764. The standard deviation of GDP per capita was 82.85913 percent, suggesting that GDP per capita was highly dispersed or far from the mean.

Inflation is measured by CPI. The table above shows that the average CPI rate for 30 years is 9.278984, the maximum amount of CPI is 55.24131 and a minimum amount of CPI is negative 11.82323. The standard deviation of CPI was 15.17370 percent, suggesting that CPI was not highly dispersed or far from the mean.

Real interest rate is calculated by subtracting inflation from deposit interest rate. The table above shows that the average RIR rate for 30 years is -3.469310, the maximum amount of RIR is 19.07874 and a minimum amount of RIR is 51.24131. The standard deviation of RIR was 16.15959 percent, suggesting that RIR was not highly dispersed or not far from the mean.

This study measured the level of education by the number of students who are learning in higher learning institutions both public and private. The table above shows that the average number of students who are learning in higher learning institutions for 30 years was 99479.23. The maximum number of students who are learning in higher learning institutions were 889,803 and a minimum number of students who are learning in higher learning institutions were 1568. The standard deviation of EDU was 195,396 suggesting that EDU was highly dispersed or far from the mean.

Life expectance is measured by the number of years that the average individual in a country is expected to live. The table above shows that, the average LEXP was 51.86231 years, the maximum LEXP was 63 years and a minimum LEXP was 43.86849 years. The standard deviation of LEXP was 5.9, suggesting that LEXP was not highly dispersed or not far from the mean.

Dependence ratio is measured by the Number of family members dependent on the main source of income. The table above shows that, the average DR was 96.63940, the maximum DR was 98.79641 and a minimum DR was 87.53764. The standard deviation of DR was 2.858605, suggesting that DR was not highly dispersed.

### 4.4 Correlation analysis

Table 4.6, shows the correlation between explanatory variable and life insurance demand. As noted in Brooks (2008), Correlation between two variables measures the degree of linear association between them. To find the association of the independent variables with life insurance demand, Correlation coefficient was used. Values of the correlation coefficient are always ranged between positive one and negative one. A correlation coefficient of positive one indicates that a perfect positive association between the two variables; while a correlation coefficient of negative one indicates that a perfect negative association between the two variables. A correlation coefficient of zero, on the other hand, indicates that there is no linear relationship between the two variables.

As it could be seen from table 4.6 GDP per capita, real interest rate, level of education and life expectance were positively correlated variables with life insurance demand.. On the other hand, inflation and dependency ratio seems to be negatively correlated with life insurance demand.

Furthermore, table 4.6 shows the degree of correlation among dependent and independent variables GDP, RIR, level of education and life expectance have positive and significant correlation with life insurance demand with the coefficient of 0.64, 0.53, 0.82, and 0.85 respectively. On the other hand, inflation and dependency ratio have negative and significant correlations with life insurance demand with the coefficient of -0.46 and 0.86 respectively

Table 4.6 Correlation matrix of dependent and independent variables

| | LIP | GDP | CPI | RIR | EDU | LEXP | DR |
|---|---|---|---|---|---|---|---|
| LIP | 1.000000 | | | | | | |
| GDP | 0.643276 | 1.000000 | | | | | |
| CPI | -0.467599 | -0.114270 | 1.000000 | | | | |
| RIR | 0.536602 | -0.385641 | -0.248707 | 1.000000 | | | |
| EDU | 0.825036 | 0.144248 | 0.081842 | -0.428890 | 1.000000 | | |
| LEXP | 0.858013 | -0.107051 | -0.264276 | -0.055854 | 0.077729 | 1.000000 | |
| DR | -0.367925 | -0.692736 | -0.001806 | 0.535481 | -0.606199 | 0.072217 | 1.000000 |

Source: Generated from Eviews6

### 4.5 Regression analysis

Table 4.7 displays the results of Ordinary Least Square (OLS) estimation for the initial test equation. From the Table OLS estimation indicates that GDP per capita, inflation, real interest rate, level of education and life expectance appear to be important variables associated with the demand for life insurance. While DR is not statistically significant variable in determining life insurance demand.

