"THE DETERMINANTS OF PRIVATE SAVING IN MALAYSIA FROM 1985 TO 2010"

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DECLARATION

We hereby declare that:

1. This UKEZ3026 RESEARCH PROJECT is the end result of our own work and that due acknowledgement has been given on 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 institutions of learning.

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

4. The words count of this project report is 12700.

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Abstract

The purpose of our paper is to narrow down the determinants of private saving in Malaysia with references from past researches. This is because of the importance of private saving when considering a country's economic stability and conditions. With a good understanding of its determinants, effective policies can be devised and implemented to maintain economic stability and growth and also identifying harmful policies and correcting them. We use regression analysis (OLS) and ran several diagnostic tests on the data to address common assumptions of the model and the variables studied—GDP per capita, inflation rate, and government budget.

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Chapter 1: Research Overview

1.0 Introduction

For the past few decades, saving is often being mentioned as a key component or variable in a country economy system. This is because saving is an important input to encourage economic growth in long run. In macroeconomic aspect, national saving is always assumed to be equal with total investment of the country. This assumption has implied that the amount of a country gross investment will be influenced a lot by the amount of savings available in the country. Hence, this means that the higher the saving amount in a country, the larger the investment capacity of the country.

National saving consists of two components which are public saving and private saving. In IS-LM model, Public saving will be obtained by using government revenue that primary comes from tax less the government expenditure. Meanwhile, private saving is the balance of disposable income minus the private consumption. Mckinnon (1973) and Shaw (1973) have suggested to the government to implement financial liberalization to encourage saving which will then enhance economic growth. However, this policy will not able to perform its effect if there is the presence of deregulation policy at the same time.

Thus, the government should identify other potential determinant that will affect both public saving and private saving. Besides, the government should also identify the relationship between all potential determinants and the saving amount in a particular country. Finally, the government must able to execute appropriate policy to work on the determinant in order to increase saving. For example, assuming that inflation is a potential determinant of the private saving in country A, and its government has found out there is positive correlation of inflation with private saving. Consequently, the government should execute a suitable policy to stimulate the economy such as implementing of monetary expansion policy.

Next, we will explain the trends of private saving, and other independent variables in Malaysia after get the data.

1.1 Historical Background of Malaysia

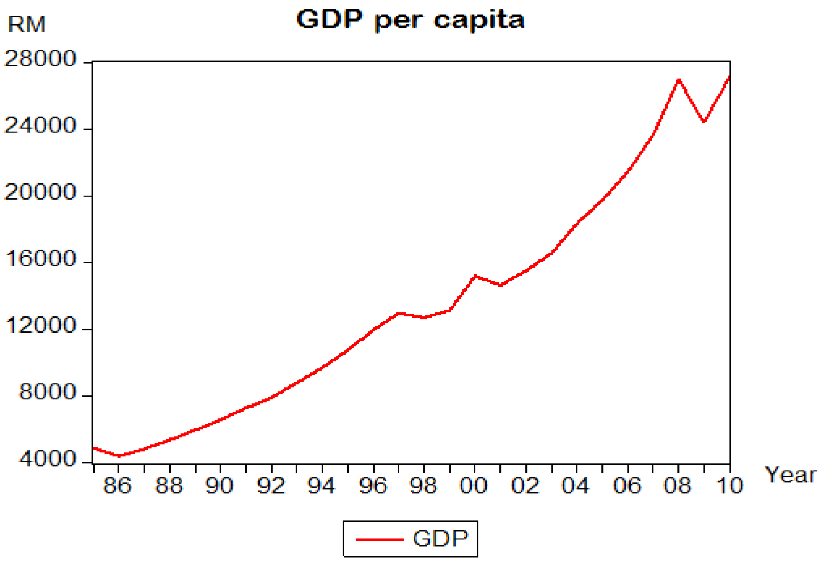


Figure 1: GDP per capita from 1985 to 2010 in Malaysia

Figure 1 shows that GDP per capita in Malaysia. It has been soaring throughout the years, about 7 times greater than in 1985, thanks to the economic development in the South East Asia. Year 1997 saw a slight dip due to the Asian crisis, of which the Malaysia government dealt with expeditiously. Year 2008 has a sudden drop due to the global recession, spurred by the United States dismal growth.

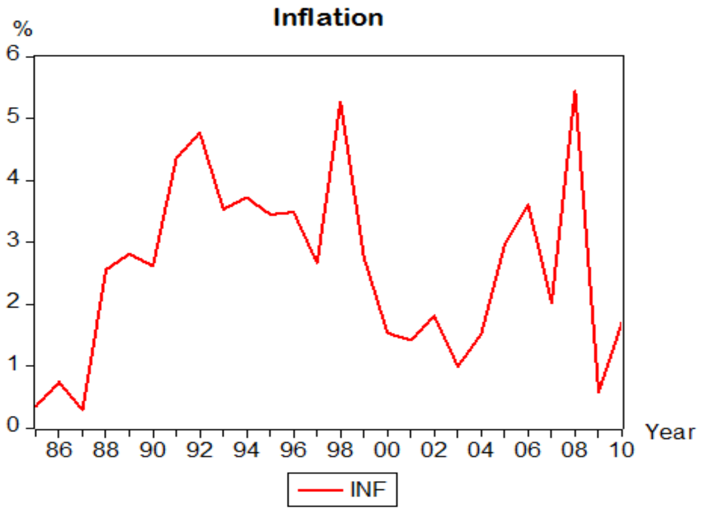


Figure 2: Inflation trend from 1985 to 2010 in Malaysia

Figure 2 shows the inflation in Malaysia over the years, which has fluctuated greatly but largely it has been maintained in between 1% to 5%, a good sign for economic health. Again, year 1997 and year 2007 saw spikes in inflation due to major economic events i.e. the Asian Financial Crisis and Great Recession in the US.

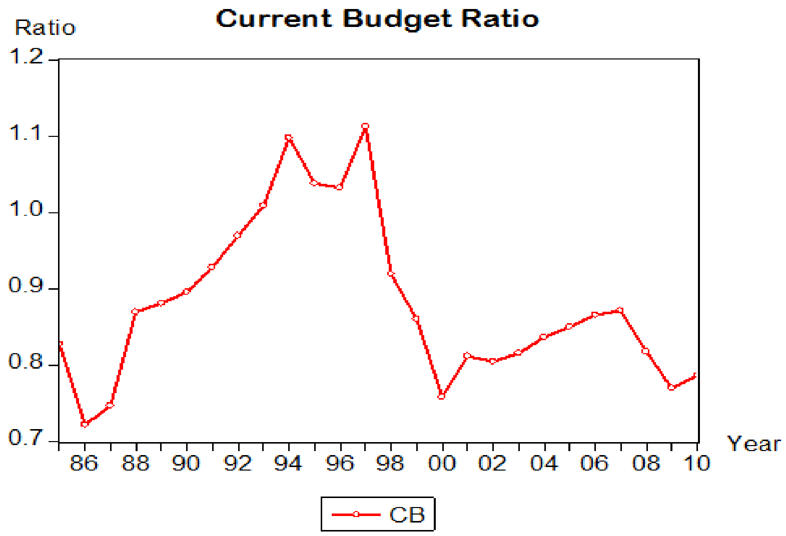


Figure 3: Current Budget Ratio

(Total government revenue/ total government expenditure)

Figure 3 shows the government budget of Malaysia throughout the years. The budget stays relatively balanced in the first two decades studied, until year 1998, which coincides with the Asian Financial Crisis. The budget plunges into deficit until year 2000, where it the deficit stays the same for another 7 years. It then plunges once more in late 2007, coinciding with the onset of the 2008 global recession.

1.2 Problem Statement

In the past few decades, there are many different opinions (either in theory or empirical result in past researches) on potential determinants of private saving. Unfortunately, past researches often come out with different empirical results. This is because different researchers are using different country and different time period as their research's target. This situation has raised an uncertainty in setting of the potential determinant of private saving.

Besides, there are also a few theories that give its opinion on determinants of private saving. For example, Ricardian Equaivalance stated that public saving (government budget) will have negative relationship with private saving. Similarly, Life Cycle Model suggested that age will also have negative relationship with private saving. However, some of the researchers have rejected these theories because they do not obtain empirical result that parallel with the theories' concept in their researches. Hence, this situation has affected validity of the theories.

Due to the problem in above, the identification of determinants of private saving still remain ambiguous, and that is less possible that able to draw a general conclusion on this issue due to difference of saving behavior of citizens in different country. Hence, it will cause a problem for policy makers in deciding the policy that used to increase private saving in a country.

