THE MACROECONOMIC EFFECTS OF OIL PRICE SHOCK UNDER DIFFERENT MONETARY POLICY RULES ON EURO AREA AND SELECTED ASIAN COUNTRIES

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DECLARATION

We hereby declare that:

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

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

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

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THE MACROECONOMIC EFFECTS OF OIL PRICE SHOCK UNDER DIFFERENT MONETARY POLICY RULES ON EURO AREA AND SELECTED ASIAN COUNTRIES

ABSTRACT

The fundamental of this study is to investigate the effect of oil price shocks on macroeconomic activities and how monetary policy responds to oil price shock on macroeconomic activities between the Euro Area and selected Asian countries. The empirical study uses time series data for the period of 1980 quarter one to 2010 quarter four which was obtained from various sources. In order to carry out a more thorough analysis, various restrictions are formed by using different monetary policy tools to observe the impact on the macroeconomic activities. In this study, two baseline and eight restrictions which can be differentiated into two different monetary policy tools. The econometric model is estimated by using the SVAR approach to find out the short-run and long-run responses of macroeconomic variables to oil price shock within these two regions. The result shows that the inflation rate of Euro Area respond the most towards oil price shock in comparison to Asian countries. However, the response of Real Gross Domestic Product (RGDP) and Nominal Effective Exchange Rate (NEER) for Japan is increasing but that is not the case for other countries even Euro Area. Later on, with the inclusion of monetary policy tools, Asian countries responses is less significant compare to Euro Area's inflation when the restrictions of all macroeconomic variables responses are included. Asian countries are indifferent or alternatively there are no significant changes whether monetary policy tool steps in or intervenes.

CHAPTER 1: RESEARCH OVERVIEW

1.0 INTRODUCTION

The availability of natural resources on earth are abundance but among these resources, there are nothing as far more important than the 'black gold' we aimed to study. This 'black gold' we are referring to is none other than oil. Oil has become our main energy that is needed in our daily lives. This natural resource plays a vital role especially in moving the economy forward where its prices are determined by the supply and demand in the economy. Apart from that, as this resource is of significant importance to the economy, the volatility of the oil price has a big impact on the economy as well (Cunado & Perez de Gracia, 2003; Peersman & Van Robays, 2009; Rafiq, Salim & Bloch, 2009; Aydin & Acar, 2011). Based on the oil price, our goal is to study the impact of this variable has on economic activities and the role of monetary policy.

Over the years, oil price shocks have become a significant phenomenon that was studied by many researchers. Since the 1970s, Hamilton (2009) stated that this is mainly due to the fact that oil price shocks have an effect on the macroeconomic variables ever since the 1970s (Peersman & Van Robays, 2009; Iwayemi & Fowowe, 2011). The impact of oil price shocks have on the macroeconomy during the 1970s drew a great deal of attention as it brings disruption to the economy especially in the United States as well as in the European countries (Cunado & Perez de Gracia, 2003; Barsky & Kilian, 2004; Peersman & Van Robays, 2009). More to the point, Barsky and Kilian (2004) stated that the high level of inflation in US is due to the increase in oil price (as cited in Ewing & Thompson, 2007). According to Hamilton (2009), oil price shock first started in 1973 where the Yom Kippur war consequently affected the Organization of Arab Petroleum Exporting Countries (OAPEC) decision to decrease its production supply. Although it did not prevent any disruption in shipments of oil directly, somehow OAPEC decided to cut production by 5

percent and as a result, oil price shocks occurred where it rose to $11 from $3 per barrel. Next, came into the late 1978 where the Iranian Revolution and the Iran-Iraq in 1980 erupted causing disruptions of oil supply in the Middle East. Then came 2nd August, 1990 where a conflict of invasion between Iraq and Kuwait that ensued for 9 months causing an oil price spike. The impact from this war greatly affected every country through the rise in oil price from $16 to $36 per barrel recorded by the US Energy Information Administration (EIA). Onto the 20th century where there were many other major events that caused shocks on the oil price. For example, in 2003 there were unrest in Venezuela and the second Persian Gulf War as well as the growing demand and stagnant supply from 2007 to 2008. In addition, recently in 2011 where Middle East and Libya faces political unrest which might spread to other oil-rich countries such as Saudi Arabia and thus causing the oil price to go up over $100 per barrel. During this course, the changes of oil price have differed over the years. Back in the 1970s up to now, the oil price change serves as an important indication of economic fluctuation. However, the changes in the oil price are significantly different compare to the 1970s and the 2000s (Blanchard & Gali, 2007; Hamilton, 2009).

Before 1973, the oil price per barrel shows stability in price. Subsequently, oil price after 1973 starts to show some fluctuations which affects policy makers and investors in their decision making process. This phenomenon is the reason as to why numerous researchers are keen to study why the oil price no longer follows the pure cyclical model that it would expect to follow. Previous researchers have done a number of studies based on oil price and the economy. Most of the earlier studies focus on the volatility of oil price on economic activities (Gisser & Goodwin, 1986; Jimenez-Rodriguez & Sanchez, 2005; Cunado & Perez de Gracia, 2005; Gounder & Bartleet, 2007; Lardic & Mignon, 2008; Hamilton, 2008; Rafiq, Salim & Bloch, 2009; Aydin & Acar, 2011; Hamilton, 2011). Volatility here refers to the increase and decrease in oil price. Majority of researchers only focus on the positive shock of oil price on economic activities (Gronwald, 2008; Lutz & Meyer, 2009; Jimenez-Rodriguez & Sanchez, 2009; Hamilton, 2009; Schubert & Turnovsky, 2011). Nevertheless, past researchers have also combined the positive and negative shocks together in their studies

(Camarero & Tamarit, 2002; Rodriguez & Sanchez, 2005; Farzanegan & Markwardt, 2009; Gomez-Loscos, Montanes & Gadea, 2011). No matter an increase or a decrease in oil price, the volatility affects the economy.

The fluctuations of oil price would deem to pose challenges to policy makers because one wrong move will result in a different outcome. From a monetary policy perspective, as different policies are adopted by different countries in the world, the adverse effect of policy responses in the event of oil price shock would vary. Therefore, there are numerous studies on the responses of monetary policy based on the oil price (Hetzel, 1999; Olomola, 2006; Lee, Lee & Ratti, 2011). However, Kormilitsina (2011) in another observer's perspective doubt that economic recession comes from oil price shock but instead the monetary policy is held responsible for multiplying the recession. Thus, we believe that the monetary policy would have an influence or impact on the macroeconomic activities when there is oil price uncertainty.

1.0.1 Behaviour of Macroeconomic Variables towards Oil Price Fluctuations

Based on the Figure 1.0(b), during the quarter 2 of 1980 up to quarter 1 of 1985, the RGDP of Korea, Japan and Singapore follows a same trend which is ascending as the oil price dropped. However, the RGDP of Euro Area shows otherwise which imply that there is an element of asymmetry. As shown by the works of Iwayemi & Fowowe (2011), asymmetric effect exist where the relationship between RGDP and oil price have changed. Subsequently, the trend changed when it reaches 1998, as oil price gradually decreased, RGDP in Euro Area does not change much whereas Korea, Japan and Singapore dropped with negative oil price shock, where Korea's RGDP drops the most. In the year 2008, Euro Area, Japan, Korea and Singapore move in a similar trend, the RGDP for Euro Area and Japan decreased in a larger magnitude when the oil price increased compared to Korea and Singapore which only dropped slightly. According Figure 1.0(c), the CPI in each country is very volatile to the oil price uncertainty, the most significant changes was during 1997 to 1998, the CPI for Korea increased more compared to others. When it comes to NEER in Figure 1.0(d), Korea, Japan together with Singapore differ in a way with the oil price when there is a decrease in oil price, the NEER appreciates and vice versa. During 1998 to 1999, NEER of Korea appreciates when oil price decreased while other countries only increase slightly. When there is an increase in oil price during 2007 to 2008, NEER of Singapore and Japan depreciate. In contrast, the NEER for Korea and Euro Area appreciates. This violates the negative relationship that should exist between

NEER and oil price. As stated by Golub (1983), in the event of an oil price increase (decrease), the exchange rate will bound to depreciate (appreciate).

