DETERMINANTS OF LIFE INSURANCE PENETRATION IN OECD COUNTRIES: THE ASYMMETRIC EFFECT OF INCOME LEVEL

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A research project submitted in partial fulfillment of the requirement for the degree of

BACHELOR OF FINANCE (HONS)

UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF BUSINESS AND FINANCE
DEPARTMENT OF FINANCE

APRIL 2018

DECLARATION

We hereby declare that:

(1) This undergraduate research project is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the research project.

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Date: 11st April 2018

ACKNOWLEDGEMENT

First of all, we would like to express our sincere gratitude to our supervisor, Mr Cheah Siew Pong, who gives us a lot of guidance, supports and suggestions in this research project. Mr Cheah is willing to spend his time on providing us with some valuable and useful advices to further enhance the quality of our research project even though he had busy schedule. Furthermore, he had also given us the strong motivation by encouraging us to always work as one team. Without the guidance and supports from Mr Cheah, the accomplishment of this research project may not be possible.

Next, we would like to express our utmost appreciation to our second examiner, Ms Kuah Yoke Chin for providing us with the professional comments and opinion. Her insightful perspectives are given to us in order to further improve the quality of our thesis. Therefore, we feel very thankful for her time spent on our presentation and the knowledge shared with us. Besides, we would like to thank Universiti Tunku Abdul Rahman (UTAR) for providing us this opportunity to carry out this research project. This opportunity enables us to expose to the process of carrying out a research with the proper methods. We are able to gain various skills and knowledge by carrying out the research.

Last but not least, we feel thankful to our friends and family for their endless support. Not forgetting the cooperative group members that spent countless time on discussion and brainstorming session. This research project is made possible with the tolerance and respect, as well as the effort of every member.

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
ARDL	Autoregressive Distributed Lag
ASEAN	Association of Southeast Asian Nations
C	Constant
CBT	Cognitive Behavioral Therapy
CEE	Central and Eastern European Country
CIS	Commonwealth of Independent States
CLRM	Classical Linear Regression Model
CPI	Consumer Price Index
CSEE	Central and South Eastern Europe Countries
DPTOTAL	Total Dependency Ratio
ECM	Error Correction Mechanism
EQ	Equation
FEM	Fixed Effects Model
GDP	Gross Domestic Product
GLS	Generalized Least Square
GMM	Generalized Method of Moment
HE	Health Expenditure

INC	Income
INCPC	Income per capita
$INCPC^-$	Economic Recession
INCPC_NEG	Income Per Capita Negative
INCPC_POS	Income Per Capita Positive
$INCPC^+$	Economic Expansion
INF	Inflation Rate
INT	Real Interest Rate
LIP	Life Insurance Premium
LSDV	Least Square Dummy Variable Model
MAX	Maximum
MENA	Middle East and North Africa
MIN	Minimum
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Square
OLS-PSCE	Estimated Method of Panel-Corrected East Squares
POLS	Pooled Ordinary Least Square
REM	Random Effects Model
S-GMM	System Generalized Method of Moment
USD	US Dollar
WDI	World Development Indicator

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ABSTRACT

This paper attempts to examine the asymmetric relationship between life insurance penetration and income level, with other controlled variables include inflation, real interest rate, health expenditure and dependency ratio, in OECD countries. In this study, cross-section data for 21 OECD countries from 1996 to 2015 was collected from World Development Indicator (WDI). Although many previous studies have done the research of analyzing the relationship between income level and life insurance penetration by using various cointegration techniques, these studies only focus on the linear effect between both variables. This study attempts to explore if the asymmetric effect occurs between life insurance penetration and income level, by splitting the income level into income positive which represents economic expansion and income negative which represents economic recession. Non-linear model was employed in this study and several estimation methods include POLS, FEM and REM were employed to decide the best model to be adopted. After running specification model test, it showed that FEM was the best model to be adopted in this study. The result under FEM showed that income positive is significantly positively related to the life insurance penetration while income negative is also positively related to life insurance penetration but insignificant. This indicates that asymmetric effect of income level on life insurance penetration does exist in the OECD countries.

CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction

In this chapter, the research background, problem statement, research objectives, research question and significance of study were included. The endogenous variable in this study is insurance penetration and exogenous variables include income level, inflation, interest rate follow by dependency ratio, and health expenditure.

1.1 Research Background

1.1.1 Background of Insurance

Nowadays, life insurance becomes one of the necessities in people life. Life insurance is known as a risk management tool that specifically provides the protection on death, critical illness and permanent disability of the insured (policyholder). It is a contract in which the insured are promised to make a periodic payment (premiums) to the insurer (insurance company) for a specific duration in exchange for the designated beneficiary a sum of money at the end of the time. The main objective of the life insurance is to provide a financial security for the families of insured in case insured pass away. Life insurance will contribute the protection to the insured's families through providing the reimbursement to the named beneficiary appointed upon the death or the unfortunate of the insured. In case of the insured is dead before the term is terminated, the named beneficiaries will receive an assured sum of money from the insurer. In opposite, if the insured survives the term then, they will obtain a part or full of the face amount of the policy from their insurer.

Life insurance supplies financial services and funds of investments in capital markets especially for those developed economies. Life insurance helps individuals in their financial services by introducing long term saving and reinvestment in the projects managed by private and public sector (Beck & Webb, 2003; Sadhak, 2006; Emamgholipour, Arab & Mohajerzadeh, 2017). Moreover, life insurance is important as it helps individuals to manage their income risks before the growth of urbanization, mobility in population, homogenization of economic relationship between community, family and individual (Beck & Webb, 2003; Emamgholipour et al., 2017). Furthermore, life insurance can help to uphold one's income hole that may exist due to the death of head of a family or losses in the only source of income in a family (Emamgholipour et al., 2017). Other than providing a shelter for financial losses, insurance can also be a shelter for bodily injury, health problems and damage of asset. It provides individual to have a peace of mind because insurance coverage may help to lower down the stress level and can help to cope with uncertainties (Chow-Chua & Lim, 2000).

1.1.2 Asymmetric Information between Insured and Insurer

In the insurance market, there is a situation where the adverse selection may occur in a deal between an insured and insurer. This theory was introduced by

Rothschild and Stiglitz (1976). Adverse selection is a problem that arises when there is asymmetric information between the two parties, it means that one of the parties will have some extra information that other party do not. In life insurance market, adverse selection normally will occur in those who work under a dangerous and high risk environment. The insured might have the incentive to purchase the life insurance without revealing the true risk they are exposed. They will choose to hide their real information that used to determine the true premiums that they required to pay. As a result, the insurer might face the possibility of loss due to the less premiums charged on high risk insured.

In nature, the insurer will charge higher premium to the insured who expose to the risk of death. In other words, higher premium will be charged on unhealthy individuals compare to healthy individuals. Smoking, drinking, consuming fast food frequently, suffering illness and obesity are grouping in the unhealthy categories. Although the statement of “higher premium will charged on unhealthy individuals” is well known by insured, there are still lots of policyholders trying to cover the real information from the insurer. As a result, adverse selection will happen where the insurer stand in the disadvantage position with charging the same premium to both individuals.

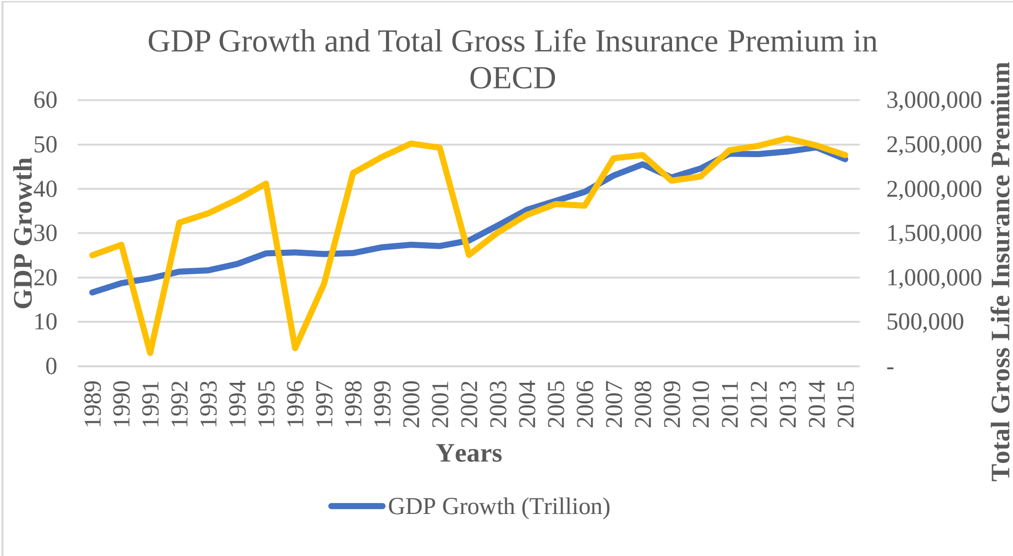
Normally, adverse selection occurs regardless of economic expansion or recession. When the economy expansion, the individuals will demand for the life insurance because they are able to afford the insurance premium. While economy downturn, even though the individuals might not have enough money to cover the insurance premium, they will borrow money from banks to purchase life insurance because they want to secure themselves against the poor economy in future. Even though there are two different situations, the demand on the life insurance yet to increase. Therefore, there is a possibility of asymmetric effect of income level to the life insurance penetration. For this part, the further explanation will be discussed in the Proposed Theoretical/ Conceptual Framework under Chapter 2.

1.1.3 Background of OECD countries GDP Growth and Life Insurance Premium

Organization for Economic Co-operation and Development (OECD) was established in 1960 which is an international organization aids to foster the economic growth and the trade for worldwide. There are 35 member countries and most of them are developed and high-revenue nations including Canada, Poland and Switzerland. The purpose of OECD is attempt to rising the economic growth to the peak by increasing the member countries' living standard (The Editors of Encyclopedia Britannica, 2017).

The line graph below shows the co-movement between GDP growth and total gross life insurance premium for OECD countries from 1989 to 2015. Based on the line graph below, the total gross life insurance premium fluctuates from 1989 to 2001 and increase stably from 2002 onwards. On one hand, the GDP of OECD countries grow stably from 1989 to 2015. The overall trend between GDP and total gross life insurance premium is positively correlated, however, it is insufficient to make the conclusion on the relationship between GDP and life insurance penetration is positive because from 1989 to 2002 there is a fluctuation in total gross insurance penetration while the GDP increase over the time period. Therefore, it is required to conduct a stringent analysis to assess both GDP and life insurance penetration relationship in this study.

Figure 1.1 GDP Growth and Total Gross Life Insurance Premium in OECD



Source: OECD iLibrary from 1989 to 2014 as at 1st August 2017

1.2 Problem Statement

According to the first fundamental welfare economics theorem, in the ideal competitive market without any externalities, the price would be adjusted accordingly so that the resources will be allocated optimally and efficiently in sense of Pareto. In this theorem, it assumes that all the goods and services traded in the market have to be observed equally by the market participants. However, this assumption was not hold in the real world as the asymmetric information was hold by most of the market participants which results in adverse selection happens in the market. In insurance market, adverse selection is the situation where insured possess hidden information, i.e. health condition and accident probability, and insurer does not realize the pivotal information, as the result, the cost that anticipated by the insurer might be affected by insured's informational advantage. The insurer might incur loss because they have to pay more coverage to the high-risk insured who hide their information from insurer and purchase more coverage insurance.

Adverse selection happens in economy expansion and recession. As the economy keeps changing over the period of time, if different phases of business cycle that may have different effect on the insurance market is not considered, the result will be biased. In previous study such as Beck and Webb (2003); Li, Moshirian, Nguyen and Wee (2007) only focus on linear relationship between income level and life insurance penetration. However, under the study of Gupta, Lahiani, Lee and Lee (2016) found that there was non-linear relationship between income level and life insurance penetration in United State. Hence, the non-linear model should be used to re-examine the relationship between income level and life insurance penetration. In this study, the reason of choosing OECD countries in this study is because the result of linear relationship between life insurance penetration and income level was found in study of Li, Moshirian, Nguyen and Wee (2007) is contrary to the result of non-linear relationship found by Gupta, Lahiani, Lee and Lee (2016). In addition, the relationship between both variables that shown in Figure 1.1 is ambiguous, therefore, it is important to further investigate the relationship between income level and life insurance penetration in the context of OECD countries. Another reason of conducting this study is due to the insurance sector is more neglected in the finance-growth literature, compare to other financial area components such as stock market. Thus, this may push our motivation for this study.

Although there are many studies using different techniques to scrutinize the relationship between the life insurance penetrations with income level, these studies assume they are symmetric relationship. Hence, there is a gap for us to apply other technique to study the asymmetric effect of independent variables to dependent variable. The current study will scrutinize the asymmetric effect of income level with other macroeconomic variables life insurance penetration by using the Ordinary Least Square (OLS) approach.

1.3 Research Questions

In accordance to the problem statement, this study attempts to answer the following research questions.

i. How is the impact of income level on life insurance penetration?
ii. Is there asymmetric relationship between income level and life insurance penetration?

1.4 Research Objectives

1.4.1 General Objectives

This study is to examine the linear and asymmetric effect of income level on insurance penetration in OECD countries.

1.4.2 Specific Objectives

The specific objectives of this study are

i. To investigate the impact of income level on life insurance penetration.
ii. To examine whether there is an asymmetric adjustment between life insurance penetration and income level.

