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**INFLATION AND MACROECONOMIC VARIABLES:
EVIDENCE FROM PANEL DATA**

BY:

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Universiti Utara Malaysia

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Othman Yeop Abdullah Graduate School of Business,
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SCHOOL OF ECONOMICS, FINANCE, AND BANKING

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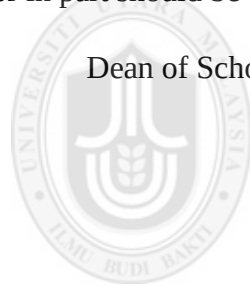
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ABSTRACT

Issues involving inflation has generated an enormous volume of literature and heated debate in recent years as different school of thoughts view the contrast cause and have different policies for fighting inflation. This study examines the relationship between selected independent variables and inflation and theory that can explain inflation in selected developed and developing countries of ASEAN and G7 countries using panel data analysis. The main variable of this study is money supply and unemployment. This study focus on the Quantity Theory of Money proposed by Irving Fisher and Phillips Curve. The issue that is brought forward is Keynesian's argument that Fisher's equation ($MV=PT$) is truism and only appropriate at full employment where it is impossible in the current situation. Hence, this employed study is to prove whether the Fisher's equation is appropriate in the long-run or short-run. The argument of the Phillips Curve flattening is brought forward by authors, stating that the curve is appropriate in the short-run. Therefore, the motivation of this study is to prove that the Fisher's Theory and the Phillips Curve is still appropriate in explaining inflationary problem. The empirical method to be employed are POLS regression, Granger Causality Test, Panel ARDL and Pooled Mean Group (PMG) estimation. The results from POLS regressions revealed that that money supply is significant to inflation (measured at CPI), and the Panel ARDL results indicate that the significance is for the long-run. There are two policy implications that is proposed in this study. First, the governments should put in place considerable reforms that will certify that the velocity of the supply of money in the market is constantly monitored and controlled. The central banks should also consider monetary policy as a suitable tool of achieving price stability because of the linear interdependency and causality between the price level and money supply growth. Second, the concerned policy makers as well as the government who are accountable for optimum level of inflation for sustainable growth and development should reduce the unemployment rate by opening more job opportunities for fresh graduates, although they are lack of job experience. This is to achieve the full employment rate in the economy.

Keywords: inflation; Phillips curve; panel ARDL; PMG

ABSTRAK

Isu-isu yang melibatkan inflasi telah menghasilkan banyak penulisan sastera dan perdebatan hangat dalam beberapa tahun kebelakangan ini kerana sekolah pemikiran yang berbeza melihat punca yang berbeza dan mempunyai dasar pemikiran yang berbeza untuk membanteras inflasi. Kajian ini mengkaji hubungan antara pemboleh ubah bebas yang dipilih dengan inflasi dan teori yang dapat menjelaskan inflasi di negara maju dan negara sedang membangun seperti ASEAN dan G7 dengan menggunakan analisis data panel. Pemboleh ubah utama kajian ini adalah pengaliran wang dan pengangguran. Kajian ini menumpukan pada Teori Kuantiti Wang yang dibawa oleh Irving Fisher dan Keluk Phillips. Isu yang dibawa ke hadapan adalah perdebatan para Keynesian bahawa persamaan Fisher ($MV = PT$) adalah *truism*, bermakna hanya berguna pada masa tertentu sahaja dan hanya sesuai di situasi pekerjaan penuh dimana ianya tidak mungkin dalam situasi sekarang. Oleh itu, kajian ini bermatlamat untuk membuktikan sama ada persamaan Fisher sesuai dalam jangka panjang atau jangka pendek. Hujah Keluk Phillips dibawa ke hadapan oleh penulis, menyatakan bahawa lengkungnya hanya sesuai dalam jangka pendek. Oleh itu, motivasi kajian ini adalah untuk membuktikan bahawa Teori Fisher dan Keluk Phillips masih sesuai untuk menjelaskan masalah inflasi. Kaedah empirikal yang digunakan ialah Regresi POLS, Ujian Kausaliti Granger, Panel ARDL dan Anggaran PMG. Hasil dari regresi POLS menunjukkan bahawa bekalan wang adalah penting kepada inflasi (diukur pada *CPI*), dan hasil Panel ARDL menunjukkan bahawa kepentingannya adalah untuk jangka masa panjang. Terdapat dua implikasi dasar yang dicadangkan dalam kajian ini. Pertama, kerajaan harus membuat pembaharuan yang akan memastikan bahawa hala tuju bekalan wang di pasaran sentiasa dipantau dan dikendalikan. Bank-bank pusat juga harus mempertimbangkan dasar monetari sebagai alat yang sesuai untuk mencapai kestabilan harga kerana terdapat hubungan linear dan kausaliti antara paras harga dan pertumbuhan bekalan wang. Kedua, pembuat dasar serta kerajaan yang bertanggungjawab untuk tahap inflasi yang optimum untuk pertumbuhan dan pembangunan yang mampan harus mengurangkan kadar pengangguran dengan membuka lebih banyak peluang pekerjaan untuk graduan baru, walaupun mereka kurang pengalaman pekerjaan. Ini adalah untuk mencapai kadar pekerjaan penuh dalam ekonomi.

Kata kunci: inflasi; keluk Phillips; panel ARDL; PMG

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List of Abbreviations



CPI	Consumer Price Index
MS	Money Supply
UEP	Unemployment
RIR	Real Interest Rate
MFG	Manufacturing
RER	Real Exchange Rate
GDP	Gross Domestic Products
MW	Money Wages
IMP	Import of Goods and Services
ADF	Augmented Dickey Fuller
ASEAN	Association of Southeast Asian Nations
G-7	Group of Seven Developed Countries
ECM	Error Correction Model
POLS	Pooled Ordinary Least Squares
ARDL	Autoregressive Distributed Lag

PMG	Pooled Mean Group
OPEC	Organization of Petroleum Exporting Countries

Glossary of Terms

ASEAN-6:

Malaysia, Thailand, Vietnam, Indonesia, Phillipines, Brunei

G-7 (Group of Seven Developed Countries):

United States, United Kingdom, Japan, Italy, France, Canada, Germany

(Singapore was opted from the ASEAN countries to be in the Developed Countries)



CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter elaborates on the overview of this research paper. Firstly, there are an overview on inflation in ASEAN and G7 countries. The chapter follows up with research background, problem statement, research questions, research objectives, hypothesis of the study, significant of the study and limitations of the study. The chapter ends with concluding remarks.

1.2 Overview of Inflation

One of the unanimity views among economists is the importance of low and stable inflation levels in an economy. Economic theory assures us low and stable inflation is important for market-driven growth, and that monetary policy is the most direct tool for controlling inflation. Inflationary issues had been debated throughout numerous literatures and research projects through these years. The debates differ in their hypotheses, mainly due to a range of conventional views about the appropriate measure to control inflation and also due to disparity between developed and developing countries. Evidences to prove the cause and effect of inflation is being poured by different school of thoughts, from classical, Keynesian, monetary to structural. It is vital to study inflation in each country because inflation is peaking throughout countries, regardless of developing or already developed countries. Inflation creates imbalance in the efficiency of the economy that affects economic growth of a particular country. A more accurate solution or method to control inflation is necessary as wrong diagnosis of the root problem may lead to adverse effects that may bounce back on the economy.

Inflation particularly is a discrepancy between the real economic variables and nominal, monetary variables. The cause and effect interpretation can't precisely clarify inflation as it is found at the joining of such various and opposing procedures, the end result end up more complex. Another contradicting issue is the discrepancy between the causes and the indications of inflation (Cristian, 2014). For an occurrence, money supply does not cause inflation, but rather it is a manifestation of inflation. The extreme development of the demand, to comply with supply, speaks for the reason of inflation in the fact that the current quantity of goods and services is lower than the one required, hence the prices are mounting. The prominence of the worldwide inflationary occurrence, with features specific to every economy, makes the subject of research for the experts in the field. In the short-run, there are numerous elements from the local economy also from the external condition that influence the aggregate supply and demand market. In the long-run, the monetary policy has the function to keep up with the price stability.

1.3 Research Background

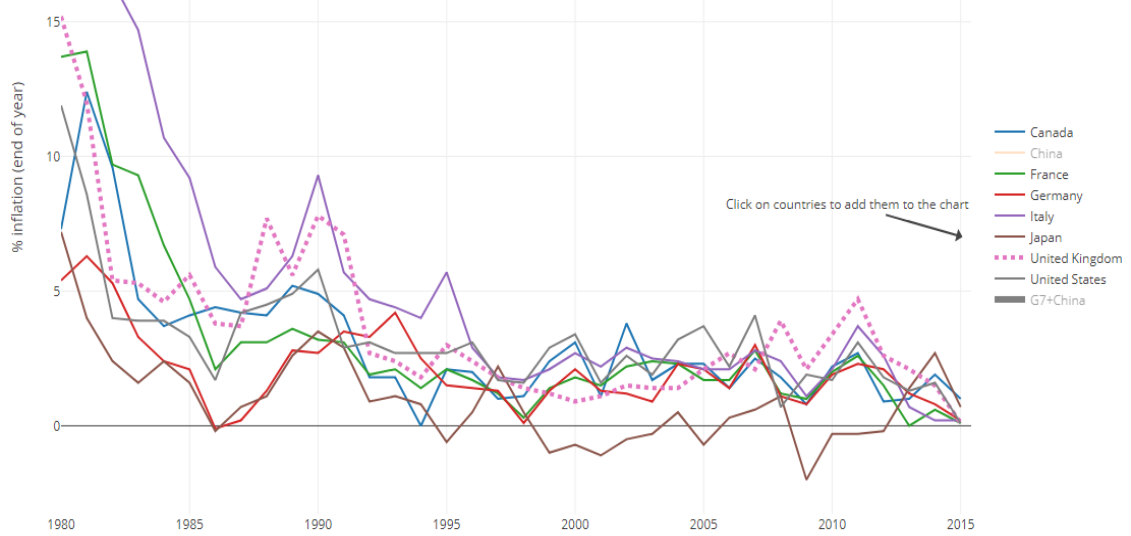
This research revolves on the determinants of inflation, comprising both the developing and developed country of ASEAN and G7. The reason developed and developing country is chosen as the sample for this study is to verify the determinant of inflation (independent variables) that might be different according to the level of income and the economic condition of a country. Although there are many research had been done in regard on inflation, this research would cover both the developed countries of G7 (Singapore, U.S, U.K, Japan, Italy, France, Canada and Germany) and the developing country of ASEAN (Malaysia, Thailand, Vietnam, Indonesia, Philippines and Brunei Darussalam). Singapore

from the ASEAN countries has joined the ranks of the rich industrial countries, making it categorized under the developed countries.

As obtained from Trading Economics (2018), the inflation rate (measured at annual inflation rate) of ASEAN-6 developing countries are: Malaysia (2.70%); Thailand (0.42%); Vietnam (2.65%); Indonesia (3.18%); Philippines (4.00%); and Brunei Darussalam (-0.02%). Whereas, the inflation rate (measured at annual inflation rate) of G7 developed countries are: Singapore (0.00%); U.S (2.10%); U.K (3.00%); Japan (1.40%); Italy (0.60%); France (1.30%); Canada (1.70%); and Germany (1.60%).

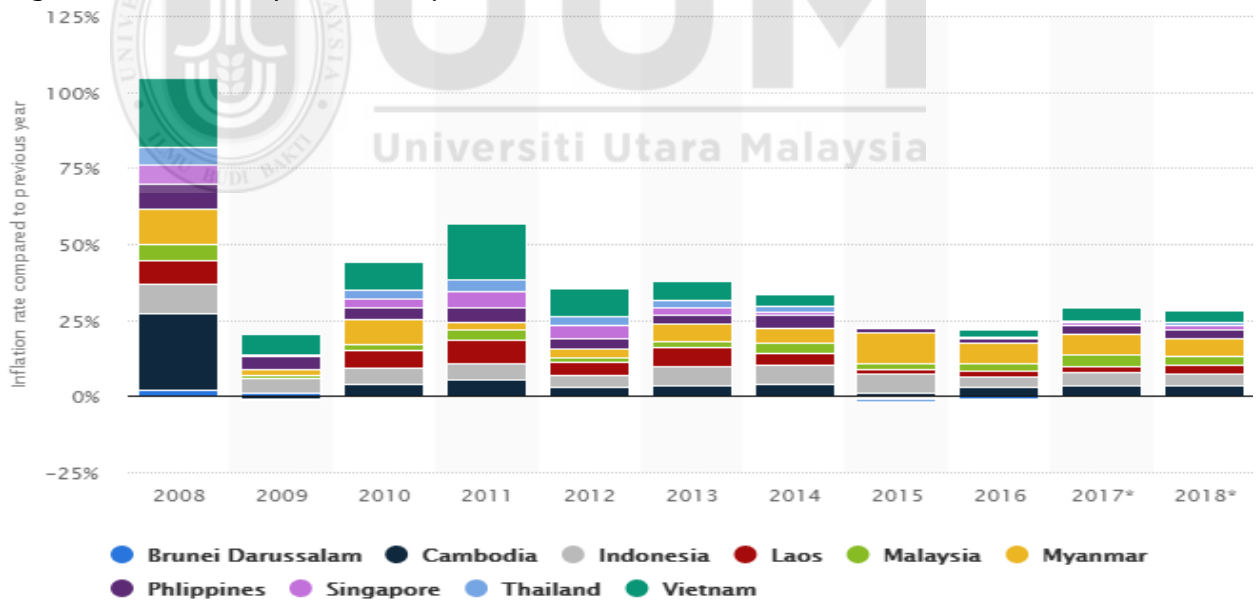
According to Totonchi (2011), in general, the cause of inflation in developed countries is broadly identified as growth of money supply. In contrast, the developing countries record that inflation is not purely a monetary phenomenon. Besides, Sergent and Wallace (2011) discussed that the factors are typically more related to fiscal imbalances such as higher money growth and exchange rate depreciation arising from a balance of payments crisis dominate the inflation process in developing countries.

Figure 1.1 Plotted Inflation Rate for G7 Countries



Source: Comley (2015)

Figure 1.2 Plotted Inflation Rate for ASEAN Countries



Source: Statistica (2018)

1.4 Problem Statement

Irving Fisher proposed the economic theory of Fisher Effect, also known as the Quantity theory of Money, where he proved the relationship of $MV=PT$. this equation explains that MV equals to PT , where M stands for money supply, V stands for the velocity of money circulation, P denominates average price level and T denominates volume of transaction of goods and services. The theory assumes that an increase in the velocity of the money supply throughout the society, contributes to the changes in the price level in an economy. This theory was supported by Gupta (2007), Gyebi and Bofo (2013), Totonchi (2011), Vogel (1974) and Sheehey (1980). Milton Friedman (1963) wrote “inflation is always and everywhere a monetary phenomenon.” approving that the growth in the quantity of money is the determinant that contributes to fluctuations in the inflation rate.

The Fisher’s theory assumes that changes in P is affected by other influencing factors, V is constant and is not affected by changes of M . As such, T is constant and is not affected by changes of M and V . The supply of money is assumed as an exogenously determined constant. Other assumptions include the theory is applicable in the long-run and based on the assumption that the economy operates at full employment. The Quantity Theory of Money states that the general price level changes in direct proportion to a change in the level of money supply (Kundu, 2017). Abolo (1997), among other researchers also supported it. Furthermore, Doroshenko (2001) found a long-run relationship between money supply and inflation in his study.

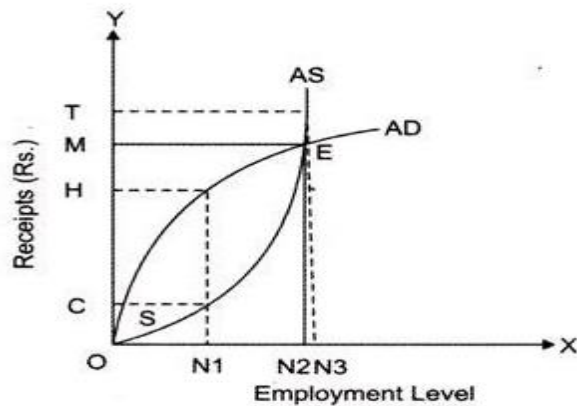
However, the Fisherian quantity theory of money has been subjected to severe criticism by Keynesian economists and economists from the Monetarist School of Economics (“Definition of ‘Quantity Theory Of Money,” 2018). Keynes (1936) theorized that

inflation is caused when aggregate demand exceeds the aggregate supply, when there is no excess capacity, a situation in which the economy operates at full employment of resources. But, Keynes also referred that “the quantity theory of money is a truism.” Fisher’s equation of exchange is simply truism because it states that the total quantity of money (MV) paid for goods and services must equal their value (PT). This cannot be accepted in the modern economy. Other than that, the direct and proportionate relation between quantity theory of money and price level in Fisher’s equation is based on assumption that ‘other things remain unchanged.’ In real life, V and T are not constant. Moreover, they are dependent on M and P. in short, all the element in the Fisher’s equation are interrelated and interdependent. For an instance, a change in M may cause a change in V.

Hence, this research attempt to investigate whether the Fisher’s theory is still relevant (in the short-run, long-run or both) although there are criticisms surrounding. Furthermore, there are strong arguments that fiscal deficits as a major cause of inflation.

On discussing the effect of inflation on unemployment, monetarists or policy makers often use these two main theories which is the Philips Curve and the Keynesian theory. The Keynesian theory was developed by British economists, Keynes John Maynard during the 1930s. In his theory, he states that the inflation and unemployment moves in parallel movement where when rate of inflation in a country rises, the unemployment rises as well. Keynes introduced the theory that the equilibrium is determined by aggregate demand. According to Keynes, when there is increase demand in the economy, this will encourage companies to make more goods or provide more services. Presented below is the graph that was proposed by Keynesian theory:

Figure 1.3 Keynesian Graph of Unemployment



Source: Wikipedia (2016)

The classicalists believed that the way to maintain full employment was to cut wages and reduce taxes because the economy was determined by demand, the cut in wages would reduce employee income, decreasing consumer spending. But, this situation will lead not lead to curing the inflationary level. Reducing taxes wasn't an option for the government when their budget was out of control due to the reduction of tax revenues. The way to recovery is to encourage spending. By encouraging consumers and firms alike to increase spending, demand will increase. This will increase quantity produced, leaving companies to need to hire more employees, increasing employee income, making them able to spend more. Put this all together and you get an increase in aggregate demand. This encourages production and helps the economy out of recession/depression.