Figure 1.0 (a): Fluctuation of Oil Price

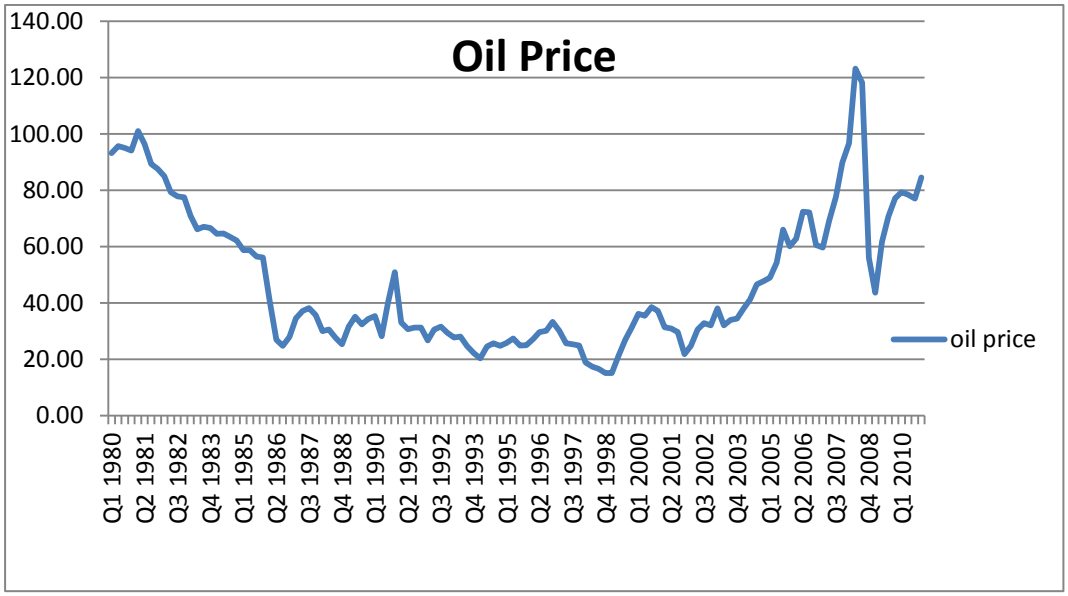


Figure 1.0 (b): Fluctuation of RGDP for Different Countries

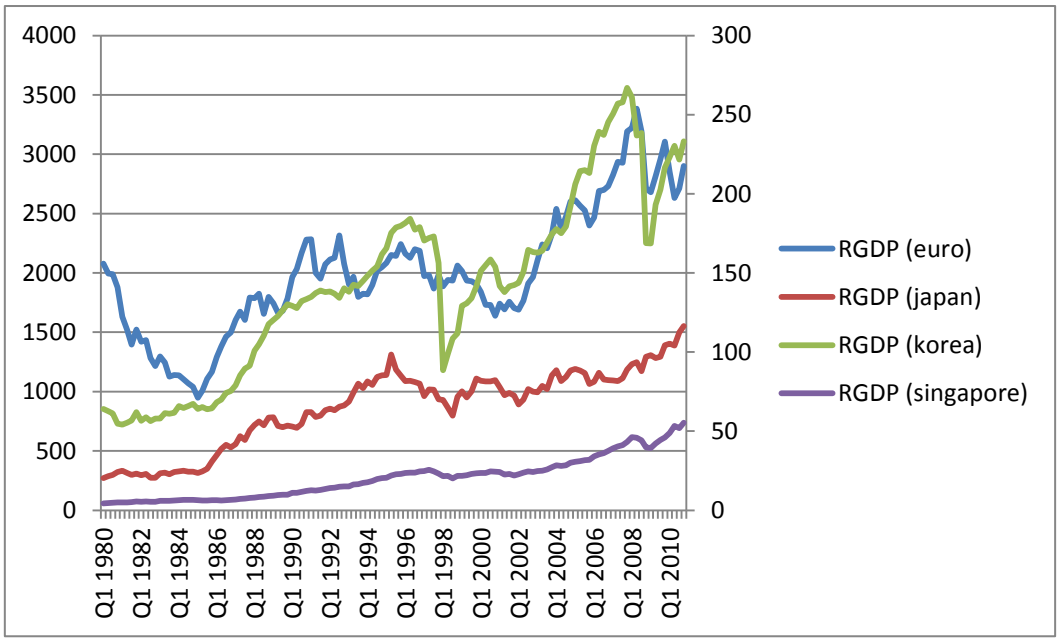


Figure 1.0 (c): Fluctuation of CPI for Different Countries

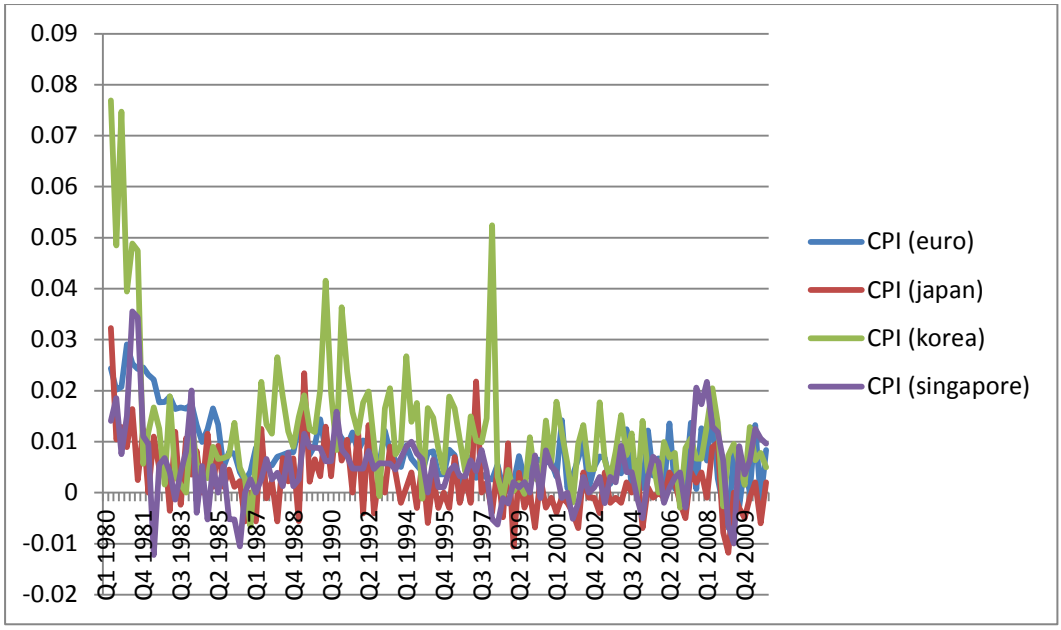
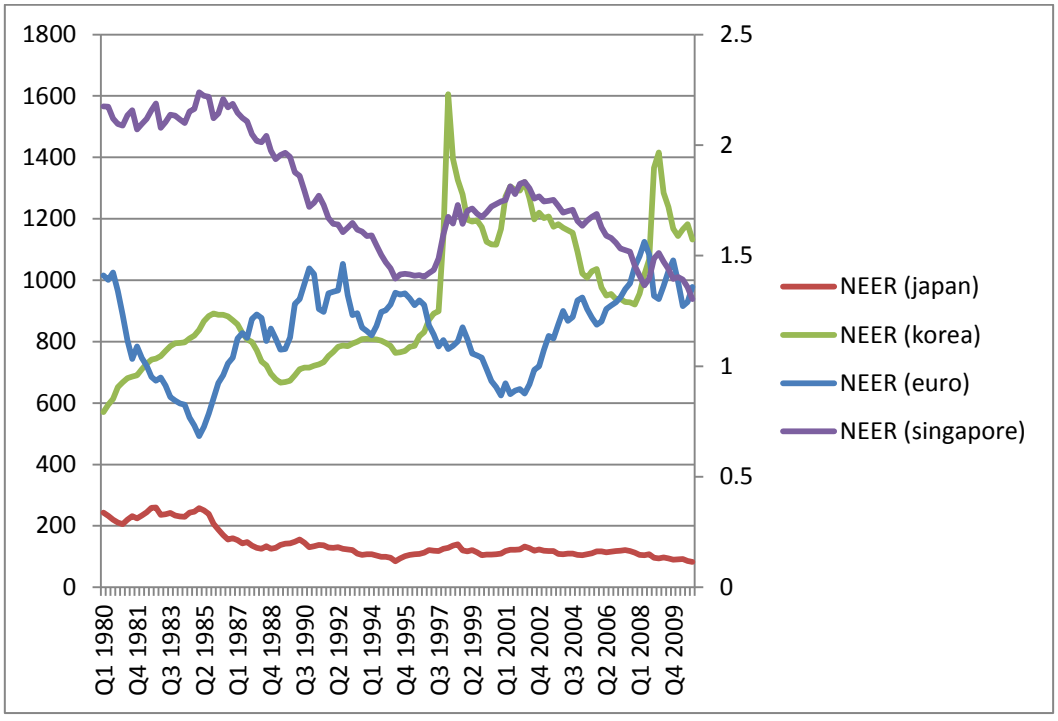