1.5 Significance of study

The objective of this study is to examine the linear and asymmetric effect of income level on insurance penetration. Hence, two group of people would be benefited from this study. First, the findings of this study is beneficial to the insurance sector. Most of the previous studies only provide readers the linear result by applying a conventional linear model. However, different income level will affect the life insurance penetration. Hence, by using the non-linear model, insurance sector can clearly understand the impact of the positive income (economic expansion) and negative income (economic recession) bring to the life insurance penetration. If the presence of asymmetric relationship between different income level and life insurance penetration is proven, the insurance sector can formulate different strategies and policies according to different income level on life insurance. Therefore, they can ensure the demand of insurance in market to be stable regardless economy expansion or recession.

Besides, this finding of study would be beneficial to the future researchers. Non-linear model is applied in this study, by separating the income level into positive and negative income in order to test the asymmetric effect on insurance penetration. This study might help future researches on solving their question on whether asymmetric relationship between the different income level with the life insurance penetration exist. The researches can obtain the latest information regarding the effect of different income level on life insurance penetration instead of getting the information from the previous linear model result.

1.6 Chapter Layout

There are total five chapters in this study. Chapter 1 is the overview of life insurance, adverse selection and GDP and life insurance penetration in OECD countries, problem statement, research questions, research objectives and the significance of study. In Chapter 2, a proposed theoretical framework related to adverse selection with income level and literature review are provided. Chapter 3 focuses on the data, empirical model, estimation method and model specification, while result obtained from the Eview will be explained in Chapter 4. Lastly, Chapter 5 highlights the summary of the statistical analysis, discussion of major findings, implications of study and the recommendation with limitation for this study.

1.7 Conclusion

The overview of the study's problem statement, objective, general questions and significance of study are discussed under this chapter. Overall, this study is to investigate the linear and non-linear relationship between income level and life insurance penetration in OECD countries. Further elaboration on the relationship between life insurance penetration with income level and other four exogenous variables include inflation, real interest rate, health expenditure and dependency ratio will be discussed in the following chapter.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

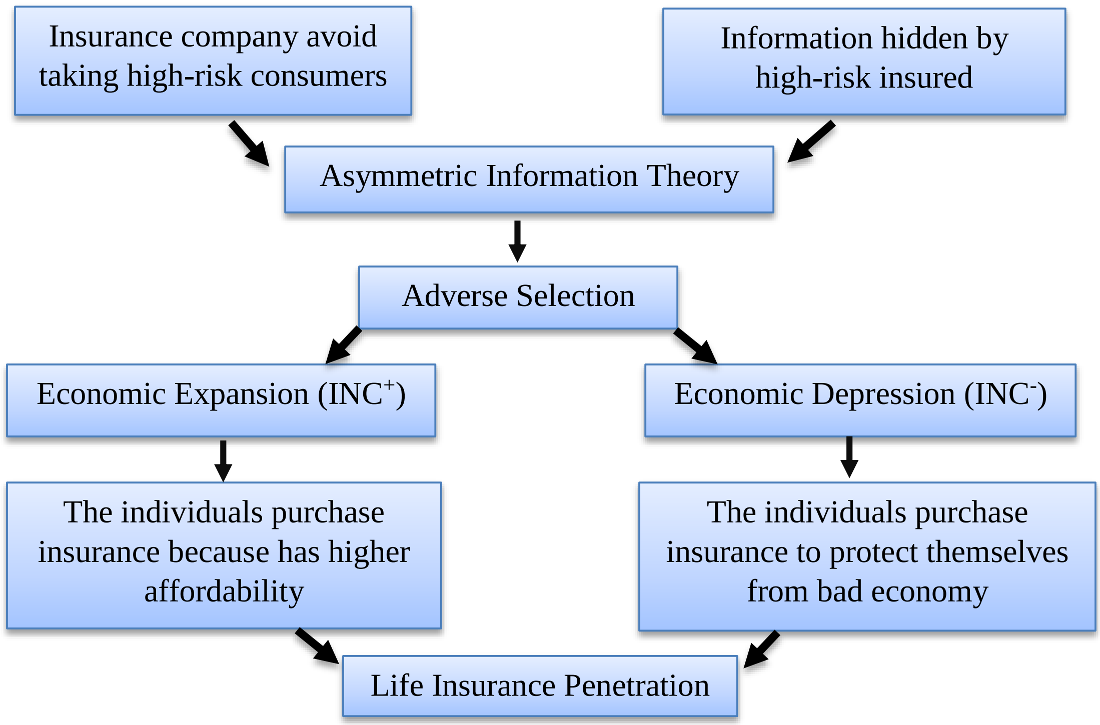
This chapter will discuss the review of literature, review and apply of theoretical model and hypotheses development.

2.1 Proposed Theoretical/ Conceptual Framework

In this study, the theoretical framework on life insurance market is the Asymmetric Information Theory which was proposed by Akerlof (1970), Spence (1973) and Rothschild and Stiglitz (1976), three economists who won Nobel Prize for Economics in 2001. Asymmetric Information Theory presents that the inefficient consequence occurred when there is disparity of information exists between one party with another party. While this theory is applied in the insurance market, it implied that there is an unequal information hold between insured and insurer. According to Rothschild and Stiglitz (1976), the asymmetric information existed in insurance market when the private information such as health condition was purposely hidden by the consumers which may disadvantage to the insurance company. This situation led to adverse selection in the insurance market (Alekrlof, 1970). According to Aldea and Marin (2007), adverse selection in insurance market is the situation happened when the high risk individuals expose less information to insurance company and just need to pay the same insurance premium as low risk individuals, while low risk individuals will not consider to buy insurance to be insured. As a result, high risk clients left in the insurance company may cause the insurance company to encounter losses. Consequently, adverse selection led to the insurance market become inefficient whenever economic expansion or depression.

In economic expansion, the demand of life insurance will increase because individuals have more funds and are able to afford insurance premium to get protection from the insurance. However, the demand of life insurance will still increase despite of economic recession because more individuals desire to protect themselves from the bad economy. Whether the economy is in good or bad time, the relationship between insurance demand and income level is positive because individuals purchase insurance is more likely based on their psyche which was affected by the economic environment, which is also called cognitive behavioral therapy (CBT). CBT describes that the consequences or actions taken by individuals are depend on the current situation. Before taking the actions, individuals will recognize if the situation is positive or negative because this might be the factors that trigger their thoughts, feelings and followed by behavior to make a decision. In insurance aspect, the individuals hold this CBT to decide whether want to be insured by insurance or not. When economy performs well, the individuals purchase insurance because they afford to buy it. While economy performs badly, the individuals will have higher willingness to purchase insurance because they want to secure themselves from future financial problems.

Figure 2.1 The Model of Income Level and Insurance Penetration



The figure above shows the proposed framework of this study. This framework is a guidance for developing the model of income level on insurance penetration.

2.2 Review of the Literature

This section reviews the previous empirical studies and discuss the relationship between each exogenous variables and endogenous variable.

2.2.1 Life Insurance Penetration

Among the earliest studies about insurance penetration is conducted by Hakansson in the year 1969. According to Hakansson (1969), the life insurance demand arises when an individual wants a guaranteed fund whenever uncertainty arises. In other words, it is known as an investment or a secured fund after retirement. Furthermore, it is supported that retirement planning is the cause of the rising demand for insurance as it is assumed as a strategy of life planning (Lin, Hsiao & Yeh, 2017).

There are different measures in measuring the demand of life insurance. There are studies that measure the demand by studying the penetration of life insurance as well as density of life insurance (Beck & Webb, 2002; Kjosevski, 2012). The life insurance penetration is the measurement of the weightage of the economy associating with the insurance activity where the density is measured by the citizen average consumption in dollars. Besides, Alhassan and Biekpe (2016) used the life insurance premium (gross domestic product) as the measure of the life insurance penetration. There is also primary collection of data by using the dummy variable to measure the demand of the insurance (Lin et al, 2017).

Next, Alhassan and Biekpe (2016) found out that the variable of demographic will highly affect the demand of the insurance. There is evidence that the demographic factor affect the demand of the insurance as carried out by Kjosevski (2012). While Beck and Webb (2002), found significant effect from demographic variables as well as economic variables. Demand of insurance will be impacted by economic variables such as income, inflation and other relevant variables (Beck & Webb, 2002). Furthermore, the demand of insurance examined in the OECD countries was also affected by economic factors, who handle a huge role in affecting the insurance demand in this case (Lin et al, 2017).There is an inconclusive result between demographic factors and economic factors that either factor was able to express the demand of insurance better. Hence, most studies are carried out by including both demographic and economic factors.

2.2.2 Income level

Income level is one of the most significant macroeconomic variables in affecting the insurance penetration. Income per capita is defined as the amount of money earned by single person which can be applied in a city, region and country as well. The proxy has been used to measure the income is GDP.

One of the studies of life insurance penetration, Beck and Webb (2003) investigated the determinants of economy, demography and institution of life insurance consumption by using panel data which included 63 countries over the period from 1980 to 1996 and 23 countries from 1960 to 1996. Besides, Nesterova (2008) whose research focused on selected 14 CIS and CEE countries over the period from 1996 to 2006 by using the simultaneous equation model and a positive result between the variable was found. Moreover, Kjosevski (2012) adopted fixed-effects panel model (FEM) and Augmented Dickey-Fuller (ADF) regression with total sample size of 182 which comprised 14 countries located in Central and Southeast Eastern Europe covered the period from 1998 to 2010. They found that income level was positive correlated to insurance penetration. In addition, Ayaliew (2013) used time series data which covered the period from 1991 to 2010 in Ethopia and linear regression model was employed. Based on the result investigated by the authors, the income level increase led to insurance demand increase because life insurance may be considered as superior good and insurance can protect the potential income of people and uphold the prospective consumption of dependents.

In Alhassan and Biekpe (2016), they examined the relationship between income level and life insurance penetration by adopting 31 African countries from 1996 to 2010. In this study, the authors formed two models which are static and dynamic model by using the estimated method of panel-corrected east squares (OLS-PSCE) and generalized method of moment (GMM) respectively. The result showed that income level is negative related with the life insurance penetration. According to Lee (2007), Zhou, Wu and Wu (2010), and Alhassan and Biekpe (2016), they believed that life insurance is inferior good. If insurance is considered as inferior good, the demand of life insurance remains low even though the income level increased. Another reason is due to the highly inequitable income distribution across the countries. The high inequitable income implies that only upper class is able to afford life insurance while lower class is unable to afford it. Hence, the income level is inversely related with the life insurance penetration.

In a nut shell, there is a number of previous empirical studies recorded that income level was positively correlated to life insurance penetration. Beck and Webb (2003), Nesterova (2008), Feyen, Lester and Rocha (2011), Kjosevski (2012) and Aderaw (2013) stated that when the income increase, the life insurance penetration will increase. There are some several reason proposed by the researchers that the greater the level of income, the greater number of consumers were able to buy the life insurance. First, the level of individual consumption and human capital is depend on the income level. Increased in income level led to an increase in consumption level and capital, thus consumers tend to purchase more insurance to protect their family's expected consumption and the insured's income potential. Furthermore, life insurance as a superior good, consumers who have higher income have higher ability to distribute higher proportion of income towards investment-related and retirement life insurance products. However, contradict result was found by Alhassan and Biekpe (2016) as some authors believe that insurance is an inferior goods, in which the result showed negative relationship between income level and insurance penetration.

2.2.3 Inflation

The scenario of how inflation changed captures the attention of macro-economists as well as policymakers. It is a discussion of public of how the inflation is affected by various reasons. Inflation is the continuous rise of the value or prices (Hussain & Malik, 2011). The rise of prices will reset and affect the standard living of the individuals. The standard living of the individuals will affect the economic growth and the expenditure of the individuals (Kasidi & Mwakanemela, 2013).

Most of the studies found out that the inflation has negative relationship with the life insurance demand. Alhassan and Biekpe (2016) did a research at Africa, which examining the amount of life insurance purchased. The researchers wanted to study the determinants that are affecting the consumption of life insurance. By examining thirty one countries of Africa from the year 1996 to 2010, the researchers found out that the life insurance demand and inflation is negatively related by employing the panel-corrected ordinary least square estimation as well as generalized method of moment for the dynamic model. Next, Nesterova (2008) carried out a research for fourteen countries of Soviet Union and Eastern Europen group in examining the request of the market in life insurance. The researcher aims to study the life insurance determinants of the countries by using panel data analysis for the 14 countries from 1996-2006. The result obtained from Nesterova (2008) found out that the result is shown to be negative related with life insurance penetration as well. In addition, high inflation level tends to decrease the wants of insurance in OECD countries (Li et al., 2007). The researchers examine the consuming amount of insurance in 30 OECD countries from year 1993 to 2000 by using generalized method of moments, it is found out that inflation appeared to be negatively influencing the life insurance consumption. This might be the inflation reduces the worth of assets and depress the worth of life insurance which resulted in a negatively influencing result. Besides, Redzuan (2014) carried out a research regarding the life insurance demand as well as family takaful. The researcher purpose was to investigate the forces or variable that has impact towards the insurance consumption in Malaysia from 1970 to 2008. The autoregressive distributed lag (ARDL) model is used and the result is that inflation is negatively correlated with the life insurance purchase. As the inflation increases, the insurance product would be less likely to be consumed (Li et al., 2007; Alhassan & Biekpe, 2016).

However, a research that is conducted in China failed to find any adverse effect of high inflation (Hwang & Gao, 2003). Hwang and Gao (2003) carried out a research to find the determinant of life insurance demand in China. The general multiple regression is adopted to carry out the research and to found out that it is not negatively related to the life insurance demand. In addition, Akhter and Khan (2017) carried a research to analyze the determinants of conventional and Takaful insurance across ASEAN and Middle East regions. Fixed effect model along with random effect model are carried out on this research of 14 Asian countries from the year 2005 to 2014. The result showed was positive relationship between inflation and Takaful insurance demand.