1.3 Research Questions

1. In past research study, many of the researchers suggested that theory of Life Cycle Model, as well as Permanent Income Hypothesis has always been used to determine the effect of income per capita towards private

saving. Therefore, **which of these theories describes the effect of income per capita towards private saving in Malaysia from 1985 to 2010?**

2. Theory of Ricardian Equivalance and Life Cycle Model always been used to study the impact of current budget on private saving. However, there are also researchers who are against these theories. Thus, **is Ricardian Equivalance or Life Cycle Model holds in Malaysia for the period of 1985-2010?**
3. Inflation is one of the potential variables that will affect private saving in the country. However, its impact towards private saving is still an inconclusive. Hence, **what is the impact of inflation on Malaysia's private saving from 1985-2010?**
4. The resources of Malaysia investment are largely generated from savings, thus it is essential to the government to identify which policy should be implemented to increase saving either private saving or public saving to prevent wrongly implementation of policy that will reduce the saving rate. Hence, **what is the suitable policy that needs to be executed to increase saving rate?**

1.4 Objectives

1. To identify the relationship between income per capita and private saving in Malaysia during 1985 to 2010.
2. To determine the potential relationship between government current budget and private saving in Malaysia during 1985 to 2010.
3. To examine the relationship between inflation and private saving in Malaysia during 1985 to 2010.
4. To suggest the appropriate policy that can be used by government to increase private saving.

1.5 Reason choosing Malaysia as A Case Study

1. Malaysia is rapidly developing economies with high growth and has a constantly expanding of private savings.
2. Malaysia has a relatively good and reliable sources of data compared to other developing nations.

1.6 Significance of Study

This research aims to contribute to the existing literature regarding potential determinants of private saving by developing a regression model for private saving in Malaysia. Through tracking down the important determinants of private saving and their relationship with each other, this study hope to aid policymakers in their decision making by providing a clear reference of what determinants affect private saving.

In addition to that, we try to verify the Life-Cycle Theory and Ricardian Equivalence on private savings with regard to major events like the 1998 Asian Financial Crisis in Malaysia. This is an important subject because a theory's validity is extremely dependent on its handling of outlier events.

We also hope to shed some light on the inconclusive results from past researches for some of the variable studied, e.g. interest rate and fiscal policies, all of them crucial to economic health and stability. If however, we fail to produce meaningful result or a good research framework, this study would at least serve as a precaution on mistakes/errors committed on our part.

Chapter 2: Literature Review

2.1 Private Saving

There are several definitions for private saving. Firstly, private saving has been defined as the remaining income or unused income of the private citizens after paying taxes and spending on consumption goods (Mankiw, 2011). Hence, a formula has been created based on this definition to measure or calculate private saving. The formula stated as in the following: S_P (Private saving) = Y (income) – T (taxes) – C (consumption). Based on the definition and formula in above, private saving rate will be depended on the income level. The income is represented by the sum of personal sector income and corporate income. The personal sector includes the household and also nonprofit institution serving household (NPISHs). For measurement of personal sector income, it is more precise if using household income instead of personal sector income because household income will exclude the rental incomes, interest and dividend received by the NPISHs (Reinsdorf M. B., 2007). As a result, the total income for the personal sector will not be overestimated.

Besides, private saving has also been defined as the component of personal income not spent on final consumption goods (including durable goods) but is instead used to finance firms/institutions in the equity market/bond market, or invest in real assets such as properties and real estates (Reinsdorf M. B., 2005). In this definition, only expenditure on durable goods will be included in the total consumption of private citizens and this measurement of consumption has been argued by other researchers. David & Scadding (1974) and Holloway (1989) suggested that the impute rental flow of durable goods should be also included in measurement of total consumption of private citizens. Impute rental flow of durable goods refer to income advantages of people who live in houses they own themselves instead of rental. In other words, it is the amount of the rent that can be avoided by the home owners in order to rent the similar accommodation in the free market. Kuhn (2010)

Meanwhile, Denison (1958) stated that private saving is the sum of net personal saving, net corporate saving and capital consumption allowances. Net corporate saving means that the difference between the income and consumption of a business firm while capital consumption allowances refer to the consumption of capital through depreciation in the processes of economic production. In other words, it means that the part of gross domestic product (GDP) which is due to depreciation Crozier (2008) However this definition has been questioned. David & Scadding (1974) argued that the household saving should be separated with corporate saving due to credit rationing and difference on the type of assets and liability for both of these sectors. For example, they may have differences in liquidity properties and liability duration Boskin (1991).

There are many significant empirical evidence shows that the aggregate saving rate is having a positive relationship with the investment rate in both time series and cross country data Marrinan & Wincoop (1996). Since private saving is one of the component of aggregate saving, it is important to identify the potential determinants of private saving. Thus, the following part of the literature review will discuss on this issues. The discussion on the potential determinants of private saving will be based on some theory that related with private saving such as Life Cycle Model and Ricardian Equivalence and also some of the empirical result in the past studies.

2.2 Income per Capita

a) Life Cycle Hypothesis

Life cycle hypothesis (Modigliani & Brumberg, 1954) suggests that consumers smooth their consumption over their lifetime, resulting in higher saving during period of high income. The theory states that without bequest motive, saving of any individual is zero over a lifecycle and in the condition of zero growth, aggregate saving will be zero too. In other words, private saving rate of a country is independent of its income per capita unless there is growth for the income per capita. Based on this theory

(Browning & Crossley, 2001), it states that the growth of income per capita has a positive relationship with private saving rate. This implies that private savings rate is higher in fast growing countries.

In short, the growth of income per capita is higher in fast growing country in which people have more money for consumption and saving. If life cycle hypothesis hold, then we should expect **positive** coefficient for growth of income per capita.

b) <u>Permanent Income Hypothesis</u>

Meanwhile, permanent income hypothesis of (Friedman, 1957) suggests different opinion from the above theory. It states that income per capita growth will actually decrease the private savings rate.

Permanent income hypothesis suggests that a person's consumption at a given time is determined not only by his/her current income but also by their expected income in the future, hence it is called permanent income. The movements in saving are determined by movements in income (Campbell, 1987). For instance, people should save more when they expect their incomes to decrease in the future likewise people should save less when they expect them to rise. Furthermore, when current growth is considered as an indication of future growth, people will expect future income to be greater than today income therefore people will save less. In other words, saving will decline when consumers' confidence is high and vice versa. Today growth and growth in the future will increase permanent income as well as consumption more than it increase current income and thus depressing saving (Jappelli and Pagano, 1997, Caroll and Weil, 1994). In particular, Kraay (2000) uses panel data on China to analyze the determinants of the saving rates of rural and urban households finds that, in the case of rural households, future income growth has a negative and significant impact on their saving rates.

In short, people anticipating higher future income when increased in today income, so they will increase current consumption and decrease their saving against future earnings. If permanent income hypothesis hold, then we should expect growth of income per capita carry a **negative** coefficient.

Therefore, these different arguments above have caused inconclusive result in determination of relationship between national income (income per capita) and the private saving rate in a country.

2.3Current Budget

Current budget represents public saving of a country's government. The amount of government savings (public savings) or current budget will be obtained by using government tax revenue minus government spending, the public savings will decrease or budget deficit will occur if government spending is more than its tax revenue. Meanwhile, there will be budget surplus if government tax revenue is more than its spending.

a) <u>Life Cycle Model</u>

There are a few theories which suggest that private savings of a country will be affected by the country's government savings or government current budget. Firstly, there is the neo-classical version of **life cycle model** which proposes a positive relationship between government saving and private saving. For example, decline in government savings through expansionary fiscal policy will increase consumption and discourage saving because the tax burden of a country's citizen has been reduced (Ozcan, Gunay, & Ertac, 2003). If this model holds, then we should expect a **positive** coefficient for current budget.

b) <u>Ricardian Equivalence</u>

On the other hand, the **Ricardian Equivalence** proposition has contrasting views on the relationship between government saving and private saving (Ricardo, 1846). It states that current budget has negative relationship with private saving. For example, current budget of a country will be decreased when expansion fiscal policy been implemented (reduce tax and increase government spending). This will cause the citizens in a country anticipate payment of higher tax in future to bear the increasing burden of government (decrease of current budget). As a result, the citizens will increase their saving to ensure that they have sufficient ability to pay the tax in future. Hence, the negative relationship has occurred between private saving and current budget. If Ricardian Equivalence holds, then we should expect current budget carry a **negative** coefficient.