Table 4.7 Regression Output

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.534747 | 0.154327 | -3.465034 | 0.0014 |
| GDP | 0.116354 | 0.016701 | 6.966818 | 0.0000 |
| CPI | -9.82E-05 | 4.89E-05 | -2.007997 | 0.0522 |
| RIR | 0.000919 | 0.000484 | 1.899534 | 0.0655 |
| EDU | 0.021284 | 0.007915 | 2.688941 | 0.0108 |
| LEXP | 1.315394 | 0.425585 | 3.090792 | 0.0038 |
| DR | -0.000917 | 0.001180 | -0.777489 | 0.4419 |
| R-squared | 0.970566 | | | |
| Adjusted R-squared | 0.965660 | | | |
| S.E. of regression | 0.006703 | | | |
| F-statistic | 197.8444 | Durbin-Watson stat | | 1.806750 |
| Prob(F-statistic) | 0.000000 | | | |

Source: Generated from Eviews6

The adjusted R squared for the model is 0.9656 which indicates that about 96.56 percent of demand for life insurance is explained by the selected six factors ( GDP per capita, inflation, real interest rate, level of education, life expectance and dependence ratio)**.** In other words, about 96.56 percent of the change in the life insurance demand is explained by the independent variables that are included in the model and the remaining 3.44 % change in life insurance demand is because of other factors that are not included in the model. From Table 4.7 the researcher found the following estimated regression equation.

$$\text{LPI} = -0.534747 + 0.116354 * \text{GDP} - 0.0000982 * \text{CPI} + 0.000919 * \text{RIR} + 0.021284 * \text{EDU} + 1.315394 * \text{LEXP}$$

The t-statistics and sig. (p-value) show that the explanatory variables such as GDP per capita, inflation, real interest rate, level of education and life expectance are statistically significant at 10 percent significance level. The coefficient for GDP per capita variable is statistically significant at 0.01significant level. The coefficients of EDU and LEXP variables are statistically significant at 0.05 significant level. The coefficients of CPI and RIR variables are statistically significant at 0.1 level. Therefore statistically significant variables (GDP, CPI, RIR, EDU and LEXP) can determine life insurance demand of Ethiopia. Whereas dependence ratio do not have a statistically significant relationship with life insurance since its p-value is greater than 10 percent.

### 4.5.1 Hypothesis testing and discussion of results

**A. Life Insurance and Level of Income**

Research hypothesis 1 predicts a positive relationship between life insurance demand and level of income. Similar to the hypothesis, the regression output showed positive and strongly statistically significant positive relationship between life insurance demand and level of income. So we can not reject $H_1$ that there is positive and statistically significant relationship between income level and demand for life insurance. This positive relationship implies that as income of the society arises, life insurance become more affordable. The coefficient at 1 percent significant level for GDP per capita indicated that 0.116354. This implies that a 1% increase in GDP per capita would result on 11.63 percent increase on LIP. This result agree with various previous research findings like Dickinson, Khajuria (1986), Truett and Truett (1990), Browne and Kim (1993), and Outreville (1996), Beck and Webb, (2003) Celik and Kayali (2009), Aderaw (2013).etc. They confirmed the significant positive relationship of income and demand for life insurance. In this situation, as income arises, insurance become

more affordable. The fourth column describes t-stat of each independent variable. This study found out that GDP per capita (t-stat =6.966818) is the highest value in this test. It means that GDP per capita is the most important factor that influences demand for life insurance.

**B. Life Insurance and Inflation**

Research hypothesis 2 predicts a negative relationship between inflation and Life insurance demand. Similar to the hypothesis, the regression showed significant negative relationship between inflation and Life insurance demand. So we can not reject $H_2$ that there is negative and statistically significant relationship between inflation and demand for life insurance. It means that when inflation becomes more and more, it tends to discourage people from owning life insurance policies or they do not afford to pay the cost of life insurance and the cost of life insurance protection would increase with anticipated inflation resulting in a decline in life insurance sales. The coefficient is significant at 10 percent level for inflation (-0.0000982). This agree with various previous research findings like Beck and Webb (2003), Li et.al (2007), Nesterova (2008), Çelik and Kayali (2009), Ibiwoye et.al (2010) suggest that a 1% increase in inflation would result on 0.00982 percent decline on LIP. This study found out that inflation (t-stat =-2.007997) is the lowest value in this test. It means that inflation is the least important factor that influence demand for life insurance.