In conclusion, most of the researchers found out that the inflation is negatively related to the demand of insurance due to the higher living standard. Higher living expenses require the people to have lesser savings to spend on insurance. However, there are researches that state otherwise because it is said that the rise of inflation will able to improve the economy, indirectly, better overall economy for the people. Therefore, improved economy will not affect the expenditure of the people towards the insurance. Hence, the inflation might be negative or positive correlated.

2.2.4 Real Interest Rate

Real interest rate is refers to the difference between inflation rate and nominal rate of return. The nominal interest rate is adjusted by deducting the inflation rate and leads to real interest rate. It is an actual rate that truly reflects the investor’s lending, investment and borrowing that affect the overall performance of economy (Sen & Madheswaran, 2013; Fessenden, 2015)

Based on the previous studies, many researches included the real interest rate as one of the explanatory variables in their studies to examine whether the real interest rate was positive or negative correlated with the life insurance penetration. Based on the study of Li et al. (2007), it showed that the relationship of real interest rate and life insurance consumption was negatively related. The research was made by choosing 30 OECD countries and collecting the data starting from 1993 until 2000, a total of 152 observations. Real interest rate was computed by referring to benchmark on government bond yields while missing data is replaced with overnight interbank lending rates. OLS and GMM method was used and computed that the real interest rate was negatively related with life insurance consumption, measured in U.S dollars per capita. The reason was high interest rate will not attract the insured to buy more life insurance because they will desire more on immediate consumption compare to deferred consumption. Nesterova (2008) also stated the negative relationship observed in life insurance demand and real interest rate by performing the panel data analysis from 1996 until 2006. The research is based on 14 countries, focused on CEE and CIS especially Ukraine that were rarely included in any research. The dependent variable, demand of life insurance was constructed by life insurance penetration and life insurance density. Reason for being the above result where the real interest rate and life insurance demand is negatively related is because the investors would choose to invest in other assets compare to life insurance.

In addition, Ayaliew (2013) carried out the research on the developing country, Ethopia for the period of 1991-2010. T-test and F-test method have used and result computed that interest rate was negatively related to the life insurance premium per capita. The reason being is that the insured preferred to save more rather than consumption so that part of the money can preserve for future emergency. Real interest rate also results as a significant factor that adversely influence consumer on Takaful demand (Sherif & Shaairi, 2013). This research is conducted on Malaysia with the period from 1986 to 2010 by using OLS and GMM approach. The researchers concluded that almost similar factors will give impact on the demand of life insurance and family Takaful. Besides that, the interest rate is negatively related to life insurance consumption because plenty of insured agree that they will purchase less insurance if interest rate had increased (Razak, Kasim, Ghazali, Paramasivam & Mello, 2014; Rezduan, 2014 and Emamgholipour et al., 2017).

However, some researchers examined the different relationship besides from negative correlation. Based on Beck and Webb (2002), a result of positive relationship between real interest rate and life insurance was detected by examining 68 countries over the period of year 1961 to 2000. Real interest rate was measured by using the average lending rates or discount rate. The result of positive relationship was found because the theory predicts that the increase in real interest rate will lead to the higher return on investment and profitability for life insurers. Besides, Lim and Haberman (2002) focused their research on Malaysia from period of 1968 to 2001 by using OLS method and utilize the savings rate as an interest rate. The study found out that the real interest rate was positively correlated with the life insurance consumption. Therefore, the researchers claimed that the possible reason is the way they compiled the variables from three different savings deposits rates have resulted a wrong sign on the variable. For the study of Kjosevski (2012), 14 countries from Central and South Eastern Europe from year 1998 to 2010 were used. Fixed effect method used on the annual panel data showed the result that the real interest rate and life insurance demand is negatively related but insignificant. As a result, this research concluded that real interest rate does not affect the insurance penetration.

In conclusion, refer to the above studies, relationship between the life insurance penetration and real interest rate can be negative or positive. Researches cannot confidently conclude that the real interest rate is perfectly negative or positive on life insurance demand. Therefore, the expected sign for real interest rate assume to be either in positive or negative.

2.2.5 Health Expenditure

Health care expenditure is an annually consumption or a type of investment that spend out the current income of an individual (Matteo, 2010). Gray, Taylor and Hunter (2004) stated that health expenditure is a source of ‘public goods’ in a family because it is a type of spending that enhance well-being of every family members. In a simple way, health expenditure is defined as the amounts spent in health services. Furthermore, Ke, Saksena and Holly (2011) believed that health expenditure is also known as a tax based or an insurance based health finance mechanism.

Based on the previous studies, many researchers included health expenditure as one of their independent variable to measure the life insurance penetration. However, not all of the researchers agreed that health expenditure and life insurance penetration has neither positive nor negative relationship. For example, Kjosevski (2012) used fixed effect panel regression from year 1998 to year 2010 in fourteen Central and South Eastern Europe countries. Demand for life insurance such as life insurance density and life insurance penetration is measured in this study. This study stated that a wealthy country was associated with a high life insurance demand because the result of positive relationship between life insurance penetration and health expenditure when there is a significant coefficient to 1%, 5% and 10% level in their base line coefficients. Therefore, it concluded that the consumers in wealthy countries will spend in health expenditure and therefore leads to the increase in consuming life insurance package. Moreover, Alhassan and Biekpe (2015) studied the association of life insurance consumption in Africa from year 1996 to year 2010 by using Ordinary Least Square method (OLS) and instrumental variable regression. The study found that health expenditure was significant and positive. This showed that when health expenditure increase, it will lead to an increase of life insurance penetration. It also braced that the social health insurance are not the substitution for the private insurance penetration. It was shown when this both are 10% significant in a more robust S-GMM estimations. Based on Akotey, Sackey, Amoah, and Manso (2013) there was a positive relationship between health expenditure and life insurance consumption by examined the yearly financial status of 10 life insurance companies from year 2000 to year 2010 which was eleven years with a total 110 sample sizes by using panel data analysis. This research studied about the financial performance in industry of life insurance of emerging economies. It showed that the revenue of the life insurance companies was positively related which was affected by the size, the growth in sales and the investment. In other words, it also showed that when the sales in life insurance increase, revenue of life insurance increases, thus led to life insurance consumption increased. Therefore, health expenditure and life insurance penetration was positively correlated. In short, Wang, Lee, Lin and Tsai (2018) made a research regarding to the changes in health status which can make an impact on health expenditure by economic growth and life insurance growth. This study used 22 OECD countries from 2004 to 2013 annually by using time varying parameter panel vector auto regression model. They demonstrated that health expenditure and life insurance consumption is positively correlated when health shocks in the recent years economic activities received attention. Due to disease, households will spend in their health expenditure and therefore led to an increase in life insurance consumption because insurance can insured their families and their life.

Browne and Kim (1993) studied about the factors that may lead to the changes of demand for the life insurance in different countries by using Lewis's theory from 1980 and 1987. They associated that health expenditures are used to measure insurance penetration. It stated that the premium for every health spending are different in different countries, therefore it would affect the demand for life insurance. They stated that when the premium increases, the willingness of the consumers to spend in health expenditure will decrease. Therefore, it may lead to the total spending in health was negatively related to the life insurance consumption where it is price inelastic in demand when they use the total expenditure ratio in life insurance premium to the consumption of life insurance. Moreover, when government spends more on social security, the life insurance penetration will decrease as well. This impact on the average of social welfare spending on life insurance was not significant in Asian countries but give a big impact in OECD countries. Emamgholipour et al., (2017) demonstrated about the life insurance demand for the period of 2004 to 2012 by using panel data model also shared the above statements. The observed countries were in MENA countries. Hence, they also stated that when social welfare by government increases, demand for life insurance will decrease because social securities act as substitutions for life insurance. Therefore, it showed a negative relationship between health expenditure and life insurance penetration. Moreover, Beck and Webb (2002) studied about the determinants of supply and demand of life insurance on the consumption of life insurance across 63 countries by using a cross sectional data from year 1980 to year 1996. This study also agreed that the social security expenditure will affect the health expenditure indirectly. This is because that the benefits of social security come from taxes. This will reduce their income to buy life insurance, hence it reduced the life insurance consumption. When government spends more in social welfare, the life insurance penetration will be reduced.

In conclusion, most of the studies showed that health expenditure was positively correlated with life insurance penetration because they believed that people in wealth country will mostly spend in health consumption and therefore life insurance penetration will increase as well. However, there is still some studies state that they are negatively correlated and the main reasons behind was because of the social welfare from the government. Therefore, in this study, it can be concluded that life insurance penetration and health expenditure are remaining to be ambiguous.

2.2.6 Dependency Ratio

Dependency ratio estimate the approximate population included the young and old dependents in a country who are too youthful or aged to have a job. The dependency ratio conveys as a percentage, comprises a number of individuals who aged under 15 or over 64 (Titu, Banu & Banu, 2012).

Beck and Webb (2003) investigated the determinants of life insurance consumption from 1961 to 2000 using a sample of 68 economies. By using multivariate regression analysis, they found that dependency ratio was significantly related to life insurance penetration while old dependency ratio was positively related to life insurance penetration. This is because as ages increase, demand for savings products increase, thus the demand for life insurance increase. When there is larger old dependents and decrease in inflation rate, this will lead to an increase in life insurance penetration. Old dependents will choose to save with life insurance rather than other types of savings during low inflation. Beck and Webb (2003) said that there were inconsistent relationships in both developed and developing countries. Based on Truett and Truett (1990), the study focused on examining the factors of life insurance demand on an entire basis in Mexico and United States using time series data and to contrast the outcome for both countries. The researchers used a time series over 20-year period from 1964 to 1984. From the research it showed that young dependency ratio was positively correlated to life insurance penetration while old dependency ratios are negatively related to life insurance demand. Unlike people between ages 25 and 64, old dependency people have no responsibility or need to protect dependent children from loss of income once they are death. Furthermore, Li et al. (2007) used 30 OECD countries from 1993 to 2000 as the sample size for their research. Ordinary least square (OLS) and generalized method of moment (GMM) was used to test the significant of their variables. As there were heteroscedasticity problems in the data using OLS, thus GMM was used to compromise those results that are inconsistent in OLS estimates. The researchers found that there was negative relationship between old dependency ratio and life insurance penetration. This is because life expectancy has positive relationship with life insurance demand, and this will influence the dependency ratio. Dependency ratio had negative relationship with life insurance demand in this research. Thus, as income increase, life expectancy increases but number of children inclines to drop. This will decrease the demand for life insurance.

In a more recent work, Alhassan and Biekpe (2016) examined the determinants of life insurance demand in thirty-one Africa countries from 1996 to 2010. This research used two methods to test for the significant of their variables for this research; ordinary least square (OLS) for static model and generalized method of moment (GMM) for dynamic model. The study found that greater dependency ratio causes lower life insurance consumption. As dependency ratio is highly related to income, they expect an inverse relationship between dependency ratio and life insurance penetration in Africa as people has no sufficient income to purchase life insurance. According to Beck and Webb (2003), by adopting a panel data of 68 economies in 1961 to 2000, young dependency ratio was found not to have strong impact on life insurance penetration. The study carried out that higher young dependency ratio means lower demand for life insurance as they are too youthful to contemplate saving for future such as retirement. Young dependents are unwilling to save their money through life insurance and annuities. Young dependents cannot be explained in life insurance penetration as there are counteract result, where a positive influence on fatality risk and a negative influence on deposits and income components, and vice versa. A country with large portion of young dependents has lesser life insurance penetration. The researcher also found that larger portion of Muslim in a country will reduce life insurance penetration. According to Sulaiman, Migiro, and Yeshihareg (2015), they used error correction mechanism (ECM), Johansen cointegration test and Augmented Dickey-Fuller test in their research. By using a time series of 1980 to 2008 in Ethiopia, the results showed that there is positive relationship between old dependency ratio and life insurance market whereas young dependency ratio had an inverse influence on life insurance penetration.

In short, based on the literature review, it can conclude that the relationship between life insurance penetration and dependency ratio tend to be ambiguous based on the above studies. Thus, ambiguous relationship between life insurance consumption and dependency ratio is expected across different countries as there are many other factors that will influence dependency ratio to have effect on life insurance penetration.

2.3 Conclusion

The inconsistent results were found in many previous studies. Major researchers found income level was positively correlated with the life insurance penetration. Meanwhile, there was inverse relationship between income level and life insurance penetration found by some researchers. The result of other exogenous variables with life insurance penetration was also inconclusive as different result found in previous different studies. Next, the methodologies will be discussed in chapter 3.

CHAPTER 3: METHODOLOGY

3.0 Introduction

This chapter outlines the methodological framework apply in this study. This study adopts the Pooled Ordinary Least Square (POLS), Random Effects Model (REM), and Fixed Effects Model (FEM) to study the linear and asymmetric effect between life insurance penetration and macroeconomic variable in OECD countries.

The layout of this chapter is as follow. Section 1 describes the rationale of data and variable choice. Section 2 establish the POLS, REM, and FEM framework. Section 3 comes up with the brief of this chapter.

3.1 The Data

According to the research objective which is to investigate the life insurance penetration in OECD countries, this study employs 5 exogenous variables which include income level, inflation, interest rate, health expenditure and dependency ratio while the life insurance penetration is the endogenous variables in this study.