Figure 1.0 (d): Fluctuation of NEER for Different Countries



1.1 Research Background

According to the OPEC's forecast for global oil demand as of 2013 remain unchanged whereby oil prices on international markets are growing with the level of 880, 000 barrel per day. Prior to 1973, oil price per barrel remain at a stable level. A big increase in oil price which occurred back in 1973-74, 1979 and 1990 were then followed by economic recessions in the United States. In 1973, the oil embargo happened back in October where United States and Western Europe support Israel against the Arab nations in the Yom Kippur War of 1973. Due to the fluctuations of oil price after 1973, this has an effect on the policy makers and investor in their decision making process. Next, with the arrival of the Iranian Revolution and the unrest in Venezuela as well as the second Persian Gulf War in 1978 and 2003 respectively in which it disrupts the oil price supply and leads to the oil price volatility. Consequently, the oil price has a significant effect not only on the macroeconomic activities but also the trade that take place between nations. That is why a number of researchers in the past have study the relationship between global oil price fluctuation and the macroeconomic activities. In this paper, we study the effect of oil price shock on macroeconomic activities. Besides that, we also intend to study the impact of monetary policy tools on the macroeconomic activities in the event of an oil price shock between regions.

1.2 Problem Statement

To the best of our knowledge, only a few researchers have yet to combine the effect of oil price uncertainty and monetary policy on the macroeconomic activities. Previous papers only focus more on the effect of oil price on the macroeconomic variables. By deviating from the studies of past researchers, the monetary policy responses towards oil price uncertainty is studied whether or not it would have an impact on economic activities across different country and region. On the other hand, this paper takes into consideration as to what is the outcome when monetary policy has different restrictions on each of the

macroeconomic variables. In other words, the monetary policy is brought into the relationship between oil price and the macroeconomic variable. Since the monetary policy was taken lightly in past studies, the impact on the macroeconomic variables in the events of oil price uncertainty after action taken with monetary policy will be investigated in this paper.

1.3 Research Objectives

The objective is to examine the effect of the macroeconomic activities in the events of an oil price uncertainty. In addition, to observe whether the outcome of the macroeconomic activities when monetary policy responds to oil price uncertainty are better, worse off or remain unchanged.

1.4 Research Questions

- What is the impact of the oil price uncertainty on the macroeconomic activities across different regions?
- What is the impact on the macroeconomic activities when monetary policy responds to oil price shock across different regions?

1.4.1 General Objectives

In this paper we study the extent to which monetary policy respond to oil price uncertainty will have an effect on the different macroeconomic variables such as interest rate, money supply, CPI, RGDP and NEER in Euro Area, Japan, Korea and Singapore.

1.4.2 Specific Objectives

Using a set of restrictions, we are aim

1) To study the effects of oil price shock on macroeconomic activities in two different regions.
2) To study the intervention of monetary policy through SVAR technique.
3) To study the effects of oil price shock on macroeconomic activities in Euro Area and selected Asian countries when monetary policy is implemented.

1.5 Significance of Study

Comparing previous studies with this study, the monetary policy is taken into account for the impact on each of the macroeconomic variables during an oil price uncertainty. Apart from that, this study will prove to be beneficial to researchers and government body whether steps need to be taken or not depending on the outcome from which the monetary responds to oil price uncertainty are better, worse off or remain unchanged. On the other hand, this study makes a comparison between Euro Area and selected Asian countries of the effect of two monetary policy instruments on macroeconomic variables when oil price shock occurs.

1.6 Chapter Layout

In order to examine the impact of monetary policy responses towards oil price uncertainty on economic activities, we identify and estimate using Structural Vector Autoregression (SVAR) technique. We report and compare the estimates consisting of different regions across time. Using quarterly sample data of advanced countries from Europe and Asian which comprise of Euro Area, Japan, Korea and Singapore ranging from 1980 to 2010 in our study is due to the fact that we want to take into consideration of the changes in the monetary policy over the years that may be blamed for the differential response of the economy to oil shocks. The policy responses which differ across different regions in Euro Area and selected Asian countries include the tightening and expansionary monetary policy as well as by doing nothing as compromising.

In this paper is organized as follows, Chapter 2 discusses the works of past researchers and how our study fits in the literature. Chapter 3 explains the methodology. Chapter 4 discusses the data as well as our results and Chapter 5 concludes.

CHAPTER 2: LITERATURE REVIEW

In this literature review, we divided each aspect into various sections. Section 2.1 discusses the oil dependency conditional on economic structure where different structure reflects the oil dependency of the country. Then, Section 2.2 deconstructs various transmission mechanisms mainly consist of supply and demand side. Section 2.3 relates the transmission across borders in terms of welfare transfer. Section 2.4 discusses the policy response to oil price shock which touches on monetary policy, fiscal policy as well as exchange rate. Next, Section 2.5 describes the nonlinearity in the effect of oil price shock.

2.1 Oil Dependency Conditional on Economic Structure

In a world filled with diversity and variability, every country has a different economic structure that is different from others. In the case of an oil price shock, the result or impact of a different type of economy that operates under certain regulation and condition may vary from sector to sector or country to country. Economic structure is defined as the different changing balances of output, income, employment and trade taken from different economic sectors from primary to secondary to tertiary as well as to quaternary sectors such as tourism. This indicates that an economy will go under a transformation from primary (farming, fishing, mining etc.) to secondary (manufacturing and construction industries) to tertiary and so on. A study done by Alt (1987), the Norway economy has transformed during the period of 1975 to 1980 where employment in manufacturing sector decreased by 5 percent while saw an increase in the services, banking, insurance, real estate and consulting sector. This shows the transformation of an economy which differs from time to time.

By relating the following point to an oil price shock, a different impact or result would register in two countries with different economic structure. According to Ran and Voon (2010), an oil price hike would not necessarily affect

an economy powered by service sector compare to another economic structure dominated by the manufacturing sector, which mainly involves production and transportation of real goods in which oil plays a role of major importance. A country may be a net oil exporter or net oil importer, which comes to the point, by referring to a country's degree of dependency on this valuable resource.

In relation to the change of economy structure, the dependency on oil changes as well. The degree of dependency of a country on oil will serve as an indicator as to how badly the effect a country would experience in case of an increase in oil price. In the case of oil dependent countries, the effect of oil price shock is significantly larger. In the study of Tang et al. (2010), the influence of oil price shock may vary from country to country due to their dependence on international energy market, energy mix, energy intensity and different economic structure.