**C. Life Insurance and Real Interest Rate**

Research hypothesis 3 predicts a positive relationship between life insurance demand and RIR. Similar to the hypothesis, the regression showed positive and statistically significant relationship between life insurance demand and RIR. So we can not reject $H_3$that there is positive and statistically significant relationship between real interest rate and demand for life insurance. The positive relationship between real interest rate and life insurance demand

implies that a higher real interest rate increases life insurer‘s investment returns and profitability, it ultimately leads to high life insurance demand. The coefficient at 10 percent significant level for RIR indicated that 0.000919. This implies that a 1% increase in RIR would result on 0.0919 percent increase on LIP. This result agrees with various previous research findings like Beck and Webb (2003). They confirmed the significant positive relationship of RIR and demand for life insurance. In this situation, as RIR arises, insurance become more affordable. This study found out that RIR (t-stat =0.000484) is the lower value in this test. It means that RIR is not the important factor that influence demand for life insurance. High real interest rate increases life insurer‘s investment returns and so profitability, in turn offering improved profitability of financial relative to real investments for potential purchasers of life insurance policies.

**D. Life Insurance and Level of Education**

Research hypothesis 4 shows a positive relationship between life insurance demand and level of Education. Similar to the hypothesis, the regression showed positive and strongly statistically significant positive relationship between life insurance demand and level of Education. So we can not reject $H_4$ that there is positive and statistically significant relationship between level of education and demand for life insurance. Increase in the educational level has led to greater awareness and understanding of the role of life insurance, and is therefore another factor that has driven the increasing demand for life insurance. Because people who are more educated are more aware of the benefits of life insurance, and may possibly have easier access to life insurance through banks and financial intermediaries as opposed to those with low levels of education. Hence, life insurance companies should increase marketing efforts targeted to those less educated and increase access of insurance among these individuals. The coefficient at 5 percent significant level for EDU indicated that 0.021284. This implies that an increase in one student in higher learning institution would

result on 2.1284 percent increase on LIP. The result agrees with various previous research findings like Truett and Truett (1990) and Browne and Kim (1993), Li et.al (2007), Kakar and Shukla (2010), Mahdzan & Victorian (2013). They confirmed the significant positive relationship of EDU and demand for life insurance. In this situation, as EDU arises, insurance become more affordable. This study found out that EDU (t-stat = 0.007915) is the high value in this test. It means that EDU is the important factor that influence demand for life insurance.

**E. Life Insurance and Life Expectance**

Research hypothesis 5 shows a positive relationship between life insurance demand and life expectance. Similar to the hypothesis, the regression output showed positive and strongly statistically significant positive relationship between life insurance demand and life expectance. So we can not reject $H_5$ that there is positive and statistically significant relationship between life expectance and demand for life insurance. This positive relationship implies that Societies with longer life expectancies should have higher savings through life insurance vehicles and more demand for income consequently it leads to higher life insurance demand. The coefficient at 1 percent significant level for life expectance indicated that 1.315394. This implies that a 1 year increase in life expectance would result on 131.5394 percent increase on Life insurance per capita. This result agree with various previous research findings like Nesterova (2008), Redzuan (2011), Aderaw (2013).They confirmed the significant positive relationship of life expectance and demand for life insurance. In this situation, as LEXP arises, insurance become more affordable. The study found out that life expectance (t-stat =3.090792) is the second highest value in this test. It means that life expectance is the most important factor that influence demand for life insurance.

**F. Life Insurance and Dependence ratio**

The regression output shows no statistically significant relationship between DR and life insurance demand, and no evidence has been found that the life insurance industry suffered an adverse impact over the periods of high DR in Ethiopia. So we can reject $H_6$ that there is positive and statistically significant relationship between Dependency ratio and demand for life insurance. This implies that an increase or decrease in DR have no impact on Life insurance per capita.