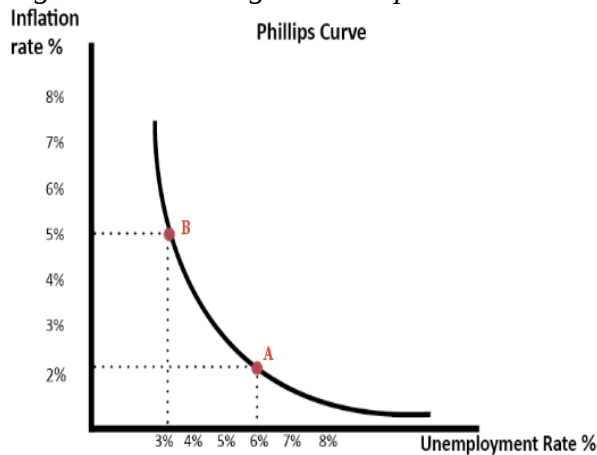
The Keynesian theory was a very important theory that was widely utilized until the year of 2008 and 2009. Its effectiveness was proven to be useful when during the U.S Financial Crisis. The U.S financial crisis was mainly caused by the shadow banking and housing loan bubble which caused the whole financial system to collapse and thus caused the economy globally to collapse. It was merely the fault of financial institutions and credit

rating agencies. Other minorities play a small role contributing to this crisis. The economists, financial institutions turned to the Keynesian theory to help the comeback and the theory was proved to be very useful. However, economists, monetarist and policy makers argue that the Keynesian theory is no longer appropriate to curb the current inflationary issues and the factors that cause them.

On the other hand, the Philips curve was the economic concept by A. W. Phillips stating that there exists an inverse relationship between inflation and unemployment. Phillips analyzed annual wage inflation and unemployment rate at U. K for the period of 1860 until 1957, then plotted them into a diagram. The data then appeared to demonstrate an inverse and stable relationship between wage inflation and unemployment. Later, economist tested the price inflation in relation to unemployment rate, and obtained the result of the Phillips Curve we use now. The curve suggest that changes in the level of unemployment have a direct effect on the price inflation level, where increase in aggregate demand would trigger the following responses:

- An increase in the demand for labor as government spending generates growth.
- The pool unemployment will fall.
- Firms must compete for fewer workers by raising nominal wages.
- Workers have greater bargaining power to seek out increases in nominal wages.
- Wage cost will rise.
- Faced with rising wage costs, firms pass on these cost increases in high prices.

Figure 1.4 The Original Phillips Curve



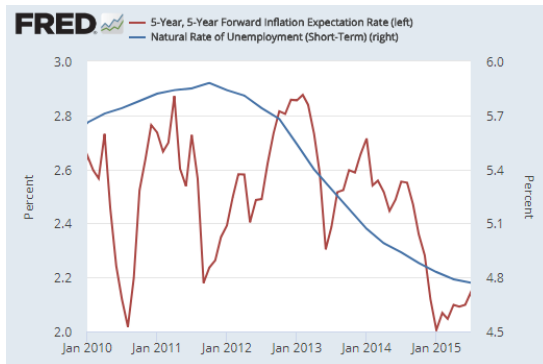
Source: stlouisfed.org/on-the-economy (2015)

By the mid of 1970s, the concept of Philips Curve was disapproved in conjunction with the stagflation event occurred in the 1970s, where there were high levels of both inflation and unemployment. Stagflation occurs when an economy experiences stagnant economy growth, high unemployment and high price inflation. American economists Friedman and Phelps offered one explanation, which there is a series of Phillips Curve: short-run Phillips Curve and the long-run Phillips Curve, which exists at natural rate of unemployment (NRU). Indeed, in the long-run, there is no trade-off between unemployment and inflation.

Recently, economists have questioned whether the Phillips Curve relationship has broken down. After the Great Recession, the inflation level stayed low and rate unemployment has decreased, below the Federal Reserve's target. When referring to the Phillips Curve's relationship, the possible explanation why the inflation rate decrease after the unemployment rate decrease is: natural rate of unemployment is lower than the current rate; the curve shifted inward simultaneously or the curve become flat. An online writing by Owyang Michael (2015) plotted 5-year forward inflation expectation rate and the

natural rate of unemployment (short-term) ranging from January 2010 until June 2015. It shows the flatness of the Phillips Curve, where:

Figure 1.5 The Shift of Phillips Curve



Source: Congressional Budget Office's (CBO)

Hence, this research also aims to analyze whether the Phillips Curve really had shifted to form a flat line, strengthening the theory of authors that stress the Phillips Curve only appropriate on the short-run. Since the graphs and statistics are based on United States assumption (developed country), we might be able to prove these statements wrong or right.

1.5 Research Questions

- What is the relationship between money supply and inflation?
- What is the relationship between unemployment and inflation?

1.6 Research Objectives

- To investigate the relationship between money supply and inflation (Fisher theory).
- To analyze the relationship between unemployment and inflation (Phillips curve).

1.7 Hypothesis of the Study

1.7.1 Money Supply

H₀: There is no relationship between the inflation level and money supply.

H₁: There is a relationship between the inflation level and money supply.

In the recent years, the relationship between money supply and economic growth has been attracting expanding attention of the monetary economists more than any other determinants of inflation. Harding and Pagan (2001), in their study, stated that economists have different view on the effect of money supply on economic growth, while some agree that fluctuations in the quantity of money is essential for the economic growth, and that countries that study the behavior of aggregate money supply rarely experience much disparity in their economic activities. Dedolab and Lippi (2000), in their research, without an appropriate level of money supply circulation in the economy, the possibility of economic growth is low, considering the credit and appropriate financial conditions in general.

Irving Fisher (1876–1947) spelled out his famous equation, the Quantity theory of Money and the equation, $MV=PT$. this equation assumes that an increase in the velocity of the money supply throughout the society, contributes to the changes in the price level in an economy. This and other equations, such as the Cambridge cash balance equation, which corresponds with the emerging use of mathematical in neo-economic analysis, define precisely the conditions under which the proportional postulate is valid. Fisher and other neo-classical economists, such as Pigou (1959) demonstrated that monetary control could be achieved in a fractional reserve-banking regime via control of an exogenously determined stock of high power money. This theory was later on supported by Gupta

(2007), Gyebi and Boafo (2013) and Sheehey (1980). Milton Friedman (1963) wrote “inflation is always and everywhere a monetary phenomenon.” approving that the growth in the quantity of money is the determinant that contributes to fluctuations in the inflation rate.

Numerous studies have been conducted to prove the significance between the rate of growth of money supply and domestic inflation. Vogel (1974), Sheehey (1980), Bhalla (1981), Saini (1982), Turnovsky and Wohar (1984), Darrat (1986), Togan (1987), Fadil (1989), Bahmani-Oskooee and Malixi (1992) found positive relationship between the rate of growth of money supply and inflation. On the other hand, Turnovsky and Wohar (1984) and Togan (1987) observed no significant in relationship between rate of growth of money supply and domestic inflation. Deme & Fayissa (1995) found a parallel movement of the rate of growth of money supply and domestic inflation where when rate of growth of real income increases, theoretically, the rate of growth of transactions demand for real money balances increases as well.

Without considering Fisher’s Theory, money supply and inflation rationally holds a positive relationship towards each other and act to influence each other. Economists analyze money supply circulation and develop policies by controlling interest rates to increase and decrease the level of money supply flowing in the economy. The country’s government or central bank collect, record and published the money supply data periodically. Then, public and private sector analysis is performed to study the money supply’s possible impacts on price level, inflation and the business cycle. In the United States, the Federal Reserve policy is the most important deciding factor in the money supply.

The monetary view suggest that, the long-run relationship between inflation and money growth are dependent on aggregate demand and aggregate supply of money. Central banks influence the money supply through their monetary policy activities, for example, trading government securities, changing reserve necessities or amending the interest rate at which the central bank provides funds for financial intermediaries. Mahamadu and Philip (2003) investigate the relationship between money growth, exchange rate and inflation in Ghana using Error Correction Mechanism. They obtain an outcome which proves the existence of a long-run relationship between inflation, money supply, exchange rate and real income. In accordance, the finding exhibits that in the long-run, money supply and inflation in Ghana are positively related to each other and exchange rate and inflation are negatively related to real income.

A study by Gyebi & Boafo (2013) found empirical evidences to support the significant impact of money supply on inflation in Ghana. The evidences on Ghana's economy specify that money supply play a very important role in price movements within the country. For instance, Lawson, Ahmed, Ewusi and Kwakye (as cited by Gyebi & Boafo (2013)) conclude that the major cause of inflation in Ghana is excessive monetary expansion, resulting from government's borrowing from the banking system to finance budget deficits in Ghana's economy. The Bank of Ghana (BOG) specifies that the financial support from the BOG to the central bank in its expansionary fiscal policies led to rise in the money supply on the average at 40% per annum, attributing to high rate of inflation that averaged 50% per annum during 1983–1989.

1.7.2 Unemployment

H_0 : There is no relationship between the inflation level and unemployment.

H_1 : There is a relationship between the inflation level and unemployment.

Unemployment rate is measured through the active number of people looking for job, adding percentage to the labor force. The statistic in Malaysia denote that the current employment rate, especially among graduates in various education industries in Malaysia recorded at static 3.5% since January 2017 and remained the same until April 2017. However, the unemployment rate is estimated to rise at 3.6% at the coming months of 2017. The highest unemployment rate were recorded at 4.50% on March 1999, during the ASEAN financial crisis that gave influenced the employment rate Malaysia. Philips Curve by A.W. Phillips and the Keynesian Theory by John Maynard Keynes is used as the model to explain the relationship between inflation and unemployment, and its often linked as per their analyzed data obtained using the variable of CPI and unemployment.

According to Tsaliki P. V (2008), the conventional economic distinguish unemployment into seasonal, frictional, structural and cyclical. Seasonal, frictional and structural unemployment are considered normal and acceptable in the labor market as they are the one that normally occurs. Only the cyclical unemployment is considered abnormal in the labor market and the Keynesian theory was to minimize (or eliminate) the effect through countercyclical economic policies.

Seasonal unemployment is when the labor requirement for the job depends on seasons. For an example, ski instructors are only required during winter seasons. Next, frictional unemployment is when a person faces temporary unemployment when changing his/her

job. Structural unemployment occurs during technology developments, when the skills of previous job are no longer appropriate in the current. For an example, when the Ministry of Education introduces technology in learning for primary and secondary students, the teachers had to take skill development courses to learn and it took some time to fully implement it to the Malaysia education system. Finally, the cyclical unemployment. The cyclical unemployment rate depends on the economic condition like increasing crude oil prices, financial crisis, deflation and inflation of a country.

During the year 1960s, the economy throughout the region of world faced an extended period of simultaneous inflation and unemployment which was a question-mark among economists. But, the Keynesian theory manage to overcome it stating that inflation and unemployment does not moves inversely. Neoclassical economists have view that any misbalance in the economy can be repaired through the trade market opposing the view of Keynesian's that different economic issues, associate differently to the employment rate. Hence, both of their views state that unemployment is curable neither through flexibility in the demand nor supply of labor.

The relationship between inflation and unemployment was found by A.W.W Phillips, who found a negative relationship between unemployment and money wages in the United Kingdom. Since 1958, ample of research had been conducted to study the causality between unemployment and inflation. Hart (2003), study the Philips curve's theory and published on how it can be applied on how it can be applied to be used in the macroeconomic theories and experimental workings. He stressed that aggregate demand and aggregate supply of labors are the underlying elements of the Philips curve. At a point where demand for labors are higher than supply for labors, it can put weight on the rate of

wages, causing inflation level to rise. Consequently, companies would procure more labors, along these lines unemployment rate drops. The theory goes vice versa when the supply for labors are higher than demand for labors.

Samuel and Robert Solow (1970) were among the earliest researcher who supported the Phillips Curve theory. They examined the relationship between inflation and unemployment for the context of the United States. Their results indicate that there exist an inverse relationship between these variables. The “Solow-Gordon affirmation” of the Phillips Curve are the name of the findings by Solow (1970) and Gordon (1971) who affirmed the existence of a negative trade-off relationship between unemployment and inflation in the United States.

Author, Dritsaki (2013), the examined inflation and unemployment in Greece and found long-run relationship between these two variables. Author, Furuoka (2007), found the existence of long-run and trade-off relationship between inflation rate and unemployment in Malaysia, thus proving the Phillips Curve to still be relevant in measuring inflationary problems. In contrary, there are researches that are trying to prove that the Phillips Curve are no longer appropriate for measuring inflation in the current economic situations, such as Owyang Michael (2015); Cunliffe (2017) and Gordon (1990).

1.8 Significant of the Study

The study of inflation is very popular among economists and theorists as inflation creates many issues in the economy, each contributing to another macroeconomic factors. However, this paper differ from the other in few terms. The contribution of this paper is two model has been proposed to examine the determinants of inflation, where each model carry different independent variables that contribute to inflation. The models would be Model 1: Developed countries of G7 and Model 2: Developing countries of ASEAN where the independent variables (money supply, unemployment, manufacturing, real interest rate, real exchange rate, GDP, money wages, import inflation) are linked to the dependent variable (CPI).

The contribution of this study include the policy makers as well such as central banks and federal governments of the selected ASEAN and G7 countries. This is so that they are putting their best foot forward in order to curb inflation through eliminating the possible factors that could have been causing it as the central bank and the federal government have more authority to make adjustment in order to maintain the economic growth. The factors causing inflation may vary as time and economic condition changes. So, these researches may contribute a new eye opening for the policy makers and the relevants.

Other than that, this study also can provide strategies or serve as reference to investors who wish to invest in any of those selected ASEAN or G7 countries. The best way to control inflation is thorough the tax system. Inflation has its own pros and cons depending on the level of risk and degree of protection taken by investors.

1.9 Limitations of the Study

This study faced some limitation when the research was progressing. First, the research was proposed on the time frame of 50 years. But, as the secondary data was insufficient for the first time period was proposed between 1968 until 2017. Then, the period was shortened to 1980 until 2016, so that the data can be appropriate to run the analysis. Hence, the secondary data collection faced limitation during the research. This situation occurs to all the G7 and ASEAN countries. The CPI data for Vietnam was the least to be obtained.

Other than that, the range of data statistics varies among different data sources. At the maximum indifference of 0.01 up till 0.05, the variable statistic was not of the same numerical. ¹For an example, the CPI for United Kingdom (U.K) was 112.559 on the Economic Indicator Statistic (World Bank data), on the other hand, the Inflation (CPI) on the OECD states 112.589. Hence, the difference of data makes the result of the analysis to be different and thus, the interpretation be different.

The inflation level in a nation is estimated through the fluctuations in the basic cost of living, how the upsurge and shrinkage of prices of goods and services influence the purchasing power of consumers. Though, there are some reasonable challenges in estimating inflation. The retired people are left out in total family consumption survey. Pensioners have distinctive way of managing money than those of working individual. Henceforth, the real consumption detail appropriate to the recent prices of goods and services might not be the exact figure because there are missing figures in the calculations.

¹ As for year 2016*

Other than that, the modifications in the quality of goods are not precisely measurable for inflationary level because the upsurge might not be caused by inflation. For an example, a computer had been priced at RM1,000 ten years ago. Currently, the price is increased to RM3,000 because of the value added features to its processors. Vice versa, this situation applies similarly to electronic gadgets and phones as well. The materials for phones and electronic gadgets, such as thumb drives, memory card and etc., ought to be expensive for its scarce resource. Now, it has become cheaper as the materials are easily available and is not in need of much time to build it.

1.10 Organization of the Study

This study is organized into five chapters. Chapter 1 provides an overview on inflation in ASEAN and G7 countries. The chapter follows up with research background, problem statement, research questions, research objectives, hypothesis of the study, significant of the study and limitations of the study. The chapter ends with concluding remarks.

Chapter 2 discusses on the literature on inflation in developed and developing countries, focusing more on the main variable which is money supply and unemployment. Other contributing variable that contribute to inflation are discussed as well. Besides that, the literature review and opinions from previous researches related to the topic presented. The literatures were sourced from different sources such as books, journals, articles, internet articles and others.

Chapter 3 discuss on the description of data and data collection methods. The chapter then continue with research framework, sampling framework the data processing method and panel data. Finally, the statistical method of analysis is elaborated employed in the study.

Chapter 4 rolls on the result and the analysis of the study. Starting with descriptive analysis followed by the analysis of correlation, Panel Ordinary Least Squares (POLS) and Granger causality analysis. After that, method employed continue with ARDL and PMG estimation and finally, unit root test.

Chapter 5 contains the summary of the whole study, from Chapter 1 until Chapter 4. First, the summary of the data generated is plotted. The chapter further discusses on the policy implication and finally, discusses on the proposed recommendations for future studies.

1.11 Concluding Remarks

Overall, this chapter discussed on the overview of inflation at ASEAN and G7 countries, providing data statistics for the sample year, 1980 until 2016. This chapter also elaborated on problem statement, research questions, research objectives, hypothesis on the main variable which is money supply and unemployment, significant of the study and limitation of the study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the relationship between inflation and macroeconomic variables at selected developed and developing countries of ASEAN and G7. The first section is on introduction of the developed and developing countries of ASEAN and G7. The second section is on concept and measurement of inflation. Third section is on theories of macroeconomic variables studies. The fourth and fifth section comprises previous empirical work and other contributing variables of inflation respectively. Section six is attached with a table of review of the related literature.

2.2 Overview of ASEAN and G7 countries

This paper focuses on the relationship between inflation and macroeconomic variables at selected developed and developing countries of ASEAN and G7. The first section is on introduction of the developed and developing countries of ASEAN and G7. The second section is on concept and measurement of inflation. Third section is on theories of macroeconomic variables studies. The fourth and fifth section comprises previous empirical work and other contributing variables of inflation respectively. Section six is attached with a table of review of the related literature.