Using a Vector Autoregression (VAR) system, Rafiq, Salim and Bloch (2009), Thailand do not own domestic oil production and reserves but rely on imports which makes a major portion of the country's oil consumption. The Thai economy would be more vulnerable compare to other developing countries with greater oil supply security. On the other hand, a finding based on the study of Doroodian and Boyd (2003), the US economy structure has change dramatically since the early 1970s whereby the economy is more of a service-based economy today in comparison to a manufacturing based economy. Subsequent literatures also share the same view where Coffman (2010) uses a computable general equilibrium (CGE) and found that United States shift away from manufacturing to a more service-based economy which could insulate it from oil price shocks due to the change in oil dependency. From a trade balance perspective, the US trade from alternative energy sources would offset or cushion the impact from an oil price increase.

Apart from that, countries like Hawaii where its economic structure lies in the technological dependence on oil, makes it more vulnerable to an increase in oil price (Makena & Coffman, 2010). Whereas, Suez and Mignon, (2009) concluded that China is a highly industry-oriented and energy-intensive economy. This is

because in China, the transportation sector is developing and has led to a surge in demand for oil products. This dependency can also be seen in other countries such as New Zealand where they rely on the imports of oil and petroleum products. In addition, this country would be vulnerably to the fluctuations of world price of crude oil (Gounder & Bartfleet, 2007).

In a nutshell, countries which are more dependent on energy imports especially suffer from rising energy prices (Ozlale & Pekkurnaz, 2010). A country's economy dependency on oil will largely determine the outcome in the event of an oil price shock. Considerable research finds that oil price shocks have affected manufacturing based economy (Lutz & Meyer, 2009). In relation to a manufacturing based economy, an oil price shock affect the most on this sector as it is related directly to the cost of production (Ewing & Thompson, 2007; Cologni & Manera, 2008). As for countries which are less dependent on crude oil in their economy such as United States, the impact of oil price shocks on their economy would be less severe because oil is being substitute with other alternative energy resources such as natural gas, hydro and so on.

2.2 Transmission Mechanism

During this period of oil price shock, there is a transmission of mechanism that can be channelled into various aspects. Firstly, as stated by Olomola (2006), Jayaraman and Choong (2009), Lutz and Meyer (2009), Peersman and Van Robays (2009), Samimi and Shahryar (2009), Berument et al. (2010), Ran and Voon (2010), Archanskaia et al. (2011) that this transmission mechanism can be directed back to the supply and demand side.

2.2.1 Supply Side

From a supply side, an oil price shock result in firms purchasing less energy and consequently there will be a decrease in productivity which then results in the fall of potential output. This decline in productivity also meant that real wages will be lower and thus lower labour supply. As a result, there will be a lower potential output than expected from an oil price shock (Zhang, 2008).

Apart from that, higher oil price push overall costs of production through the aggregate supply (Rong, 2006; Rafiq, Salim & Bloch, 2009; Farzanegan & Markwardt, 2009; Ran & Voon, 2010). A supply side oil shock can also be divided into two effects. According to Suez and Mignon (2009), supply side oil shock has two effects which are direct and second round effect. The direct effect comes into play when there is an increase in oil which then pushes the cost of production up. This will cause cost push inflation and eventually a decrease in aggregate output. Conversely, the second round effect happens when an increase in oil price will cause the Consumer Price Index (CPI) to increase. The increase in CPI makes the purchasing power of consumer to decrease and so workers demand for an increase in wages. This effect will go through a vicious cycle called the inflationary spiral and wage spiral.

2.2.2 Demand Side

An oil price shock can bring an impact through the aggregate demand where the rise in oil price reallocates the income of net oil importer and net oil exporter countries from a demand side. Through the demand side of oil price shock, as oil price increases, this will reduce the aggregate demand by decreasing the spending on goods and services. Increase in oil price reduces the purchasing power or in other words the real income.

Besides that, an increase in oil price may affect the investment through rising firms' cost (Jimenez-Rodriguez, 2005). The increasing cost or higher production cost in firm implies that it will lower the rate of return on investment

which then investment demand is negatively affected. In the events of an oil price shock, there is a negative effect on investment due to an increase in firm costs (Lardic & Mignon, 2008). According to Tang, Wu and Zhang (2010), a rise in oil price have a negative effect on output and investment. Besides investment, consumption and stock prices portray a negative relationship with oil price hikes. The fall in consumption results from an oil price shock because consumption is positively related with disposable income.

2.3 Transmission across Borders

How does one country is able to influence another country varies across different regions and borders? The answer lies in the trade balance of a country. Trade balance involves the transaction between a nation's import and export and by relating to an oil price shock, it reduces the international trade flow. In the event of an oil price shock, it raises the uncertainty about the path of oil price in the future. These fluctuations in oil price make consumers to delay their purchase of irreversible consumer durable goods as well as firms to postpone irreversible investment. Chen and Hsu (2012) stated that the decrease in investment expenditure and domestic consumption implies a reduction in aggregate demand and thus reducing international trade.

Moving on, a nation classified under net oil importing country may be a non-oil energy exporting country as well. In other words, a country which imports oil but on the other hand this country is a net exporter of alternative energy resources as well. If an oil price shock does occur, this country would not be affected much. Based on the study of Peersman and Van Robays (2009), they examine a number of countries that are dependent on imports of oil and other energy resources (France, Germany, Italy, Spain, Japan and Switzerland), net oil and energy importing country which has a noticeable domestic oil production sector (United States), net oil and energy exporters (Canada and Norway), net oil importing but non-oil energy exporting country (Australia) and oil exporting but energy importing country (United Kingdom).

2.3.1 Welfare Transfer

When an oil price shocks occur between net oil exporting and importing countries, a welfare transfer occurs from net oil importing to net oil exporting country (Ayadi, 2005; Jimenez-Rodriguez & Sanchez, 2005; Cologni & Manera, 2006; Grounder & Bartfleet, 2007; Peersman & Van Robays, 2009; Iwayemi & Fowowe, 2011). Apart from that, Dohner (1981) found that the increase of oil price worsen the terms of trade for oil-importing countries (as cited in Lardic & Mignon, 2008). Chuku, Akpan, Sam and Effiong (2011) stated that the effects of oil price shock usually come in two where it brings lucrative profits and revenue to oil exporting countries like Nigeria and on the other hand ushering in several policy challenges, including distortions to macroeconomic dynamics.

However, some researchers stated otherwise where Olomola (2006) conclude that it is the monetary policies responses that caused fluctuations in the economic activity and not oil price shock itself. Apart from that, the largest source of variation other than the variable itself is oil price shock and monetary shocks (Jimenez-Rodriguez & Sanchez, 2005). Bohi (1991) which states that oil price themselves do not have a significant macroeconomic effect (as cited by Hooker, 2002). Hooker (2002), states that it is difficult to identify the possibilities that monetary policy responds to oil price movement.

2.4 Policy Response to Oil price Shock

The monetary policy is a great tool to influence a country's economic condition in which the central bank implements by expanding or contracting the money supply. Past researchers have shown that by using the monetary and fiscal policy, an economic condition can be tamed depending on its suitable expansionary or contractionary tools. Over the years, many have argued indecisively on the impact of oil price shocks on the macroeconomic variables. Researchers stand divided on how oil price shocks do or do not affect the macroeconomic variables. Past studies have stated that the increase in oil price

does not have a major impact on the macroeconomic variables (Iwayemi & Fowowe, 2010; Ou, Zhang & Wang, 2012). In contrast, as oil becomes a very important commodity in the world, researchers conclude that it does have an impact on macroeconomic variables.