Life insurance penetration (LIP) is measured by the life insurance premium divided by GDP per capita, and it is an adequate proxy after natural log-transform. Income level (INCPC) is derived from gross domestic products per capita in term of US$.

The inflation rate (INF) is measured with the consumer price index in annual percentage (CPI, base year 1996). The real interest rate (INT) is measured in term of percentage of the expenses while health expenditure (HE) is measured by using the percentage of GDP. In addition, total dependency ratio (DPTOTAL) is the sum of the young and old dependency ratio in term of percentage of working age population.

All data are obtained from World Development Indicator (WDI) on a yearly basis because most of the macroeconomic data are only available in yearly basis. We employed a panel data in this study. This study covered 21 OECD countries with 20 years period which is from 1996 to 2015, which provide 420 observations in total. All variables are expressed in natural logarithms, except for inflation and interest rate, which is expressed in percentage form. The further description of the variable will be explained in detail as below.

Table 3.1: Data Sources and Descriptions

Variable	**Description**	**Source**
LIP	Life insurance premiums /GDP Yearly data from 1996-2015, Natural log transformed	WDI
INCPC	GDP per capita in USD Yearly data from 1996-2015, Natural log transformed	WDI
INF	Consumer price index Yearly data from 1996-2015	WDI
INT	Real interest rate Yearly data from 1996-2015	WDI
HE	Health Expenditure in % of GDP Yearly data from 1996-2015, Natural log transformed	WDI
DPTOTAL	Young dependency ratio + Old dependency ratio (% of working-age population) Yearly data from 1996-2015, Natural log transformed	WDI

3.2 Empirical Model

In the previous studies, the researchers such as Nesterova (2008), Kjosevski (2012) and Alhassan and Biekpe (2016) employed the static model[1]. Therefore, we follow the general practices and estimate the model by using a static model. Since our data given is in cross-sectional and time-series form, the general linear equation is as follow:

$LIP_{i,t} = c_o + c_1 INCPC_{i,t} + c_2 INF_{i,t} + c_3 INT_{i,t} + c_4 HE_{i,t} + c_5 DPTOTAL_{i,t} + e_{i,t}$ (EQ1)

Where,

LIP = life insurance penetration,

INCPC = income level per capita,

INF = inflation,

INT = real interest rate,

HE = health expenditure

DPTOTAL = total dependency ratio.

Other than the variables of inflation and real interest rate, all the variables are expressed in natural logarithm form although the equation is not specified algebraically. Since there is a possibility of asymmetry in the relation as mentioned in conceptual framework (Page 10-12), EQ(1) can be modified and extended to nonlinear equation as:

[1] Static model draws the structure of distributed parameter such as a stated specific time period. It calculates the equilibrium in a system and therefore it is a time invariant model.

$LIP_{i,t} = \alpha_o + \alpha_1 \, INCPC^{+}_{i,t} + \alpha_2 \, INCPC^{-}_{i,t} + \alpha_3 INF_{i,t} + \alpha_4 INT_{i,t} + \alpha_5 HE_{i,t} + \alpha_6 DPTOTAL_{i,t} + \varepsilon_{i,t}$ (EQ2)

Where $\alpha = \alpha_o, \alpha_1, \ldots, \alpha_6$ is the estimate for long run elasticity. α_o is the constant term where take all the exogenous factors such as constant term, linear trend and dummy variables into consideration. The $INCPC^{+}_{i,t}$ and $INCPC^{-}_{i,t}$ are the nonlinear elements in the static model and they are extracted from

$$INCPC^{+}_{i,t} = \varepsilon^{+}_{j=1} \, \Delta \, INCPC^{+}_{j} = \Delta \, INCPC^{+}_{j} = \varepsilon^{t}_{j=1} \max (INCPC_{i,t}, 0) \quad \text{(EQ3)}$$

and

$$INCPC^{-}_{i,t} = \varepsilon^{+}_{j=1} \, \Delta \, INCPC^{-}_{j} = \Delta \, INCPC^{+}_{j} = \varepsilon^{t}_{j=1} \min (INCPC_{i,t}, 0) \quad \text{(EQ4)}$$

Where $INCPC^{+}_{i,t}$ is partial sum of positive changes in INCPC and $INCPC^{-}_{i,t}$ is partial sum of negative changes in INCPC. The table below shown the m ore detailed data generated by Eview.

Table 3.2: Extracted data of INCPC, $INCPC^{+}$ and $INCPC^{-}$

Year	Ln (INCPC)	Ln (INCPC_POS)	Ln (INCPC_NEG)
1996	9.996256099	-	-
1997	10.06693299	0.070677	0.000000
1998	9.969555282	0.070677	-0.097378
1999	9.931174545	0.070677	-0.135758
2000	9.984649065	0.124151	-0.135758
	⋮	⋮	⋮
2011	10.81558281	0.533707	-0.029349
2012	10.84836812	0.566492	-0.029349
2013	10.87402074	0.592145	-0.029349
2014	10.90776262	0.625887	-0.029349
2015	10.93679724	0.654921	-0.029349

A positive change in INCPC represents economic expansion while a negative change in INCPC represents economic recession. The impact of purchasing life insurance during economic expansion may be dominant to economic recession does (H_1). In order to test this hypothesis, values of α_1 and α_2 in EQ2 can be evaluated as they capture the purchasing power of life insurance in economic expansion and economic recession, respectively. If the result shows $\alpha_1 = \alpha_2$, this indicates that no asymmetry relationship is found between income level and life insurance penetration. On the other hand, if $\alpha_1 \neq \alpha_2$ and if α_1 is greater than α_2, then H_1 would be proven.

The ambiguous results of α_1 and α_2 are expected to due to the contradictory results from the previous studies. Most of the past studies used the linear model to investigate the unilateral relationship between insurance penetration and income level and the positive results were found (Beck & Webb, 2003; Nesterova, 2008; Kjosevski, 2012; Aderaw, 2013). They believe that people will able to afford the insurance when they have more income. However, there was few arguments from Enz (2000) and Gupta, Lahiani, Lee and Lee (2016), they believe that income level has non-linear relationship with the insurance penetration. Hence in this study, α_1 and α_2 are expected to have a positive relationship which indicates that whenever income level is increase or decrease, the demand of insurance will still increase.

In term of other macroeconomic determinants, the signs of α_3 and α_4 are expected to be negative, while α_5 and α_6 are expected to be positive. The negative sign of α_3 indicates that the increase in price level of goods and services will lead to decrease in demand of life insurance because the value of financial asset will be depressed by the inflation and therefore its attractiveness will drop (Li et al., 2007; Nesterova, 2008; Alhassan & Biekpe, 2016). While the negative sign of α_4 represents that increase in real interest rate will lead to downturn of life insurance penetration, and it is because the individuals will prefer intermediate consumption rather than deferred consumption (Li et al., 2007; Nesterova, 2008). On the other hand, the positive sign of α_5 indicates households wealth country will mostly spend in health consumption and therefore demand more for life insurance. α_6 indicates that the increase the total dependency ratio will increase the demand of life insurance (Li et al., 2007; Beck & Webb, 2003).

3.3 Estimation Method

Several methods are used to estimate our panel regression models which are Pooled Ordinary Least Square (POLS), Fixed Effect Model (FEM), and Random Effect Method (REM). However, we estimate the model by using the static model.

Pooled Ordinary Least Square model is an estimation of a "grand" regression model by neglecting the time series and cross sectional data by pooling a number of observations. The explanatory variables of POLS model are assumed to be non-stochastic. They will be uncorrelated to the error terms if it is stochastic. In POLS, it is assumed that it is linear in parameter, the disturbances are not correlated with any of the repressor and the error terms is follow the normally independent distributed. However, it is also assumed that POLS have constant variance, in other words means homoscedasticity, and it does not related with each other, no autocorrelation. POLS is assumed to have common intercept (Gujarati & Porter, 2009).

The term of fixed effect in **Fixed Effect Model (FEM)** defined that the intercept may be different across the subjects while every interception of an entity does not change over time, which is known as time invariant. If the model is in time variant, it will be assumed that the coefficients of a regression do not change over time or across individuals. Instantly, FEM needs to fulfill the Classical Linear Regression Model

(CLRM) assumptions as well as POLS method. Individual effect and exogenous variables are correlated. FEM assumed to have no common intercept. FEM model will be unbiased when more regressors are correlated with individual effect (Gujarati & Porter, 2009).

For instant, **Random Effects Model (REM)** allow a model to have its own interception value and it is fixed. It is assumed that the intercept value is randomly draw from a bigger populations. In REM, exogenous variables and individual effect are uncorrelated. If the individual effect and more regressors are correlated, the REM method is biased. The REM model will be consistent even if true model of it is pooled estimator. However, the model will be inconsistent if its true value is in fixed effect. In addition, REM method can estimate the dummy variables such as race, gender and ethnicity by using Least Square Dummy Variable model (LSDV). REM is assumed to have random intercept (Gujarati & Porter, 2009).

Three different methods have its own characteristics, therefore, it is clearly shows when POLS and FEM model have common intercept while the REM model has no common intercept. POLS and FEM need to fulfill the CLRM assumptions whereas REM do not need to fulfill the assumptions. POLS assumes the common intercept for all the insurance penetration data, whereas FEM assumes that each of the endogenous variable have their own interception. It is said that REM are more efficient than FEM when the number of cross sectional units are large and the number of time series data are small. REM method can estimate the coefficient of the time-invariant variables but POLS and FEM are not able to measure the dummy variables. Furthermore, when the true value is pooled estimator, FEM and REM is consistent. However, when the true value is in fixed effect, the REM will no longer remain consistent.

3.4 Model Specification for Redundant Fixed Effect Test and Hausman Test

Redundant fixed effect test is used to test whether the FEM and REM is necessary or not. It is test by using the F-test among POLS and FEM. The null hypothesis for this test will be redundant effects for that model. When the FEM is not redundant, it can be said that the fixed effect coefficients are significant at its significance level by suggesting that the POLS will hide heterogeneity among the cross-sectional variable. The first step to examine the significance of that model is unrestricted model must include the estimated effect. After that, the likelihood ratio (chi square test) of redundant fixed effect will be performed. The EViews will estimate three of the restrict specification. The restrict specification are period fixed effects, cross section fixed effect, and one with all the effect. The model is called to be one way fixed effect if the intercept is allowed to vary from the entity to the other. However, it is called to be two way fixed effect model when the intercept is allowed to differ across the time and cross section model (Gujarati & Porter, 2009).

In analysis, Hausman test can be performed by using FEM and REM model. It will compare between fixed effect estimators, β_{FEM} and random effect estimators, β_{REM}. Hausman test can be tested to investigate whether the FEM and REM regression is zero by choosing between both of these two models. The result of OLS fixed effects is consistent while the GLS estimates is inconsistent due to the presence of correlation between regressors and individual effect. The OLS fixed effect estimator will be inefficient and both the estimators will be consistent when there is no correlation between the regressors and the fixed effects (Gujarati & Porter, 2009).

The following is the results for Hausman test in linear form:

$H_{0:}$ REM preferred

$H_{1:}$ FEM preferred

Description: When p-value obtained is less than the α, reject the H_0

3.0 Conclusion

The data and methodology adopted is discussed in this chapter. Three approaches include POLS, FEM and REM are used to analyse the asymmetric relationship between life insurance penetration and income level, with other determinants. Model specification test include Redundant Fixed Effect test and Hausman test are used to select the best approaches to examine the asymmetric effect. The empirical result and interpretation will be discussed in the following chapter.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

This chapter will focus on reporting and interpreting the results evaluated by using the Pooled Ordinary Least Square, Fixed Effect Model, Random Effect Model, Redundant Fixed Effect Test and Hausman Test. The figure for each test will be inserted and interpreted in a separate section as below.

4.1 Linear Model

Table 4.1 Linear Model Result

Endogenous Variable: Life Insurance Penetration			
Exogenous Variable	Model 1 POLS	Model 2 FEM	Model 3 REM
Income	-0.606233	0.231315	0.230428
(INCPC)	(0.0070)	(0.0000)	(0.0001)
Inflation	-0.163358	-0.019282	-0.019490
(INF)	(0.0000)	(0.0000)	(0.0000)
Real Interest Rate	-0.240909	-0.002823	-0.003296
(INT)	(0.0000)	(0.5875)	(0.5349)
Health Expenditure	1.671124	0.466501	0.470559
(HE)	(0.0027)	(0.0035)	(0.0045)
Dependency Ratio	0.683839	-0.712051	-0.700503
(DPTOTAL)	(0.4569)	(0.0093)	(0.0132)
Constant	0.983667	-1.030187	-1.071871
(C)	(0.7872)	(0.3407)	(0.3281)

Obs	420	420	420
Adjusted R^2	0.194260	0.986360	0.286297
F-Statistics / (Probability)	21.20375 (0.0000)	1212.998 (0.0000)	34.61586 (0.0000)
Redundant Fixed Effects / (Probability)	-	1733.879722 (0.0000)	-
Hausman Test / (Probability)	-	-	18.459062 (0.0024)

Notes: Numbers in parenthesis indicate the p-value.

4.1.1 Pooled Ordinary Least Squares

Table 4.1 is the summary of the results of the linear model. In Model 1, the Pooled ordinary least squares (POLS) model was used to examine the significance of the variables as well as to see the effect on each exogenous variables. Under this model, the constant value is 0.983667. When all of the exogenous variable's value is equal to zero, the expected mean value of the life insurance penetration (LIP) is 0.9837.