On the August 8th, 1967, the Association of Southeast Asian Nations (ASEAN) signed the ASEAN Declaration (Bangkok Declaration) at Bangkok, Thailand. It was a collaboration by the Founding Fathers of ASEAN consisting of totally 10 members, namely Indonesia, Malaysia, Philippines, Singapore and Thailand. Brunei Darussalam then joined on 7th

January 1984, Vietnam on 28th July 1995, Laos and Myanmar on 23rd July 1997 and Cambodia on 30th April 1999.

The G7 countries, or known as Group of Seven, are the group of developed nations, consisting of: U.S (The United States of America), U.K (United Kingdom), Japan, France, Italy, Canada and Germany. The G7 countries are the most developed countries among the countries of the world and they are highly industrialized. These developed countries possess high human development index and conquer almost 64% of the world's wealth, where 50% of the world economy are of the top G7 countries. Annual meeting will be held, bringing together all the representatives of the to discuss emerging global issues such as financial crisis, monetary systems and other major issues such as crude oil supply or demands. The members of the G7 countries are all one mind of preventing global economy from entering into another recession. The G7 members aim to progress the economies of member countries and the whole world. World economies and the economic development of other member states are discussed every year (sometimes more frequently in a year) by the finance ministers of the member countries.

Although articles and research papers are commonly based on ASEAN and G7 countries for the study of inflation, this study differs in the way that the Phillips Curve and the Fisher's Theory are again attempted to be proved using the context of developed and developing countries. This, in a way, shows if the health of economy in countries have particular effect towards inflation explaining theory, Phillips Curve and Fisher's Theory.

2.3 Concept and Measurement of Inflation

The specific meaning of inflation varies as it is implied through various measures. In broader terms, inflation is a generalized and continual increases in price (McNabb; McKenna, 1990). Inflation is a sustained increase in the price of goods and services in an economy over a period of time. General price level is something that mirrors the general price level for goods and services in an economy at a specific time (Islam, Abdul Ghani, Mahyudin & Manickam, 2017). Inflation mirror the condition of the economy of a nation and it might led to many negative effects on its economic development. High inflation rate will increase the daily living expenses and the living standards of people in it.

The value of currency is expressed in terms of its purchasing power, which is the amount of real, tangible goods or actual services that money can buy at that period. When inflation rate goes up, there is a decline in the purchasing power of money. After inflation, the currency won't decrease back as it was before. For an example, in year 1940, a packet of rice costs RM5. In 2010, at inflation rate 3%, a packet of rice costs RM 6.50. Even though the inflation rate fall back to 2% in the upcoming years, the price won's fall back. In recent years, most developed countries have attempted to sustain an inflation rate of 2% till 3% by using monetary policy tools put to use by central banks. This general form of monetary policy is known as inflation targeting.

Inflation, commonly are referred to be caused by over-supply of money in an economy. Many research papers and researchers have proved this fact as well. This inflation is called the monetary inflation, the inflation caused by an oversupply of money in the economy. Just like any other commodity, the prices of things are determined by their supply and demand. If there is too much supply, the price of that this go down. Like, too much supply

of money in the economy, makes its value to depreciate. Other than the monetary policy, the causes of inflation include demand-pull inflation and cost-push inflation. This will be discussed in the following sections.

2.3.1 Demand-Pull Inflation

Demand-pull inflation is the inflation caused by the overall increase in demand for goods and services, which bids up their prices. This theory can be summarized as too much money chasing little amount of goods. In other words, if demand is growing faster than supply, prices will increase. This usually occurs in rapidly growing economies. This theory is often promoted by the Keynesian school of thought. The prices of natural resources, commodities are increasing steadily because the demand for it are rapidly growing as well.

The Keynesian theory, proposed by John Maynard Keynes, express that the cause of inflation roots from an increase in aggregate demand as the major source of demand-pull inflation. The aggregate demand consist of government expenditure, consumption and investment. Agba (1994) stated in his research that, according to the Keynesian theory, demand-pull inflation occurs when aggregate demand exceeds aggregate supply at full employment level of output. The rise in price over the full employment is called inflationary gap. The greater the gap between aggregate demand and aggregate supply, the inflation rate increase more rapidly.

In addition, high rate of inflation will result in the declining power of purchasing nominal assets, like money and wages. Research by Agenor and Hoffmaister (1997), using the middle income developing countries: Chile, Korea, Mexico and Turkey states that the

fluctuation in the rate of nominal wages cause inflation rate to upsurge. The Keynesian theory states, a decrease in the component of aggregate demand considered as effective policy in reduction of inflation and demand pressure. The government expenditure can be reduced by rising the tax and appropriate management of the money supply. This method seem to be effective in reducing demand and controlling inflation (Totonchi, 2011).

Osorio and Unsal (2013) contended that 60% of the oscillations in the inflation levels in the Asian region is initiated from local factors, particularly for bigger and more developed countries, like Indonesia, Japan and China. Nevertheless, inflation rate in the selected ASEAN economies are more dependent on external elements, like openness in trade. It has also been discovered that the key cause for Asia's inflation are supply shock and monetary shock, with demand-pull inflation playing a relatively small role.

2.3.2 Cost-Push Inflation

Cost-push inflation is caused by a rise in costs of labor, raw material and other relatable. When the manufacturing costs increase, the supply of goods for production decrease. The cost-push inflation is triggered when the prices of supplies increase causing a rise in the overall price level, at constant demand. In this case, the overall price level increases due to higher costs of production which reflects in terms of increased prices of goods and commodities which majorly use these inputs. This kind of inflation is triggered because of less supply. The opposite effect of this is called demand pull inflation where higher demand triggers inflation. Apart from rise in prices of inputs, there could be other factors leading to supply side inflation such as natural disasters or exhaustion of natural resources, monopoly, government regulation or taxation, change in exchange rates, etc. Generally,

cost-push inflation may occur in case of an inflexible demand curve where the demand cannot be easily adjusted to go along with the rising prices of goods.

Cost-push inflation occurs when demand is inflexible. Demand is inflexible when there is a high demand for the good or service even if the price goes up. For example, inelastic demand occurs with gasoline. People can't easily buy less gas no matter how high the price goes. It's even worse for those who don't have good alternatives, such as mass transit. It takes time for people to find alternatives, such as joining a carpool or buying a fuel-efficient vehicle. Until then, they need the same amount of gas. When demand is elastic, people won't pay the higher prices. They simply buy less of the good or service. They'll either switch to a slightly different product or do without it. A good example of this is single family homes. Obviously, people can't do without housing. But if prices rise, they have other options. They can rent, buy townhomes or condos, or live with friends or relatives. Higher housing prices and higher gas prices are just some of the ways that inflation impacts your life.

Cost-push inflation occurs under five special circumstances: monopoly, wage inflation, natural disaster, government regulation and taxation and exchange rates. In all of these circumstances, the demand stays constant, even when the price level fluctuates. Companies that achieve a monopoly over an industry create cost-push inflation. A monopoly reduces supply to meet its profit goal. Organization of Petroleum Exporting Countries (OPEC) sought monopoly power over oil prices. Before OPEC, its members competed with each other on prices as they didn't receive a reasonable value for a non-renewable natural resource. OPEC members now produce 42 percent of oil each year. They control 80 percent of the world's proven oil reserves. OPEC members created

cost-push inflation during the 1970s' oil embargo. When OPEC restricted oil in 1973, the prices increased fourfold. In 2014, shale oil producers paused OPEC's monopoly power causing the prices to drop. Wage inflation occurs when workers have enough power to force themselves through wage increment. Companies then pass the higher costs to consumers. The U.S. auto industry experienced it when labor unions were able to push for higher wages. However, contribute to China and the declining union power in the United States, it hasn't been a driver of inflation for many years.

Natural disasters cause inflation by disrupting supply. Like, after the Japan's earthquake in 2011, it disrupted the supply chain of auto parts. It also occurred after Katrina Hurricane. When the storm destroyed oil refineries, gas prices rise. The reduction of natural resources is type of natural disaster. It works the same way, by limiting supply and causing inflation. A fourth driver is government regulation and taxation. These rules can reduce supplies of many other products. Taxes on these unhealthy products, cigarettes and alcohol, were meant to decrease on its demand, unfortunately, its prices rise instead, creating inflation. The fifth reason is a shift in exchange rates. Any country that allows the value of its currency to fall will experience higher import prices. The foreign supplier does not want the value of its product to drop along with that of the currency. If demand is inelastic, it can raise the price and keep its profit margin intact.

2.4 Theories of Macroeconomic Variables

2.4.1 Quantity Theory of Money

The Quantity Theory of Money is one of the established economic policies. This theory states that changes in the level of general price are mostly regulated by changes in the

demand and supply of the quantity of money. The theory of money was established since 19th century by classical monetarists by providing the principal conceptual framework for interpretation of modern financial events. As stated by Totonchi (2011), this theory was contributed by classical economists, such as, Hume (1711-1776), Ricardo (1772-1823), Fisher (1876-1947) and Pigou (1877-1959).

Hume introduced the influence of monetary change spread from one sector to another economy sector, changing quantity and relative price in the process. Hume also further elaborated, refined and explained the quantity theory of money. Ricardo, the greatest pioneers of the classical economy, argued that the imbalance effects is not important in the long-run equilibrium. He stress that the inflation in Britain was the penalties paid under the irresponsible issue of money during the Napoleonic war in 1797.

Irving Fisher used mathematical analysis in his famous equation $MV=PT$. In neo-economic analysis, Cambridge cash balance equation matches with the emerging mathematics use. This defines the precise term to discover and compare to which the proportional assumption is valid. Fisher and Pigou demonstrated that monetary policy could be reached by monitoring a certain part of monetary base in the fractional reserve-banking regime.

2.4.2 Philips Theory of Unemployment

Philips curve's theory denotes that the inflation rate and unemployment rate moves inversely with each other. Philips curve stress that when the unemployment rate is high, the aggregate demand for goods and services will fall because of less money supply. When aggregate demand decrease, the prices will fall to increase the aggregate demand. For a

few eras, the Philips curve of acts as an important guiding theory for those economists. The first researcher who proved the Philips theory to be relevant was Paul Samuelson and Robert Solow (1970). The study conducted by them using the data of United States lead to the conclusion of existing of inverse relationship between unemployment and inflation rates in the United States of America.

According to Islam et al. (2003), the Philips curve was an important tool in the macroeconomic policy makers for neither well-developed nor less-developed countries throughout the world during the 1960s and 1970s. It acted as an instrument for the policy formulators and government for measuring the rate of inflation and unemployment. The Phillips theory is also used to control inflation and unemployment without affecting other variables of the macroeconomic factors.

Unemployment rate and inflation in Malaysia can be used to explain the Philips Curve. Unemployment and inflation level in Malaysia had inverse relationship in previous years. The unemployment rate in Malaysia was recorded at 5% during the 1970s, but it decreased lower than 5% during 1981 and the year after. In 1983, the unemployment rate steadily increased and by 1987, the rate was 8.7%. When Malaysia faced an economic crisis in 1988, the unemployment rate started to decrease and by 1997, the rate was 2.6%. The unemployment rate remained steady at 3.5% during 1998 till 2004.

2.4.3 Keynesian Theory of Unemployment

The Keynesian theory of unemployment is that inflation and unemployment rate moves parallel to each other. To explain more, the Keynesian theory denotes that when unemployment rate increases, the inflation increases as well because the aggregate

demand for goods and services decreases in the market. So, reducing the unemployment rate would be the choice to handle inflation according to the Keynesian theory. The difference between the Keynesian theory and the Philips curve is that the Philips curve of unemployment are relevant in the short-run whereas the Keynesian theory are relevant in the long-run.

The Keynesian Theory occupies that changes in aggregate demand, whether anticipated or unanticipated, have their greatest short-run effect on real output and employment, not on prices. This idea is portrayed, for example, in Phillips Curve that show inflation rising only slowly when unemployment falls. Keynesians believe that what is true about the short-run cannot necessarily be inferred from what must happen in the long-run.

However, the Keynesian theory is said not to be adaptable to the current economy. The rejection is probably because the model was developed during the 1970s and it is outdated. But, the Keynesian theory do helped during 2008, The Great Recession in United States (U.S), when the government seek alternative solutions for the financial crisis occurred. Keynesian model is proved to be useful for the inflation changes in these days, however, it does not elaborate more on the factors that he relatively proposed. Keynes might claim that it was so because different factors influence the inflation in different situations but the Keynesian factors might be commonly effecting the inflation more than others.

2.5 Previous Empirical Work

2.5.1 Money Supply and Inflation

Numerous studies have been conducted to prove the significance between the rate of growth of money supply and domestic inflation. Vogel (1974), Sheehey (1980), Bhalla

(1981), Saini (1982), Turnovsky and Wohar (1984), Darrat (1986), Togan (1987), Fadil (1989), Bahmani-Oskooee and Malixi (1992) found positive relationship between the rate of growth of money supply and inflation. On the other hand, Turnovsky and Wohar (1984) and Togan (1987) observed no significant in relationship between rate of growth of money supply and domestic inflation. Deme & Fayissa (1995) found a parallel movement of the rate of growth of money supply and domestic inflation where when rate of growth of real income increases, theoretically, the rate of growth of transactions demand for real money balances increases as well. Deme & Fayissa (1995) further explains that constant rate of growth of the nominal money supply, rises the demand for money which is expected to be inversely related with a higher rate of inflation. The domestic interest rate do not have any measurable impact on the domestic inflation for the G7 countries (Deme & Fayissa (1995)) because the financial institutions in these countries are not well-refined to allow the operation of the interest rate transmission mechanism. In monetarists' tradition, increase in the foreign interest rate is expected to increase the domestic rate of inflation (Saini, 1982; Darrat, 1986). When the foreign interest rates incline, it stimulates the capital flight and reduce the demand for real money balances in the domestic economy resulting in excess money supply which lead to rise in the domestic inflation.

Rana and Dowling (1982) proposed according to the economic theory, there is an inverse relationship between expected rate of inflation and domestic rate of inflation. When the expected rate of inflation rises, it increases the opportunity cost of real assets and the demand for real money balances drops resulting in excess money supply that causes the rate of inflation to rise. For small countries, the monetarists' model assumes that both changes in the real exchange rate and foreign inflation are instantly and proportionately

transmitted into higher domestic prices. In accordance of the monetary approach to the balance of payments, when foreign prices, or domestic currency fluctuates, the international reserve components of domestic money supply will increase causing a decrease in excess demand for money and a rise in the inflation.

2.5.2 Unemployment and Inflation

As reported by the International Labor Organization (2001), unemployed are person who are above a specified age without work, currently available for paid employment or self-employment and actively seeking for work. There are three categories of unemployment: structural unemployment, frictional unemployment and cyclical unemployment. The CEIC ASEAN unemployment rate for the second quarter of 2017 mentioned in their website that The Philippines has the highest unemployment rate (5.7%) with Vietnam (2.3%) and Singapore (2.9%) to record the lowest compared to other members of the ASEAN. However, when the unemployment rate of the G7 countries, or developed countries, are reviewed, the results are shocking. The unemployment rate for G7 countries, for August 2017, are as follows: Japan (2.9%), Germany (3.8%), U.K (4.3%), U.S (4.4%), Canada (6.5%), France (9.4%) and Italy (11.2%).

Meisler (2017), elaborated in the Bloomberg website: Germany's unemployment rate is at an all-time low, Japan's is the lowest since 1994, Canada's is the smallest since late 2008 and the last time The U.K saw a jobless rate as low as 4.6% was in August 1975. Workers in France and Italy are less fortunate. While France's rate climbed slightly in the past 5 years, Italy's has risen more than 1% as the country still struggles to recover from the financial crisis. The U.S is the big winner at improving its unemployment rate. Its

unemployment rate is at pre-financial-crisis levels, having decreased more in 5 years than any of the G7 countries. An article in the website, UK ESSAYS (2015), explains that there are four independent variables that effect unemployment which are consumption, investment, government spending and trade. According to Samuel et. al (2001), an increase in the duration of unemployment of male household tend to cause a decrease in the consumption in related countries of Germany, Great Britain and U.S. cited by UK ESSAYS (2015), authors, Cochrane (1991); Browning and Crossley (2011), proven that there are a decrease in the consumer consumption, when unemployment increases. Cochrane (1991) stated that the consumption growth decreased from 24% to 27% during unemployment period. On the other hand, Browning and Crossley (2011) also proved that a mean fall in consumption of 14% on unemployment. The next variable explaining unemployment is investment.

Harms and Hefeker (2003) found that returns of portfolio investment abroad are positively correlated with U.S. labor demand shocks. An increase in investment lead to increase in new jobs and labor demand. Marino (2000) showed the significance between (Foreign Direct Investment) FDI, economic growth, employment and factors stimulating the FDI inflow in the open economy. The GDP growth is positively correlated with the capacity of FDI inflow. However, in the context of closed economy, there are opposing relationship between GDP growth and FDI inflow. Christoph Ernst (2005) studied that a stable and productive investment inflows of a country would rise the production and employment rate as well as the increase of production of value added goods. Joseph Prokopenko (2000) found strong correlation between domestic productivity and its level of unemployment. When the domestic economy is productive and competitive, the foreign market would be

competitive, thus, lowering the unemployment rate. However, investment will increase due to high production rate. So, it will create new job opportunities and the increase the employment rate. Hence, investing in a productive market is a source which can create new market and then increases the job opportunities in the market.

Other than that, government programs are the largest source for the households to compensate earnings shocks arising from the unemployment in the U.S (Dynarski & Gruber, 1997). Agell, et al. (1997) noted that the government consumptions and spending can enhance employment thus strengthen and stabilize the economic growth of the nation. Kenyon (1997) mentioned in his article that government spending on infrastructure will create more jobs opportunity. Government spending can raise labor productivity and at the same time increase the investment from private sectors. Consequently, when the demand for labor increase, the unemployment rate decreases as process of government spending is like a facilitator that fuel the economic growth in a country. Feldstein (1978) found that the unemployment insurance and taxation on labor income could affect work-leisure decisions where it increase the unemployment rate. The situation where even if they do not have a job, they could still get the unemployment insurance to support their daily lives. Hence, this will result in a negative situation where labors will depend on the unemployment insurance instead of working hardly. On the other hand, increase in income tax will lead to unemployment because income taxes charge according to personal income of individuals. Everyone have to work hard to get better income for a better life and yet they need to pay higher tax to compensate high income.