However, Ricardian equivalence has also been rejected by empirics. For example, Corbo & Schmidt-Hebbel (1991) uses the evidence of his empirical test to estimate that there is about 50% of offset of private saving of change in government saving. Haque & Montiel (1989) also reject Ricardian theory by testing the sample of developing countries. They suggested that the Ricardian equivalence will fail due to the presence of liquidity constraints which will affect some of the individual saving behavior. In addition, Domenech, Taguas, & Varela (2000) has done a research by using OECD countries as the sample to investigate the relationship between budget deficits and national saving. Based on their result, they also reject the Ricardian equivalence by saying the private saving will only compensated a fraction on budget deficit. Lastly, Seater (1993) stated that Ricardian theory will not be applicable in the future due to a change of government behavior compared to the past. Therefore, since there are different results from the past researches on the study of role of government budget towards private saving rate, thus there is a gap to draw a general and standard conclusion.

2.4 Inflation

Inflation might affect saving behavior through various mechanisms. The relationship between the private saving and inflation rate varied among economists, ranging from positive to the negative relationship. Most of the studies on the impact of inflation on savings found that inflation has substantial **negative** impact on savings (Heer & Süssmuth, 2006). This is due to high inflation causing rising opportunity cost in holding money and increase the benefits of spending and consuming, hence reducing savings (Miller & Benjamin, 2008). The impact on savings are dependent the households' reactions to a rise in inflation (Chopra, 1988). If they channel their savings from financial to real tangible assets, then due to them consuming related durables goods, the present savings fall. The utility of holding money declines, which will lead to greater consumption and lesser savings due to an increase in uncertainty.

Opposing this is another theory, (Chopra, 1988) which proposes that the higher uncertainty will incentivize people to save a larger part of their income as a precaution to future financial difficulties instead. Thus a rise in inflation should have a **positive** effect on savings. In particular, (Deaton, 1977) affirms that private saving may increase with rising inflation if consumers misinterpret an increase in nominal prices for an increase in the real prices and decided not to spend. Loayza, Schmidt-Hebbel, and (Serven, 2000) found a inflation is positively correlated with both private and national saving in industrial and developing nations. Similarly, (Masson et al, 1998) found the same positive correlations for industrial nations, however, a negative correlation for developing countries. With samples of six countries in East Asia and twenty in Latin America, (Gavin et al, 1997) found a positive and significant effect of inflation on saving when lagged effects are factored into consideration. Whereas, (Bandiera et al, 2000) findings indicated that there is one positive and significant relationship while there are two or three significant and negative relationship dependent on their respective specifications, in addition to finding the others to be insignificant in the sampled eight developing countries. Moreover, (Edwards, 1996) found no significant relationship between inflation and savings, in either of their sampled developing nation or mixed-country. (Gupta, 1987) found a positive and significant relationship between unexpected inflation and saving rate for the sampled Asian nations.

In short, inflation creates uncertainty and macroeconomic instability. (Carroll, 1991) indicates that future uncertainty causes people to save more as they face an uncertain change in living costs. In addition, Skinner (1988), Zeldes (1989) and Sandmo (1970) observe that in the case of inflation driven uncertainty relating to future income growth, households who are risk-averse tends to save more as a precaution to drastic changes in income. Similar to other findings, the study deduce that this uncertainty may induces households to increase their purchases to before prices increase further. Hence, the effect of inflation on saving rate is **ambiguous** theoretically and practically (Heer and Suessmuth, 2006; and (Deaton and Paxson, 1993). Therefore, since there are different results from the past researches on the study of role of inflation towards private saving rate, there is a gap in drawing a general and standard conclusion.

Chapter 3: Methodology

3.1 Introduction

In Chapter 2, we explain the various opinions on potential determinants of private saving suggested by the theories or researchers. This part of paper will discuss on the method used by this research to produce a significant and efficient empirical results. Besides, this part of paper will also provide a specific regression model for private saving in Malaysia during period of 1985 to 2010. Next, it will also show the sources of the data and the type of the data used in this research.

Several tests will be discussed on this part of paper also. For example, unit root test (Augmented Dickey Fuller, 1981) will be conducted to test stationarity of the variables. Furthermore, cointegration test (Johansen & Juselius, 1990) will be used to determine long run relationship among the variables. Moreover, diagnostic test for Ordinary Least Square (OLS) such as White Heteroscedasticity test and Durbin Watson test will be also carried out to identify whether the regression model fulfills the assumptions of classical linear regression model (CLRM) or not.

3.2 Type of Research

The research that been conducted in this paper is an example of a causal research. This type of research can be used to identify whether there is cause and effect relationship among the variables or not. Besides, causal research can also measure the degree of the impact of a change in an independent variable towards a change in a dependent variable (DJS Research Ltd., 2005). Hence, causal research is the most suitable research type for the research in this paper because it is able to determine the cause and effect relationship between the independent variables (income per capita, real interest rate, current budget, age dependency ratio, and inflation rate) and the dependent variable (private saving).

Despite of causal research, the research in this paper can also be considered as quantitative research. This type of research uses numerical data to develop a mathematical model, theories or hypothesis that can be used to describe a phenomena or trend (Sibanda, 2009). Hence, our research in the paper will be conducted under quantitative research as the data of all variables is in numerical form.

3.3 Model Specification

Given the theories and empirical evidences from previous studies (Hafizah & Hussien, 2010), a private saving (PS) function can be expressed as follows:

$$PS_t = f\,(GDP_t, INF_t, CB_t)$$

The symbol of PS_t represents private saving, GDP_t represents income per capita, INF_t represents inflation rate, CB_t represents government current budget (budget deficit/budget surplus).,

An econometric model has been formed to estimate the effect of LogGDP, INF, and CB on LogPS:

$$Log\,(PS_t) = \beta_0 + \beta_1\, Log\,(GDP_t) + \beta_2\, INF_t + \beta_3\, CB_t + \mu_t$$

In the above model, $_t$ represents time series data and β represents the coefficient of the independent variables. Meanwhile, μ_t is the disturbance or error term. This term capture the effects of other variables or factors that not mention in the model on the variation of the dependent variable in the model.

The dependent variable in this model will be Log Private Saving (*logPS*). Meanwhile, independent variables in this model are Log Income per Capita (*logGDP*), Inflation rate (*INF*) and Government Current Budget (*CB*).

For Income per Capita, we have use gross domestic product per capita (GDP) to represent it. Based on (Landefeld, Seskin & Fraumeni, 2008), gross domestic product will represent total value of final output that been produced within a country in a given period. They stated that production of those output will generate income (wage, rent and others) for the owner of production factor, and thus gross domestic product will equal to the income earned by factor of production in a country. As a result, gross domestic product can be used as an indicator to measure national income. Thus, in our research, we have used gross domestic product per capita (GDP) to represent the income per capita.

Meanwhile, the government current budget (CB_t) that used in this research will be express in term of ratio form, which is *government total revenue/government total expenditure*.

Based on the model, it will show the effect of percentage change of GDP and on the percentage change of PS. Moreover, the model will also show the effect of change of 1 unit of INF and CB on the percentage change in PS.

3.4 Hypothesis for the Model

Each independent variable in the regression model has its own hypothesis. The hypothesis for each independent variable will be shown in following:

a) Income per capita

H_0: There is no relationship between income per capita and private saving

H_1: There is relationship between income per capita and private saving

b) Government Current Budget

H_0: There is no relationship between government current budget and private saving

H_1: There is relationship between government current budget and private saving

c) Inflation Rate

H_0: There is no relationship between inflation rate and private saving

H_1: There is relationship between inflation rate and private saving

3.5 Data and Variables

The research in this paper uses secondary data. This means that the data which used in this research has been prepared by other person or agencies in the past for their own purpose. As mentioned in above, all the data that been used in this research are quantitative data, which means that all the data are in numerical form.