By using the conventional levels of significance (1%, 5%, 10%), this study examines the significance of each determinants on the life insurance penetration. In this model, income level variable is significant at all levels to the life insurance penetration by having a p-value of 0.007. The estimated coefficient is -0.606233, where this implies that there will be negative relationship between income level and life insurance penetration. When the income level increase by 1%, on average, the life insurance penetration will decrease by 0.6062%, holding other variables constant.

For the inflation, real interest rate and health expenditure variables, the variables will significantly affect the life insurance penetration at all significance level, while the dependency ratio (p-value: 0.4569) will not significantly affect the life insurance penetration. The estimated coefficient for inflation variable is -0.163358, indicates when the inflation increase by 1 unit, on average, the life insurance penetration will decrease by 16.3358%, holding other variables constant. This negative relationship is similar with the real interest rate variable. When real interest rate increase by 1 unit, on average, the life insurance penetration will decrease by 24.0909%, holding other variables constant. However, the health expenditure with an estimated coefficient of 1.671124 indicates that it is positively related to the endogenous variable. When health expenditure increase by 1%, on average, the life insurance penetration will increase by 1.6711%, holding other variables constant. Although the dependency ratio is insignificant to insurance penetration, but the estimated coefficient of 0.683839 indicates that the variables are positively related. When the dependency ratio increase by 1%, on average, the life insurance penetration will increase by 0.6838%, holding other variables constant.

The value of R^2 is 0.203875 while the adjusted R^2 value is 0.194260 in POLS model. 19.4260% of the life insurance penetration is explained by income level, inflation, real interest rate, health expenditure and the dependency ratio. Moreover, the F-test as a part of the result is to examine the significance of model. The probability of F-statistics is 0.0000, appears to be lower than the significance level. This indicates that the whole model is significant.

However, using pooled ordinary least squares (POLS) model, the coefficients might suffered from endogeneity problem or the correlation with the error term. This problem will lead to the biased estimation of the coefficients. The existence of this problem will be justified by using the Redundant Fixed Effect Test in section 4.1.4. Therefore, fixed effect model (FEM) and random effect model (REM) will be carry out to eliminate the problem suffered from pooled ordinary least squares (POLS) model.

4.1.2 Fixed Effect Model

For the fixed effect model (FEM), the constant value in Model 2 is -1.030187. This can be interpret as when all of the exogenous variable's value are equal to zero, the expected mean value of the life insurance penetration is -1.0302. The variable, income level will significantly affect insurance penetration by having the p-value of 0.0000 and the value of estimated coefficient is 0.231315. When the income level increase by 1%, on average, the life insurance penetration will increase by 0.2313%, holding other variables constant.

Besides, the inflation, health expenditure and dependency ratio variables will be significantly affecting the insurance penetration with the p-value of 0.0000, 0.0035 and 0.0093 respectively. However, the real interest rate with the p-value of 0.5875 proved to have no significant effect towards life insurance penetration at all significance level. The estimated coefficient for inflation, health expenditure, dependency ratio and real interest rate are -0.019282, 0.466501, -0.712051 and -0.002823 respectively. The coefficient figures showed that inflation, real interest rate and health expenditure will have the negative relationship, while health expenditure will be positively related with life insurance penetration. When the inflation increase by 1 unit, on average, the life insurance penetration will decrease by 1.9282%, holding other variables constant. For real interest rate variable, when real interest rate increase by 1 unit, on average, the life insurance penetration will decrease by 0.2823%, holding other variables constant. In addition, when health expenditure increase by 1%, on average, the life insurance penetration will increase by 0.4665%, holding other variables constant. Lastly, the interpretation for dependency ratio is when the dependency ratio increase by 1%, on average, the life insurance penetration will decrease by 0.7121%, holding other variables constant.

Moreover, the value of R^2 is 0.987174 and the adjusted R^2 is 0.986360. The interpretation is 98.6360% of the variation of life insurance penetration is explained by income level, inflation, real interest rate, health expenditure and dependency ratio. The probability of the F-test is 0.0000, where this value appeared to be lower than the significance level indicating that the FEM model is significant.

4.1.3 Random Effect Model

For Model 3, which is the random effect model, the value of constant is equals to -1.071871. The interpretation is when all of the exogenous variable’s value is equal to zero, the expected mean value of the life insurance penetration is -1.0719%. The result shows that the income level will significantly affect the insurance penetration with the p-value of 0.0001. There will be a positive relationship between income level and life insurance penetration by having an estimated coefficient value of 0.230428. When the income level increase by 1%, on average, the life insurance penetration will increase by 0.2304%, holding other variables constant.

The result of other controlled variables is similar to the fixed effect model. Inflation and health expenditure variables will significantly affect the insurance penetration with p-value of 0.0000 and 0.0045. In addition, dependency ratio (p-value: 0.0132) is also significant to the life insurance penetration but only at 5% and 10% significance level. While for the real interest rate (p-value: 0.5349), the variable will not significantly affect life insurance penetration at all significance level. The estimated coefficient for inflation, real interest rate, health expenditure and dependency ratio are -0.019490, -0.003296, 0.470559 and -0.700503 respectively. The inflation, real interest rate and dependency ratio will be negatively related while health expenditure will be positively related with the life insurance penetration. When inflation increase by 1 unit, on average, the life insurance penetration will decrease by 1.9490%, holding other variables constant. When real interest rate increase by 1 unit, on average, the life insurance penetration will decrease by 0.3296%, holding other variables constant. Furthermore, when health expenditure increase by 1%, on average, the life insurance penetration will increase by 0.4706%, holding other variables constant. Lastly, when the dependency ratio increase by 1%, on average, the life insurance penetration will decrease by 0.7005%, holding other variables constant.

In this random effect model, the value of R^2 is 0.294814, while the adjusted R^2 is 0.286297. The interpretation is 28.6297% of the variation of life insurance penetration is explained by income level, inflation, real interest rate, health expenditure and dependency ratio. In addition, under the F-test, F-statistics appeared to be 0.0000 which is lower than all of the significance level. As a result, the REM model is significant.

4.1.4 Redundant Fixed Effect

Redundant fixed effect test was carried out to examine which model is better. For this test, pooled ordinary least squares (POLS) and fixed effect model (FEM) will be analysed. Null hypothesis should be pooled ordinary least square (POLS) preferred, while the alternative hypothesis should be fixed effects model (FEM) preferred. Null hypothesis should be rejected if the p-value is lower than the significance level, otherwise do not reject the null hypothesis. By looking at the table 4.1, the p-value of the test is 0.0000, rejecting the null hypothesis. Therefore, fixed effect model (FEM) is chosen as the preferred model.

4.1.5 Hausman Test

The Hausman test will be assisting on choosing a more preferred model between fixed and random effect model. For the null hypothesis of this test will be, random effect model is preferred and otherwise. The Hausman test will enable the researchers to decide on the most efficient model to be used. After analysing the result table 4.1, the p-value is 0.0024. This indicates that the null hypothesis should be rejected at all significance level. Thus, fixed effect model (FEM) is more efficient and preferred for the linear model.

Based on the previous discussion, it is very possible that this set of result (Table 4.1, Equation 1) is not able to capture the asymmetric effect like the economic growth and life insurance penetration. Therefore, the reporting of Equation 2 for asymmetric will be continue in the below section.

4.2 Asymmetric model

Table 4.2 Asymmetric Model Result

Endogenous Variable: Life Insurance Penetration			
Exogenous Variable	Model 1 POLS	Model 2 FEM	Model 3 REM
Income_Positive	-1.044869 (0.0000)	0.168815 (0.0022)	0.162117 (0.0033)
Income_Negative	-0.789035 (0.2088)	0.064217 (0.6557)	0.063202 (0.7032)
Inflation	-0.181700 (0.0000)	-0.016755 (0.0058)	-0.017203 (0.0094)
Real Interest Rate	-0.219784 (0.0000)	0.000639 (0.9040)	0.000174 (0.9743)
Health Expenditure	0.742389 (0.0958)	0.425649 (0.0109)	0.447695 (0.0113)
Dependency Ratio	-0.381328 (0.6857)	-0.673248 (0.0159)	-0.660072 (0.0304)
Constant	1.382775 (0.6950)	1.146273 (0.3129)	1.055606 (0.3955)
Obs	399	399	399
Adjusted R^2	0.222704	0.987677	0.220074
F- Statistics/ Probability	20.00519 (0.0000)	1227.859 (0.0000)	19.71746 (0.0000)
Redundant Fixed Effects / Probability	-	1674.479855 (0.0000)	-
Hausman Test/ Probability	-	-	15.001577 (0.0202)

Notes: Numbers in parenthesis indicate the p-value.

4.2.1 Pooled Ordinary Least Square

Table 4.2 above shows the results of the asymmetric model that has conducted. For this asymmetric model, the income level variable has separated into positive and negative sign. Positive income represents the economy expansion, where economy is good while for the negative income, it represents economy recession, where economy is consider bad. From the POLS method in Model 1, the value of constant is 1.382775. When all of the exogenous variable's value is equal to zero, the expected mean value of the life insurance penetration is 1.3828.

The result for the positive income indicates that it will significantly affect the life insurance penetration by having the p-value of 0.0000. Negative income will not significantly affect the life insurance penetration at all significance level as the p-value is 0.2088. Both positive and negative income level is having -1.044869 and -0.789035 for the estimated coefficient respectively. The interpretation is when there is economy expansion and the income level increase by 1%, on average, life insurance penetration will decrease by 1.0449%, holding other variables constant. Conversely, during economy recession and when income level decrease by 1%, on average, life insurance penetration will decrease by 0.7890%, holding other variables constant. However, negative income will not be significantly affecting life insurance penetration.

Both inflation and real interest rate is significant to life insurance penetration with the same p-value of 0.0000. For health expenditure (p-value: 0.0958), it will be significantly affecting the life insurance penetration only at 10% significance level. Dependency ratio will not significantly affect the life insurance penetration with the p-value of 0.6857. Inflation shows an estimated coefficient of -0.1817, indicates when inflation increase by 1 unit, on average, life insurance penetration will decrease by 18.17%, holding other variables constant. The coefficient for real interest rate is -0.219784, implies that when real interest rate increase by 1 unit, on average, life insurance penetration will decrease by 21.9784%, holding other variable constant. For health expenditure, the coefficient is 0.742389, indicates when health expenditure increase by 1%, on average, life insurance penetration will increase by 0.7424%, holding other variables constant. The estimated coefficient for dependency ratio is -0.381328, however, it will not significantly affect the life insurance penetration. When the dependency ratio increase by 1%, on average, life insurance penetration will decrease by 0.3813%, holding other variables constant.

In this POLS model, the R^2 value is 0.234422, while the adjusted R^2 value is 0.222704. 22.2704% of the life insurance penetration can be explained by positive income, negative income, inflation, real interest rate, health expenditure and dependency ratio. For the F-test, probability of 0.0000 reveals that the null hypothesis should be rejected. Therefore, this model is proved to be significant.

4.2.2 Fixed Effect Model

From the results of fixed effect model (FEM), the constant value in Model 2 is 1.146273. The interpretation is when all of the exogenous variable's value is equal to zero, the expected mean value of the life insurance penetration is 1.1463. For the income level variable, positive income shows that it will significantly affect the life insurance penetration with the p-value of 0.0022. While negative income will not significantly affect life insurance penetration at all significance levels with the p-value of 0.6557. The estimated coefficient for positive income is 0.168815, indicating a positive relationship. When positive income increases by 1%, on average, life insurance penetration increases by 0.1688%, holding other variables constant. Negative income will positively related but will not be significantly affect the life insurance penetration. When income level decrease by 1%, on average, life insurance penetration will increase by 0.06422%, holding other variables constant. Positive relationship resulted for positive income and negative income is similar to the expected sign in our study which is the positive sign.

Inflation will significantly affect the life insurance penetration with the p-value of 0.0058. Inflation also indicates a negative relationship with the life insurance penetration, which is similar with the expected negative sign. When inflation increase by 1 unit, on average, life insurance penetration will decrease by 1.6755%, holding other variables constant. For health expenditure and dependency ratio, both will significantly affect life insurance penetration at 5% and 10% significance level by having the p-value of 0.0109 and 0.0159 respectively. Health expenditure’s coefficient is 0.425649, indicates when health expenditure increases by 1%, on average, life insurance penetration will increase by 0.4257%, holding other variables constant. The positive estimated coefficient for health expenditure is same with our expected positive sign. The estimated coefficient for dependency ratio is -0.673248. When dependency ratio increases by 1%, on average, life insurance penetration will decrease by 0.6733%, holding other variables constant. However, the real interest rate (p-value: 0.9040) will not significantly affect life insurance penetration but having the estimated coefficient of 0.000639. This can be interprets when real interest rate increase by 1 unit, on average, life insurance penetration will increase by 0.0639%, holding other variables constant. Surprisingly, the sign for dependency ratio and real interest rate is opposite with what we have expected, which are positive sign for dependency ratio and negative sign for real interest rate.

FEM model shows 0.988482 in R^2 and 0.987677 in adjusted R^2. This indicates that 98.7677% of life insurance penetration can be explained by positive income, negative income, inflation, real interest rate, health expenditure, and dependency ratio. The result for F test is 0.0000, which is lower than the conventional significant level. This indicates that the FEM model is significant in this study.