## CHAPTER FIVE

# Conclusions and Recommendations

The basic aim of this chapter is to present the overall overview of the research by summing the main findings of the analysis part and give recommendations for future researchers. Accordingly, the chapter briefly sum up the overviews of the study and its main findings. In section two based on the study finding the researcher highlight some recommendations to concerning stakeholders. Finally, recommendations for future researchers are presented in section three.

### 5.1 Conclusions

The study aims to examine the relationship between life insurance demand and its main determinants and their statistical significance.

Based on the analysis made in previous chapter on factors that determine life insurance demand the following conclusions are drawn.

- There is significant positive relationship between income and demand for life insurance. In this situation, as income rises, insurance become more affordable. This study found out that GDP per capita is the most important factor that influence demand for life insurance. Similar to the hypothesis, the regression showed positive and strongly statistically significant relationship between life insurance demand and level of income. The coefficient at 1 percent significant level for GDP per capita indicated that 0.116354. This implies that a 1% increase in GDP per capita would result on 11.63 percent increase on life insurance per capita.
- It is found out that inflation is the least important factor that influence demand for life insurance. Similar to the hypothesis, the regression showed significant negative relationship between inflation and Life insurance demand. It means that when

inflation becomes more and more, it tends to discourage people from owning life insurance policies or they do not afford to pay the cost of life insurance or the cost of life insurance protection would increase with anticipated inflation resulting in a decline in life insurance sales. The negative impact of inflation also confirms that anticipated inflation depresses the value of financial assets and therefore reduces the attractiveness of life insurance products. The coefficient is significant at 10 percent level for inflation (-0.0000982). It suggests that a 1% increase in inflation would result on 0.00982 percent decrease on Life insurance per capita.

- There is a significant positive relationship between Real interest rate and demand for life insurance. Similar to the hypothesis, the regression showed positive and statistically significant relationship between life insurance demand and RIR. The positive relationship between real interest rate and life insurance demand implies that higher real interest rate increases life insurer‘s investment returns and profitability, it ultimately leads to high life insurance demand. The coefficient at 10 percent significant level for RIR indicated that 0.000919. This implies that a 1% increase in RIR would result on 0.0919 percent increase on Life insurance per capita.
- Level of education is an important factor that influence demand for life insurance. Increase in educational level has led to greater awareness and understanding of the role of life insurance. Similar to the hypothesis, the regression showed positive and strongly statistically significant positive relationship between life insurance demand and level of Education. Increase in educational level has led to greater awareness and understanding of the role of life insurance, and is therefore another factor that has driven the increasing demand for life insurance. Because people who are more educated are more aware of the benefits of life insurance, and may possibly have easier access to life insurance through banks and financial intermediaries as opposed

to those with low levels of education. Hence, life insurance companies should increase marketing efforts targeted to those less educated and increase access of insurance among these individuals. The coefficient at 5 percent significant level for EDU indicated that 0.021284. This implies that an increase in one student in higher learning institution would result on 2.1284 percent increase on Life insurance per capita.

- Life expectance is the second most important factor that influence demand for life insurance. Similar to the hypothesis, the regression showed positive and strongly statistically significant positive relationship between life insurance demand and life expectance. This positive relationship implies Societies with longer life expectancies should have higher savings through life insurance vehicles and more demand for income consequently it leads to higher life insurance demand. The coefficient at 1 percent significant level for life expectance indicated that 1.315394. This implies that a 1 year increase in life expectance would result on 131.5394 percent increase on Life insurance per capita.
- The study found no significant relationship between DR and life insurance demand, and no evidence has been found that the life insurance industry suffered an adverse impact over the periods of high DR in Ethiopia. This implies that an increase or decrease in DR have no impact on Life insurance per capita.

## 5.2 Recommendations

The researcher recommended some alternative ways pertaining to promote and increase demand for life insurance in Ethiopia.

Hence, the possible and constructive recommendations are forwarded as follows.