This research uses the annual data for Malaysia from the year of 1985 to 2010. There are several sources to retrieve or obtain the needed data of variables such as World Data Bank (inflation rate and income per capita), Ministry of Finance Malaysia (government current budget data) and Annual Reports of Bank Negara Malaysia (private saving data). The data of private saving, and current budget (government revenue and government expenditure) is measured with the unit of RM in million (constant price by using 2000 as base year) whereas income per capita is measured with the unit of RM. Then, the data of private saving and income per capita is been logged for interpretation purpose. The variables which appear in the regression model (in the empirical result part) will be represented as below symbol:

LPS	Log Private Saving (RM in million) (constant price, 2000 as base years)
LGDP	Log Income per capita (RM) (constant price, 2000 as base years)
CB	Government Current Budget (express in ratio form, *total government revenue/ total government expenditure)*
INF	Inflation Rate (%)

Descriptive statistic for each variable in the model has been carried out and show in the following table:

Table 1: Descriptive Statistic

	LPS	LGDP	CB	INF
Mean	10.78076	9.364224	0.880692	2.575654
Median	10.87446	9.458202	0.863432	2.640158
Maximum	12.15435	10.20777	1.112096	5.440782
Minimum	9.20954	8.385717	0.722247	0.290008
Std. Dev.	0.815037	0.566656	0.105986	1.467489
Skewness	-0.000905	-0.209779	0.718831	0.233049
Kurtosis	2.093064	1.88656	2.661317	2.233551
Jarque-Bera	0.891082	1.533759	2.363374	0.871749
Probability	0.640478	0.46446	0.306761	0.646699
Sum	280.2998	243.4698	22.898	66.967
Sum Sq. Dev.	16.60714	8.027469	0.280828	53.83809
Observations	26	26	26	26

3.6 Tests for the Data

3.6.1 Unit Root Test

Unit root test is a very essential test to ensure that all the variables in the model are in stationary state. A regression model will become not realistic if not all variables are stationary (Hafizah & Hussien, 2010).

A variable will be considered has unit root or not stationary if there are changes in its mean and variance over time. It is important to ensure that all the collected data must be stationary or do not contain unit root for it to not violate the assumption of CLRM. Besides, all the data have to be stationary to prevent the occurrence or generation of spurious regression problem. Typically, spurious regression problem will cause a misleading and invalid result although the model has a significant t-statistic, high value of R^2 and low Durbin-Watson statistic. If this happen, a pair of totally uncorrelated variables will be shown to have significant relationship (misleading result). As a result, this cause the regression model becomes totally untrustworthy and unreliable.

Thus, it is important to conduct unit root test in our research to test the stationarity of the collected data and thereby ensure trustworthy and reliability of our regression model. There are a few unit roots test that can be carried out. However, in our research, we have chosen Augmented Dicky Fuller (ADF) test and Phillips-Perron (PP) test as our unit root test.

a) Augmented Dicky Fuller (ADF) test

Augmented Dicky-Fuller (ADF) test is the most common method to test whether a variable has unit root or not. The test statistic value in this test will in negative number. The test statistic that has higher magnitude of negative number will have a stronger probability to reject the null hypothesis of ADF test. In simple word, the more negative the ADF test statistic value, the higher the probability to reject the null hypothesis of the test. ADF test will be carried out by using the following equation:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-1} + \varepsilon_t$$

Based on the equation in above, Y is the variable of interest in this research (LPS, LGDP, INF and CB), t represents time trend, Δ represents differencing operator, and ε_t represents noise residual of zero mean (pure white noise) and constant variance. Meanwhile, β_1, β_2, α_i, and δ represent parameters to be estimated. The null hypothesis for ADF test is that δ equal to zero or the variable is not stationary while the alternative hypothesis is that δ not equal to zero or the variable is stationary. The null hypothesis for this ADF test will be rejected if the test statistic value is negatively less than the test critical value (computed ADF test statistic value higher than critical value in absolute value). When null hypothesis of ADF test successfully been rejected, it indicates that the data is stationary

Hypothesis for ADF test:

H_0: Y_t is a unit root or non-stationary

H_1: Y_t is stationary

b) Phillips-Perron (PP) test

Typically, Phillps-Perron (PP) test is closely similar to ADF test which mentioned in above. The only difference between both tests is that PP test amends the high order serial correction by making a correction to the t statistic of the coefficient δ ADF test add lagged differenced terms on the right hand side. Both PP and ADF test can be carried out with the inclusion of intercept, an intercept and trend or neither in the test regression. Similar to ADF test, PP test will also be carried out by using the following equation:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-1} + \varepsilon_t$$

Based on the equation in above, Y is the variable of interest in this research (LPS, LGDP, INF and CB), t represents time trend, Δ represents differencing operator, and ε_t represents noise residual (pure white noise) of zero mean and constant variance. Meanwhile, β_1, β_2, α_i, and δ represent parameters to be estimated. The null hypothesis for PP test is that δ equal to zero or the variable is not stationary while the alternative hypothesis is that δ not equal to zero or the variable is stationary. The null hypothesis for this ADF test will be rejected if the computed PP test statistic value is higher than test critical value in absolute value. When null hypothesis of PP test successfully been rejected, it indicates that the data is stationary.

Hypothesis for PP test:

H_0: Y_t is a unit root or non-stationary

H_1: Y_t is stationary

3.6.2 Cointegration Test

If the time series data of a variable is proven not stationary in level form, then a corintegration test need to be performed to determine the cointergration relationship among the variables. By performing cointergration test, variables in a regression model that been proven not stationary in level form (after carried out unit root test) not need to be differentiated in first order or second order form.

In our research, we will use the cointegration test that provided by Johnson and Juselius (1990), JJ Cointegration Test. This test has been widely used if there is a stationary linear combination of nonstationary random variables, and those variables have long run relationship when they tied together. If a stationary series can be obtained by differencing the series for *d* times, then it is referred as 'integrated of order (*d*)'.

Hypothesis for JJ Cointegration Test

$H_{0:}\ \gamma = 0$ *(The series do not cointegrated)*

$H_{1:}\ \gamma < 0$ *(The series are cointegrated)*

There are a few procedures to conduct JJ Cointegration test. Firstly, we need to determine the number of countegration vector among a vector of series by using the following VECM model:

$$\Delta Y_t = \Pi\ Y_{t-k} + \Gamma_1\ Y_{t-1} + \Gamma_1\ Y_{t-2} + \ldots + \Gamma_k\ Y_{t-k} + \varepsilon_t$$

In which, Δ represent difference operator, Y_t represent all the variables (LPS, LGDP, CB and INF) in this research which represented as a column vector. Π is error correction term (ECT) or long run relationship between the variables in Y_t process while Γ_i represents coefficient matrices. The *t* refers to the time trend used (1985 -2010 in this research) while *k* is the lagged period.

The rank of ECT or Π will indicates whether cointegration exist in the vector (those variables) or not. If the rank of ECT or Π is equal to zero, then it implies that no cointegration exists among those variables used in the research. If Π is equal to the number of variables (*k*), then Y_t is a stationary process. If the rank of Π more than zero but less than *k* (0< Π<*k*), then it indicates that there are Π cointergating vectors.

After the procedure mentioned in above, there are two likelihood ratio test statistic that need to be used to determine the number of cointegrating vectors. These tests are known as Trace and Maximum Eigenvalue Statistic.

Trace Test

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln(1-\hat{\lambda}_i)$$

In this equation, *T* represents number of observation (sample size), while *k* represents number of variables. Meanwhile, λ_i refers to the estimated values of the characteristic roots (known as eigenvalue) which been obtained from Π matrix.

Trace test will test the null hypothesis under this testing sequence, r = 0, 1, 2, …, k-1, so that the hypothesis for λ_{trace} will be as in the following:

$H_0: r = 0$	$H_1: 0 < r < 1$
$H_0: r = 1$	$H_1: 0 < r < 2$
…	…
$H_0: r = k-1$	$H_1: r = k$

Maximum Eigenvalue Test

$$\lambda_{max}(r, r+1) = -T\, IN\, (1 - \lambda_{r+1})$$

Maximum Eigenvalue test is more powerful than trace test as its alternative hypothesis (H_1) different as in trace test. The null hypothesis for Maximum Eigenvalue Test will also under the testing sequence that similar with Trace Test which are r = 0, 1, 2, …, k-1, thus the hypothesis for Macxmimu Eigenvalue Test will be as in the following:

$H_0: r = 0$	$H_1: r = 1$
$H_0: r = 1$	$H_1: r = 2$
…	…
$H_0: r = k-1$	$H_1: r = k$

r value will continue to increase until the null hypothesis no longer can be rejected ($r = k$)

3.7 Method of Estimation of the Regression Model

The research that been conducted in this paper will use Ordinary Least Square Method (OLS) to estimate the regression model. Based on Gauss-Markov Theorem, a linear regression model that has zero mean value of error, uncorrelated error (no relationship with other error and no relationship with independent variables), and constant variance of error will have the **best linear unbiased estimators** or abbreviated as **BLUE**—the value of estimator predicted by OLS is equal to its true value on average and the OLS estimator will have the minimum variance among other linear unbiased estimators.