4.2.3 Random Effect Model

For the result of random effect model (REM), we obtain the value of constant in Model 3 is 1.055606, which indicates, when all of the exogenous variable's value is equal to zero, the expected mean value of the life insurance penetration is 1.0556. Result states that positive income will significantly affect life insurance penetration with the p-value of 0.0033 but the negative income will not significantly affect the life insurance penetration at all significance levels with the p-value of 0.7032. The positive income and negative income is having the coefficient of 0.162117 and 0.063202, having a positive relationship with the life insurance penetration. When positive income increases by 1%, on average, insurance penetration will increase by 0.1621%, holding other variables constant. When negative income decrease by 1%, on average, life insurance penetration will increase by 0.0632%, holding other variables constant but it will not significantly affect the life insurance penetration.

The variable, inflation will significantly affect the life insurance penetration with the p-value of 0.0094, while health expenditure (p-value: 0.0113) and dependency ratio (p-value: 0.0304) will significantly affect the life insurance penetration at 5% and 10% significance level. Inflation shows a negative relationship with the life insurance penetration, when inflation increase by 1 unit, on average, life insurance penetration will decrease by 1.7203%, holding other variables constant. Similar with dependency ratio, when dependency ratio increase by 1%, on average, life insurance penetration will decrease by 0.6601%, holding other variables constant. The estimated coefficient of health expenditure is 0.447695, means when health expenditure increases by 1%, on average, life insurance penetration will increase by 0.4477%, holding other variables constant. Lastly, the real interest rate is appeared to be not significantly affecting the insurance penetration with the p-value of 0.9743 and the estimated coefficient is 0.000174. When real interest rate increase by 1 unit, on average, insurance penetration will increase by 0.0174%, holding other variables constant but it will not significantly affect the life insurance penetration.

In REM model, the value of R^2 is 0.231832 and the adjusted R^2 is 0.220074, indicates that 22.0074% of the life insurance penetration can be explained by both positive and negative income, real interest rate, inflation, health expenditure, and dependency ratio. For the F-test, statistics showed a probability of 0.0000, appeared to be lower than the conventional significance level. As a result, this whole model is significant in this study.

4.2.4 Redundant Fixed Effect

For this redundant fixed effects test, POLS model and fixed effects model (FEM) was compared. Referring to the result computed in table 4.2, the p-value showed a figure of 0.0000. From this result, the null hypothesis should be rejected since p-value is obviously lower than the conventional significance level. Thus, fixed effects model (FEM) is chosen as the preferred model.

4.2.5 Hausman Test

Under this Hausman test, random effects model (REM) and fixed effects model (FEM) was compared. The p-value computed in this test is 0.0202, which is only lower than 5% and 10% significance level. Null hypothesis is still should be rejected. Therefore, fixed effects model (FEM) is chosen as the preferred model in asymmetric model.

In short, by looking at the result of redundant fixed effects test and Hausman test for both linear and asymmetric model in table 4.1 and 4.2, the conclusion can be made is the fixed effect model (FEM) will be more suitable in this study.

4.3 Robustness Checking

Besides the above result that utilizing GDP per capita as a proxy for income level variable, this study has also estimated the model by using the GDP as another proxy for the variables as an indicator for the economic growth. The result for both proxies is largely unchanged. Therefore, the conclusion is the result in this study is robust against the use of indicator.

4.4 Conclusion

In this study, both symmetric and asymmetric model have estimated by using POLS, FEM and REM to examine the asymmetric effect focus on income level variable and how the other controlled variables affect the life insurance penetration. Based on the three tests conducted for both linear and asymmetric model, there is some different result between them.

First of all, this study has partitioned the economic growth (GDP per capita) into positive growth and negative growth in the asymmetric model. The main purpose is to test whether there is any asymmetric effect for the income level variable to the life insurance penetration. The result showed in table 4.2 under FEM model, when there is economy expansion, it will affect the life insurance penetration and is positively related. When income increases, the life insurance penetration will also increase. However, in economy recession, negative income is positively related with insurance penetration too but is insignificant with a p-value of 0.6557, which is greater than all of the significance level. Life insurance penetration will not be affected by the bad economy but only will remain constant. Therefore, this proved that the asymmetric effect is actually existed among them, as both are not linear related.

Referring to the comparison of other 4 controlled variables between table 4.1 and table 4.2, there are some different results computed. Under Pooled OLS method, the health expenditure is significantly affects the life insurance penetration at all significance level in linear model but the variable changes to only significant at 10% in asymmetric model with life insurance penetration. For dependency ratio, the variable changes from positively related in linear model to negatively related in asymmetric model with the life insurance penetration.

For the fixed effect model (FEM), the coefficient of the real interest rate and constant have changed from having the negative relationship in linear model to positive relationship in asymmetric model with the life insurance penetration. Since Random Effect Model (REM) is similar to the FEM model, same independent variable, the real interest rate and the constant have changed when comparing the both models. In linear model, the constant of the model and the real interest rate is negatively related to the life insurance penetration. When moving to asymmetric model, the p-value changed and it becomes positively related to life insurance penetration. Excluding the real interest rate and constant, the other 3 controlled variables remain the same result in p-value and coefficient for both linear and asymmetric model.

Lastly, after conducting the redundant fixed effect test and Hausman test for both model, the result showed that Fixed Effect Model (FEM) is the best suited method for this study. Therefore, all comparisons, policy suggestions and conclusions in next chapter will rely on the result of FEM under asymmetric model.

CHAPTER 5: CONCLUSION

5.0 Introduction

The main objective for this study is to study the asymmetric relationship between life insurance penetration and income level, with other controlled variables in OECD countries. Summarized result obtained from chapter 4 will be discussed in this chapter. Furthermore, this chapter will also discuss about the major findings, policy implication, limitations and recommendations.

5.1 Summary of Statistical Analysis

Table 5.1.1 Results of T statistic for asymmetric model (Pooled Ordinary Least Square model)

Independent Variable	Parameter	Positive/ Negative Effect	Significance
Income_Positive	α_1	Negative	Significant
Income_Negative	α_2	Negative	Insignificant
Inflation	α_3	Negative	Significant
Real Interest Rate	α_4	Negative	Significant
Health Expenditure	α_5	Positive	Significant
Dependency Ratio	α_6	Negative	Insignificant

Table 5.1.2 Results of T statistic for asymmetric model (Fixed Effects Model)

Independent Variable	Parameter	Positive/ Negative Effect	Significance
Income_Positive	α_1	Positive	Significant
Income_Negative	α_2	Positive	Insignificant
Inflation	α_3	Negative	Significant
Real Interest Rate	α_4	Positive	Insignificant
Health Expenditure	α_5	Positive	Significant
Dependency Ratio	α_6	Negative	Significant

Table 5.1.3 Results of T statistic for asymmetric model (Random Effects Model)

Independent Variable	Parameter	Positive/ Negative Effect	Significance
Income_Positive	α_1	Positive	Significant
Income_Negative	α_2	Positive	Insignificant
Inflation	α_3	Negative	Significant
Real Interest Rate	α_4	Positive	Insignificant
Health Expenditure	α_5	Positive	Significant
Dependency Ratio	α_6	Negative	Significant

From Table 5.1.1 to Table 5.1.3 above show the results for POLS, FEM, and REM tests. Results for FEM and REM show the same direction on the relationship between the macroeconomic variables and insurance penetration whereas result for POLS present a slight difference compare with the results of FEM and REM. From result of POLS, it showed that there are negative relationships between positive income, negative income, and real interest rate with the life insurance penetration, while the results of FEM and REM showed opposite effects. In addition, from the result of

POLS, it showed that real interest rate will significantly affect the insurance penetration and dependency ratio will not significantly affect the insurance penetration. However, from the results of FEM and REM, real interest rate will not significantly affect the insurance penetration and dependency ratio will significantly affect the insurance penetration.

Table 5.1.4 Results of diagnostic checking

Diagnostic Checking	Decision	Conclusion
Redundant Fixed Effects Test	Reject H_0	FEM is better
Hausman Test	Reject H_0	FEM is better

Based on Table 5.1.4, the results show that fixed effects model is better and suitable in this study in comparison to pooled ordinary least square and random effects model.

5.2 Discussion of Major Findings

5.2.1 Income Level

From previous studies, researchers found that income level will significantly affect the life insurance consumption. According to Nesterova (2008), there is positive relationship between income level and life insurance consumption by adopting the simultaneous equation model. Besides, Kjosevski (2012) found that there was a positive relationship between income level and life insurance consumption as well. Moreover, Aderaw (2013) research also showed a positive relationship between variable by adopting linear regression model.

However, based on the research of Hoy and Robson (1981), Brisys, Dionne and Eeckhoudt (1989), Lee (2007), Zhou, Wu and Wu (2010), Alhassan and Biekpe (2016), the results showed a negative relationship between income level and life insurance penetration as the researchers believe that life insurance is an inferior good. They also believe that high inequitable income in a country can lead lower classes are unaffordable to life insurance and thus shows an inverse relationship between income level and life insurance consumption.

Based on our empirical result, both positive and negative income level show positive relationship towards life insurance penetration but only positive income is significant toward life insurance penetration. This indicates that when income level increase, life insurance penetration increases, and vice versa. Individual with higher income will purchase more insurance to insure their closest person such as their family members, to insure their family members' expected consumption in case of any accident happened to the individuals or family members. Besides, higher income individuals will consider taking insurance as an investment and will purchase retirement life insurance products.

5.2.2 Inflation

Based on our empirical result, inflation will significantly affect the life insurance penetration with a negative relationship. This was proved by Alhassan and Biekpe (2016), Nesterova (2008), Li et al. (2007), and Redzuan (2014), where their studies showed negative relationship between inflation and demand for life insurance. When inflation increase, life insurance consumption will decrease and vice versa. This indicates that when there is an increase in inflation, people will have higher living expenses and hence will reduce spending on insurance. However, there are contradict results carried out by Hwang and Gao (2003), and Akhter and Khan (2017).

5.2.3 Real Interest Rate

From the empirical result of FEM, we found that real interest rate will not significantly affect the life insurance penetration and having a positive relationship. This result is consistent with the result of Beck and Webb (2002), and Lim and Haberman (2002), where the studies showed positive relationship between real interest rate and life insurance penetration. This indicates that a rise in real interest rate will lead to higher return on investment and increasing the return for life insurers. However, in this study states that real interest rate as insignificant indicating that this variable has no impact on life insurance consumption and this was proved by the research of Kjosevski (2012), where its result showed that the real interest rate will not significantly the life insurance demand in a negative relationship

5.2.4 Health Expenditure

Based on this study empirical result, it shows health expenditure is significantly affecting the life insurance penetration associating with a positive relationship. According to Kjosevski (2012), Alhassan and Biekpe (2015), Akotey et al. (2013), and Wang et al. (2018), the health expenditure is significantly affecting life insurance penetration with a positive relationship. The researchers stated that individuals increase life insurance consumption because they are afraid of disease and this insurance is able to insure their families and themselves. However, there is contradict results showed by Browne and Kim (1993), Emamgholipour et al., (2017), and Beck and Webb (2002). They explained that social security expenditure will have indirect impact on health expenditure. They believe that the social security comes from taxes. When government spends more on social welfare, individual income will be reduced and hence reducing the consumption of life insurance.

5.2.5 Dependency Ratio

Based on empirical findings, dependency ratio has significant negative relationship with life insurance penetration. This finding matches with the studies of Alhassan and Biekpe (2016), Beck and Webb (2003), and Sulaiman et al. (2015). It stated that there was a negative relationship between dependency ratio and life insurance penetration as young generation is too young to contemplate savings for retirement. Besides, as dependency ratio is strongly related to income, it will have indirect impact on life insurance consumption. Older dependents tend to have lower income and thus will decrease the consumption for life insurance. On the contrary, some researchers showed that there is positive relationship between dependency ratio and life insurance penetration. This happens because older dependents will demand for more retire products and hence increase the demand for life insurance consumption. Besides, individuals will try to invest in life insurance when there is low inflation in order to get a higher return. Furthermore, old dependents have the responsibility to protect young dependents from the loss of income once they are dead and this induce them to purchase life insurance.

5.3 Implication of Study

This study will significantly contribute towards several parties regarding the penetration of insurance. The empirical result of the test has shown that the positive income, inflation, health expenditure and dependency ratio is significant towards the insurance penetration. While examining the macroeconomic variables toward the insurance consumption, the parties will be significantly involved is the insurance sector. In addition, governments and researchers will also be benefited from this study.

Inflation and income is able to manipulate by the government and the policy makers, so the level of insurance penetration can indirectly be controlled by the government. As the inflation level and income level can significantly be affected by the government's policy, therefore, the inflation level could be controlled with monetary policy. Monetary policy will be able to be controlled via the financial intermediaries by the policy makers in affecting the money supply. Next, the income level can be controlled by the fiscal policy. Fiscal policy is a policy that controls the taxation rates that may affect the income of the individuals. Thus, the government can take action based on the economic situation of expansion or recession by controlling the inflation or income level.

Next, the insurance sector can be also benefited as the companies and firms are able to refer the factors that will affect the life insurance penetration. Insurance sector could refer to this study to do forecast or prediction by making their future decisions or goals. The factors like health expenditure or dependency ratio could be referred by the insurance sector as an important reference. In addition, the income level on both asymmetry and symmetry showed the difference on the consumption that could be guidance towards the insurance. The market could also be analyzed with the prediction by taking into account of the macroeconomics variables in the study.

Lastly, researchers could also refer to this study by retrieving more ideas from the current study of macroeconomic variables that are affecting the life insurance penetration. This study carried out symmetry and asymmetry effect of pooled ordinary least square, fixed effect model and random effect model. Thus, future researchers could make improvement based on the current study. Additional variables or different types of models are also encouraged to carry out to discover new results.