- As it has been observed from the regression output, the major determinant factor that explains life insurance demand is GDP per capita. Therefore the government should have to give much emphasis for increasing GDP per capita through more investment; more exports and decreasing unemployment rate of the country so that the per capita GDP will be increased.
- The government should have to decrease the level of inflation through direct intervention in the price mechanism of the country. Since as inflation becomes more and more, it tends to discourage people from owning life insurance policies or they do not afford to pay the cost of life insurance or the cost of life insurance protection would increase with anticipated inflation resulting in a decline in life insurance sales.
- The positive relation between level of education and life insurance demand implies that life insurance companies should have to do more in creating awareness to the general public. Thus, the National bank of Ethiopia and the managements of insurance companies should further enhance public‘s awareness and financial literacy by using different approaches. For example they should use media, internet and billboard as a medium of promoting the life insurance and made a program such true story regarding the life insurance. This program will give big picture to society about how important the life insurance is to their family as extra saving in the future such health, education and job losses.
- Regulatory bodies understanding should be improved on life insurance area, especially National Bank of Ethiopia; since the sector have a great importance for the

economy the National Bank of Ethiopia should have to give much attention for the development of the sector.

- It is true that, societies with longer life expectancies should have higher savings through life insurance vehicles and more demand for annuities. Therefore, it is better if the government will develop a nationwide structural plan that gives much emphasis for health promotion and disease prevention activities through hospitals and health centers expansion that facilitate especially preventive mechanisms by giving training and professional advice to the community at large.

### 5.3 Recommendation for Future Research

Given the key role that the life insurance sector plays in the economy of the country, future research should focus on other factors which are not touched in this study that will provide better insights for concerning management and regulatory bodies. Different studies suggests that several factors such as income, inflation, real interest rate, banking sector development, savings, unemployment, pension, price of insurance, education, life expectance, dependency ratio and age are considered important factors that determine life insurance demand. However the researcher selected six determinants to test empirically in Ethiopian context. These are income/ GDP per capital, inflation, real interest rate, level of education, life expectance and dependency ratio. Therefore, the researcher would like to recommend future researchers to include variables like banking sector development, savings, unemployment, pension, price of insurance. Furthermore it is better if mixed approach is used by future researchers in order to investigate the main factors that affect life insurance demand in a better way.

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# Appendixes

# Appendix A: Unit root testss

**Unit root test at level and intercept**

Null Hypothesis: GDP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.071339 | 0.0038 |
| Test critical values: | 1% level | -3.679322 | |
| | 5% level | -2.967767 | |
| | 10% level | -2.622989 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: CIP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.888655 | 0.0005 |
| Test critical values: | 1% level | -3.679322 | |
| | 5% level | -2.967767 | |
| | 10% level | -2.622989 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: RIR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.291908 | 0.0022 |
| Test critical values: | 1% level | -3.679322 | |
| | 5% level | -2.967767 | |
| | 10% level | -2.622989 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: EDU has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.991169 | 0.2888 |
| Test critical values: | 1% level | -3.679322 | |
| | 5% level | -2.967767 | |
| | 10% level | -2.622989 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LEXP has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.407920 | 0.0017 |
| Test critical values: | 1% level | -3.689194 | |
| | 5% level | -2.971853 | |
| | 10% level | -2.625121 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: DR has a unit root
Exogenous: Constant
Lag Length: 7 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -7.503785 | 0.0000 |
| Test critical values: | 1% level | -3.769597 | |
| | 5% level | -3.004861 | |
| | 10% level | -2.642242 | |

*MacKinnon (1996) one-sided p-values.

## Unit root test at 1st difference and Intercept

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -8.509317 | 0.0000 |
| Test critical values: | 1% level | -3.699871 | |
| | 5% level | -2.976263 | |
| | 10% level | -2.627420 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(CIP) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.236499 | 0.0002 |
| Test critical values: | 1% level | -3.711457 | |
| | 5% level | -2.981038 | |
| | 10% level | -2.629906 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(RIR) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.153711 | 0.0003 |
| Test critical values: | 1% level | -3.711457 | |
| | 5% level | -2.981038 | |
| | 10% level | -2.629906 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(EDU) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.280125 | 0.0024 |
| Test critical values: | 1% level | -3.689194 | |
| | 5% level | -2.971853 | |
| | 10% level | -2.625121 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LEXP) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -0.482563 | 0.8800 |
| Test critical values: | 1% level | -3.699871 | |
| | 5% level | -2.976263 | |
| | 10% level | -2.627420 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(DR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.026160 | 0.2746 |
| Test critical values: | 1% level | -3.689194 | |
| | 5% level | -2.971853 | |
| | 10% level | -2.625121 | |

*MacKinnon (1996) one-sided p-values.