In this research, OLS method is used to capture the relationship between the dependent variable (LPS) and the independent variables (LGDP, INF and CB).

Since there are three independent variables in the regression model, thus Multiple Regression Model has been selected for this research rather than simple regression model. Under multiple regression model, several items can show the fitness or strength of the model. Firstly, R^2 will tell us about the fraction of the change in a dependent variable that is due to the change in the independent variables. The higher the value of R^2, the better the regression model. Besides, F test can be also used to measure the efficiency of a model. It will show overall significance of a regression model. Lastly, t-test can be used to test individually significance of an independent variable towards the dependent model. Hence, t test will tell us about which independent variables are most probably the determinants for private saving (independent variables that been proven individually statistically significant) in Malaysia during 1985 to 2010.

3.8 Assumption of Ordinary Least Square

There are several assumptions of OLS that need to be fulfilled by a regression model in order to obtain BLUE estimators. Firstly, the regression model must linear in parameter (ß). Secondly, the sample size must be more that the number of independent variables in the specified model. Next, the mean value of error term should be equal to zero. Furthermore, the error term of a model must be normally distributed, especially for the model that uses small sample size. Fifthly, there is no autocorrelation between the errors term in the model. Moreover, the error or disturbance should not have relationship with the independent variables (homoscedasticity or no heteroscedasticity). Besides, there must also do not have perfect multicollinearity between the independent variables in the model. Last but not least, the value of independent variables must also in non-stochastic manner.

Several diagnostic tests need to be conducted to test the availability of the assumption multicollinearity, autocorrelation, and heteroscedasticity in a regression model. The type of test that needs to be conducted is shown in the following part of this paper.

3.9 Diagnostic Test for OLS model

3.9.1 Jarque Bera Test

A histogram of errors in the regression model can be constructed or drawn before conduct Jarque Bera Test to test for normality of error. The pattern of error in a histogram should be in bell shaped if it is normally distributed. However, histogram of error is not a formal way to test for normality of error.

Jarque Bera Test is the formal method in detection of this problem (normality of the error term). The test will use the skewness of the error and kurtosis to calculate the test statistic value. The error of a regression model will be considered normally distributed if the error's skewness is equal to zero or very closer to zero and the error's kurtosis is equal to 3 or very closer to three.

The null hypothesis and alternative hypothesis for Jarque Bera Test will be shown as following:

H_0 = *There is normally distribution of errors in the regression model*

H_1 = *There is not normally distribution of errors in the regression model*

The null hypothesis of the test will be rejected if the p-value for Jarque Bera Test is less than the level of significance (α).

3.9.2 White Heteroscedasticity Test

Presence of heteroscedasticity will cause a regression model become inefficient (does not has minimum variance). Besides, it will also cause the t-test statistic of a model become bias. Thus, it is essential to conduct a test to identify whether or not the model commits hetoroscedasticity problem.

In our research we have use White Heteroscedasticity Test (one of the methods) to detect this problem. The null hypothesis and hypothesis in this test is shown as following:

H_0 = There is no heteroscedasticity in the model

H_1 = There is heteroscedasticity in the model

The null hypothesis in White Heteroscedasticity Test will be rejected if the test's OBS*R-square is greater than the test critical value or p value (Chi-Square p value) of OBS*R-square is smaller than the level of significant (α).

3.9.3 Autoregressive Conditional Heteroskedasticity Test (ARCH Test)

Beside White Heteroscedasticity Test that been mentioned in above, we also use ARCH Test to identify whether the regression model in this research involve in heteroskedasticity problem or not. By carrying out ARCH Test, this can further solidify and strengthen the result obtained from White Heteroscedasticity Test.

Similar to White Heteroscedasticity Test, ARCH Test also has null hypothesis and alternative hypothesis that as shown in the following:

H_0 = There is no ARCH effect (no heteroscedasticity) in the model

H_1 = There is ARCH effect (heteroscedasticity) in the model

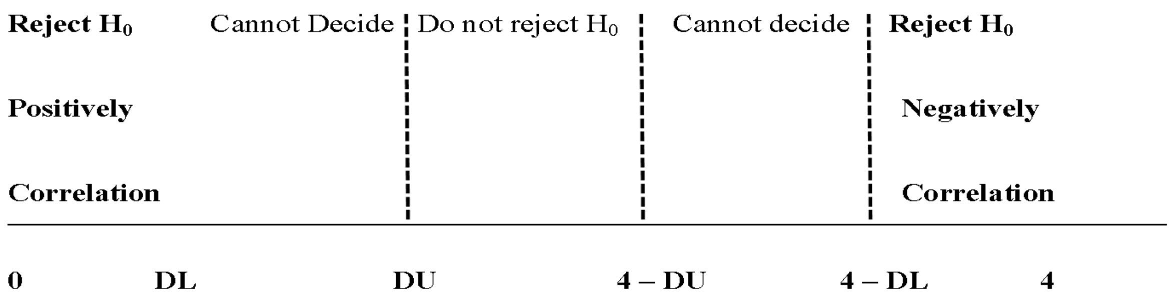
The null hypothesis of the test will be rejected if the test's OBS*R-square is greater than the test critical value or p value (Chi-Square p value) of OBS*R-square is smaller than the level of significant (α).

3.9.4 Durbin Watson Test

Autocorrelation means that there is relationship either positive or negative between neighbour residuals or errors. Similarity to heteroscedasticity, presence of autocorrelation will cause the estimator does not longer have minimum variance (inefficient) among other estimators. As a consequence, the F, t, and R^2 test for a regression model may not be valid.

For the purpose of testing whether there is the presence of first order autocorrelation in a regression model, Durbin-Watson d Test can be carried out.

Figure 4: Decision Rule of Durbin Watson d Test



The figure above shows the decision rule of Durbin-Watson d Test. DL represents lower value while DU represents upper value. Both of these values will different according to the degree of freedom of the test. The degree of freedom for this test will be decided by number of independent variables (numerator) and sample size (denominator). The null hypothesis for Durbin Watson Test is that there is no first order autocorrelation in the regression model. This hypothesis will be rejected if the Durbin Watson test statistic value lesser than value of DL or greater than value of 4 – DL.

3.9.5 Auxiliary Regressions Test

Auxiliary regressions test can be used to detect multicollinearity problem between the independent variables. Under this test, each independent variable in a regression model will be act as a dependent variable for other independent variables. After that, t-test approach will be used to determine whether or not the independent variables in the test is individually significant to the dependent variable (is actually the independent variable in a regression model). The independent variable is considered may cause a multicollinearity problem to the regression model if it is proven individually significant to other independent variable (dependent variable in the auxiliary regression test).

Besides, R^2 in auxiliary regression test can also be used to calculate the TOL ($1-R^2$) and VIF ($1/1-R^2$) value. The value of TOL will be range from 0 to 1. The closer the value of TOL to 0, the higher degree of multicollinearity problem of independent variables. An independent variable will be considered to cause a serious multicollinearity problem if its TOL value smaller than 0.1. Meanwhile, an independent variable will be considered to cause serious multicollinearity problem if its VIF value is greater than 10.

Chapter 4: Result and Interpretation

4.1 Introduction

In this chapter, result from different tests will be obtained and interpreted accordingly. Firstly, we will interpret result from two type of unit root test which are Augemnted Dickey Fuller (ADF) and Philips-Perron (PP) tests to ensure the stationary of the series. Next, result of Johnson and Juselius Cointegration test (JJ Cointegration test) will also been obtained and interpreted to determine the existence or presence of long run relationship between variables in the research.

Thirdly, we will further explain and interpret the regression result that been obtain through Ordinary Linear Square (OLS) regression model. This enable us the understand relationship (positive, negative or no relationship) between the dependent variable, Log Private Saving (LPS) and the independent variables, which are Log Income per Capita (LGDP), Inflation Rate (INF), Government Current Budget that expressed in ratio form (CB). Besides, the regression result will also enable us to identify the fitness and goodness of the regression model in this research (by looking at R^2).

Finally, we will interpret result of several diagnostic test such as White Heteroscedasticity Test, Durbin Watson Test, Jarque Bera Test and Auxiliary Regressions Test. This step is important to ensure that all the OLS assumptions are strictly obeyed and not been violated.