5.4 Recommendation and Limitation of Study

This study includes several limitations as well as recommendations for each of the limitation. The first limitation of this study is that it is estimated by using OECD countries. OECD countries includes all the developed countries, therefore it may not applicable for the non-developed and developing countries. Therefore, it recommends that the future study can analyze the life insurance penetration by using other countries such as the developing and non-developed countries.

On the other hand, this study has a limited data availability to analyse the life insurance penetration in the OECD countries. OECD is formed by 35 members of developed countries, however, 21 countries were employed in this study due to the incomplete data. This might be resulting in a slightly inefficient outputs. Thus, it recommends that the future researchers could wait for the complete set of data of other countries before researching in this area, to ensure that the results would be more accurate and efficient compared to this study.

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APPENDICES

Appendix 1.1 Countries choose in this study

Australia	Italy
Belgium	Japan
Canada	Korea
Czech Republic	Mexico
Finland	Poland
France	Slovak Republic
Germany	Spain
Greece	Switzerland
Hungary	United Kingdom
Iceland	United States
Ireland	

Appendix 4.1 Linear Model with INC Proxy (Pooled OLS)

Dependent Variable: LIP
Method: Panel Least Squares
Date: 01/24/18 Time: 10:41
Sample: 1996 2015
Periods included: 20
Cross-sections included: 21
Total panel (balanced) observations: 420

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INC	1.365136	0.024417	55.90905	0.0000
INF	-0.010848	0.010787	-1.005709	0.3151
HE	-1.981536	0.158096	-12.53372	0.0000
INT	-0.024528	0.011342	-2.162557	0.0311
DPTOTAL	-1.671336	0.318134	-5.253556	0.0000
C	-26.56986	1.247497	-21.29854	0.0000

R-squared	0.905237	Mean dependent var	-0.535529
Adjusted R-squared	0.904092	S.D. dependent var	2.167099
S.E. of regression	0.671128	Akaike info criterion	2.054469
Sum squared resid	186.4710	Schwarz criterion	2.112187
Log likelihood	-425.4386	Hannan-Quinn criter.	2.077282
F-statistic	790.9571	Durbin-Watson stat	0.117795
Prob(F-statistic)	0.000000		

Appendix 4.2 Linear Model with INC Proxy (Fixed Effect Model)

Dependent Variable: LIP
Method: Panel Least Squares
Date: 01/25/18 Time: 21:02
Sample: 1996 2015
Periods included: 20
Cross-sections included: 21
Total panel (balanced) observations: 420
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INC	0.206271	0.055012	3.749548	0.0002
INF	-0.019848	0.004219	-4.704744	0.0000
HE	0.462650	0.165496	2.795539	0.0054
INT	-0.002922	0.005212	-0.560590	0.5754
DPTOTAL	-0.719243	0.273819	-2.626709	0.0090
C	-4.224691	1.573065	-2.685643	0.0075

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.987114	Mean dependent var	-0.535529
Adjusted R-squared	0.986296	S.D. dependent var	2.167099
S.E. of regression	0.253688	Akaike info criterion	0.154480
Sum squared resid	25.35684	Schwarz criterion	0.404591
Log likelihood	-6.440884	Hannan-Quinn criter.	0.253336
F-statistic	1207.258	Durbin-Watson stat	0.512175
Prob(F-statistic)	0.000000		

Appendix 4.3 Linear Model with INC Proxy (Random Effect Model)

Dependent Variable:L IP
Method: Panel EGLS (Cross-section random effects)
Date: 01/25/18 Time: 21:01
Sample: 1996 2015
Periods included: 20
Cross-sections included: 21
Total panel (balanced) observations: 420
Swamy and Arora estimator of component variances
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INC	0.503308	0.063584	7.915604	0.0000
INF	-0.015959	0.005261	-3.033502	0.0026
HE	-0.229298	0.177928	-1.288710	0.1982
INT	-0.004353	0.006330	-0.687674	0.4920
DPTOTAL	-0.380000	0.289337	-1.313347	0.1898
C	-12.10144	1.687580	-7.170884	0.0000

Effects Specification

	S.D.	Rho
Cross-section random	0.607687	0.8516
Idiosyncratic random	0.253688	0.1484

Weighted Statistics

R-squared	0.350288	Mean dependent var	-0.049774
Adjusted R-squared	0.342441	S.D. dependent var	0.356577
S.E. of regression	0.289148	Sum squared resid	34.61319
F-statistic	44.64108	Durbin-Watson stat	0.377463
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.559540	Mean dependent var	-0.535529
Sum squared resid	866.7179	Durbin-Watson stat	0.015074

Appendix 4.4 Linear Model with INC Proxy (Redundant Fixed Effects Test)

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	125.171279	(20,394)	0.0000
Cross-section Chi-square	837.995333	20	0.0000

Cross-section fixed effects test equation:
Dependent Variable: LIP
Method: Panel Least Squares
Date: 01/27/18 Time: 07:35
Sample: 1996 2015
Periods included: 20
Cross-sections included: 21
Total panel (balanced) observations: 420
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INC	1.365136	0.033888	40.28420	0.0000
INF	-0.010848	0.012058	-0.899671	0.3688
INT	-0.024528	0.012256	-2.001256	0.0460
HE	-1.981536	0.155940	-12.70700	0.0000
DPTOTAL	-1.671334	0.282359	-5.919184	0.0000
C	-26.56987	1.009330	-26.32426	0.0000

R-squared	0.905237	Mean dependent var	-0.535529
Adjusted R-squared	0.904092	S.D. dependent var	2.167099
S.E. of regression	0.671128	Akaike info criterion	2.054469
Sum squared resid	186.4710	Schwarz criterion	2.112187
Log likelihood	-425.4386	Hannan-Quinn criter.	2.077282
F-statistic	790.9570	Durbin-Watson stat	0.117795
Prob(F-statistic)	0.000000		

Appendix 4.5 Linear Model with INC Proxy (Hausman Test)

Correlated Random Effects - Hausman Test
Equation: LINEAR_RAND_INC
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	128.827156	5	0.0000

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
INC	0.206271	0.503308	0.000717	0.0000
INF	-0.019848	-0.015959	0.000000	0.0000
HE	0.462650	-0.229298	0.004501	0.0000
INT	-0.002922	-0.004353	0.000000	0.0011
DPTOTAL	-0.719243	-0.380000	0.002969	0.0000

Cross-section random effects test equation:
Dependent Variable: LIP
Method: Panel Least Squares
Date: 01/25/18 Time: 21:00
Sample: 1996 2015
Periods included: 20
Cross-sections included: 21
Total panel (balanced) observations: 420

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.224691	1.688206	-2.502474	0.0127
INC	0.206271	0.053454	3.858837	0.0001
INF	-0.019848	0.004777	-4.154398	0.0000
HE	0.462650	0.176574	2.620155	0.0091
INT	-0.002922	0.005401	-0.540983	0.5888
DPTOTAL	-0.719243	0.247244	-2.909039	0.0038

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.987114	Mean dependent var	-0.535529
Adjusted R-squared	0.986296	S.D. dependent var	2.167099
S.E. of regression	0.253688	Akaike info criterion	0.154480
Sum squared resid	25.35684	Schwarz criterion	0.404591
Log likelihood	-6.440884	Hannan-Quinn criter.	0.253336
F-statistic	1207.258	Durbin-Watson stat	0.512175
Prob(F-statistic)	0.000000		

Appendix 4.6 Asymmetric Model with INC Proxy (Pooled OLS)

Dependent Variable:L IP
Method: Panel Least Squares
Date: 01/24/18 Time: 10:14
Sample (adjusted): 1997 2015
Periods included: 19
Cross-sections included: 21
Total panel (balanced) observations: 399

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INC_POS	-0.970437	0.234879	-4.131644	0.0000
INC_NEG	-0.907196	0.648223	-1.399512	0.1625
INF	-0.177231	0.039048	-4.538834	0.0000
HE	0.797598	0.446750	1.785335	0.0750
INT	-0.221838	0.031379	-7.069715	0.0000
DPTOTAL	-0.242033	0.934162	-0.259091	0.7957
C	0.702507	3.492454	0.201150	0.8407

R-squared	0.233621	Mean dependent var	-0.509839
Adjusted R-squared	0.221891	S.D. dependent var	2.156253
S.E. of regression	1.902041	Akaike info criterion	4.141121
Sum squared resid	1418.163	Schwarz criterion	4.211102
Log likelihood	-819.1536	Hannan-Quinn criter.	4.168837
F-statistic	19.91608	Durbin-Watson stat	0.078185
Prob(F-statistic)	0.000000		

Appendix 4.7 Asymmetric Model with INC Proxy (Fixed Effect Model)

Dependent Variable: LIP
Method: Panel Least Squares
Date: 01/25/18 Time: 21:19
Sample (adjusted): 1997 2015
Periods included: 19
Cross-sections included: 21
Total panel (balanced) observations: 399
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INC_POS	0.138457	0.054928	2.520679	0.0121
INC_NEG	0.006574	0.151014	0.043534	0.9653
INF	-0.017107	0.006048	-2.828383	0.0049
HE	0.442709	0.169215	2.616248	0.0093
INT	0.000698	0.005286	0.132129	0.8950
DPTOTAL	-0.711179	0.280424	-2.536079	0.0116
C	1.258624	1.135945	1.107997	0.2686

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.988433	Mean dependent var	-0.509839
Adjusted R-squared	0.987625	S.D. dependent var	2.156253
S.E. of regression	0.239870	Akaike info criterion	0.047832
Sum squared resid	21.40401	Schwarz criterion	0.317762
Log likelihood	17.45750	Hannan-Quinn criter.	0.154738
F-statistic	1222.657	Durbin-Watson stat	0.582286
Prob(F-statistic)	0.000000		

Appendix 4.8 Asymmetric Model with INC Proxy (Random Effect Model)

Dependent Variable: LIP
Method: Panel EGLS (Cross-section random effects)
Date: 01/25/18 Time: 21:21
Sample (adjusted): 1997 2015
Periods included: 19
Cross-sections included: 21
Total panel (balanced) observations: 399
Swamy and Arora estimator of component variances
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INC_POS	0.132778	0.054792	2.423327	0.0158
INC_NEG	0.005429	0.170503	0.031840	0.9746
INF	-0.017498	0.006586	-2.656866	0.0082
HE	0.462701	0.177614	2.605093	0.0095
INT	0.000285	0.005386	0.052852	0.9579
DPTOTAL	-0.699599	0.303969	-2.301546	0.0219
C	1.177721	1.235727	0.953059	0.3411

Effects Specification

	S.D.	Rho
Cross-section random	1.890496	0.9842
Idiosyncratic random	0.239870	0.0158

Weighted Statistics

R-squared	0.229988	Mean dependent var	-0.014834
Adjusted R-squared	0.218202	S.D. dependent var	0.273511
S.E. of regression	0.241836	Sum squared resid	22.92606
F-statistic	19.51387	Durbin-Watson stat	0.544984
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.017847	Mean dependent var	-0.509839
Sum squared resid	1817.447	Durbin-Watson stat	0.006875

Appendix 4.9 Asymmetric Model with INC Proxy (Redundant Fixed Effect)

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	1213.777770	(20,372)	0.0000
Cross-section Chi-square	1673.222120	20	0.0000

Cross-section fixed effects test equation:
Dependent Variable:LIP
Method: Panel Least Squares
Date: 01/27/18 Time: 07:43
Sample (adjusted): 1997 2015
Periods included: 19
Cross-sections included: 21
Total panel (balanced) observations: 399
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INC_POS	-0.970437	0.189144	-5.130674	0.0000
INC_NEG	-0.907195	0.850877	-1.066188	0.2870
INF	-0.177231	0.051302	-3.454687	0.0006
INT	-0.221838	0.036201	-6.128015	0.0000
HE	0.797598	0.483470	1.649735	0.0998
DPTOTAL	-0.242035	0.919983	-0.263087	0.7926
C	0.702514	3.583220	0.196057	0.8447

R-squared	0.233621	Mean dependent var	-0.509839
Adjusted R-squared	0.221891	S.D. dependent var	2.156253
S.E. of regression	1.902041	Akaike info criterion	4.141121
Sum squared resid	1418.163	Schwarz criterion	4.211102
Log likelihood	-819.1536	Hannan-Quinn criter.	4.168837
F-statistic	19.91608	Durbin-Watson stat	0.078185
Prob(F-statistic)	0.000000		

Appendix 4.10 Asymmetric Model with INC Proxy (Hausman Test)

Correlated Random Effects - Hausman Test
Equation: ASY_RAND_INC
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	12.453189	6	0.0526

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
INC_POS	0.138457	0.132778	0.000017	0.1690
INC_NEG	0.006574	0.005429	0.000073	0.8935
INF	-0.017107	-0.017498	0.000000	0.0131
HE	0.442709	0.462701	0.000353	0.2875
INT	0.000698	0.000285	0.000000	0.0235
DPTOTAL	-0.711179	-0.699599	0.000350	0.5362

Cross-section random effects test equation:
Dependent Variable: LIP
Method: Panel Least Squares
Date: 01/25/18 Time: 21:24
Sample (adjusted): 1997 2015
Periods included: 19
Cross-sections included: 21
Total panel (balanced) observations: 399

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.258624	1.083525	1.161601	0.2461
INC_POS	0.138457	0.054838	2.524831	0.0120
INC_NEG	0.006574	0.152575	0.043089	0.9657
INF	-0.017107	0.005807	-2.946191	0.0034
HE	0.442709	0.179035	2.472752	0.0139
INT	0.000698	0.005349	0.130554	0.8962
DPTOTAL	-0.711179	0.271901	-2.615580	0.0093