Brecher (1974) found that after trade fluctuations in the unemployment rate depend on whether the country exports labor-intensive goods or not supported by the Heckscher-

Ohlin model. Davis (1998(a), 1998(b)) further discussed about the effect in a two-country framework where if home country produces and exports labor-intensive goods, then the employment rate will increase. Matusz (1996) studies the consequences of openness to trade on the unemployment rate using the efficiency-wage framework. Openness to trade will create intra-industry trade where it creates new jobs opportunity, thus, reduce the unemployment rate. Brecher (1974) and Davis (1998), further found that trade liberalization can reduce unemployment rate. The inexistence of barrier of trade allows foreign workers to go to other countries anytime. This will lead to excessive supply of foreign labors and reduce the job opportunity for domestic labors. Thomas (2004) in his research says, Malaysia is heavily dependent on foreign trades as the nation's exports account contributes large proportion of GDP and manufactured goods are one of the main exports of Malaysia. Many problems would arouse when the exporting sector of Malaysia fails as it is dependent on generating revenue through exports. Failure in the exporting sector would cause major unemployment issues, causing its people to experience economic collapse. This is because manufacturing factories fail to sell and export their products, causing them to face financial problem, resulting in the closing down of the factory, thus, the unemployment rate rises.

2.6 Other Contributing Variables

2.6.1 Real Interest Rate and Inflation

In monetarists' tradition, people tend to borrow more when the interest rates are low resulting in more money-in-hand to spend and excess money supply in the economy. This will cause the economy to grow and inflation to increase. In contrast, when the interest

rates are increased, consumers tend to deposit money as returns from savings are higher. When the interest rate increase, the spending of disposal income decrease, thus, the economy slows and inflation decreases. The currency of a country will appreciate when interest rates increases because it will cost more to repay over the period of the loan. When interest rates reaches zero, the money become cheaper, thus it's easier to borrow for a mortgage, car financing and etc. Abdul Aziz Farid Saymeh and Marwan Mohammad Abu Orabi (2013) stated that there is a positive relationship between current interest rates and growth rates.

Magda Kandil (2014) examined the allocation for monetary policy shocks, both expansionary and contractionary, between price inflation and output growth, indicated by time-series based sample data of the countries. The variability of output growth decreases when there occurs to be monetary fluctuations across countries, consistent with the stabilizing function of monetary policy. High and sustainable economic growth and low inflation are the two main objectives of policy-makers and the central bank. Khan and Senhadji (2001) mentioned in their article that, commonly, it is believed that inflation has a negative impact on economic growth in medium and long-run. Vikesh Gokal and Subrina Haniff (2004) reveal in their findings that there is a statistically significant negative relationship between inflation and growth and of an economically interesting magnitude.

2.6.2 Real Exchange Rate and Inflation

Mundell (1963) identified exchange rate as another determinant of the demand for money. The exchange rate fluctuations can be influenced by many macroeconomic variables such as money demand, inflation (measured using CPI), import/export prices and etc. Any

depreciation in the exchange rate, is likely to cause an increase in inflation rate as import prices gets more expensive. Vice versa, appreciation in the exchange rate will tend to reduce inflation as import prices gets cheaper. Previous authors who have tried to estimate a money demand function inclusive of the exchange rate, have employed the bilateral rates and estimated their model only for a limited number of industrial companies (Bahmani-Oskooode & Malixi, 1991). Developing countries have received no attention in this regard. When the international monetary system changed from fixed to relatively more floating exchange rates, most of the less developed countries (LDCs) preferred to peg their currencies to one major currency or to a basket of major currencies (Bahmani-Oskooode & Malixi, 1991).

However, as argued by Warner and Kreinin (1983), these countries cannot avoid fluctuations in their effective exchange rates, as long as major currencies fluctuate against each other. Previous studies have included an exchange rate variable in the money demand function. They heavily relied on bilateral rates. Bilateral exchange rates involves a currency pair, while an effective exchange rate is a weighted average of a basket of foreign currencies and it can be views as an overall measure of the country's external competitiveness. For example, Arango and Nadiri (1981), who estimated a money demand function for Canada, Germany, U.K and the U.S included an exchange rate variable that was defined as number of units of each country's currency per unit of U.S dollar. This same definition was also used by Domowitz and Elbadawi (1987) who estimated a money demand function for Sudan (cite). The relationship between exchange rate and money demand was originally conjectured by Mundell (1963, p. 484) who wrote, "the demand

for money is likely to depend upon the exchange rate in addition to the interest rate and the level of income.”

2.6.3 Money Wages and Inflation

Vast majority of the published evidence suggests that there are reasons for researchers make statements of wage inflation causes price inflation. In fact, it is more often found that price inflation cause wage inflation. Researcher, Cacnio (2011), found that wages and price inflation diverged in the late 1990s but tracked the same trend in the 2000s with wage inflation leading the price inflation by a few quarters. This statement implies that wages and price inflation are related. Hess & Schweitzer (2000) provide a little support in their article for the view that wage gains cause inflation. They noted that the growth of nominal wages may not be a good measure of the cost pressures faced by firms.

If the wage growth is due to productivity growth, then it should not translate to higher prices. This implies that employers have to compensate their workers for increased productivity. Thus, productivity should be accounted for when looking into the effects of wages on inflation. The unit labor cost which is the cost to the firm of producing one unit of output, is used as a measure of wages adjusted for labor productivity. However, Hess & Schweitzer (2000) further concluded that wage inflation, whether measured using labor compensation, wages or unit-labor-costs growth, is not a reliable predictor of inflationary pressures.

The significant relationship between changes in wages and price inflation has been widely studied in literature. While economic theory is able to explain the possible significance between the two variables, the empirical evidences on the effect of wage growth on

inflation point to a weak relationship. On the contrary, it is more often observed that price inflation results in wage inflation (Cacnio, 2011). A simple Granger causality test between wage growth and price inflation was conducted using Philippine data for the period 1989 until 2009. It was found that causality between wage changes and inflation runs in both directions.

2.6.4 Import and Inflation

The impact of foreign competition in U.S. domestic and international markets can probably explain the low inflation situation the U.S. in recent years. It states that “globalization” has made it virtually impossible for domestic companies to raise domestic or export prices regardless of the cost pressures to do so. As explained by Tootell (1998) and others, globalization’s gives neither direct nor indirect pressure on pricing and inflation. The direct impact refers that the (CPI), includes the prices of U.S. imports where a decline in the import prices will have a muting effect on the overall CPI. The indirect pressure comes from foreign companies competing against U.S. companies in domestic markets. Another indirect effect is transmitted through the cost channel. When foreign components are used to manufacture domestic goods, price changes for these components could have turnarounds on the price adjustments for the finished goods, subject to market conditions.

While Tootell disagree on the direct and indirect link between CPI inflation in the U.S. and import prices, others are convinced that such links exist. Robert Rich and Donald Rissmiller (2000) of the Federal Reserve Bank of New York believe that import prices have significant effect on the inflationary process. In their writings, there are explained

that when there is a large and continued decline in import prices, the inflation level seem to be reducing, proven with statistic inflation over the past several years. For example, Paul Kasriel of The Northern Trust Company (2004) wrote that when dollar appreciates, the expected inflation level graph is in downward trend in the greenback's foreign exchange value. Hence, the prices of imported goods is expected to rise at a faster rate. In such event, the core consumer inflation is also expected to continue rising.

Economists are convinced that “new economy” dynamics were responsible for the subdued inflation in the 1990s. They believe that increase in the global competition in many markets was forcing companies to find non-price ways to protect or expand their profit margins. Hence, it is understandable that inflation will remain low when the domestic pricing decisions are determined by global demand and supply forces. Most of the recent literature on import prices, has focused on the relationship between import prices and exchange rates. Obstfeld (2002) mentioned that most researchers have concentrated on developing “models of pricing to market and destination-currency pricing of exports” in recent years. Along these lines, Taylor (2000), supported by Campa and Goldberg (2002), argues that there has been a significant weakening in the desire or ability of firms to manage price increases when there are unfavorable movements in exchange rates.

2.7 Table of Literature Review

NUM.	AUTHOR (YEAR)	COUNTRY / DATA FREQUENCY	VARIABLES USED	METHOD OF ESTIMATION	FINDINGS
1	Farah Dina Zakaria (2016)	Selected ASEAN AND G7 (1990-2014)	DV – CPI IV – Wages, Money supply (M2), GDP, Interest rate, Import	POLS, Random Effects Model, Fixed Effect Model, Granger Causality Test, Housman Test	- The fixed effect result, POLS state wage and import has effect on CPI. M2 is insignificant, negative relationship between money supply and inflation. GDP is significant and negatively related to CPI. - Overall conclusion, all variables have effect on the inflation rate except money supply.
2.	Jakada Aminu Hassan (2016)	Nigeria (1970-2012)	DV – Inflation rate (annual %) IV – Money supply; GDP; Exchange rate; Interest rate; Import of Goods and Services	Descriptive statistics; Unit Root Test; Co- integration Test; Granger causality; Vector Error Correction Model	- This study concentrate on the impact of money growth on inflation in Nigeria, focusing on the effect of money supply growth on inflation and other variables. - The result reveal that inflation in Nigeria is determined by money supply growth, GDP, exchange rate, value of import and interest rate.
3.	Abderezak Ali Abdurehman; Samet Hacilar	Turkey (2005-2014)	DV – Inflation Rate	OLS (Ordinary Least Square); Unit Root Test;	- This paper investigate the relationship between inflation and exchange rate in Turkey.

	(2016)		IV – Exchange Rate (represented by pound and lira rate)	Generalized Autoregressive Conditional Heteroskedasticity (GARCH)	- The OLS result shows that there is no relationship between exchange rate and inflation observed. The explanatory variable has a coefficient different from one and constant near to zero but not significant. - The existence of ARCH and GARCH in the relationship indicates that the deviations of PPP are not random and follow a certain pattern. Therefore, we conclude that the deviation of PPP might be attributed to certain factors such as transaction cost, government restriction, product specialization or other related factors.
4.	Dewan Muktadir-Al-Mukit; A. Z. M. Shafiullah (2015)	Bangladesh (1994-2011)	DV – CPI IV – Import; Export	OLS; ADF Unit Root Test; Unrestricted Co-Integration; Error Correction Model (ECM); analysis of Variance Decomposition; Granger Causality	- This study investigate the relationship between inflation with import and export using different econometric frameworks. - Variance decompositions exposed that export has the highest shock impact on inflation between the variables in the inflation system.

					- Granger causality shows bilateral causality between inflation and export and a unidirectional causality between inflation and import.
5.	Dennis Nchor; Samuel Antwi Darkwah (2015)	Ghana (1991-2013)	DV – Inflation Rate IV – Nominal Interest Rate; Exchange Rate Movement	Autoregressive Distributed Lag Model; Unrestricted Error Correction Model (to estimate long- run and short-run relationship between variables); ARDL Model; Regression Model (Fisher Effect, International Fisher Effect)	- The objective of this paper is to determine the impact of IV on inflation in Ghana. This study also investigate the Fisher Effect and International Fisher Effect. - Results indicate, in the short-run, 1% increase in level of depreciation of Ghana cedi, increase the inflation rate by 0.20%. - 1% increase in inflation, increase the nominal interest rate by 0.51%, demonstrating the <u>partial</u> Fisher effect. 1% increase in the interest rate difference leads to depreciation of the Ghana cedi by approximately 1% indicate the <u>full</u> International Fisher effect.
6.	Korhan Gokmenoglu; Vahid Azin; Nigar Taspinar	Turkey (1961-2012)	Oil Price; Inflation; GDP; Industrial Production	ADF Unit Root Test; Johansen Co- integration; Granger Causality	- The purpose of this study is to test any possible long-run relationship among the variables at Turkey.

	(2015)			tests; Descriptive statistics	- The result reveals that there are long-run relationship among variables tested and Granger causality test confirms that oil price changes affect the industrial production of Turkey, which is a net oil importer country.
7.	Fumitaka Furuoka; Qaiser Munir (2014)	Malaysia (1973-2004)	DV – Inflation rate IV – Unemployment rate	ADF Unit Root Test; Johansen Co-integration Test; Error Correction Model (ECM)	- This study focuses on Malaysia and aims to empirically analyze the relationship between unemployment rate and inflation rate in a developing country. - The main finding is that there existed an equilibrium relationship between unemployment rate and inflation rate in Malaysia using the Phillips Curve theory. - The result generated proves the existence of the Phillips Curve, verifying that there are social-economic factors that may influence the unemployment rate and inflation rate.
8.	Pamela F. Resurreccion (2014)	Philippines (1980-2009)	DV – Unemployment rate	ADF Unit Root Test; OLS (Ordinary Least	- Based on Okun's Law and Phillips Curve, this study is to determine the link between

			IV – Inflation rate; Growth (proxy: real GDP); Age Dependency ratio	Square) regression analysis; Heteroscedasticity; Collinearity; Serial Correlation	unemployment with inflation and economic growth in Philippines. - Regression results proves the Okun's Law where economic growth negatively influence unemployment and the study confirmed the Phillips Curve where inflation negatively influences unemployment. - The age dependency ratio found to be positively related with unemployment.
9.	Owolabi A. Usman; Adegbite Tajudeen Adejare (2014)	Nigeria (1988-2010)	DV – GDP IV – Narrow money; Broad money; exchange rate; interest rate.	Multiple Regression Method (using secondary data)	- This study examines the effect of proposed IV towards the Nigerian economy. - The result indicate that broad money (M2) impacted on the key macroeconomic variable, GDP, as the result shows a positive effect on the Nigerian economy. The growth in money supply was attributed to credits extended by the deposit money banks to the private sector. - The existence of currency substitution (exchange rate) introduces a different monetary policy dynamics because it

					exposes the Nigerian economy to external and internal shocks.
10.	Norikazu Takami (2014)	United States (1950s')	Theory paper - Cost-push inflation	N/A	- This paper examine how cost-push inflation theories caused by increases of wages and other production costs as a cause of inflation. - This paper discuss the rise of cost-push inflation theories in the late 1950s. First, in the period of economic expansion (1956-1957), it was realized that tight money policy could not fully restrain the upward price movement - Second, during the recession of 1958, a rapid increase of unemployment with a steady rise of general prices was considered to be a sign of the validity of cost-push inflation.
11.	Alexandru Ioan (2014)	Romania (conducted on monthly data: June 1997- December 2013)	DV – Inflation Rate IV – Money supply, nominal wage, exchange rate, interest rate	Principal Component Analysis (PCA), a descriptive method for the	- When wage increase, inflation increase. - Wage increase has no relation with the productivity increment. - Increase in wage led to decrease in supply and employment.

				multidimensional analysis of data.	- Reducing the interest rate would allow price stability.
12.	Francis Gyebi; Godfried K. Boafo (2013)	Ghana (1990-2009)	DV – CPI IV – Money supply, exchange rate, growth in GDP	OLS; Durbin Watson (DW) statistic	- It is concluded that real exchange rate and money supply are the main macroeconomic factors responsible for inflation at Ghana.
13.	Evans Agalega; Samuel Antwi (2013)	Ghana (1980-2010)	DV – GDP IV – Inflation rate, interest rate,	SPSS; Regression Analysis; ANOVA	- There exist strong positive relationship between GDP, interest rate and inflation rate over the period of study. - The behavioral patterns of interest rate and inflation rate have influence on GDP. - Positive relation between GDP and inflation rate. - Negative relationship between GDP and interest rate.
14.	Fauzi Hussin; Nooraini Saidin (2012)	ASEAN-4 countries (Malaysia, Indonesia, Thailand, Philippines) (1981-2008)	DV – GDP IV – Foreign Direct Investment (FDI); Openness; Gross Fixed Capital Formation	POLS (Pooled Ordinary Least Square); Fixed Effect Model (FEM); Random Effect Model (REM)	- This paper examines the impact of economic variables, IV, which indicates using DV. - The findings show that all variables correlate with each other and have positive relationship with GDP. Hence, the variables may lead economic

					growth to boost when they increase. - FDI become the most efficient variable to assist economic growth, followed by openness and gross fixed capital formation.
15.	Girijasankar Mallik and Anis Chowdhury (2001)	4 selected South-Asian countries: Bangladesh, India, Pakistan, Sri Lanka (1957-1997)	DV – CPI IV – Economic Growth	Descriptive analysis, Unit root test, Phillips Perron test, Error Correction Model	- The author found two results. First, inflation and economic growth are positively related. - Second, the sensitivity if inflation to changes in growth rates are larger than that of growth to changes in inflation rates.

2.8 Concluding Remarks

Overall, this chapter explained the main theories of inflation and strengthen it with supporting examples and theories. Other than that, the Quantity Theory of Money, Philips' Theory and Keynesian theory are included, held with writings that support and oppose the theory. This chapter is further added with previous empirical works and added Table of Literature Review.



CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter can be divided into eight sections. Section one discuss on the description of data. Section two is related to data collection method. The third section is the research framework continued with sampling framework in the section four. Section six and section seven compromise on the data processing method and panel data respectively. Finally, the statistical method of analysis is on section eight.

3.2 Data Description

This research paper used a total of eight macroeconomic variables and Consumer Price Index (CPI) to conduct this research. The macroeconomic variables are yearly frequency from 1980 until 2016. To observe the outcome of this research, this research is conducted based on the already 8 developed G7 countries and 6 developing ASEAN countries. There are total of 296 yearly panel observations for G7 countries and 222 yearly panel observation for ASEAN countries. All variables are obtained from various statistic sources to have a complete yearly data.

This paper is a quantitative research paper that involves a series of empirical techniques. The data set for each of the dependent and independent variables consist of 296 observation and 222 observation for developed countries and developing countries respectively which was obtained from various statistic sources. The empirical method that had been used in this paper to investigate the relationship between the dependent variables and macroeconomic variables is using the E-views version 9 software.