4.2 Unit Root Test

As mentioned in above, stationary of the time series data in this research will be tested by using two type of unit root test which are ADF test and PP test. In both test, the time series variable will be tested **without intercept** and **with intercept and trend.** The null hypothesis for both tests will be as in the following:

H_0: *Y_t is a unit root or non-stationary*

H_1: *Y_t is stationary*Time series variable that has unit root in level form (unable to reject H_0) need to be differencing in first order or second order until the null hypothesis for all the time series variables in this research is able to be rejected (all-time series variables do not contain unit root and stationary). The summary of result that obtained from E-view software will show in below table, with the level, first differencing and second differencing.

Table 2: Result of unit root test on time series data (LPS, LGDP, INF and CB)

	ADF Test		PP Test	
Level	**With Intercept and Trend**	**Without Intercept and Trend**	**With Intercept and Trend**	**Without Intercept and Trend**
LPS	-3.0817	-2.6607	-2.9503	3.0596
LGDP	-2.2426	5.1428	-2.2992	5.9887
INF	-3.5084*	-0.7303	-3.5084*	-1.3478
CB	-1.6538	-0.2916	-1.6538	-0.2916
First Different				
LPS	-4.6271***	-2.9938***	-4.6271***	-3.7342***
LGDP	-6.9848***	-0.9743	-7.6428***	-2.8007***
INF	-8.3539***	-8.3280***	-8.7353***	-8.5995***
CB	-5.1756***	-4.9801***	-5.1849***	-4.9761***
Second Different				
LPS	-7.9309***	-8.2121***	-7.9309***	-8.2660***
LGDP	-6.0897***	-6.4114***	-21.0432***	-18.4855***
INF	-5.2259***	-7.1434***	-24.9696***	-25.9551***
CB	-7.6172***	-8.0300***	-16.6705***	-18.6647***

Notes: ***, **, * indicates the null hypothesis will be rejected at 1%, 5% and 10% significant level. The null hypothesis for ADF test and PP test is the existence of unit root.

Based on Table 2, by using both ADF and PP test, at level form, all the variables (except for *INF*) are insignificance at any significant level with or without intercept and trend. In level form, only INF is significant at 10% in both ADF and PP test that with intercept and trend.

This means that in level form, majority variables (those variable that not significance in level form such as *LPS*, *LGDP and CB*) are having unit root problem and not stationary. Thus, the test will proceed to first difference to achieve stationary for all variables. At first difference, Table 2 shows that all variables are significant at any level of significance for both tests (with or without intercept and trend) except for LGDP, which are insignificant in ADF test that without trend and intercept.

Although there is only one variable that insignificant or has unit root problem, unit root test for second difference still need to be carried out to ensure all the variables in research do not have unit root problem and stationary. In second difference, it shows that all the variables are significant at 1%, 5% and 10% for both ADF and PP test (with or without intercept and trend). Based on the result obtained and listed in Table 2, we can conclude that all variables in the research (*LPS*, *LGDP*, *INF and CB*) are stationary at second difference and are integrated in the order of I (2).

4.3 Cointegration Test (JJ Cointegration Test)

In this subtopic, we will interpret the result of JJ Cointegration Test to indicate whether there is a presence of long term relationship among the variables or not (whether the variables achieve cointegration or not). The null hypothesis for JJ cointegration test will as in below:

H0: $\gamma = 0$ (The series do not cointegrated)

H1: $\gamma < 0$ (The series are cointegrated)

The JJ test computed value must greater than the critical value to able to reject the test's hull hypothesis in order to ensure that the series are cointegrated, which in other words, there is long term relationship among the variables. The summary of result for JJ Cointegration Test that obtained from E-view software will show in below table 3:

Table 3: Result of JJ Cointegration Test

Hypothesized no. of CE(s)	**Trace Value**	**Critical Value**
None	45.35164*	44.49359
At most 1	28.54253*	27.06695
At most 2	14.65536*	13.42878
At most 3	2.57014	2.705545

Notes: * indicates the null hypothesis of JJ Cointegration Test will be rejected at 10% significant.

Based on Table 3, we can see that JJ test computed value which is Trace value is greater than its critical value when the hypothesized no of CE equal to ***none, at most 1 and at most 2***. This means that the null hypothesis of JJ test is able to be rejected at three of the above situation. Thus, with this result, we can conclude that there are three cointegrating equation at 10% significance, in other words, it means that long term relationship exists among the variables in the research (*LPS, LGDP, INF and CB*).

4.4 Ordinary Least Square (OLS) Regression Result

In this part, we will interpret OLS regression result that obtained through E-view software to identify the relationship between dependent variable, between the dependent variable, Log Private Saving (LPS) and the independent variables, which are Log Income per Capita (LGDP), Inflation Rate (INF), and Government Current Budget that expressed in ratio form (CB). This test will also enable us to identify the goodness and fitness on the whole regression model.

The summary of OLS Regression result has been obtained through E-view software and shown in below table:

Table 4: Summary of OLS Regression Result

Intercept (Standard Error)	-1.343972 (1.100088)
LGDP	1.36169 (0.096377)***
INF	0.057026 (0.030183)*
CB	-0.878073 (0.383463)**
R^2 **Number of Observation**	0.951587 26

Note: ***, **, * indicates the null hypothesis will be rejected at 1%, 5% and 10% significant level. The null hypothesis in this test is that the independent variables do not have significant relationship with dependent variable.

Based on above table, **Model 1** has been formed to show the relationship of the dependent variable and independent variable. The model is as in the following:

LPS_t= -1.344 + 1.362($LGDP_t$) + 0.057(INF_t) - 0.878 (CB_t) **(Model 1)**
(S.E) (1.1101) (0.00964) *** (0.0302)* (0.3835) **

R^2 = 0.951587

F-stat = 6.868832, Prob (F-statistic) = 0.004582

Symbol of variables in model 1 has been explained in the data and variable part. Based on Table 4, the value in first row for each independent variable (or intercept) represents the coefficients or parameter (β) of that variable. Meanwhile, the value in second row for each independent variable (or intercept) represents the standard error of that variable. For example, -1.343972 represents the coefficient of the intercept while 1.100088 represents the standard error of the intercept.

Based on empirical result in Table 4 and Model 1, there are a few interpretations that can be done. Firstly, the value and sign of the coefficients shows that how the independent variables affect the dependent variable (positive or negative relationship). Based on the empirical result, 1% increase of income per capita (log income per capita, LGDP) will increase 1.362 % of private saving (logged private saving, LPS). Meanwhile, change in 1 unit of inflation rate (INF) will increase 5.7% (0.057*100) of private saving (LPS). Next, increase of 1 unit in government current budget (CB, which expressed in term of ratio, government revenue/government expenditure) will decrease 0.118 % of private saving (LPS).

Besides, Table 4 can be used to test individually significance of each independent variable. The null hypothesis for each individual test is that coefficient of the independent variable is zero, which means that an independent variable does not significant to the dependent variable. Based on Table 4, the symbol of ***, ** and * indicates the null hypothesis will be rejected at 1%, 5% and 10% significant level respectively. Hence, by looking at Table 4, LGDP is able to reject null hypothesis at any significance level, which suggest that LGDP has significant relationship to LPS at 1%, 5% and 10% significant level. Meanwhile, for INF, it only significant at 10% significant level, which suggest that INF is individually statiscally significant to LPS at 10% significant level. Lastly, CB is significant at 5% and 10% significant level, which suggest that it has significant relationship on LPS at both significant level.

F statistic and R^2 are the tools that been used to identify the overall significance of the model. Based on this result, R^2 of 0.951578 means that 95.16% of variation in LPS in Malaysia can be explained by variation in LGDP, INF, and CB. Besides, F test statistic will be used to identify the overall significance of the model. The null hypothesis for the F test statistic is that all independent variables are equal to 0, which means that all independent variables are not significant to the dependent variable. From the result above, the F test statistic is 6.868832 while critical value of F at 0.05 level of significance, with degree freedom of 3 (numerator) and 22 (denominator) is 3.05. This means that the null hypothesis is able to be rejected as F critical value < F test value. Hence, at 5 % confidence level, there is sufficient evidence that the overall model is statistically significance.

Based on model 1, the sign of parameters for GDP and INF are positive while it is negative for CB. This shows that the independent variables in the model have a sign of parameters or coefficient which consistent with the theories that mentioned previously. For example, sign of **parameter for LGDP in the model is consistent with Life Cycle Model theory (positive relationship)** and **sign of parameter for CB in the model is consistent with Ricardian Equivalence theory (negative relationship)**.

4.5 Diagnostic Test

Model 1 is done by using Ordinary Least Square method. According to Gauss-Markov Theorem, a regression model needs to fulfil a few assumptions of Classical Linear Regression Model (CLRM) in order to achieve BLUE (Best Linear Unbiased Estimator).