The roles of central bankers are not only to implement these policies but also to take a follow up action. In other words, central banks would have to maintain its credibility so that people will not revise their expectations and will not change their consumption and investment. So, when there is an event of oil price shocks, there will be a less impact compare to other central banks which are not credible. According to Loscos, Montanes and Gadea (2011), the effect of oil price shocks on economies became less important was because of the changing role of monetary policy, greater independence, credibility gained subsequently as well as the commitment to a stable inflation rate. From this, we could see why it is important that the monetary policy is effective but also central banks are responsible to gain trust and credibility in implementing it.

2.4.1 Monetary Policy

An appropriate monetary policy decision would bring a significant impact on the economy in case of an oil price shock does occur. Even so, central banks across the regions have different objective in tackling their own economic problem. For example, Peersman and Robays (2009) found that the Federal Reserve (Feds) is more in line with its output stabilization while the Euro Central Bank (ECB) focuses more on its inflation objective.

A study by Blanchard and Gali (2009) stated that one of the factors which historically shows that the oil price shocks in the 1970s are different than 2000 is due to the changes in the way monetary policy is implemented. Based on Barsky and Kilian (2004), the upward trend of oil price in the 1970s was because of worldwide monetary expansion that drove the output levels above potential level accompanied by periods of low interest rate. Ultimately, this boom gave way to recession and to increasing interest rate. In reality, monetary policy goes both way

in the economy in which it may bring good to an economy but it may also turn the economy into recession.

The monetary policy on economies such as Nigeria, China and United States are examined in some studies, such as those by Chuku, Akpan, Sam and Effiong (2011), Darrat, Gilley and Meyer (1996) and Tang, Wu and Zhang (2010). All of these studies discussed on the role of monetary policy and the effect it has on the macroeconomy through the money supply using expansionary or contractionary tools. As stated by Darrat, Gilley and Meyer (1996), even though an oil price does not cause changes in industrial production directly, but through presence of the monetary base, the oil price would affect it indirectly. In contrast, Hooker (2002) stated that monetary policy helped to create a system where inflation is less sensitive to price shocks instead of being less accommodative of oil shocks. Results from the same study shows that the role of monetary policy is only a minor one since oil price have a small impact on inflation. In relation, the role of monetary policy in solving macroeconomic problems remains ambiguous. This is due to the fact that there is insufficient information as to whether oil price or the monetary policy brings a positive or negative effect on the macroeconomy.

2.4.2 Fiscal Policy

This fiscal channel covers government spending and taxes. Government spending can also be interpreted as a subsidy that is provided by the government. In order to cushion the impact of oil price shock, government provide subsidies to consumers directly and indirectly. Indirectly, government subsidize the price of oil whereas in direct is when the government pays to producers or consumers directly (Jbir & Zouari-Ghorbel, 2009). No matter if it is direct or in an indirect way, if government choose to subsidize in the events of oil price, the government will eventually experience high debt burden and this may lead to failure to finance their economy. So, in order to finance it, the government would either choose to make more foreign borrowing or create more money and as a result hyperinflation occurs. Evidently, Ozlale and Pekkurnaz (2010) stated that oil funds have been

recommended in order to mitigate the negative effects of oil price but usually this oil funds are use to subsidized the oil price.

Furthermore, rising oil prices can be thought as a tax levied from oil-exporting countries to oil consumers. In terms of tax, the share of tax on oil prices between developing and developed country would also determine the severity of the impact from increase in oil price. In developing countries, the share of tax is lower compare to developed countries. When oil price shocks occur, countries with a higher share of tax of fuel could somewhat be mitigated by suspending the taxes. Whereas, when it comes to countries with low share of taxes on fuel, it is less useful.

2.5 Exchange Rate

Macroeconomic variable such as exchange rate can also be affected by oil price shocks. There are numerous studies conducted by previous researchers that explain the relationship between oil price and the exchange rate. According to Olomola (2006), a high oil price may give rise to wealth effect which then appreciates the real exchange rate. He then added that this may squeeze the tradable sector and as a result Dutch disease would occur. In the course of studying the Chinese economy, Huang and Guo (2007) found a minor appreciation of the long term for Renminbi (RMB) stems from an oil price shocks (as cited in Ou, Zhang and Wang, 2012). In the case of an oil price increase, the exchange rate will tend to fluctuate. As oil importing countries goes into trade with another oil exporting countries, the currency of the oil importing countries will depreciate and the currency of oil exporter countries would appreciate instead. A study conducted by Golub (1983) stated that there will be a surplus of supply of dollars in the foreign exchange market and dollar will depreciate when the OPEC countries' demand for dollars falls short of the decrease in demand of dollar by oil importing countries. More to the point, in the events of an oil price shocks also changes the demand of a currency due to transactions demand and also for investment reasons too. Based on the same author, Golub (1983) found

that the Deutschmark appreciate against US dollar when the demand for mark increases and the demand for US dollar decreases in the event of an oil price increase.

2.6 Nonlinearity in the Effect of Oil Price Shock

Ran, Voon and Li (2010) found that oil price shocks have an asymmetric effect on the macroeconomy by which the effect of an increase in oil price is more significant than the decrease in oil price. The existing effects of oil shock are asymmetric between positive oil price shock and negative oil price shock on GDP. A positive oil price shock causes a decrease in GDP. In other words, a decrease in oil price should in turn cause an increase in GDP but this negative oil price shock effect does not hold. This is consistent with the statement of Ran, Voon and Li (2010) which stated that the oil price shocks have asymmetric effects on the macroeconomy whereby the effects of the oil price increase were much more significant than those from the oil price decrease. On a statistical view, the results of Hamilton (2003) shows that the estimated regression for data from 1949 to 1980 shows that a 10% increase in oil price will result in a 1.4% dropped in GDP for the following four quarters later. The linearity of the regression shows that it also requires a 10% decrease in oil price to result in a 1.4% higher level of GDP. When the same regression is re-estimated using data from 1949 to 2001, the result was different. It shows that an oil price decrease of 10% does not cause a 1.4% increase in the level of GDP.

Apart from that, the research of Iwayemi & Fowowe (2011) shows that the effects of oil shock before year 1985 is greater compare to the effects of oil shock after year 1985. It shows that the relationship between oil shock and macroeconomy variables has been changed to non-linear and it shows an asymmetric effect among them. In terms of the inflation and industrial production in Japan, the effect of oil price shock on these two variables is significant in the 1970s and 1980s. However, it was only recently that the effect on inflation and industrial production are barely visible in the events of an oil price shock

(Jimenez-Rodriguez & Sanchez, 2012). In other words, the results show that the inflation is not affected even by a large increase in oil price in the case of the Japanese macroeconomy. According to Elder and Serletis (2007), this mainly is due to two factors which is the respondent of Tax Reform Act of 1986 to negative oil shock has caused a huge decline in investment spending. This effect has been exacerbated by an unexpected reduction in investment for domestic energy exploration. These are the main reason why a negative oil shock does not boost up the economy (as cited in Edelstein and Kilian, 2007a). Moving to another reason, Elder and Serletis (2007) shows the failure of a drop in oil price to increase output growth and the failure of oil increases to induce a recession is due to sectoral reallocation of labor (as cited in Davis and Haltiwanger, 2001 ; Hamilton, 1988).

However, Elder and Serletis (2007) did not find any evidence for Edelstein and Kilian (2007) findings on Tax Reform Act 1986 causing a declining in investment spending but they do confirm the decline in the domestic mining exploration was due to lower oil prices. With the lower oil prices, domestic mining expenditures tends to decline in a large proportion where higher oil price only cause an increase in domestic mining expenditures in small proportion.

2.7 What We Are Going to Do?

The goal of this study is meant to investigate how the fluctuations in oil price would affect the macroeconomic activities as well as how it would affect the monetary policy responses and the impact it brings on the economic activities in advanced countries. These regions consist of European and selected Asian countries. The European countries are grouped together as Euro Area whereas Selected Asian countries include Japan, Korea and Singapore. We estimate and report using the Structural Vector Autoregression (SVAR) technique from year 1980 to 2010 consisting of quarterly data.