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.988433	Mean dependent var	-0.509839
Adjusted R-squared	0.987625	S.D. dependent var	2.156253
S.E. of regression	0.239870	Akaike info criterion	0.047832
Sum squared resid	21.40401	Schwarz criterion	0.317762
Log likelihood	17.45750	Hannan-Quinn criter.	0.154738
F-statistic	1222.657	Durbin-Watson stat	0.582286
Prob(F-statistic)	0.000000		

Appendix 4.11 Linear Model with INCPC Proxy (Pooled OLS)

Dependent Variable: LIP
Method: Panel Least Squares
Date: 01/26/18 Time: 07:50
Sample: 1996 2015
Periods included: 20
Cross-sections included: 21
Total panel (balanced) observations: 420

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INCPC	-0.606233	0.223662	-2.710485	0.0070
INF	-0.163358	0.034014	-4.802715	0.0000
INT	-0.240909	0.031862	-7.560928	0.0000
HE	1.671124	0.554541	3.013527	0.0027
DPTOTAL	0.683839	0.918326	0.744658	0.4569
C	0.983667	3.642259	0.270071	0.7872

R-squared	0.203875	Mean dependent var	-0.535529
Adjusted R-squared	0.194260	S.D. dependent var	2.167099
S.E. of regression	1.945254	Akaike info criterion	4.182845
Sum squared resid	1566.581	Schwarz criterion	4.240563
Log likelihood	-872.3974	Hannan-Quinn criter.	4.205658
F-statistic	21.20375	Durbin-Watson stat	0.083561
Prob(F-statistic)	0.000000		

Appendix 4.12 Linear Model with INCPC Proxy (Fixed Effect Model)

Dependent Variable: LIP
Method: Panel Least Squares
Date: 01/26/18 Time: 07:52
Sample: 1996 2015
Periods included: 20
Cross-sections included: 21
Total panel (balanced) observations: 420
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INCPC	0.231315	0.055276	4.184725	0.0000
INF	-0.019282	0.004200	-4.590859	0.0000
INT	-0.002823	0.005200	-0.542930	0.5875
HE	0.466501	0.159004	2.933902	0.0035
DPTOTAL	-0.712051	0.272598	-2.612094	0.0093
C	-1.030187	1.079897	-0.953967	0.3407

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.987174	Mean dependent var	-0.535529
Adjusted R-squared	0.986360	S.D. dependent var	2.167099
S.E. of regression	0.253094	Akaike info criterion	0.149798
Sum squared resid	25.23838	Schwarz criterion	0.399909
Log likelihood	-5.457559	Hannan-Quinn criter.	0.248653
F-statistic	1212.998	Durbin-Watson stat	0.514783
Prob(F-statistic)	0.000000		

Appendix 4.13 Linear Model with INCPC Proxy (Random Effect Model)

Dependent Variable:LIP
Method: Panel EGLS (Cross-section random effects)
Date: 01/26/18 Time: 07:53
Sample: 1996 2015
Periods included: 20
Cross-sections included: 21
Total panel (balanced) observations: 420
Swamy and Arora estimator of component variances
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INCPC	0.230428	0.056457	4.081506	0.0001
INF	-0.019490	0.004488	-4.343007	0.0000
INT	-0.003296	0.005308	-0.621042	0.5349
HE	0.470559	0.164797	2.855395	0.0045
DPTOTAL	-0.700503	0.281328	-2.489987	0.0132
C	-1.071871	1.094699	-0.979147	0.3281

Effects Specification

	S.D.	Rho
Cross-section random	1.661923	0.9773
Idiosyncratic random	0.253094	0.0227

Weighted Statistics

R-squared	0.294814	Mean dependent var	-0.018226
Adjusted R-squared	0.286297	S.D. dependent var	0.304419
S.E. of regression	0.257176	Sum squared resid	27.38167
F-statistic	34.61586	Durbin-Watson stat	0.474948
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.047165	Mean dependent var	-0.535529
Sum squared resid	1874.949	Durbin-Watson stat	0.006936

Appendix 4.14 Linear Model with INCPC Proxy (Redundant Fixed Effect Test)

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	1203.106233	(20,394)	0.0000
Cross-section Chi-square	1733.879722	20	0.0000

Cross-section fixed effects test equation:
Dependent Variable:L IP
Method: Panel Least Squares
Date: 01/27/18 Time: 00:40
Sample: 1996 2015
Periods included: 20
Cross-sections included: 21
Total panel (balanced) observations: 420
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INCPC	-0.606233	0.276977	-2.188746	0.0292
INF	-0.163358	0.049195	-3.320651	0.0010
INT	-0.240909	0.038527	-6.253055	0.0000
HE	1.671124	0.639985	2.611195	0.0094
DPTOTAL	0.683839	0.881771	0.775528	0.4385
C	0.983667	4.235452	0.232246	0.8165

R-squared	0.203875	Mean dependent var	-0.535529
Adjusted R-squared	0.194260	S.D. dependent var	2.167099
S.E. of regression	1.945254	Akaike info criterion	4.182845
Sum squared resid	1566.581	Schwarz criterion	4.240563
Log likelihood	-872.3974	Hannan-Quinn criter.	4.205658
F-statistic	21.20375	Durbin-Watson stat	0.083561
Prob(F-statistic)	0.000000		

Appendix 4.15 Linear Model with INCPC Proxy (Hausman Test)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	18.459062	5	0.0024

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
INCPC	0.231315	0.230428	0.000014	0.8094
INF	-0.019282	-0.019490	0.000000	0.0062
INT	-0.002823	-0.003296	0.000000	0.0061
HE	0.466501	0.470559	0.000158	0.7471
DPTOTAL	-0.712051	-0.700503	0.000285	0.4937

Cross-section random effects test equation:
Dependent Variable:L IP
Method: Panel Least Squares
Date: 01/26/18 Time: 07:56
Sample: 1996 2015
Periods included: 20
Cross-sections included: 21
Total panel (balanced) observations: 420

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.030187	1.092340	-0.943101	0.3462
INCPC	0.231315	0.056419	4.099980	0.0001
INF	-0.019282	0.004783	-4.031160	0.0001
INT	-0.002823	0.005389	-0.523935	0.6006
HE	0.466501	0.170483	2.736345	0.0065
DPTOTAL	-0.712051	0.246380	-2.890048	0.0041

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.987174	Mean dependent var	-0.535529
Adjusted R-squared	0.986360	S.D. dependent var	2.167099
S.E. of regression	0.253094	Akaike info criterion	0.149798
Sum squared resid	25.23838	Schwarz criterion	0.399909
Log likelihood	-5.457559	Hannan-Quinn criter.	0.248653
F-statistic	1212.998	Durbin-Watson stat	0.514783
Prob(F-statistic)	0.000000		

Appendix 4.16 Asymmetric Model with INCPC Proxy (Pooled OLS)

Dependent Variable: LIP
Method: Panel Least Squares
Date: 01/26/18 Time: 07:58
Sample (adjusted): 1997 2015
Periods included: 19
Cross-sections included: 21
Total panel (balanced) observations: 399

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INCPC_POS	-1.044869	0.253112	-4.128086	0.0000
INCPC_NEG	-0.789035	0.626725	-1.258981	0.2088
INF	-0.181700	0.038870	-4.674601	0.0000
INT	-0.219784	0.031333	-7.014366	0.0000
HE	0.742389	0.444595	1.669810	0.0958
DPTOTAL	-0.381328	0.941434	-0.405051	0.6857
C	1.382775	3.524446	0.392338	0.6950

R-squared	0.234422	Mean dependent var	-0.509839
Adjusted R-squared	0.222704	S.D. dependent var	2.156253
S.E. of regression	1.901048	Akaike info criterion	4.140076
Sum squared resid	1416.682	Schwarz criterion	4.210058
Log likelihood	-818.9452	Hannan-Quinn criter.	4.167792
F-statistic	20.00519	Durbin-Watson stat	0.078221
Prob(F-statistic)	0.000000		

Appendix 4.17 Asymmetric Model with INCPC Proxy (Fixed Effect Model)

Dependent Variable:L IP
Method: Panel Least Squares
Date: 01/26/18   Time: 08:00
Sample (adjusted): 1997 2015
Periods included: 19
Cross-sections included: 21
Total panel (balanced) observations: 399
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INCPC_POS	0.168815	0.054678	3.087413	0.0022
INCPC_NEG	0.064217	0.143928	0.446177	0.6557
INF	-0.016755	0.006041	-2.773738	0.0058
INT	0.000639	0.005293	0.120739	0.9040
HE	0.425649	0.166296	2.559589	0.0109
DPTOTAL	-0.673248	0.277923	-2.422425	0.0159
C	1.146273	1.134297	1.010558	0.3129

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.988482	Mean dependent var	-0.509839
Adjusted R-squared	0.987677	S.D. dependent var	2.156253
S.E. of regression	0.239367	Akaike info criterion	0.043635
Sum squared resid	21.31437	Schwarz criterion	0.313565
Log likelihood	18.29476	Hannan-Quinn criter.	0.150541
F-statistic	1227.859	Durbin-Watson stat	0.582992
Prob(F-statistic)	0.000000		

Appendix4.18 Asymmetric Model with INCPC Proxy (Random Effect Model)

Dependent Variable: LIP
Method: Panel EGLS (Cross-section random effects)
Date: 01/26/18 Time: 08:02
Sample (adjusted): 1997 2015
Periods included: 19
Cross-sections included: 21
Total panel (balanced) observations: 399
Swamy and Arora estimator of component variances
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INCPC_POS	0.162117	0.054901	2.952894	0.0033
INCPC_NEG	0.063202	0.165776	0.381251	0.7032
INF	-0.017203	0.006591	-2.610328	0.0094
INT	0.000174	0.005420	0.032178	0.9743
HE	0.447695	0.175962	2.544277	0.0113
DPTOTAL	-0.660072	0.303793	-2.172765	0.0304
C	1.055606	1.240871	0.850698	0.3955

Effects Specification

	S.D.	Rho
Cross-section random	1.808146	0.9828
Idiosyncratic random	0.239367	0.0172

Weighted Statistics

R-squared	0.231832	Mean dependent var	-0.015477
Adjusted R-squared	0.220074	S.D. dependent var	0.274137
S.E. of regression	0.242100	Sum squared resid	22.97606
F-statistic	19.71746	Durbin-Watson stat	0.542233
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.015142	Mean dependent var	-0.509839
Sum squared resid	1822.453	Durbin-Watson stat	0.006836

Appendix 4.19 Asymmetric Model with INCPC Proxy (Redundant Fixed Effect Model)

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	1217.668623	(20,372)	0.0000
Cross-section Chi-square	1674.479855	20	0.0000

Cross-section fixed effects test equation:
Dependent Variable: LIP
Method: Panel Least Squares
Date: 01/27/18 Time: 00:43
Sample (adjusted): 1997 2015
Periods included: 19
Cross-sections included: 21
Total panel (balanced) observations: 399
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INCPC_POS	-1.044869	0.204000	-5.121908	0.0000
INCPC_NEG	-0.789035	0.863359	-0.913913	0.3613
INF	-0.181700	0.051421	-3.533590	0.0005
INT	-0.219784	0.036276	-6.058698	0.0000
HE	0.742389	0.478735	1.550730	0.1218
DPTOTAL	-0.381328	0.929416	-0.410288	0.6818
C	1.382775	3.622649	0.381703	0.7029

R-squared	0.234422	Mean dependent var	-0.509839
Adjusted R-squared	0.222704	S.D. dependent var	2.156253
S.E. of regression	1.901048	Akaike info criterion	4.140076
Sum squared resid	1416.682	Schwarz criterion	4.210058
Log likelihood	-818.9452	Hannan-Quinn criter.	4.167792
F-statistic	20.00519	Durbin-Watson stat	0.078221
Prob(F-statistic)	0.000000		

Appendix 4.20 Asymmetric Model with INCPC Proxy (Hausman Test)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	15.001577	6	0.0202

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
INCPC_POS	0.168815	0.162117	0.000019	0.1236
INCPC_NEG	0.064217	0.063202	0.000063	0.8985
INF	-0.016755	-0.017203	0.000000	0.0078
INT	0.000639	0.000174	0.000000	0.0134
HE	0.425649	0.447695	0.000373	0.2534
DPTOTAL	-0.673248	-0.660072	0.000350	0.4812

Cross-section random effects test equation:
Dependent Variable:L IP
Method: Panel Least Squares
Date: 01/26/18 Time: 08:03
Sample (adjusted): 1997 2015
Periods included: 19
Cross-sections included: 21
Total panel (balanced) observations: 399

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.146273	1.074106	1.067187	0.2866
INCPC_POS	0.168815	0.056971	2.963155	0.0032
INCPC_NEG	0.064217	0.143894	0.446280	0.6557
INF	-0.016755	0.005791	-2.893140	0.0040
INT	0.000639	0.005334	0.119821	0.9047
HE	0.425649	0.176193	2.415809	0.0162
DPTOTAL	-0.673248	0.267298	-2.518719	0.0122

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.988482	Mean dependent var	-0.509839
Adjusted R-squared	0.987677	S.D. dependent var	2.156253
S.E. of regression	0.239367	Akaike info criterion	0.043635
Sum squared resid	21.31437	Schwarz criterion	0.313565
Log likelihood	18.29476	Hannan-Quinn criter.	0.150541
F-statistic	1227.859	Durbin-Watson stat	0.582992
Prob(F-statistic)	0.000000		