3.3 Data Collection Method

This paper focus on secondary data which was obtained from the different sources to ensure a more accurate data is lined. The reason of using the secondary data is that it is more reliable and time saving. For an example, the World Bank Open Data indicates that, “Timely and reliable statistics are key inputs to the broad development strategy. Improvements in the quality and quantity of data on all aspects of development are essential to achieve the goal of a world without poverty.” The panel data that covered from year 1980 till 2016 in compromise of 37 years of data set for each variables. The total selected 8 developed G7 countries and 6 developing ASEAN countries and 8 variables has been chosen to be regressed to find an outcome from this research. The 8 developed countries consist of U.S, U.K, Japan, France, Italy, Canada and Germany from G7 countries. Then, the developed countries from the ASEAN region was included, which is Singapore. The developing countries consist of 6 selected ASEAN countries: Vietnam, Indonesia, Philippines, Brunei, Malaysia and Thailand. The variables data that has been extracted from various sources to complete this research is Consumer Price Index (CPI), money supply, unemployment, manufacturing, real interest rates, real exchange rate, Gross Domestic Products (GDP), money wages and import inflation. The variables are obtained from different sources such as World Bank Data, International Monetary Fund (IMF), U.S Bureau of Labor Statistics, Organization for Economic Co-operation and Development (OECD) statistical data and Department of Statistics Malaysia. After eliminating some of the incompatible data, a total of 3,626 data points consisting of countries and variables were generated.

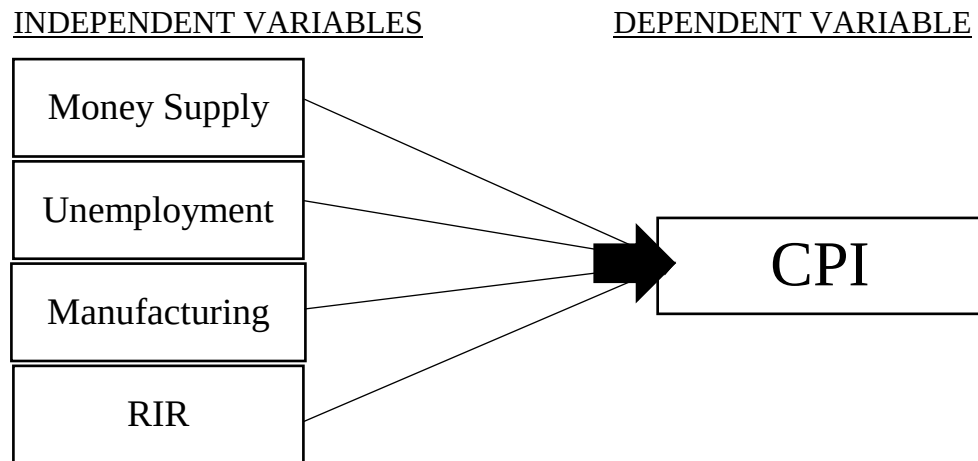
Table 3.1 Explanation of Data

Variables	Proxy	Explanation	Units	Sources of Data
<u>Dependent</u>				
Consumer Price Index	CPI	Measured by the Consumer Price Index	Annual Growth (%)	OECD
<u>Independent</u>				
Money Supply	MS	Broad Money	Annual Growth (%)	World Bank
Unemployment	UEP	Total Labor Force (modeled ILO estimate)	Percentage Growth (%)	World Bank
Manufacturing Statistics	MFG	Industry Contribution to Business Sector Productivity Growth	Annual Growth (%)	IMF Economic Statistic
Real Interest Rate	RIR	Real Interest Rate implied	Percent (%)	World Bank
Real Exchange Rate	RER	Real Effective Exchange Rate Index	2010=100	World Bank
Gross Domestic Products	GDP	GDP per capita Growth	Annual Growth (%)	World Bank
Money Wages	MW	Wage and Salaried Workers	Annual Growth (%)	World Bank
Import Inflation	IMP	Import of Goods and Services	Annual Growth (%)	World Bank

3.4 Theoretical Framework

3.4.1 Theoretical Framework for Developed Countries

Figure 3.1 Theoretical Framework for Developed Countries

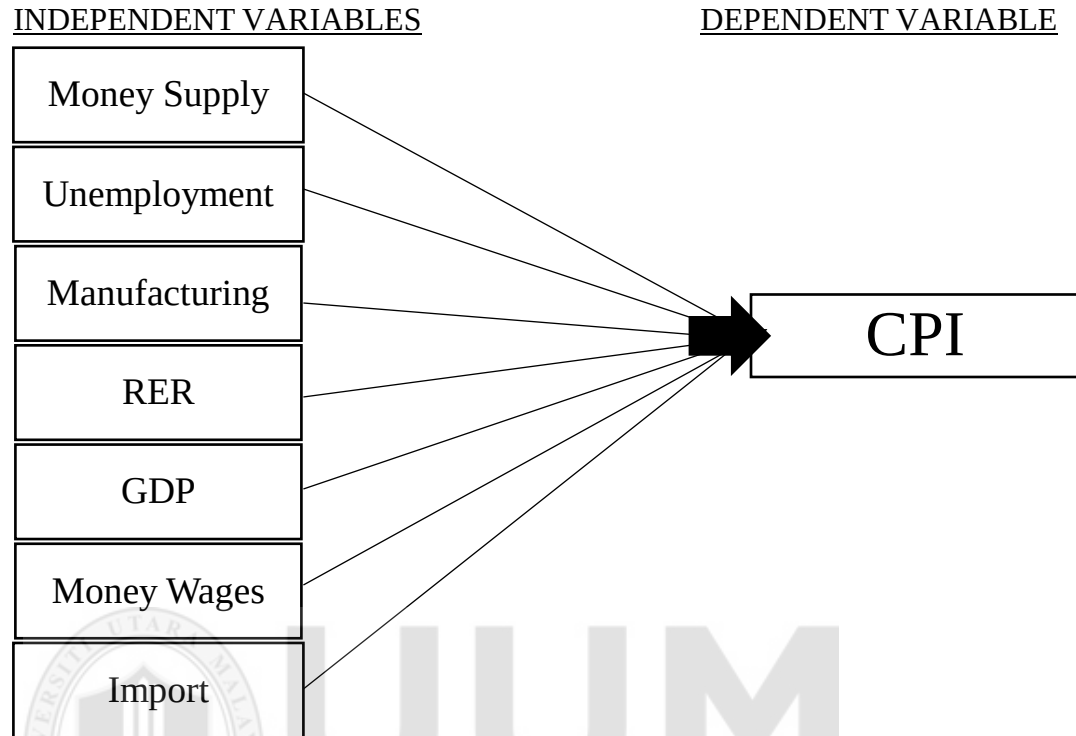


The theoretical framework presented at *Figure 3.1* is supported by the following theories and authors:

- Money supply = Fisher Effect (Quantity Theory of Money); classical economist: Hume (1711-1776), Ricardo (1772-1823), Fisher (1876-1947) and Pigou (1877-1959); Bawumia and Abradu (2003); Zakaria (2016); Hassan (2016)
- Unemployment = Morley, Piger, & Rasche (2011); Kitov (2013); Bans-Akutey, Dey, & Mohammed (2015); Bhattarai (2016)
- Manufacturing = Gokmenoglu et. al (2015); Judith & Chijindu (2016);
- RIR = Cheng and Tan (2002); Agalega and Antwi (2013); Hassan (2016)

3.4.2 Theoretical Framework for Developing Countries

Figure 3.2 Theoretical Framework for Developing Countries



The theoretical framework presented at *Figure 3.2* is supported by the following theories and authors:

- Money supply = Fisher Effect (Quantity Theory of Money); classical economist: Hume (1711-1776), Ricardo (1772-1823), Fisher (1876-1947) and Pigou (1877-1959); Gyebi (2013), Godfried (2013); Zakaria (2016); Hassan (2016)
- Unemployment = Furuoka & Munir (2014); Resurreccion (2014); Mohseni & Jouzaryan (2015)
- Manufacturing = Hussin & Saidin (2012); Suci, Asmara & Mulatsih (2015)
- RER = Cheng & Tan (2002); Gyebi & Godfried (2013); Cristian (2014)
- GDP = Kardioglu (2000); Mallik & Chowdhury (2001); Agalega & Antwi (2013)
- Money Wages = Cristian (2014); Zakaria (2016)

- Import = Zakaria (2016); Hassan (2016)

3.5 Sampling Framework

3.5.1 Target Population

This research paper target on the economies of 8 developed and 6 developing countries of ASEAN and G7. ASEAN countries is a regional organization comprising of ten Southeast Asian which promotes intergovernmental cooperation and facilitates economic integration amongst its members. Its principal aims include accelerating economic growth, social progress and sociocultural evolution among its members, alongside the protection of regional stability and the provision of mechanism for member countries to resolve differences peacefully. The G7 countries are the Group of 7 countries, with the largest advanced economies in the world. They represent more than 62% of the global net wealth, 46% of the global nominal GDP evaluated at market exchange rates and 32% of the global purchasing power parity GDP. The reason why this both target, G7 and ASEAN, is chosen, is to the find out the possible macroeconomic variables that influence the level of inflation in those selected countries. Based on the variables proposed, the might be indifferences of evidence that can influence the level of inflation in the selected countries. For developed countries, Singapore is selected from the ASEAN countries plus all the G7 countries which is U.S, U.K, France, Italy, Japan, Canada and Germany. As for the developing economy, the 6 selected ASEAN countries include Malaysia, Thailand, Vietnam, Indonesia, Philippines and Brunei.

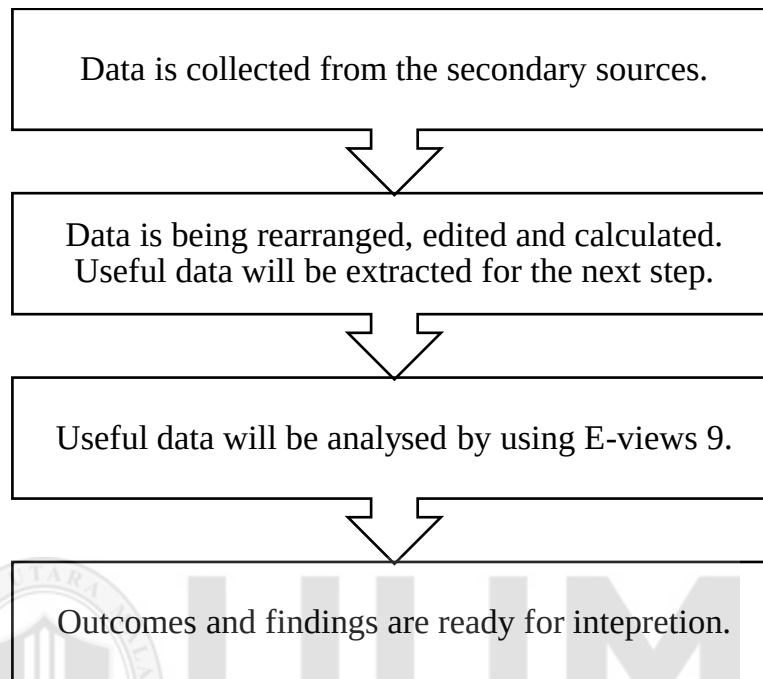
3.5.2 Sampling Technique

In this research paper, E-views 9 will be adopted as a tool to regress the findings. E-views is a simple and interactive econometrics software package which provide data analysis and also acts as tool for estimating and forecasting. E-views is the frequently used tool in practical econometrics. E-views has the advantage as the visual feature of modern windows software. E-views 9 is used to perform various empirical analysis such as Ordinary Least Square (OLS), Panel Ordinary Least Square (POLS), Panel Co-integration and also Granger Causality. For an example, by using the OLS, researcher can detect the error that originates from the empirical model. After detecting the error, a new empirical model, which has more causality, can be featured. E-views can be used to analyze the combination of ideas and opinions from different researchers and try to link them into the ASEAN and the G7 prospects case.



3.6 Data Processing Method

Figure 3.6: Diagram of Data Processing



Source: E-Views Help

The data processing for research is basically consist of four basic steps. First, the data need to be extracted from is respective sources such as World Bank data, IMF data or OECD data. Second, the data need to be arranged, free from missing numbers, and to be edited before moving to the third step. Third, after deleting the incompatible data, the remaining useful data need to be analyzed using the E-views. The final fourth step, the outcomes and findings are ready for interpretation.

3.7 Panel Data

In statistics and econometrics, panel data can be referred as multi-dimensional data commonly involving measurements over time. Panel data comprise observations of numerous occurrences found over multiple time periods for the same subject. A common panel data regression can be modelled as $Y_{it} = \alpha + \beta X_{it} + \varepsilon_{it}$ where Y is the dependent variable, X is the independent variable, α and β are coefficient, i and t are indices for subject and time. μ_t is an error term.

Economic Function (Developed Countries)

Consumer Price Index = f (Money Supply, Unemployment, Manufacturing, Real Interest Rates)

Economic Function (Developing Countries)

Consumer Price Index = f (Money Supply, Unemployment, Manufacturing, Real Exchange Rate, GDP, Money Wages, Import Inflation)

Econometric Model (Developed Countries)

$$CPI_t = \beta_0 + \beta_1 MS_t + \beta_2 UEP_t + \beta_3 MFG_t + \beta_4 RIR_t + \varepsilon_t$$

Econometric Model (Developing Countries)

$$CPI_t = \beta_0 + \beta_1 MS_t + \beta_2 UEP_t + \beta_3 MFG_t + \beta_5 RER_t + \beta_6 GDP_t + \beta_7 MW_t + \beta_8 IMP_t + \varepsilon_t$$

Where,

CPI_t = Consumer Price Index in countries at t year.

$\beta_1 MS_t$ = Coefficient for money supply in countries at t year.

$\beta_2 UEP_t$ = Coefficient for unemployment in countries at t year.

$\beta_3 MFG_t$ = Coefficient for unemployment in countries at t year.

$\beta_4 RIR_t$ = Coefficient for interest rate in countries at t year.

$\beta_5 RER_t$ = Coefficient for exchange rate in countries at t year.

$\beta_6 GDP_t$ = Coefficient for Gross Domestic Products in countries at t year.

$\beta_7 MW_t$ = Coefficient for money wages in countries at t year.

$\beta_8 IMP_t$ = Coefficient for import inflation in countries at t year.

3.7.1 Advantages of Using Panel Data

There are advantages why we use panel data while conducting this research. One of the advantages are panel data provide more accurate inference of parameters. Panel data usually contain more degrees of freedom and more sample variability than cross-sectional data which may be viewed as panel with $T = 1$ or time series data which is panel with $N = 1$, hence improving efficiency of econometric estimates. Secondly, panel data is said to have greater capacity for capturing the complexity rather than a single cross-section or time series. This include constructing and testing more complicated behavioral hypothesis

and controlling the impact of omitted variables. Lastly, panel data is said to have less collinearity among variables and more variability.

3.7.2 Limitation of Panel Data

The panel data also has its own limitations. Firstly, it has selectivity problem and collection of data. Secondly, dimension of time series is short, measurement error disruption and dependence in cross section. Lastly, a little limitations can be imposed in panels on distributed lag model than in a time series study.

3.8 Statistical Method of Analysis

3.8.1 Descriptive Analysis

Descriptive statistical analysis is used to describe the sample concerned in the study. It is a set of simple descriptive coefficient that summarizes a set of data. There are two types of measurements: variability and central tendency, which can be applied to explain the sample. The measures of variability, or also known as dispersion, consist of standard deviation, skewness, variance and maximum and minimum variables. The measures of central tendency, consist of median, mode and mean.

3.8.2 Correlation Analysis

The correlation analysis is referring to the strength of relationships between 2 variables. The following variables are known as 'independent' and 'dependent' variables. Correlation coefficient appears if the changes in the independent variable cause changes in the dependent variable. It can be ranged from -1.00 to +1.00. Coefficient of +1.00

signifies a perfect positive correlation and a coefficient of -1.00 represents a perfect negative correlation while zero coefficient indicates the absence of relationship between the two variables and therefore, any changes in the independent variable does not affect the dependent variable. Perfect positive correlation means that independent variable will have identical changes as per dependent variable, meanwhile for the perfect negative correlation means that independent variable will not have identical changes as per dependent variable. The higher the coefficient, the stronger the relationship between two variables, because the effect is more significant.

3.8.3 Pooled Ordinary Least Square (POLS) Regression Model

After the testing for descriptive and correlation, POLS is used to test the relationship between dependent variable and independent variable for the developed and developing countries. This method of analysis is a method to estimate the unknown parameters in a linear regression model. The main goal is to minimize the differences between the observed responses in some arbitrary dataset and the responses predicted by the linear approximation of the data. The equation for POLS are as shown below:

$$Y_{i,t} = \alpha + \beta X_{i,t} + \varepsilon_{i,t} \quad \text{for, } i = 1, 2, \dots, N; t = 1, 2, \dots, T$$

There are several advantages for our least square method are:

- a. The best-fitting regression line is easily can be found.
- b. Only one best-fitting line can be confirmed.

- c. The OLS estimator is consistent when the regressors are exogenous and there is no perfect multi-collinearity and optimal in the class of linear unbiased estimators when the errors are homoscedastic.
- d. OLS provides minimum-variance mean-unbiased estimation when the errors have finite variances.
- e. Under the additional assumption that the errors be normally distributed, OLS is the maximum likelihood estimator.

3.8.4 Granger Causality Test

The Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another. Granger Causality test is a convenient practical technique used for identifying the direction of the causal relationship between the variables and therefore, it may also be used within the co-integration analysis when there is an absence of theoretical framework clearly concerning the investigated variables. To explain further, in a regression equation independent variable, X_t , influence the explained variable, Y_t , where this indirectly acknowledge that X_t variable cause Y_t variable, which means that if variable X_t changes, it will induce variable Y_t to change also. In a simplified term, this is the concept of causality. The causality between the variables are determined also using the F-statistics (above critical value) and probability (below 10%). Therefore, the following cases will be identifying with regard to the direction of the causality:

- When Y_t does not cause X_t but X_t cause Y_t , this case will be called as unidirectional causal relationship (one-way causality).