CHAPTER 3: METHODOLOGY

In this chapter, we will discuss about the sources of the variables, the techniques that we used to perform the empirical test and also the process to carry out all the tests. The first part is the source of the data and its description. On the second part of this chapter is to find how the oil price shock affects the macroeconomic activities whereby a model was developed without the inclusion of monetary policy tools. The third part of this chapter, various restrictions are included to test out the different scenario under different monetary policy tools.

3.0 Data Description

Based on table 3.0 below, the data included comes from various sources. These sources comprise of U.S Energy Information Administration (EIA), International Financial Statistics (IFS), Oxford Economics, Bank of Japan, International Monetary fund (IMF), Bank of Korea, Main Economic Indicator, Bank of National Settlement, Statistic Singapore, Monetary Authority Singapore. In addition, each country contains real oil price (in US Dollars), interest rate (in percentage), broad money (M2 in USD Billion), Consumer Price Index (CPI in index), Real Gross Domestic Product (RGDP in USD Billion) and Nominal Effective Exchange Rate (NEER in national currency unit to USD) variables. The data that was collected are in quarterly and ranges from 1980 to 2010. In order to have a range of data which is in a consistent form and a smaller gap, the data are transformed into a natural logarithm form. For instance, interest rate is first divided by 100 before it is added with one and then transformed into a natural logarithm form. In this section, we provide more evidence on the macroeconomic effects of oil price shock and also how fluctuations of the oil price would have on the monetary responses as well as the impact it brings on the economic activities in advance countries. These advanced countries that are included in this study are Euro Area, Japan, Korea and Singapore.

Table 3.0: Data sources for macroeconomics variables

Countries	Real oil price (US$)	Interest rate (%)	M2 (USD Bil)	Consumer price index (2005=100)	Real GDP (USD Bil)	NEER (NCU/USD)
Euro Area	EIA	Oxford economic	Oxford economic	Oxford economic	Oxford economic	Bank of International Settlement
Japan	EIA	IMF	Main Economic Indicators	International monetary fund (IMF)	Oxford economic	International monetary fund (IMF)
Korea	EIA	IMF	Main Economic Indicators	International monetary fund (IMF)	Bank of Korea	International monetary fund (IMF)
Singapore	EIA	IMF	Monetary Authority Singapore	International monetary fund (IMF)	Statistics Singapore	International monetary fund (IMF)

3.1 Empirical Model

In conducting our empirical test, we use the six-variable SVAR model. Originally the Vector Autoregression does not contain the restriction that is stated in SVAR. It is a natural generalisation of autoregressive models that was popularized by Sims (1980) and it is in a form of a systems regression model which can be used with more than one dependent variable. However, VAR draws criticism such as the insufficient of attention to structural or parameter stability, non-robustness of identification as well as uncertainty regarding the choice of policy indicator (Bernanke & Mihov, 1998).

In examining the relationship between a set of economic variables, a VAR can be quite handy. In addition, the resulting estimates can be used for forecasting purposes (Enders, 2004, p.291). A general t-order VAR model is specified as:

$$Y_t = A_0 + A_1X_{t-1} + ... + A_pY_{t-p} + \mu_t \quad (3.1)$$

Equation 3.1 VAR (t) process where A_i (i = 1, 2, ..., p) are k x k matrix of coefficient. We define a_{io} as the element of vector A_0 while a_{ij} as the element in row i and column j of the matrix A_p, U_t is a vector of structural shock. Y_t = [ℓoil , ℓi , $\ell m2$, ℓcpi , $\ell rgdp$, $\ell neer$] is a vector of six variables, consisting of oil price (ℓoil), interest rate (ℓi), M2 ($\ell m2$), CPI (ℓcpi), RGDP ($\ell rgdp$) and NEER ($\ell neer$).

From the equation VAR (p) can be interpret as a reduced form model. SVAR is a structural form and is defined as:

$$Y_t = A_0 + A_1Y_{t-1} + A_pY_{t-1} + B\ \mu_t \quad (3.2)$$

$$Y_t = A^{-1}A_0 + A^{-1}A_1Y_{t-1} + A^{-1}A_pY_{t-1} + A^{-1}B\ \mu_t \quad (3.3)$$

$$Y_t = A^{-1}A_0 + A^{-1}A_1Y_{t-1} + A^{-1}A_pY_{t-1} + \ell_t \quad (3.4)$$

Therefore, a reduced form residual can be retrieved from a SVAR model in equation (3.3) and (3.4).

$$\ell_t = A^{-1}B\ \mu_t \qquad (3.5)$$

So, this equation (3.5) is a generalised model which is used to develop the following matrix model.

A recent study by Ahmedn and Wadud (2011) used the SVAR in conducting the same study comparable to this paper. Similarly, other researchers used SVAR model as a way of conducting their study consistent with this paper as well (Ozlale & Pekkurnaz, 2010; Peersman & Van Robays, 2011). According to Gottschalk (2001) SVAR methodology has been made relatively simple, straightforward and understandable as it is packaged and implemented in computer econometric software such as E-Views and Regression Analysis of Time Series (RATS). Though SVAR is not suitable for policy simulations like what simultaneous equation models could but it is able to analyze the dynamics of a model which is subjected to unexpected shock. Hence, the Structural Vector Autoregression (SVAR) model was chosen. SVAR in general uses economic theory to sort out contemporaneous links among the variables. In other words, it can be manipulated in accordance to theory and structural form. Apart from that, SVAR allows a modelling of structural contemporaneous restrictions across different equations rather than a recursive structure (Kim & Roubini, 2000).

On another note, there is another method such as Vector Error Correction Model (VECM) which is rarely used in this kind of study. This model adds an error correction features into a VAR model which is used when there is a first difference and when cointegration is detected in the series, a long term equilibrium relationship between them is known. In contrast, VAR in level is much more robust and reliable in comparison to VECM because even if there is no stochastic trends and cointegration, it can still be applied (Jang & Ogaki, 2004).

3.2 Model without Intervention of Monetary Policy Tools

In order to answer the first aim of this paper, a matrix model of 4x4 dimensions is modelled as equation (3.6) below and through analysing the Impulse Response Function, we could investigate how the oil price shock would affect the macroeconomic variables. This model does not contain the monetary policy tools such as interest rate and money (M2), meaning that these two variables does not play any role since the idea was to see how the oil price shock would affect the macroeconomic activities.

$$\begin{bmatrix} \ell oil \\ \ell cpi \\ \ell rgdp \\ \ell neer \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ a21 & 1 & 0 & 0 \\ a31 & a32 & 1 & 0 \\ a41 & a42 & a43 & 1 \end{bmatrix}^{-1} \begin{bmatrix} b11 & 0 & 0 & 0 \\ 0 & b22 & 0 & 0 \\ 0 & 0 & b33 & 0 \\ 0 & 0 & 0 & b44 \end{bmatrix} \begin{bmatrix} \mu oil \\ \mu cpi \\ \mu rgdp \\ \mu neer \end{bmatrix} \quad (3.6)$$

However, in reality this is not true as central bank tend to implement monetary policies in dealings with macroeconomic problems. Thus, in the real world, the interest rate and M2 would exist and therefore we have come up with two baseline model and 8 possibilities which represent different kind of scenario.

In developing the arrangement of the variables in the matrix model, each of this order arrangement are set based on how these variables would react to an oil price shock. Oil price would place first followed by interest rate, M2, CPI, RGDP and eventually NEER. Interest rate is set that way is because policy makers would move the interest rate correspond to inflation rate when there is an oil price shock (Kilian, 2009). This is a way how monetary policy is implemented and so, M2 is set right after interest rate. Next order would be CPI as a result from rising inflation in the event of an oil price increase. With these increase, it creates a cost-push inflation where production decreases and followed by a decrease in real output as well (Gisser & Goodwin, 1986). Lastly, NEER would not only be affected by the oil price but also other factors as well, such as the export and import activities of a country. For example, a high import ratio can cause a depreciation of a currency whereas it appreciates with higher exports (Chow & Chen, 1998). This is because a domestic country deals with other countries as well

in accordance to the open economy. There are other factors as well where researchers Can Inci and Lu (2004) stated that a term structure of interest rate which contains information on future inflation rate and economic growth rates are both considered determinants of currency values and relates back to exchange rate indirectly.