Firstly, the regression model must linear in parameter. This assumption was met as shown in the econometric model (showed in model specification part). Secondly, the sample size must be more that the number of independent variables in the model. Again, this assumption was met as the sample size of 26 is more than the number of independent variables used in the model which is 3. Despite of two assumption that been mentioned in above, there are a few assumption that must be strictly obeyed and not to be violated in order to ensure the reliability of the OLS model.

Thus, in this part, there are few diagnostic test that need to be conducted to ensure that the OLS regression model that used in this research obey all of the required assumption.

4.5.1 Test on Zero Mean Value of Error Term

For an OLS model to achieve BLUE, the mean value of the error term should be equal to zero. For this purpose, a descriptive statistic of error term have been conducted and shown in the following table:

Table 5: Descriptive Statistic of Error Term for Model 1

Mean	3.26E-15
Median	0.009966
Maximum	0.432175
Minimum	-0.310169
Std. Dev.	0.179332
Skewness	0.049433
Kurtosis	2.808724
Observations	26

Based on table, the mean value of error (3.26E-15) is almost equal to zero. Hence, this indicates that model 1 has met the zero mean value of error assumption.

4.5.2 Jarque Bera Test (test on normality)

Next assumption for an unbiased and efficient OLS model is that the error term of a model must be normally distributed, especially for the model that uses small sample size. This assumption ensures that the availability of usage of F-test, T-test, and $\chi 2$ test for hypothesis testing. For the purpose of testing normality of error term, a histogram of errors or residuals has been conducted and shown in the following graph:

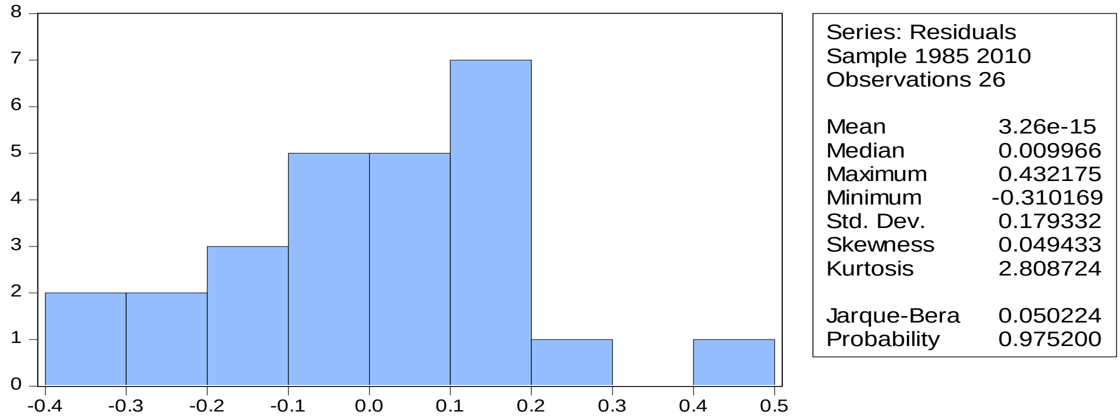


Figure 5: Normality Diagram

Based on the graph above, the errors term or residuals show a bell shape curve. Besides, the skewness of the curve (0.049) is also close to zero whiles the Kurtosis value (2.809) is close to 3. Both of these values indicate that model 1 met the normality assumption.

Next, based on diagram in above, we will need to conduct a Jarque Bera test to indicate whether the error is normal distributed or not. The null hypothesis for Jarque Bera Test will be shown as in the following:

H_0 = *There is normally distribution of errors in the regression model*

H_1 = *There is not normally distribution of errors in the regression model*

Based on the diagram above, the P value for the Jarque-Bera Test is 0.975200. It is greater than α value (significance level) in 1%, 5% and 10% significance. Hence, this indicates that it is unable to reject the null hypothesis which suggested that the residuals or error term are normally distributed.

There are three more assumption that needs to be met by the regression model to achieve BLUE which is autocorrelation, heteroscedasticity, and multicollinearity. These assumptions will be discussed individually in the following part of the paper.

4.5.3: White's Generalized Heteroscedasticity test (test for heteroscedasticity)

Heteroscedasticity means that variance or error terms does not present constantly between the observations in a regression model (no homoscedasticity). Presence of heteroscedasticity will cause a regression model become inefficient (does not has minimum variance). Besides, it will also cause the t-test statistic of a model become bias.

There are few tests that can be used to detect heteroscedasticity problem. The most popular and easiest test is known as White's Generalized Heteroscedasticity test. For the purpose of identify whether there is the presence of heteroscedasticty in model 1, the White's test has been carried out through Eview and shown in the following table:

Table 6: White's Generalized Heteroscedasticity test for model 1

Heteroskedasticity Test: White			
F-statistic	1.3081	Prob. F(9,16)	0.3061
Obs*R-squared	11.0214	**Prob. Chi-Square(9)**	**0.2742**

In this research, the null hypothesis for White's test is that there is no heteroscedasticity in the OLS regression model (model 1) while the alternative hypothesis is that there is heteroscedasticity in the OLS regression model (model 1). The hypothesis will be rejected if the P value (p value Chi-Square that Bold) is lesser than α (0.01, 0.05 or 0.10) or the OBs*R-squared greater than the critical value of the test. Based on the result in Table 4, the null hypothesis of White's test in model 1 will not be rejected as the P value of 0.2742 is greater than α in 1%, 5% and 10% significance. This indicates that errors or residuals in model 1 do not have heteroscedasticity problem at any level of significance.

4.5.4 ARCH Test (test for heteroscedasticity)

As mentioned in methodology chapter, in this research, we have used two methods to detect the heteroscedasticity problem. Besides White Heteroscadesticity Test that been mentioned in above, ARCH test also has been carried out through Eview and the result of the test is shown in the following table:

Table 7: ARCH test for model 1

Heteroskedasticity Test: White			
F-statistic	0.03461	Prob. F(9,16)	0.854
Obs*R-squared	0.03756	**Prob. Chi-Square(9)**	**0.8643**

Based in the table above, we can see that the p value (p value Chi-Square that Bold) of Obs*R-squared in the test is 0.8643. This value (0.8643) is greater than α in 1%, 5% and 10% significance. Therefore, the null hypothesis of this ARCH test (which suggest model 1 do not have ARCH effect or heteroskedasticity) will not been rejected at any level of significance. Thus, we can further indicate the error or residual in model 1 do not have heteroskedasticity problem.

4.5.5 Autocorrelation

Autocorrelation means that there is relationship either positive or negative between neighbour residuals or errors. Similarity to heteroscedasticity, presence of autocorrelation will cause the estimator does not longer have minimum variance (inefficient) among other estimators. As a consequence, the F, t, and $\chi 2$ test for a regression model may not be valid.

For the purpose of testing whether there is the presence of first order autocorrelation in model 1 or not, Durbin-Watson d Test has been carried out and shown in the following:

Figure 6: Durbin-Watson d Test for model 1

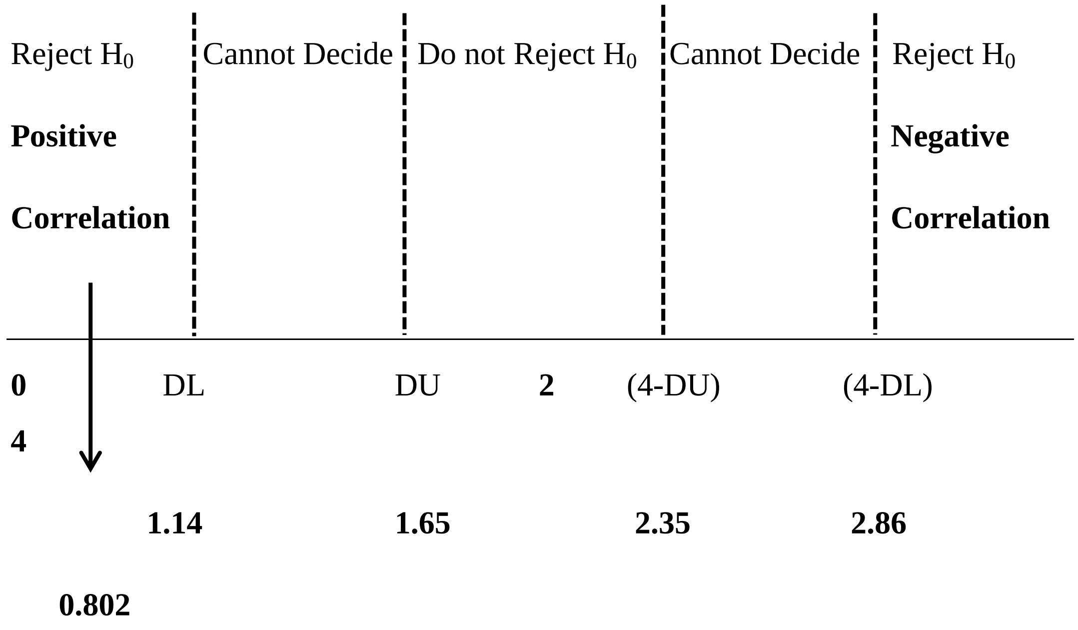


Figure in above shows the decision rule of Durbin-Watson d Test (α=0.05) for model 1. The null hypothesis for this test will be as in the following:

H_0: there is no first order autocorrelation occurs in the OLS regression model

H_1: there is first order autocorrelation occurs in the OLS regression model

Based on the decision rule, the null hypothesis will be rejected if the Durbin-Watson d Test computed value less than 1.14 or more than 2.86 (reject region). For model 1, the computed value for the Durbin-Watson d Test is 0.802 which means that it has fallen in the reject region. Hence, there is sufficient evidence to reject the null hypothesis or suggest that there are positive autocorrelation between the residuals in model 1 at 5% level of significance.

As a remedy to overcome this autocorrelation problem, the OLS regression model in the research has been fixed by using **Newey-West Standard Error Method**. Most of the time, this method will be deemed as the approach that sufficient to overcome autocorrelation.

4.5.6 Test for Multicollinearity

Presence of multicollinearity means that there are linear relationships between the independent variables in a regression model. This factor is a vital assumption for OLS method because high degree of multicollinearity may cause problem of unable to obtain OLS estimators.

There are few methods that can be used for detection of multicollinearity problem such as common samples correlation, auxiliary regressions, and VIF. Besides, R^2 and individual t-test statistic will has some symptoms if there is multicollinearity in a regression model. A model will have high R^2 but only little number of individually significant independent variable. Based on table 2 (first part of empirical result), the R^2 for the model is high and there also many independent variables that individually significant (3 out of 5 independent variables). However, this does not enough to prove that model1 does not have multicollinearity. Hence, further tests have to be conducted.

Firstly, method of correlation matrix between independent variables needs to be carried out. The result is been shown in the following table:

Table 8: Correlation Matrix of independent variables in model 1

	LPS	LGDP	INF	CB
LPS	1	0.970736	0.14871	-0.1516
LGDP	0.97074	1	0.11932	-0.1031
INF	0.14871	0.119317	1	0.58616
CB	-0.1516	-0.103064	0.58616	1

Based on the table, the higher the magnitude of correlation between the independent variables, the higher degree of multicollinearity of the pair of variables. In the table, the pair of LGDP and INF as well as LGDP and CB shows a low magnitude of correlation which is 0.119317 and -0.103064 respectively. Meanwhile, INF has the highest correlation magnitude in the model with CB which is **0.5816** (which highlighted in red colour). Hence, this may indicate that the pair of INF and CB will have the highest possibility (compare to other pairs of variables) to cause multicollinearity problem in the model. Thus, further test need to be conducted to identify the problem.

VIF and TOF is a formal method to test for multicollinearity problem. Hence this test has been carried out for model 1 and the result is shown in the following table:

Table 9: VIF and TOF table for Model 1

Dependent Variables	R^2	TOL	VIF
LGDP	0.0600	0.9400	1.0638
INF	0.3762	0.6238	1.6031
CB	0.3739	0.6261	1.5972

The value of TOL will be ranged from 0 to 1. The closer the value of TOL to 0, the higher degree of multicollinearity problem of independent variables. An independent variable will be considered to have a serious multicollinearity problem if its TOL value smaller than 0.1. Based on the table, three variables in model 1 do not have cause a serious multicollinearity problem as their TOL value (0.9400, 0.6298, and 0.6261 respectively) are greater than 0.1. Besides, VIF can be also used for multicollinearity testing. An independent variable will be considered to have serious multicollinearity problem if its VIF value is greater than 10. Again, GDP, INF, and CB have the VIF value (1.0638, 1.5878, and 1.5972 respectively) that smaller than 10, this again indicates three variables in model 1 do not have serious multicollinearity problem.

Although there is some degree of multicolinearity problem occurs in model 1, however it does not cause a serious problem for the regression model. This is because R^2 on this model (model 2) is high, and also there is many independent variables that individually statistically significant (3 out of 3 independent variables), and the signs were consistent with the expectations. Therefore, the best solution is that left the model alone to avoid the regression model become worse (omit variable).

Chapter 5: Discussion and Conclusion

5.1 Summary & Conclusion

The study is conducted to investigate the determinants to private savings. Building from previous studies like ((Hafizah & Hussien, 2010), we investigate the relationship of GDP per capita, GDPt inflation rate, INFt and government current budget, CBt between private savings, PSt using an OLS linear regression model, with the function expressed as : PSt = f (GDPt, INFt, CBt) In order to ensure the validity of the statistical significance of our tests, we ran the two types of unit root tests, a cointegration tests and successfully resolves all validity concerns of stationarity. We also ran several diagnostic tests to ensure our model is consistent with assumptions of OLS.

We found in our results, two variables GDPt and CBt are consistent with our literature review and INFt to be partially consistent. In the case of GDPt, it is positively correlated with PSt, consistent with subsistence-consumption theory and Life Cycle Hypothesis. In the case of CBt, it is negatively correlated with PSt, consistent with the theory of Richardian Equivalence. We found INFt to be positive correlated with private savings, consistent with the claim that inflation causes uncertainty in households, thus inducing savings.

In conclusion with respects to the research questions and objectives:

1. Our findings support the theory of Life Cycle Model, which posits that as the growth of income per capita increases, people tends to save more. Our findings go against Permanent Income Hypothesis, which posits that people consume more and save less when income increases.
2. Our findings support the theory of Ricardian Equivalence in Malaysia during the studied period, where higher current budget deficit causes decreases in saving rate.
3. The year from 1985 to 2010, Malaysia's inflation rate has a positive relationship with private savings; this could be partly

caused by households concern on future uncertainties, likely caused by Asian Financial crisis in 1997.

4. Our findings suggest that policy that encourages growth and positive government budget, while maintaining a moderate inflation rate, can increase private savings.

5.2 Policy Implication

Based on our findings, policy makers might want to implement a tax reform that involves redistributing the proportion between consumption tax, corporate tax and income tax. Policy makers should try to increase consumption tax—which would decrease private savings as a result—and at the same time, decreases corporate tax and income tax—which would increase private savings. One notable example is the new implementation of 6% Goods and Service Tax (GST) rate in Malaysia Budget 2015, with a reduction of one percentage point to three percentage points for income tax rate and one percentage point decrease for corporate tax rate. By doing this so that the reduction in corporate and income tax offsets or exceeds the effect of increment in consumption tax, the consumers have more disposable income due to reduced income tax and are more inclined to save as they are taxed more when they spend. Hence, the outcome is ambiguous and further research need to be done to ascertain the suitable levels of taxation.

Another possible policy that can help increase private savings is by reducing income inequality in the country, lower income inequality means people with ability are given due opportunity, which would increase productivity and economic growth, which in turn would increase income per capita of the country. Finally with an increased income per capita, households have higher ability to save, thus private savings increases as a result.

Policy makers can also affect private savings through monetary policy. An expansionary monetary policy that increases the deposit rate and lowers the lending rate can spur private savings. Lowered interest rates create inflationary pressure, and higher inflation would increase private savings as people save more when they anticipate uncertainties.

5.3 Limitations

There are only three regressors in the model. Therefore, it is possible that there are relevant omitted variables out there such as age dependency ratio, macroeconomic policies and tax policies that could capture the reality better. Hence, future research should include these variables to get a more complete model. There is also a limitation of data for this study. The limitation of those collected data in this research is that the number of annual data that collected is not large enough. It only has a small sample size (26). In this condition, a regression model that uses small sample size of data may face several problems. Firstly, it creates difficulty for the regression model to predict the true relationship between the dependent variable and independent variables. Next, small sample size of data will cause a regression model to have a higher probability in committing multicollinearity and outlier errors. As a result, this will cause the evaluation of the chosen regression model to become more ambiguous. (Bissonette, 1999)

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