- When X_t and Y_t variables are determined jointly, this case will be called as bilateral causality (two-way causality).

3.8.5 Panel ARDL and Pooled Mean Group (PMG) Estimation

E-views offer new tools for estimating and examining the properties of Autoregressive Distributed Lag (ARDL) models. ARDLs are standard least squares regressions which include lags of both the dependent variable and independent variables as regressors. ARDL model estimation tools include:

- Built-in lag-length selection methods.
- Co-integrating relationship estimation.
- Bounds testing for long-run relationship.

When one co-integrating vector exists, Johansen and Juselius (1990) co-integration procedure cannot be applied. Hence, it become imperative to explore Pesaran and Shin (1995) and Pesaran et. al (1996) proposed Autoregressive Distributed Lag (ARDL) approach to co-integration or bound procedure for a long-run relationship, irrespective of whether the underlying variables are I_0 , I_1 or a combination of both. In such situation, the application of ARDL approach to co-integration will give realistic and efficient estimates. Unlike the Johansen and Juselius (1990) co-integration procedure, Autoregressive Distributed Lag (ARDL) approach to co-integration helps in identifying the co-integrating vector(s). That is, each of the underlying variables stands as a single long run relationship equation.

3.8.6 Unit Root Test

A unit root is a uniqueness of techniques that develop through time that can result in issues of statistical inferences, which involves models of time series. E-views implement a variety of test for unit root or stationary in panel datasets with unit root testing. The unit root are universal in economics as well as business time series variables, most of the variables of macroeconomics such as interest rate, GDP, inflation and so on have one unit root at least. This is expected somehow because all those variables are closely related even though they are measuring different parts of the economy. There are different kinds of unit roots tests, such as: Levin-Lin-Chu (2002), Harris-Tzavalis (1999), Breitung (2000), Im-Pesaran-Shin (2003) and Fisher-ADF (2001) and Fisher-PP (Phillip Perron).

The assorted tests make different asymptotic assumptions regarding the number of panels in your dataset and the number of time periods in each panel. Unit root has all the bases covered, including tests appropriate for datasets with a large number of panels and few time periods, datasets with few panels but many time periods, and datasets with many panels and many time periods. The majority of the tests assume to have a balanced panel dataset, but the Im-Pesaran-Shin and Fisher-type tests allow for unbalanced panels. If the ADF (Augmented Dickey Fuller) test shows that is stationary at first difference, it means that the data is considered stable when lag one period. In general, if the data is stationary after first difference, it means that the data set is stationary.

3.9 Concluding Remarks

Overall, this chapter has defined the data employed in this study and explained the sample selection to examine the hypothesis whether the main macroeconomic variables, money supply and unemployment, are the determinants of inflation in developed and developing countries of G7 and ASEAN. The total sample are 8 developed countries and 6 developing countries and total sample year of 37 years. Balanced panel data is utilized in this study as panel data provides several advantages that can be controlled in the regression analysis. Next, the statistical method of analysis is listed and explained.



CHAPTER 4

DATA ANALYSIS

4.1 Introduction

Under this chapter, we will discuss on the result and the analysis of the study. We start with descriptive analysis followed by the analysis of correlation. Next, we discuss on Panel Ordinary Least Squares (POLS) and Granger causality analysis. After that, we will continue with ARDL and PMG estimation and finally, unit root test.

4.2 Descriptive Analysis

4.2.1 Developed Countries

Table 4.1 Descriptive Analysis

	CPI	MS	UEP	RIR	MFG
Mean	92.6047	120.4540	6.9392	3.4954	1.7410
Median	94.7660	107.2417	6.2000	3.3200	1.6705
Maximum	113.7740	242.8290	13.1000	12.7667	29.6750
Minimum	59.5536	48.7208	1.7000	-3.7128	-17.6856
Std. Dev.	12.6026	46.9666	2.9243	2.5077	5.4213
Skewness	-0.3258	1.1421	0.3162	0.2889	0.4145
Kurtosis	2.1577	3.3185	2.0340	3.8761	9.1027
Jarque-Bera	7.2302	33.9075	8.4995	7.0216	241.8024
Probability	0.0269	0.0000	0.0143	0.0299	0.0000
Sum	14168.51	18429.47	1061.700	534.7908	266.3662
Sum Sq. Dev.	24141.37	335290.4	1299.865	955.8685	4467.394
Observations	153	153	153	153	153

As shown in *Table 4.1*, the descriptive analysis states that variables have 153 observations.

CPI has mean value of 92.60 while the maximum is 113.77 and minimum value is 59.55.

The standard deviation of CPI is 12.60. Mean value for money supply, unemployment,

real interest rate and manufacturing is 120.45, 6.94, 3.50 and 1.74 respectively. The standard deviation for money supply, unemployment, real interest rate and manufacturing is 46.97, 2.92, 2.51 and 5.42 respectively. Hence, the money supply has the highest standard deviation and largest variation between the minimum and maximum amongst all variables. Money supply has the maximum value of 424.83 and the minimum value of 48.72. This implies that from the mean of money supply, the dispersion is more spread for money supply than the other variables.

4.2.2 Developing Countries

Table 4.2 Descriptive Analysis

	CPI	MFG	GDP	RER	IMP	MW	MS	UEP
Mean	80.7710	5.2540	3.0474	3975.725	52.1419	51.3937	14.7401	4.6524
Median	83.0766	5.3333	3.6449	40.2201	51.2418	45.1000	11.9425	3.600
Max.	149.6066	18.3125	7.6596	21935.00	100.5974	95.0000	71.9121	11.800
Min.	8.4000	-21.8388	-14.3468	1.2496	18.3059	13.5000	-11.9304	0.600
Std. Dev.	29.5085	6.0817	3.5004	6454.256	22.3953	21.9929	12.0458	2.8754
Skewness	-0.2518	-1.0345	-1.7757	1.3580	0.4089	0.5087	1.9962	0.6403
Kurtosis	2.7468	5.6033	7.7082	3.4666	2.0412	2.1295	9.3448	2.4258
Jarque-Bera	1.8932	65.8854	207.2304	45.2521	9.4616	10.6835	334.8371	11.735
Probability	0.3881	0.0000	0.0000	0.0000	0.0088	0.0048	0.0000	0.0028
Sum	11550.25	751.3201	435.7782	568528.7	7456.294	7349.300	2107.834	665.30
Sum Sq. Dev.	123646.8	5252.198	1739.857	5.9209	71219.93	68683.56	20604.34	1174.017
Observton	143	143	143	143	143	143	143	143

As shown in *Table 4.2*, the descriptive analysis states that variables have 143 observations. CPI has mean value of 80.77 while the maximum is 149.61 and minimum value is 8.40. The standard deviation of CPI is 29.51. Mean value for manufacturing, GDP, real exchange rate, import, money wages, money supply and unemployment is 5.25, 3.05,

3975.73, 52.14, 51.39, 14.74 and 4.65 respectively. The standard deviation for manufacturing, GDP, real exchange rate, import, money wages, money supply and unemployment is 6.08, 3.50, 6454.26, 22.40, 21.99, 12.05 and 2.88 respectively. Hence, the real exchange rate has the highest standard deviation and largest variation between the minimum and maximum amongst all variables. Real exchange rate has the maximum value of 21935.00 and the minimum value of 1.25. This implies that from the mean of real exchange rate, the dispersion is more spread for exchange rate than the other variables.

4.3 Correlation Analysis

4.3.1 Developed Countries

Table 4.3 Correlation Analysis

Correlation Probability	CPI	MS	UEP	RIR	MFG
CPI	1.0000 -----				
MS	0.1432 0.0774	1.0000 -----			
UEP	-0.2518 0.0017	0.4489 0.0000	1.0000 -----		
RIR	-0.5350 0.0000	0.0647 0.4266	0.1613 0.0464	1.0000 -----	
MFG	-0.1065 0.1901	-0.0513 0.5289	-0.1646 0.0421	0.0645 0.4285	1.0000 -----

Table 4.3 represents the Pearson correlation coefficient for the developed countries of G7. The correlation analysis analyze the relationship between dependent variable and four independent variables. If the correlation coefficient is more than 0.80, it might lead

multicollinearity problem between the variables. It can be seen that there is a positive correlation between MS and CPI (corr: 0.143222, p-value: 0.0774). In contrast, there is a negative correlation between UEP (corr: -0.251777, p-value: 0.0017), RIR (corr: -0.535030, p-value: 0.0000) and MFG (corr: -0.106501, p-value: 0.1901) towards the CPI. Among these, only UEP and RIR have the perfect negative correlation towards the CPI indicating that independent variable will not have identical changes as per dependent variable. MS and MFG have zero correlations, indicating the absence of relationship between the two variables and therefore, any changes in MS and MFG does not affect the CPI. The higher the coefficient, the stronger the relationship between two variables, because the effect is more significant. On the other hand, assuming the significant level at 5%, when p-value is less than 0.05, there is a risk in concluding the existence of relationship between the variables, in other words, there is no correlation between the variables. Thus, the p-value of MS and MFG indicate that there is a correlation between MS and MFG towards CPI.

4.3.2 Developing Countries

Table 4.4 Correlation Analysis

Correlation Probability	CPI	MFG	GDP	RER	IMP	MW	MS	UEP
CPI	1.0000 -----							
MFG	-0.2165 0.0094	1.0000 -----						
GDP	-0.0633 0.4528	0.7873 0.0000	1.0000 -----					

RER	0.0899	0.1943	0.2450	1.0000				
	0.2854	0.0201	0.0032	-----				
IMP	0.1855	0.1899	0.1842	0.0820	1.0000			
	0.0265	0.0231	0.0277	0.3302	-----			
MW	0.4106	-0.3063	-0.3660	-0.5764	0.1353	1.0000		
	0.0000	0.0002	0.0000	0.0000	0.1073	-----		
MS	-0.3814	0.2146	0.1596	0.3975	0.0883	-0.3964	1.0000	
	0.0000	0.0101	0.0569	0.0000	0.2942	0.0000	-----	
UEP	-0.1308	-0.2365	-0.2547	-0.1227	-0.5205	0.1236	-0.0989	1.0000
	0.1196	0.0045	0.0021	0.1444	0.0000	0.1414	0.2401	-----

Table 4.4 represents the Pearson correlation coefficient for the developing countries of ASEAN. The correlation analysis analyze the relationship between dependent variable and seven independent variables. If the correlation coefficient is more than 0.80, it might lead multicollinearity problem between the variables. It can be seen that there is a positive correlation for RER (corr: 0.089941, p-value: 0.2854), IMP (corr: 0.185543, p-value: 0.0265) and MW (corr: 0.410636, p-value: 0.0000) towards the CPI. In contrast, there is a negative correlation between UEP (corr: -0.130754, p-value: 0.1196), GDP (corr: -0.063280, p-value: 0.4528), MS (corr: -0.381427, p-value: 0.000) and MFG (corr: -0.216490, p-value: 0.0094) towards the CPI. Among these, MW have the perfect positive correlation towards the CPI indicating that independent variable have identical changes as per dependent variable. MFG and MS have the perfect negative correlation towards the CPI indicating that independent variable will not have identical changes as per dependent variable. GDP and RER have zero correlations, indicating the absence of relationship between the two variables and therefore, any changes in GDP and RER does not affect the CPI. The higher the coefficient, the stronger the relationship between two variables,

because the effect is more significant. On the other hand, assuming the significant level at 5%, when p-value is less than 0.05, there is a risk in concluding the existence of relationship between the variables, in other words, there is no correlation between the variables. Thus, the p-value of RER, GDP and UEP indicate that there is a correlation between RER, GDP and UEP towards CPI.

4.4 Panel Ordinary Least Square (POLS)

4.4.1 Developed Countries

Table 4.5 POLS Regression Analysis

Dependent Variable: CPI				
Method: Panel Least Squares				
Sample (adjusted): 1991 2016				
Periods included: 26				
Cross-sections included: 7				
Total panel (unbalanced) observations: 153				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	101.4164	2.630148	38.55919	0.0000***
MS	0.085692	0.019023	4.504668	0.0000***
UEP	-1.439397	0.313429	-4.592424	0.0000***
RIR	-2.485370	0.323907	-7.673096	0.0000***
MFG	-0.263145	0.149954	-1.754834	0.0814*
R-squared	0.406487	Mean dependent var		92.60467
Adjusted R-squared	0.390446	S.D. dependent var		12.60257
S.E. of regression	9.839324	Akaike info criterion		7.442785
Sum squared resid	14328.22	Schwarz criterion		7.541819
Log likelihood	-564.3730	Hannan-Quinn criter.		7.483014
F-statistic	25.34066	Durbin-Watson stat		0.353784
Prob(F-statistic)	0.000000			

Note: ***, **, * indicate significant level at 1%, 5% and 10% respectively

$$Y_{IT} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon_t$$

$$CPI_t = \beta_0 + \beta_1 MS_t + \beta_2 UEP_t + \beta_3 MFG_t + \beta_4 RIR_t + \varepsilon_t$$

$$CPI = 101.42 + 0.09MS - 1.44UEP - 2.49MFG - 0.26RIR + \varepsilon_t$$

Based on the result generated on POLS for the developed countries, the results are presented at *Table 4.5*. The POLS result shows that all the variables tested is found to be significant under the probability of below 1%. At the probability of 0.000* (under 1%), the independent variables of money supply, unemployment and RIR shows a significant t-statistic of 4.504668, 4.592424 and 7.673096 respectively. The t-statistic of manufacturing is insignificant but the probability is under 10% (0.0814 @ 8.14%). This shows that there is a positively significant relationship between money supply and CPI. There are also negative significant relationship between unemployment and RIR with CPI.

4.4.2 Developing Countries

Table 4.6 POLS Regression Analysis

Dependent Variable: CPI				
Method: Panel Least Squares				
Sample (adjusted): 1991 2016				
Periods included: 26				
Cross-sections included: 6				
Total panel (unbalanced) observations: 143				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	49.23773	9.388148	5.244669	0.0000***
MFG	-1.679597	0.477755	-3.515601	0.0006***
GDP	2.621825	0.849429	3.086574	0.0025**
RER	0.002544	0.000349	7.279779	0.0000***
IMP	0.005913	0.098761	0.059872	0.9523
MS	-0.855293	0.166718	-5.130174	0.0000***

MW	0.834103	0.111746	7.464248	0.0000***
UEP	-1.787087	0.744213	-2.401312	0.0177**
R-squared	0.517356	Mean dependent var	80.77100	
Adjusted R-squared	0.492330	S.D. dependent var	29.50850	
S.E. of regression	21.02510	Akaike info criterion	8.983630	
Sum squared resid	59677.42	Schwarz criterion	9.149383	
Log likelihood	-634.3295	Hannan-Quinn criter.	9.050984	
F-statistic	20.67271	Durbin-Watson stat	0.453316	
Prob(F-statistic)	0.000000			

Note: ***, **, * indicate significant level at 1%, 5% and 10% respectively

$$Y_{IT} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \varepsilon_t$$

$$CPI_t = \beta_0 + \beta_1 MS_t + \beta_2 UEP_t + \beta_3 MFG_t + \beta_4 RER_t + \beta_5 GDP_t + \beta_6 MW_t + \beta_7 IMP_t + \varepsilon_t$$

$$CPI = 49.24 - 1.68MS + 2.62UEP + 0.003MFG + 0.006RER - 0.86GDP + 0.83MW - 1.79IMP + \varepsilon_t$$

Based on the result generated on POLS for the developing countries, the results are presented at *Table 4.6*. The POLS result shows that all the variables tested is found to be significant, except import, under the probability of below 10%. At the probability below 10%, the independent variables of GDP, real exchange rate and money wages show a positively significant relationship with CPI. Besides, at the probability below 10%, the independent variables of manufacturing, money supply and unemployment show a negatively significant relationship with CPI. However, the result of POLS indicated that there are no significant relationship between import of goods (t-statistic=0.059872; probability=0.9523) with CPI.

4.4.3 Relationship between money supply and inflation.

Based on the result generated on POLS, the results are presented at *Table 4.5* and *Table 4.6*. The POLS result shows that all the variables tested is found to be significant under probability of below 1%. At the probability of 0.000* (under 1%), the independent variable of money supply for developed and developing countries show significant t-statistic of 4.504668 and 5.130174 respectively. The positive relationship of money supply and inflation means that the level of money supply and inflation rate of a country moves in parallel. This indicate that the inflation rate of both developed and developing countries, measured at CPI, does effect the level of money supply in an economy. Therefore, we can reject the null hypothesis for money supply presented earlier in Chapter 1. Therefore, the Fisher's Effect, Quantity Theory of Money (QTM), is proven in the case of developed and developing countries of G7 and the ASEAN where the money supply and inflation rate of a country moves in inversely.

4.4.4 Relationship between unemployment and inflation

Based on the result generated on POLS, the results are presented at *Table 4.5* and *Table 4.6*. The POLS result shows that all the variables tested is found to be significant under probability of below 10%. At the probability of 0.000* (under 10%), the independent variable of unemployment for developed and developing countries show significant t-statistic of -4.592424 and -2.401312 respectively. The negative relationship of unemployment and inflation means that the level of unemployment and inflation rate of a country moves inversely. This indicate that the inflation rate of both developed and developing countries, measured at CPI, does effect the level of unemployment in an

economy. Therefore, we can reject the null hypothesis for unemployment presented earlier in Chapter 1. Therefore, the Philips' curve is proven in the case of developed and developing countries of G7 and the ASEAN where the unemployment and inflation rate of a country moves inversely. The Keynesian Theory is proven to be inappropriate.

4.5 Granger Causality Test

The next step of this analysis is to examine the causal relationship among variables by looking at the direction. Therefore, we used a pairwise Granger causality test to estimate the causal relationship among the variables. The test result of the Granger causality test is presented in Appendix C.