3.3 Baseline Model

We have included two baselines SVAR that makes use of the real oil price data, interest rate, M2, CPI, RGDP and NEER. The oil price takes on a role of an exogenous variable which will affect other macroeconomic variables included in the SVAR. To begin with, the forming of two baseline layout with respect to Euro Area, Japan, Korea and Singapore which represents the general guideline is set where the CPI (a24) and RGDP (a25) influence the interest rate. This scenario is described where the CPI and RGDP are affected by the event of an oil price shock, this changes will in turn determine the changes of interest rate and M2 provided that central bank uses the interest rate as a monetary policy instrument on the baseline model and M2 on the other model. That is why CPI and the RGDP will influence the interest rate and M2 change. These two baseline models serve as a benchmark for the other 8 different possibilities or cases. The lag length criteria of these cases are based on Akaike's Information Criterion (AIC), Likelihood Ratio (LR) and Final Prediction Error (FPE). Another criterion like Schwarz Information Criterion (SIC) is less preferable in comparison to AIC because the latter is more linear.

Baseline Model for Interest Rate Tool

The following equation (3.7) and (3.8) depicts the baseline model,

$$\begin{bmatrix} \ell oil \\ \ell i \\ \ell m2 \\ \ell cpi \\ \ell rgdp \\ \ell neer \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & a24 & a25 & 0 \\ a31 & a32 & 1 & 0 & 0 & 0 \\ a41 & 0 & a43 & 1 & 0 & 0 \\ a51 & 0 & a53 & a54 & 1 & 0 \\ a61 & a62 & a63 & a64 & a65 & 1 \end{bmatrix}^{-1} \begin{bmatrix} b11 & 0 & 0 & 0 & 0 & 0 \\ 0 & b22 & 0 & 0 & 0 & 0 \\ 0 & 0 & b33 & 0 & 0 & 0 \\ 0 & 0 & 0 & b44 & 0 & 0 \\ 0 & 0 & 0 & 0 & b55 & 0 \\ 0 & 0 & 0 & 0 & 0 & b66 \end{bmatrix} \begin{bmatrix} \mu oil \\ \mu i \\ \mu m2 \\ \mu cpi \\ \mu rgdp \\ \mu neer \end{bmatrix} \quad (3.7)$$

Baseline Model for M2 Tool (Case 5)

$$\begin{bmatrix} \ell oil \\ \ell i \\ \ell m2 \\ \ell cpi \\ \ell rgdp \\ \ell neer \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ h21 & 1 & h23 & 0 & 0 & 0 \\ 0 & 0 & 1 & h34 & h35 & 0 \\ h41 & h42 & 0 & 1 & 0 & 0 \\ h51 & h52 & 0 & h54 & 1 & 0 \\ h61 & h62 & h63 & h64 & h65 & 1 \end{bmatrix}^{-1} \begin{bmatrix} b11 & 0 & 0 & 0 & 0 & 0 \\ 0 & b22 & 0 & 0 & 0 & 0 \\ 0 & 0 & b33 & 0 & 0 & 0 \\ 0 & 0 & 0 & b44 & 0 & 0 \\ 0 & 0 & 0 & 0 & b55 & 0 \\ 0 & 0 & 0 & 0 & 0 & b66 \end{bmatrix} \begin{bmatrix} \mu oil \\ \mu i \\ \mu m2 \\ \mu cpi \\ \mu rgdp \\ \mu neer \end{bmatrix} \quad (3.8)$$

In the process of implementing SVAR, a number of restriction or condition was set to restrict the model in order to investigate the effect from a monetary policy on the macroeconomic variables in the events of an oil price shock. Based on this restriction, we have come up with 8 different possibilities in the form of matrices using two tools which are interest rate and money (M2). For instance, from case 1 to 4, the tool used to restrict the model is interest rate while case 6 to 9 uses the M2 tool. These two tools are used as the basis for the formation of 8 different restrictions. In doing so, when interest rate serves as a tool, the M2 is always treated as an endogenous variable and vice versa.

3.3.1 Case One: Interest Rate only Responds to Oil Price

The following combination in case one is modelled by observing whether there is any response of interest rate (c21) towards an oil price shock. The matrix of case 1 is as follow,

$$\begin{bmatrix} \ell oil \\ \ell i \\ \ell m2 \\ \ell cpi \\ \ell rgdp \\ \ell neer \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ c21 & 1 & 0 & 0 & 0 & 0 \\ c31 & c32 & 1 & 0 & 0 & 0 \\ c41 & c42 & c43 & 1 & 0 & 0 \\ c51 & c52 & c53 & c54 & 1 & 0 \\ c61 & c62 & c63 & c64 & c65 & 1 \end{bmatrix}^{-1} \begin{bmatrix} b11 & 0 & 0 & 0 & 0 & 0 \\ 0 & b22 & 0 & 0 & 0 & 0 \\ 0 & 0 & b33 & 0 & 0 & 0 \\ 0 & 0 & 0 & b44 & 0 & 0 \\ 0 & 0 & 0 & 0 & b55 & 0 \\ 0 & 0 & 0 & 0 & 0 & b66 \end{bmatrix} \begin{bmatrix} \mu oil \\ \mu i \\ \mu m2 \\ \mu cpi \\ \mu rgdp \\ \mu neer \end{bmatrix} \quad (3.9)$$

3.3.2 Case Two: Interest Rate only Responds to CPI

Case two refers to a restriction where the CPI (b24) affects the interest rate. In other words, case two is formed where the interest rate is a function of CPI. As such, the expected result of the relationship between oil price and interest rate as well as the oil price and CPI would produce a positive one. In this particular case, we expect that the central bank will use the interest rate as a tool to deal with inflation since Taylor rule is defined as how the central bank should set its interest rate against inflation. Therefore, the model is as shown,

$$\begin{bmatrix} \ell oil \\ \ell i \\ \ell m2 \\ \ell cpi \\ \ell rgdp \\ \ell neer \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & b24 & 0 & 0 \\ b31 & b32 & 1 & 0 & 0 & 0 \\ b41 & 0 & b43 & 1 & 0 & 0 \\ b51 & b52 & b53 & b54 & 1 & 0 \\ b61 & b62 & b63 & b64 & b65 & 1 \end{bmatrix}^{-1} \begin{bmatrix} b11 & 0 & 0 & 0 & 0 & 0 \\ 0 & b22 & 0 & 0 & 0 & 0 \\ 0 & 0 & b33 & 0 & 0 & 0 \\ 0 & 0 & 0 & b44 & 0 & 0 \\ 0 & 0 & 0 & 0 & b55 & 0 \\ 0 & 0 & 0 & 0 & 0 & b66 \end{bmatrix} \begin{bmatrix} \mu oil \\ \mu i \\ \mu m2 \\ \mu cpi \\ \mu rgdp \\ \mu neer \end{bmatrix} \quad (3.10)$$

3.3.3 Case Three: Interest Rate Responds to CPI, RGDP and NEER

In the following case three, this is an extension of the baseline model which adds the NEER into the function. The model is formed by observing how the CPI (d24), RGDP (d25) and NEER (d26) would react to oil price shock and in turn how the interest rate responds to their changes contemporaneously.