**Unit root test at level and trend and intercept**

Null Hypothesis: GDP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.032121 | 0.0018 |
| Test critical values: | 1% level | -4.309824 | |
| | 5% level | -3.574244 | |
| | 10% level | -3.221728 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: CIP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.201168 | 0.0012 |
| Test critical values: | 1% level | -4.309824 | |
| | 5% level | -3.574244 | |
| | 10% level | -3.221728 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: RIR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.753250 | 0.0035 |
| Test critical values: | 1% level | -4.309824 | |
| | 5% level | -3.574244 | |
| | 10% level | -3.221728 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: EDU has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.301050 | 0.4203 |
| Test critical values: | 1% level | -4.309824 | |
| | 5% level | -3.574244 | |
| | 10% level | -3.221728 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LEXP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.269034 | 0.0921 |
| Test critical values: | 1% level | -4.323979 | |
| | 5% level | -3.580623 | |
| | 10% level | -3.225334 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: DR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 7 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.691202 | 0.0447 |
| Test critical values: | 1% level | -4.440739 | |
| | 5% level | -3.632896 | |
| | 10% level | -3.254671 | |

*MacKinnon (1996) one-sided p-values.

**Unit root test at 1st difference and trend and intercept**

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -8.369269 | 0.0000 |
| Test critical values: | 1% level | -4.339330 | |
| | 5% level | -3.587527 | |
| | 10% level | -3.229230 | |

Null Hypothesis: D(CIP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.155400 | 0.0016 |
| Test critical values: | 1% level | -4.356068 | |
| | 5% level | -3.595026 | |
| | 10% level | -3.233456 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(EDU) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.171048 | 0.0141 |
| Test critical values: | 1% level | -4.323979 | |
| | 5% level | -3.580623 | |
| | 10% level | -3.225334 | |

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LEXP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | 2.380533 | 1.0000 |
| Test critical values: | 1% level | -4.323979 | |
| | 5% level | -3.580623 | |
| | 10% level | -3.225334 | |

*MacKinnon (1996) one-sided p-values.

# Appendix B: Heteroscedasticity Test

Heteroskedasticity Test: White

| | | | |
|---|---|---|---|
| F-statistic | 1.587531 | Prob. F(26,3) | 0.3977 |
| Obs*R-squared | 27.96729 | Prob. Chi-Square(26) | 0.3601 |
| Scaled explained SS | 37.17580 | Prob. Chi-Square(26) | 0.0721 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 04/25/14 Time: 12:00
Sample: 1983 2012
Included observations: 30
Collinear test regressors dropped from specification