4.5.1 Developed Countries

Uni-Directional Causality (One-Way)

Variables	F-Statistic	Prob.
CPI does Granger cause MS	3.5232	0.0308**
CPI does Granger cause UEP	9.4678	0.0001***
MFG does Granger cause CPI	6.3495	0.0022***
UEP does Granger cause RIR	3.1412	0.0459**

Based on the result generated above, there is a one-way causality, or unidirectional causality, between CPI and money supply; CPI and unemployment (UEP) for the developed countries. The CPI does Granger cause money supply at f-statistic 3.52323 and probability 0.0308**. The CPI does Granger cause unemployment at f-statistic 9.46784 and probability 0.0001***. This indicate that the inflation rate, measured at CPI, does effect the unemployment rate and the level of money supply in an economy. Therefore, we can reject the null hypothesis for money supply and unemployment presented earlier

in Chapter 1. Other than that, the Granger causality test reveals that there exist a one way relationship between manufacturing (MFG) and CPI, where, the fluctuations of the manufacturing growth (annual %) have effect on the CPI.

Bi-Directional Causality (Two-Way)

Variables	F-Statistic	Prob.
RIR ↔ CPI	3.5182	0.0313**
	8.3456	0.0003***
MFG ↔ UEP	5.4006	0.0054***
	2.9363	0.0560**

Based on the result generates, there is a two-way causality, bi-directional causality between real interest rate (RIR) and inflation rate (measured at CPI) for the developed countries. At probability under 10%, the result indicate that the annual real interest rate and CPI affect each other whenever both variables fluctuate. The Fisher Effect proposed an equation where: real interest rate is equal to nominal interest rate minus inflation rate. Hence, the theory support the bi-directional relationship between real interest rate and inflation rate. Other than that, manufacturing (MFG) and unemployment (UEP) show a bi-directional relationship with each other. When there is an increase in the level of manufacturing, the production side will require more labors in order to comply with the increase manufacturing percentage. Hence, this will decrease the unemployment rate in the labor market. This denote that manufacturing and employment holds a positive relationship with each other.

No Causality

Variables	F-Statistic	Prob.
UEP ↔ MS	0.7834	0.4584
	0.4402	0.6446
MFG ↔ RIR	0.0798	0.9233
	1.2420	0.2907
MFG ↔ MS	0.1724	0.8418
	0.3958	0.6737

The result generated indicate that there exist no causality between unemployment and money supply; manufacturing and real interest rate; manufacturing and money supply for the developed countries. At the probability level more than 10%, these variables has no relationship with each other.

4.5.2 Developing Countries

Uni-Directional Causality (One-Way)

Variables	F-Statistic	Prob.
CPI does Granger cause MFG	4.8105	0.0092***
CPI does Granger cause RER	5.5895	0.0043***
MS does Granger cause CPI	4.4593	0.0130***
MW does Granger cause CPI	2.6554	0.0737*
MFG does Granger cause IMP	4.7503	0.0097***
MFG does Granger cause MS	4.9612	0.0081***
MW does Granger cause MFG	4.8013	0.0096***
RER does Granger cause GDP	3.6006	0.0291**
GDP does Granger cause IMP	4.9937	0.0077***
GDP does Granger cause MS	4.5164	0.0123***
GDP does Granger cause UEP	2.8912	0.0589**
RER does Granger cause IMP	3.2747	0.0398**
RER does Granger cause MS	3.1174	0.0468**
MW does Granger cause MS	8.3239	0.0004***
UEP does Granger cause MS	2.3548	0.0991*

Based on the result generated above, there is a one-way causality, or unidirectional causality, between CPI and manufacturing (MFG); CPI and real exchange rate (RER) for

the developing countries. The CPI does Granger cause MFG at f-statistic 4.81049 and probability 0.0092***. The CPI does Granger cause RER at f-statistic 5.58954 and probability 0.0043***. This indicate that the inflation rate, measured at CPI, does effect the annual manufacturing percentage and the real exchange rate of the economy. When the inflation rate is high in the economy, the production costs increase as there ought to increase the prices of raw materials, and there occurs to be a disruption in the annual manufacturing level. Other than that, there found to be one-way relationship between money supply to inflation and money wages to inflation. When the level of money supply in an economy increases, the prices of goods and services have to be rise as well to decrease the level of money supply in the economy. When the employers increase the level of money wage, the prices of goods and services rise as well to accommodate with high money supply in economy. There also found to be significant one-way relationship between GDP to money supply and GDP to unemployment. The Granger test result reveal that real exchange rate, unemployment and money wages does significantly Granger cause money supply.

Bi-Directional Causality (Two-Way)

Variables	F-Statistic	Prob.
MW↔ GDP	8.1815	0.0004***
	4.4164	0.0138***

Based on the result generates, there found to be two-way relationship between money wages and GDP for the developing countries. Significant at probability under 10%, money wages and GDP does effect each other in the sense that subdued wage growth has been seen as both cause and consequence of the slow pace of economic growth and persistently low inflation rates (Ii & Zaman, 2014). It also may have contributed to rising inequality.

In some forecast narratives, a pickup in wage growth is viewed as a necessary condition for a stronger recovery and rising inflation. In others, it is a natural consequence of a tightening labor market.

No Causality

Variables	F-Statistic	Prob.
GDP ↔ CPI	0.2010	0.8181
	0.0309	0.9696
IMP ↔ CPI	0.4307	0.6507
	1.5865	0.2071
UEP ↔ CPI	0.2761	0.7591
	1.6875	0.1888
GDP ↔ MFG	1.0618	0.3479
	0.1111	0.8949
RER ↔ MFG	1.6864	0.1880
	0.4568	0.6340
UEP ↔ MFG	0.5837	0.5592
	1.2259	0.2967
MW ↔ RER	1.0413	0.3557
	10.3666	6.E-05
UEP ↔ RER	0.1042	0.9011
	0.5346	0.5871
MS ↔ IMP	1.9744	0.1420
	0.4449	0.6416
MW ↔ IMP	1.9481	0.1463
	0.1185	0.8884
UEP ↔ IMP	1.0214	0.3628
	1.0983	0.3363
UEP ↔ MW	0.1456	0.8646
	1.8086	0.1677

Based on the result generated, there found to be no causality between the variables presented at the table above for the developing countries. Surprisingly, there found to be no significant relationship between GDP, import of goods and services and unemployment with inflation rate (measured at CPI). On the other hand, there seem to be no significant

causality between money wages and unemployment with real interest rate. Besides, there seem to be no significant causality between money supply, money wages and unemployment with import.

4.6 Panel ARDL and Pooled Mean Group (PMG) Estimation

4.6.1 Developed Countries

Table 4.7 Panel ARDL and PMG Estimation

Dependent Variable: D(CPI)				
Method: ARDL				
Included observations: 168				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
MW	0.670658	0.606021	1.106658	0.2718
UEP	-0.854271	0.428293	-1.994595	0.04958**
MS	-0.061373	0.024688	-2.485902	0.0150***
RIR	-1.263451	0.275932	-4.578856	0.0000***
GDP	-0.281972	0.328493	-0.858380	0.3933
Short Run Equation				
COINTEQ01	-0.233715	0.044523	-5.249350	0.0000
D(CPI(-1))	0.149795	0.209103	0.716370	0.4759
D(MW)	0.151629	0.437558	0.346535	0.7299
D(MW(-1))	0.210954	0.238693	0.883786	0.3795
D(UEP)	-0.360222	0.227827	-1.581119	0.1178
D(UEP(-1))	0.414191	0.130491	3.174092	0.0021
D(MS)	-0.033082	0.024426	-1.354348	0.1795
D(MS(-1))	0.007032	0.067423	0.104304	0.9172
D(RIR)	0.209940	0.118617	1.769890	0.0806
D(RIR(-1))	0.015232	0.056378	0.270174	0.7877
D(GDP)	-0.092364	0.084531	-1.092659	0.2779
D(GDP(-1))	0.040082	0.069283	0.578534	0.5645
C	8.100661	4.507206	1.797269	0.0761
@TREND	0.232777	0.088138	2.641054	0.0100

Mean dependent var	1.443745	S.D. dependent var	1.159284
S.E. of regression	0.682578	Akaike info criterion	2.069575
Sum squared resid	36.80707	Schwarz criterion	3.882832
Log likelihood	-85.33132	Hannan-Quinn criter.	2.804643

Note: ***, **, * indicate significant level at 1%, 5% and 10% respectively

Based on the result generated on Panel ARDL and PMG estimation for the developed countries, the results are presented at *Table 4.7*. The result shows that variables: UEP, MS and RIR are found to be significant under the probability of below 10%. At the probability of below 1%, the independent variables of unemployment, money supply and RIR shows a significant t-statistic of -1.994595, -2.485902 and -4.578856 respectively. The t-statistic of MW and GDP is insignificant with the t-statistic of 1.106658 and -0.858380 respectively. This shows that there is a negatively significant relationship between unemployment, money supply and RIR with the dependent variable, CPI.

4.6.2 Developing Countries

Table 4.8 Panel ARDL and PMG Estimation

Dependent Variable: D(CPI)				
Method: ARDL				
Included observations: 130				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
MS	-0.228970	0.082210	-2.785171	0.0068***
MW	1.114324	0.202004	5.516345	0.0000***
UEP	-3.551488	0.407308	-8.719427	0.0000***
IMP	-0.199333	0.034634	-5.755441	0.0000***
Short Run Equation				
COINTEQ01	-0.053263	0.082496	-0.645650	0.5205
D(MS)	-0.015745	0.020460	-0.769512	0.4441

D(MS(-1))	-0.012659	0.019717	-0.642040	0.5229
D(MW)	-0.307205	0.153010	-2.007744	0.0484
D(MW(-1))	0.140993	0.214896	0.656101	0.5138
D(UEP)	-0.903718	1.462283	-0.618019	0.5385
D(UEP(-1))	-0.904657	0.527475	-1.715072	0.0906
D(IMP)	0.020777	0.082582	0.251588	0.8021
D(IMP(-1))	0.107170	0.086260	1.242407	0.2181
C	0.484538	3.669150	0.132057	0.8953
@TREND	0.299354	0.244847	1.222619	0.2254
Mean dependent var	3.270682	S.D. dependent var	3.003180	
S.E. of regression	1.966267	Akaike info criterion	2.972664	
Sum squared resid	282.2331	Schwarz criterion	4.423008	
Log likelihood	-142.5455	Hannan-Quinn criter.	3.562014	

Note: ***, **, * indicate significant level at 1%, 5% and 10% respectively

Based on the result generated on Panel ARDL and PMG estimation for the developing countries, the results are presented at *Table 4.8*. The result shows that all the variables tested: MS, MW, UEP and IMP are found to be significant under the probability of below 1%. At the probability of below 1%, the independent variables of money wages show a positively significant t-statistic of 5.516345. Whereas, at the probability of below 1%, the independent variables of money supply, unemployment and import shows a negatively significant t-statistic of -2.785171, -8.719427 and -5.755441 respectively. The result indicate that there is a negatively significant relationship between unemployment and import of goods and services with the dependent variable, CPI.

4.7 Unit Root Test

4.7.1 Developed Countries

Table 4.9 Unit Root Test

Variables	Level (I_0)		1 st Difference (I_1)	
	Intercept	Trend and Intercept	Intercept	Trend and Intercept
CPI	0.50097 (0.6918)	-0.33652 (0.3682)	-5.84696*** (0.0000)	-4.96257*** (0.0000)
MS	3.26089 (0.9994)	0.66208 (0.7460)	-6.00654*** (0.0000)	-5.07731*** (0.0000)
UEP	-1.68181** (0.0463)	0.11641 (0.5463)	-5.46569*** (0.0000)	-4.79753*** (0.0000)
MFG	-11.5437*** (0.0000)	-6.32010*** (0.0000)	-12.2273*** (0.0000)	-6.66116*** (0.0000)
RIR	-0.72557 (0.2341)	-3.32664*** (0.0004)	-12.5479*** (0.0000)	-12.2338*** (0.0000)

Note: ***, **, * indicate significant level at 1%, 5% and 10% respectively

This unit root test is conducted under the individual root–Im, Pesaran, Shin. Based on the result presented in *Table 4.9*, the unit root test for developed countries show that all the variables: CPI, MS, UEP, MFG and RIR show significance with probability below 1%. At level (I_0), all variables are not stationary except MFG and RIR show stationary with negative significant results at the individual trend and intercept. At the first (1st) difference, both intercept and trend and intercept for all the variables are stationary at probability below 1% and t-statistic greater than the critical value. However, all the variables are negatively significant at the 1st difference.

4.7.2 Developing Countries

Table 4.10 Unit Root Test

Variables	Level (I_0)		1 st Difference (I_1)	
	Intercept	Trend and Intercept	Intercept	Trend and Intercept
CPI	4.29447*** (1.0000)	0.29076 (0.6144)	-5.84696*** (0.0000)	-4.96257*** (0.0000)
MFG	-11.5437*** (0.0000)	-6.32010*** (0.0000)	-12.2273*** (0.0000)	-6.66116*** (0.0000)
GDP	-7.67050*** (0.0000)	-7.90722*** (0.0000)	-16.3665*** (0.0000)	-15.0752*** (0.0000)
RER	-3.51490*** (0.0000)	-2.37470*** (0.0088)	-7.64016*** (0.0000)	-6.02647*** (0.0000)
IMP	-8.02095*** (0.0000)	-6.96838*** (0.0000)	-15.0697*** (0.0000)	-13.8242*** (0.0000)
MS	3.26089 (0.9994)	0.66208 (0.7460)	-6.00654*** (0.0000)	-5.07731*** (0.0000)
MW	0.47007 (0.6808)	0.26617 (0.6049)	-6.87783*** (0.0000)	-6.58048*** (0.0000)
UEP	-1.68181** (0.0463)	0.11641 (0.5463)	-5.46569*** (0.0000)	-4.79753*** (0.0000)

Note: ***, **, * indicate significant level at 1%, 5% and 10% respectively

This unit root test is conducted under the individual root–Im, Pesaran, Shin. Based on the result presented in *Table 4.10*, the unit root test for developing countries show that, at level, all the variables: CPI, MFG, GDP, RER and IMP are stationary with probability below 1%. MS, MW and UEP are not stationary at level. At the first (1st) difference, both intercept and trend and intercept for all the variables are stationary at probability below 1% and t-statistic greater than the critical value. However, all the variables are negatively significant at the 1st difference for both intercept and trend and intercept.

4.8 Summary of Data Analysis

4.8.1 Developed Countries

Table 4.11 Summary of Findings for Developed Countries

Methodology	MONEY SUPPLY	UNEMPLOYMENT
Descriptive Analysis	Positive - Significant	Positive - Significant
<i>Prob.</i>	<i>0.0000</i>	<i>0.0143</i>
POLS Analysis	Positive - Significant	Negative - Significant
<i>Prob.</i>	<i>0.0000</i>	<i>0.0000</i>
Granger Causality	One-way causality with CPI	No causality with CPI
<i>Prob.</i>	<i>0.0130</i>	<i>0.7591</i>
Panel ARDL	Negative - Significant	Negative - Significant
<i>Prob.</i>	<i>0.0068</i>	<i>0.0000</i>
Unit Root Test	Negative - Significant	Negative - Significant
<i>Prob.</i>	<i>0.0000</i>	<i>0.0000</i>

4.8.2 Developing Countries

Table 4.12 Summary of Findings for Developing Countries

Methodology	MONEY SUPPLY	UNEMPLOYMENT
Descriptive Analysis	Positive - Significant	Positive - Significant
<i>Prob.</i>	<i>0.000000</i>	<i>0.002830</i>
POLS Analysis	Negative - Significant	Negative - Significant
<i>Prob.</i>	<i>0.0000</i>	<i>0.0177</i>
Granger Causality	One-way causality with CPI	One-way causality with CPI
<i>Prob.</i>	<i>0.0308</i>	<i>0.0001</i>
Panel ARDL	Negative - Significant	Negative - Significant
<i>Prob.</i>	<i>0.0150</i>	<i>0.04958</i>
Unit Root Test	Negative - Significant	Negative - Significant
<i>Prob.</i>	<i>0.0000</i>	<i>0.0000</i>

4.9 Concluding Remarks

Overall, this chapter has reported the findings and discussions of the study. This chapter discusses on the results from the e-View regression and elaborated on its relevance toward the main variable and other contributing variables. This chapter contains the findings of the descriptive analysis, correlation analysis, POLS analysis, Granger Causality Test, Panel ARDL and PMG Estimation and finally the unit root test. This chapter finally combines all the results into one table for the developed and developing countries.



CHAPTER 5 CONCLUSION

5.1 Introduction

This chapter contains the summary of the whole study, from Chapter 1 until Chapter 4. Section 5.2 explains the summary of the data generated and find the relation between the hypotheses proposed the results from the data statistics. Section 5.4 further discusses on the policy implication and Section 5.5 discusses on the proposed recommendations for future studies.

5.2 Conclusion

This research aims to study on the relationship between inflation and the macroeconomic variables at G7 countries and ASEAN countries on the time period of 1980-2016. Both G7 and ASEAN countries are classified as the developed countries (G7) and the developing countries (ASEAN). Singapore from ASEAN is opted into the developed countries and make it of total 8 countries. This separation is to reject the null hypothesis that for both developed and developing countries have same inflation causing factor in common which is money supply (M2) and unemployment (total percentage of labour force). To find significant of these two variables, other independent variables such as manufacturing, real interest rate, real exchange rate, GDP, money wages and import of goods are used. As expected, the money supply and unemployment show significance at positive and negative relationship with inflation rate (measured at CPI) respectively.

Other than that, this research attempts to prove the Fisher's Theory and the Philips curve. The money supply variable is to prove the Quantity Theory of Money (QTM) by Irving Fisher where the amount of money in the market are the main determinant of the increase

or decreasing price of goods and services. On the other hand, the Phillip's curve is to prove that the unemployment rate and inflation, moves inversely. Based on the result obtained, we reject the Keynesian Theory that there is a parallel relationship between unemployment and inflation rate.

Developed Countries

At Chapter 4, author has run a few regression model ranging from descriptive analysis, correlation analysis, POLS, Granger causality test, Panel ARDL and PMG estimation and also the ADF unit root test. As for the POLS regression, at the probability of 0.000*, the independent variables of money supply and unemployment show a significant t-statistic of 4.504668 and 4.592424 respectively. This shows that there is a positively significant relationship between money supply and CPI and negative significant relationship between unemployment with CPI. Other variables such as RIR and MFG also show significance with CPI. The Granger causality test indicate that there is a one-way causality, or unidirectional causality, between CPI and money supply; CPI and unemployment (UEP) for the developed countries. The CPI does Granger cause money supply at f-statistic 3.52323 and probability 0.0308**. The CPI does Granger cause unemployment at f-statistic 9.46784 and probability 0.0001***. This indicate that the inflation rate does effect the unemployment rate and the level of money supply in an economy. Besides, the results for Panel ARDL and PMG estimation point out that variables: UEP, MS and RIR are found to be significant under the probability of below 10%. At the probability of below 1%, the independent variables of unemployment, money supply and RIR shows a significant t-statistic of -1.994595, -2.485902 and -4.578856 respectively. The t-statistic

of MW and GDP is insignificant with the t-statistic of 1.106658 and -0.858380 respectively. This shows that there is a long-run relationship where there exist negatively significant relationship between unemployment, money supply and RIR with the dependent variable, CPI. Finally, the unit root test conducted for developed countries show that all the variables: CPI, MS, UEP, MFG and RIR show significance with probability below 1%. At level (I_0), all variables are not stationary except MFG and RIR show stationary with negative significant results at the individual trend and intercept. At the first (1^{st}) difference, both intercept and trend and intercept for all the variables are stationary at probability below 1% and t-statistic greater than the critical value. However, all the variables are negatively significant at the 1^{st} difference.

Hence, based on the test run on the secondary data collected, we can reject the null hypothesis and accept the alternate hypothesis for the developed countries. There is a relationship between money supply with CPI and unemployment with CPI. Furthermore, this research had successfully proved the Fisher's Effect, Quantity Theory of Money (QTM), in the case of G7 countries where the money supply and inflation rate of a country moves in parallel. The Phillip's Curve is proven also through this research as unemployment and CPI moves at a parallel trend.

Developing Countries

For the developing countries, as for the POLS regression, at the probability below 10%, the independent variables of money supply and unemployment show a negative significant relationship with CPI with a t-statistic of -5.130174 and -2.401312 respectively. The Granger causality test indicate that there is a one-way relationship between money supply

with inflation. When the level of money supply in an economy increases, the prices of goods and services have to be rise as well to decrease the level of money supply in the economy. There also found to be significant one-way relationship between GDP to money supply and GDP to unemployment. The Granger test result reveal that unemployment and money wages does significantly Granger cause fluctuation in the level of money supply.

Besides, the results for Panel ARDL and PMG estimation point out that all the variables tested: MS, MW, UEP and IMP are found to be significant under the probability of below 1%. At the probability of below 1%, the independent variables of money wages show a positively significant t-statistic of 5.516345. Whereas, at the probability of below 1%, the independent variables of money supply, unemployment and import shows a negatively significant t-statistic of -2.785171, -8.719427 and -5.755441 respectively. The result indicate that there is a long-run relationship where there exist negatively significant relationship between unemployment and import of goods and services with the dependent variable, CPI. Finally, the unit root test conducted for developing countries show that all the variables: CPI, MS, UEP, MFG and RIR show significance with probability below 1%. At level (I_0), all variables are not stationary except MFG and RIR show stationary with negative significant results at the individual trend and intercept. At the first (1^{ST}) difference, both intercept and trend and intercept for all the variables are stationary at probability below 1% and t-statistic greater than the critical value. However, all the variables are negatively significant at the 1^{ST} difference.

Hence, based on the test run on the secondary data collected, we can reject the null hypothesis and accept the alternate hypothesis for developing countries. There is a relationship between money supply with CPI and unemployment with CPI. Furthermore,

this research had successfully proved the Fisher's Effect, Quantity Theory of Money (QTM), in the case of ASEAN countries where the money supply and inflation rate of a country moves in parallel. The Phillip's Curve is proven also through this research as unemployment and CPI moves at a parallel trend.

5.3 Policy Implication

Both theoretical and empirical consideration reveals that considerable benefit will accumulate when moving from a level of high inflation rate to a level of low inflation rate. However, decreasing inflation to a low level helps to lessen relative price vulnerability thereby enhancing resource allocation. Therefore, policy recommendation should be made based on the empirical result of this study that examine the effect of money supply and unemployment on inflation (measured as CPI) in developed and developing countries of G7 and ASEAN respectively. The following are the policy recommendation of this study:

- This study reveal that money supply is found to be very important in explaining inflation variation in G7 and ASEAN countries. Consequently, the governments of these countries should put in place considerable reforms that will certify that the supply of money into the market should be controlled. The level of money rotating in the economy should be monitored and controlled. The policy makers should also consider monetary policy as a suitable tool of achieving price stability because of the linear interdependency and causality between the price level and money supply growth.

- Moreover, unemployment as a significant determinant factor of inflation in both G7 and ASEAN is positively related with inflation as shown by the results of this study. Therefore, the concern policy makers as well as the government who are accountable for optimum level of inflation for sustainable growth and development should reduce their unemployment rate by opening more job opportunities for fresh graduate, although they are lack of job experience. The employers should focus on instilling practical skills and talents on the young employees, so that they can survive throughout the industry and job market.
- Furthermore, import as a significant determinant factor of inflation in both G7 and ASEAN is positively related with inflation as shown by the results of this study. Therefore, there should be restrain on the import of goods and services from those country, whose inflation rate are considerably high that could affect the value of domestic currency. Other than that, government should put more pressure in promoting the local goods, so that the country's GDP will increase.

5.4 Recommendation for Future Studies

This study utilizes the panel data in order to investigate the determinants of inflation in the developing and developed countries of ASEAN and G7 respectively. Results obtained to explain inflation and the explanatory variables is very dynamic as it gives an opportunity to economists and policy makers in achieving macroeconomic objectives. For this research, the independent variables used are: MS; UEP; RIR; MFG; RER; GDP; MW and IMP with dependent variable of CPI. So, author come out with some suggestions for the future research on inflation and related variables.

The ASEAN country consist of 10 countries, but for this research, only the country which is categorized under developing countries is picked as sample. The ASEAN country, most of them are striving to achieve the developing state (such as Cambodia and Laos) and some are striving to achieve the developed state (such as Brunei and Malaysia). As such, Singapore from the ASEAN region is categorized as developed country. So, the future research should include this countries, and the result may differ as the number of sample has increased.

Other than that, originally the time period for this research started during 1968 until 2016. However, due to lack of statistical data on the variables tested, the time period had to be reduced to 1980 until 2016. Countries like Vietnam, Thailand and Indonesia are lacking of statistical data, even there was continuous searching throughout various data portals, ranging from World Bank, IMF and etc. The bigger the time range, the more accurate the result to be obtained because over a big time range, the fluctuations of the data statistics are more clearly seen and easy to interpret and analyse.

Besides, this study utilize descriptive analysis, correlation analysis, POLS analysis, Granger causality test, Panel ARDL and PMG and also Unit Root test. Future studies may include the Fixed Effect Model (FEM), Random Effect Model (REM), Housman Test, Vector Autoregression (VAR) model, panel co-integration test (to determine the long-run relationship and short-run relationship between variables) and other methods that can be used in order to see the reliability of the model proposed. Research by Hassan (2016) used Vector Error Correction Model to investigate the relationship between money growth and inflation in Nigeria. Research by Abdurehman & Haciler (2016) used (ARCH) Autoregressive Conditional Heteroskedasticity and Generalized Autoregressive Conditional Heteroskedasticity (GARCH) to study the relationship between inflation and exchange rate in Turkey.

5.5 Concluding Remarks

This chapter contains the summary of the whole study, from Chapter 1 until Chapter 4. This chapter explains the summary of the data generated and find the relation between the hypothesis proposed the results from the data statistics. This chapter further discusses on the policy implication and proposed recommendations for future studies.

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APPENDIX

APPENDIX A

Panel Regression – Fixed Effect Model (FEM) for Developed Countries

Dependent Variable: CPI					
Method: Panel Least Squares					
Sample (adjusted): 1991 2016					
Periods included: 26					
Cross-sections included: 7					
Total panel (unbalanced) observations: 153					
Variable		Coefficient	Std. Error	t-Statistic	Prob.
C		74.24039	5.663894	13.10766	0.0000
MS		0.261150	0.033683	7.753192	0.0000
UEP		-0.798527	0.438303	-1.821861	0.0706
RIR		-2.082240	0.319260	-6.522085	0.0000
MFG		-0.156803	0.130443	-1.202076	0.2313
Effects Specification					
Cross-section fixed (dummy variables)					
R-squared	0.619239	Mean dependent var	92.60467		
Adjusted R-squared	0.592425	S.D. dependent var	12.60257		
S.E. of regression	8.045687	Akaike info criterion	7.077329		
Sum squared resid	9192.096	Schwarz criterion	7.295204		
Log likelihood	-530.4157	Hannan-Quinn criter.	7.165834		
F-statistic	23.09372	Durbin-Watson stat	0.458106		
Prob(F-statistic)	0.000000				

Note: ***, **, * indicate significant level at 1%, 5% and 10% respectively

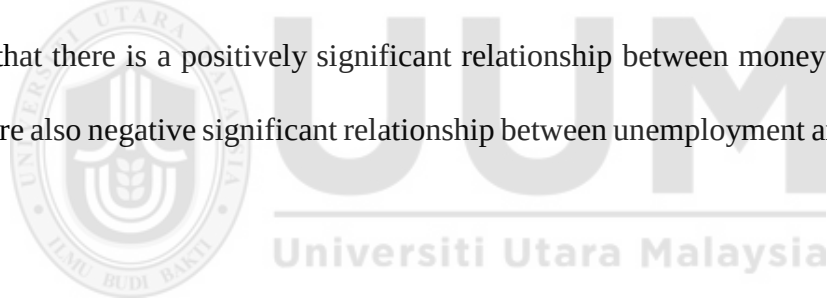
Table A FEM Regression Analysis

$$Y_{IT} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon_t$$

$$CPI_t = \beta_0 + \beta_1 MS_t + \beta_2 UEP_t + \beta_3 MFG_t + \beta_4 RIR_t + \varepsilon_t$$

$$CPI = 74.24 + 0.26MS - 0.80UEP - 0.16MFG - 2.08RIR + \varepsilon_t$$

Based on the result generated on FEM for the developed countries, the results are presented at *Table A*. The FEM result shows that variables MS, UEP and RIR tested is found to be significant under the probability of below 10%. At the probability below 1%, the independent variables of money supply, unemployment and RIR shows a significant t-statistic of 7.753192, -1.821861 and -6.522085 respectively. The t-statistic of manufacturing is insignificant as the probability is above 10% (0.2313 @ 23.13%). This shows that there is a positively significant relationship between money supply and CPI. There are also negative significant relationship between unemployment and RIR with CPI.



APPENDIX B

Panel Regression – Fixed Effect Model (FEM) for Developing Countries

Dependent Variable: CPI					
Method: Panel Least Squares					
Sample (adjusted): 1991 2016					
Periods included: 26					
Cross-sections included: 6					
Total panel (unbalanced) observations: 143					
Variable	Coefficient	Std. Error	t-Statistic	Prob.	
C	-108.4786	17.82858	-6.084533	0.0000	
MFG	-0.530204	0.257855	-2.056207	0.0418	
GDP	1.473350	0.453968	3.245496	0.0015	
RER	0.004253	0.000757	5.619382	0.0000	
IMP	-0.549633	0.104751	-5.247035	0.0000	
MS	-0.409915	0.093597	-4.379570	0.0000	
MW	4.135354	0.357806	11.55754	0.0000	
UEP	-1.546475	0.829362	-1.864657	0.0645	
Effects Specification					
Cross-section fixed (dummy variables)					
R-squared	0.873821	Mean dependent var	80.77100		
Adjusted R-squared	0.862174	S.D. dependent var	29.50850		
S.E. of regression	10.95501	Akaike info criterion	7.711980		
Sum squared resid	15601.61	Schwarz criterion	7.981329		
Log likelihood	-538.4066	Hannan-Quinn criter.	7.821430		
F-statistic	75.02363	Durbin-Watson stat	0.714829		
Prob(F-statistic)	0.000000				

*Note: ***, **, * indicate significant level at 1%, 5% and 10% respectively*
Table B FEM Regression Analysis

$$Y_{IT} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \varepsilon_t$$

$$CPI_t = \beta_0 + \beta_1 MS_t + \beta_2 UEP_t + \beta_3 MFG_t + \beta_4 RER_t + \beta_5 GDP_t + \beta_6 MW_t + \beta_7 IMP_t + \varepsilon_t$$

$$CPI = -108.48 - 0.41MS - 1.54UEP - 0.53MFG + 0.004RER - 1.47GDP + 4.14MW - 0.55IMP + \varepsilon_t$$

Based on the result generated on FEM for the developing countries, the results are presented at *Table B*. The FEM result shows that all the variables tested is found to be significant and below the probability of below 1% and 10%. The independent variables of GDP, real exchange rate and money wages show a positively significant relationship with CPI. Besides, the independent variables of manufacturing, money supply, import and unemployment show a negatively significant relationship with CPI.



APPENDIX C

Granger Causality Test – Developed Countries

Null Hypothesis:	Obs	F-Statistic	Prob.
MS does not Granger Cause CPI CPI does not Granger Cause MS	280	0.97825 3.52323	0.3773 0.0308**
UEP does not Granger Cause CPI CPI does not Granger Cause UEP	192	0.26695 9.46784	0.7660 0.0001***
RIR does not Granger Cause CPI CPI does not Granger Cause RIR	235	3.51820 8.34564	0.0313** 0.0003***
MFG does not Granger Cause CPI CPI does not Granger Cause MFG	184	6.34945 19.1160	0.0022*** 3.E-08
UEP does not Granger Cause MS MS does not Granger Cause UEP	192	0.78335 0.44020	0.4584 0.6446
RIR does not Granger Cause MS MS does not Granger Cause RIR	235	0.07984 1.24198	0.9233 0.2907
MFG does not Granger Cause MS MS does not Granger Cause MFG	184	0.17242 0.39580	0.8418 0.6737
RIR does not Granger Cause UEP UEP does not Granger Cause RIR	168	2.23631 3.14119	0.1101 0.0459**
MFG does not Granger Cause UEP UEP does not Granger Cause MFG	162	5.40055 2.93627	0.0054*** 0.0560**
MFG does not Granger Cause RIR RIR does not Granger Cause MFG	161	1.45935 2.26493	0.2355 0.1072

*Note: ***, **, * indicate significant level at 1%, 5% and 10% respectively*

APPENDIX D

Granger Causality Test – Developing Countries

Null Hypothesis:	Obs	F-Statistic	Prob.
MFG does not Granger Cause CPI CPI does not Granger Cause MFG	194	1.46803 4.81049	0.2330 0.0092***
GDP does not Granger Cause CPI CPI does not Granger Cause GDP	205	0.20095 0.03090	0.8181 0.9696
RER does not Granger Cause CPI CPI does not Granger Cause RER	210	0.89251 5.58954	0.4112 0.0043***
IMP does not Granger Cause CPI CPI does not Granger Cause IMP	210	0.43068 1.58651	0.6507 0.2071
MS does not Granger Cause CPI CPI does not Granger Cause MS	174	4.45934 10.5645	0.0130*** 5.E-05
MW does not Granger Cause CPI CPI does not Granger Cause MW	148	2.65539 0.17078	0.0737* 0.8432
UEP does not Granger Cause CPI CPI does not Granger Cause UEP	144	0.27612 1.68746	0.7591 0.1888
GDP does not Granger Cause MFG MFG does not Granger Cause GDP	194	1.06178 0.11109	0.3479 0.8949
RER does not Granger Cause MFG MFG does not Granger Cause RER	194	1.68635 0.45684	0.1880 0.6340
IMP does not Granger Cause MFG MFG does not Granger Cause IMP	194	0.58787 4.75028	0.5565 0.0097***
MS does not Granger Cause MFG MFG does not Granger Cause MS	174	0.64875 4.96119	0.5240 0.0081***
MW does not Granger Cause MFG MFG does not Granger Cause MW	148	4.80126 2.32451	0.0096*** 0.1015
UEP does not Granger Cause MFG MFG does not Granger Cause UEP	144	0.58370 1.22586	0.5592 0.2967
RER does not Granger Cause GDP GDP does not Granger Cause RER	205	3.60056 1.43802	0.0291** 0.2398
IMP does not Granger Cause GDP GDP does not Granger Cause IMP	205	0.70722 4.99369	0.4942 0.0077***
MS does not Granger Cause GDP GDP does not Granger Cause MS	174	0.03037 4.51635	0.9701 0.0123***
MW does not Granger Cause GDP GDP does not Granger Cause MW	148	8.18148 4.41640	0.0004*** 0.0138***

UEP does not Granger Cause GDP GDP does not Granger Cause UEP	144	0.07750 2.89123	0.9255 0.0589**
IMP does not Granger Cause RER RER does not Granger Cause IMP	210	1.20451 3.27466	0.3020 0.0398**
MS does not Granger Cause RER RER does not Granger Cause MS	174	0.50664 3.11740	0.6034 0.0468**
MW does not Granger Cause RER RER does not Granger Cause MW	148	1.04128 10.3666	0.3557 6.E-05
UEP does not Granger Cause RER RER does not Granger Cause UEP	144	0.10418 0.53463	0.9011 0.5871
MS does not Granger Cause IMP IMP does not Granger Cause MS	174	1.97444 0.44491	0.1420 0.6416
MW does not Granger Cause IMP IMP does not Granger Cause MW	148	1.94808 0.11848	0.1463 0.8884
UEP does not Granger Cause IMP IMP does not Granger Cause UEP	144	1.02137 1.09831	0.3628 0.3363
MW does not Granger Cause MS MS does not Granger Cause MW	134	8.32388 0.95196	0.0004*** 0.3887
UEP does not Granger Cause MS MS does not Granger Cause UEP	130	2.35478 0.11002	0.0991* 0.8959
UEP does not Granger Cause MW MW does not Granger Cause UEP	144	0.14564 1.80855	0.8646 0.1677

Note: ***, **, * indicate significant level at 1%, 5% and 10% respectively