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 63.06681 | 263.4566 | 0.239382 | 0.8262 |
| GDP | 0.079649 | 0.158731 | 0.501785 | 0.6503 |
| GDP^2 | -2.49E-05 | 7.06E-05 | -0.353032 | 0.7474 |
| GDP*CPI | -0.001592 | 0.002527 | -0.629843 | 0.5735 |
| GDP*RIR | -0.001440 | 0.002346 | -0.613722 | 0.5828 |
| GDP*EDU | 3.47E-08 | 3.25E-07 | 0.106677 | 0.9218 |
| GDP*LEXP | -0.000358 | 0.001790 | -0.200027 | 0.8543 |
| GDP*DR | -0.000412 | 0.002259 | -0.182361 | 0.8669 |
| CPI | 14.16294 | 15.48808 | 0.914441 | 0.4279 |
| CPI^2 | 0.006720 | 0.013257 | 0.506931 | 0.6471 |
| CPI*RIR | 0.012197 | 0.024806 | 0.491703 | 0.6567 |
| CPI*EDU | -3.58E-06 | 9.53E-06 | -0.375686 | 0.7321 |
| CPI*LEXP | 0.014557 | 0.053548 | 0.271849 | 0.8034 |
| CPI*DR | -0.148859 | 0.175575 | -0.847840 | 0.4588 |
| RIR | 13.43999 | 15.20605 | 0.883858 | 0.4419 |
| RIR^2 | 0.005796 | 0.011843 | 0.489383 | 0.6581 |
| RIR*EDU | -3.63E-06 | 9.98E-06 | -0.363658 | 0.7402 |
| RIR*LEXP | 0.015576 | 0.057298 | 0.271845 | 0.8034 |
| RIR*DR | -0.142184 | 0.174506 | -0.814784 | 0.4749 |
| EDU | 0.000754 | 0.002606 | 0.289091 | 0.7913 |
| EDU^2 | -4.91E-11 | 4.87E-11 | -1.008238 | 0.3876 |
| EDU*LEXP | -2.92E-06 | 1.22E-05 | -0.238493 | 0.8269 |
| EDU*DR | -5.96E-06 | 1.92E-05 | -0.310958 | 0.7762 |
| LEXP | -5.063388 | 11.71684 | -0.432146 | 0.6948 |
| LEXP^2 | 0.018681 | 0.025260 | 0.739538 | 0.5132 |
| LEXP*DR | 0.033423 | 0.100604 | 0.332220 | 0.7616 |
| DR^2 | -0.002482 | 0.021563 | -0.115127 | 0.9156 |

| | | | |
|---|---|---|---|
| R-squared | 0.932243 | Mean dependent var | 0.032426 |
| Adjusted R-squared | 0.345015 | S.D. dependent var | 0.070140 |
| S.E. of regression | 0.056765 | Akaike info criterion | -3.402386 |
| Sum squared resid | 0.009667 | Schwarz criterion | -2.141308 |
| Log likelihood | 78.03578 | Hannan-Quinn criter. | -2.998956 |
| F-statistic | 1.587531 | Durbin-Watson stat | 2.627701 |
| Prob(F-statistic) | 0.397719 | | |

## Appendix C: Correlation matrix

| | LIP | GDP | CPI | RIR | EDU | LEXP | DR |
|---|---|---|---|---|---|---|---|
| LIP | 1.000000 | | | | | | |
| GDP | 0.643276 | 1.000000 | | | | | |
| CPI | 0.467599 | -0.114270 | 1.000000 | | | | |
| RIR | 0.536602 | -0.385641 | -0.248707 | 1.000000 | | | |
| EDU | 0.825036 | 0.144248 | 0.081842 | -0.428890 | 1.000000 | | |
| LEXP | 0.858013 | -0.107051 | -0.264276 | -0.055854 | 0.077729 | 1.000000 | |
| DR | -0.367925 | -0.692736 | -0.001806 | 0.535481 | -0.606199 | 0.072217 | 1.000000 |

# Appendix D: Regression result

Dependent Variable: LIP
Method: Least Squares
Date: 04/25/14 Time: 17:17
Sample: 1983 2012
Included observations: 30

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.534747 | 0.154327 | -3.465034 | 0.0014 |
| GDP | 0.116354 | 0.016701 | 6.966818 | 0.0000 |
| CPI | -9.829190 | 4.89E-05 | -2.007997 | 0.0522 |
| RIR | 0.000919 | 0.000484 | 1.899534 | 0.0655 |
| EDU | 0.021284 | 0.007915 | 2.688941 | 0.0108 |
| LEXP | 1.315394 | 0.425585 | 3.090792 | 0.0038 |
| DR | -0.000917 | 0.001180 | -0.777489 | 0.4419 |

| | | | |
|---|---|---|---|
| R-squared | 0.970566 | Mean dependent var | 0.042280 |
| Adjusted R-squared | 0.965660 | S.D. dependent var | 0.036172 |
| S.E. of regression | 0.006703 | Akaike info criterion | -7.024600 |
| Sum squared resid | 0.001618 | Schwarz criterion | -6.737893 |
| Log likelihood | 158.0289 | Hannan-Quinn criter. | -6.918872 |
| F-statistic | 197.8444 | Durbin-Watson stat | 1.806750 |
| Prob(F-statistic) | 0.000000 | | |