$$\begin{bmatrix} \ell oil \\ \ell i \\ \ell m2 \\ \ell cpi \\ \ell rgdp \\ \ell neer \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & d24 & d25 & d26 \\ d31 & d32 & 1 & 0 & 0 & 0 \\ d41 & 0 & d43 & 1 & 0 & 0 \\ d51 & 0 & d53 & d54 & 1 & 0 \\ d61 & 0 & d63 & d64 & d65 & 1 \end{bmatrix}^{-1} \begin{bmatrix} b11 & 0 & 0 & 0 & 0 & 0 \\ 0 & b22 & 0 & 0 & 0 & 0 \\ 0 & 0 & b33 & 0 & 0 & 0 \\ 0 & 0 & 0 & b44 & 0 & 0 \\ 0 & 0 & 0 & 0 & b55 & 0 \\ 0 & 0 & 0 & 0 & 0 & b66 \end{bmatrix} \begin{bmatrix} \mu oil \\ \mu i \\ \mu m2 \\ \mu cpi \\ \mu rgdp \\ \mu neer \end{bmatrix} \quad (3.11)$$

3.3.4 Case Four: Interest Rate Responds to All Variables except M2

Case four consist of all the macroeconomic variables which are oil price (e21), CPI (e24), RGDP (e25) and NEER (e26) except M2. The M2 variable is restricted in this particular function. When an oil price shock occurs, the macroeconomic variables would change and so the interest rate would respond to all of these macroeconomic variable changes.

$$\begin{bmatrix} \ell oil \\ \ell i \\ \ell m2 \\ \ell cpi \\ \ell rgdp \\ \ell neer \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ e21 & 1 & 0 & e24 & e25 & e26 \\ e31 & e32 & 1 & 0 & 0 & 0 \\ e41 & 0 & e43 & 1 & 0 & 0 \\ e51 & 0 & e53 & e54 & 1 & 0 \\ e61 & 0 & e63 & e64 & e65 & 1 \end{bmatrix}^{-1} \begin{bmatrix} b11 & 0 & 0 & 0 & 0 & 0 \\ 0 & b22 & 0 & 0 & 0 & 0 \\ 0 & 0 & b33 & 0 & 0 & 0 \\ 0 & 0 & 0 & b44 & 0 & 0 \\ 0 & 0 & 0 & 0 & b55 & 0 \\ 0 & 0 & 0 & 0 & 0 & b66 \end{bmatrix} \begin{bmatrix} \mu oil \\ \mu i \\ \mu m2 \\ \mu cpi \\ \mu rgdp \\ \mu neer \end{bmatrix} \quad (3.12)$$

3.3.5 Other cases: Money Supply (M2) as Policy Instrument

Case five is referred to as the baseline model for M2 as shown in equation (3.8). In the case of six, seven, eight and nine, the formation of matrices or model stays the same except for the fact that the monetary policy tool change from interest to M2 instead. Case six correspond to case one while case seven correspond to case two. In addition, case eight and case nine correspond with case three and four respectively.

Case Six: M2 Responds to Oil Price

$$\begin{bmatrix} \ell oil \\ \ell i \\ \ell m2 \\ \ell cpi \\ \ell rgdp \\ \ell neer \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ f21 & 1 & f23 & 0 & 0 & 0 \\ f31 & 0 & 1 & 0 & 0 & 0 \\ f41 & f42 & f43 & 1 & 0 & 0 \\ f51 & f52 & f53 & f54 & 1 & 0 \\ f61 & f62 & f63 & f64 & f65 & 1 \end{bmatrix}^{-1} \begin{bmatrix} b11 & 0 & 0 & 0 & 0 & 0 \\ 0 & b22 & 0 & 0 & 0 & 0 \\ 0 & 0 & b33 & 0 & 0 & 0 \\ 0 & 0 & 0 & b44 & 0 & 0 \\ 0 & 0 & 0 & 0 & b55 & 0 \\ 0 & 0 & 0 & 0 & 0 & b66 \end{bmatrix} \begin{bmatrix} \mu oil \\ \mu i \\ \mu m2 \\ \mu cpi \\ \mu rgdp \\ \mu neer \end{bmatrix} \quad (3.13)$$

Case Seven: M2 Responds to CPI

$$\begin{bmatrix} \ell oil \\ \ell i \\ \ell m2 \\ \ell cpi \\ \ell rgdp \\ \ell neer \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ g21 & 1 & g23 & 0 & 0 & 0 \\ 0 & 0 & 1 & g34 & 0 & 0 \\ g41 & g42 & 0 & 1 & 0 & 0 \\ g51 & g52 & g53 & g54 & 1 & 0 \\ g61 & g62 & g63 & g64 & g65 & 1 \end{bmatrix}^{-1} \begin{bmatrix} b11 & 0 & 0 & 0 & 0 & 0 \\ 0 & b22 & 0 & 0 & 0 & 0 \\ 0 & 0 & b33 & 0 & 0 & 0 \\ 0 & 0 & 0 & b44 & 0 & 0 \\ 0 & 0 & 0 & 0 & b55 & 0 \\ 0 & 0 & 0 & 0 & 0 & b66 \end{bmatrix} \begin{bmatrix} \mu oil \\ \mu i \\ \mu m2 \\ \mu cpi \\ \mu rgdp \\ \mu neer \end{bmatrix} \quad (3.14)$$

Case Eight: M2 Responds to CPI, RGDP and NEER

$$\begin{bmatrix} \ell oil \\ \ell i \\ \ell m2 \\ \ell cpi \\ \ell rgdp \\ \ell neer \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ i21 & 1 & i23 & 0 & 0 & 0 \\ 0 & 0 & 1 & i34 & i35 & i36 \\ i41 & i42 & 0 & 1 & 0 & 0 \\ i51 & i52 & 0 & i54 & 1 & 0 \\ i61 & i62 & 0 & i64 & i65 & 1 \end{bmatrix}^{-1} \begin{bmatrix} b11 & 0 & 0 & 0 & 0 & 0 \\ 0 & b22 & 0 & 0 & 0 & 0 \\ 0 & 0 & b33 & 0 & 0 & 0 \\ 0 & 0 & 0 & b44 & 0 & 0 \\ 0 & 0 & 0 & 0 & b55 & 0 \\ 0 & 0 & 0 & 0 & 0 & b66 \end{bmatrix} \begin{bmatrix} \mu oil \\ \mu i \\ \mu m2 \\ \mu cpi \\ \mu rgdp \\ \mu neer \end{bmatrix} \quad (3.15)$$

Case Nine: M2 Responds to All Variables except Interest Rate

$$\begin{bmatrix} \ell oil \\ \ell i \\ \ell m2 \\ \ell cpi \\ \ell rgdp \\ \ell neer \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ j21 & 1 & j23 & 0 & 0 & 0 \\ j31 & 0 & 1 & j34 & j35 & j36 \\ j41 & j42 & 0 & 1 & 0 & 0 \\ j51 & j52 & 0 & j54 & 1 & 0 \\ j61 & j62 & 0 & j64 & j65 & 1 \end{bmatrix}^{-1} \begin{bmatrix} b11 & 0 & 0 & 0 & 0 & 0 \\ 0 & b22 & 0 & 0 & 0 & 0 \\ 0 & 0 & b33 & 0 & 0 & 0 \\ 0 & 0 & 0 & b44 & 0 & 0 \\ 0 & 0 & 0 & 0 & b55 & 0 \\ 0 & 0 & 0 & 0 & 0 & b66 \end{bmatrix} \begin{bmatrix} \mu oil \\ \mu i \\ \mu m2 \\ \mu cpi \\ \mu rgdp \\ \mu neer \end{bmatrix} \quad (3.16)$$

3.4 Formation of SVAR Coefficient

$$\begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} & a_{15} & a_{16} \\ a_{21} & a_{22} & a_{23} & a_{24} & a_{25} & a_{26} \\ a_{31} & a_{32} & a_{33} & a_{34} & a_{35} & a_{36} \\ a_{41} & a_{42} & a_{43} & a_{44} & a_{45} & a_{46} \\ a_{51} & a_{52} & a_{53} & a_{54} & a_{55} & a_{56} \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & a_{66} \end{bmatrix}^{-1} \begin{bmatrix} b_{11} & b_{12} & b_{13} & b_{14} & b_{15} & b_{16} \\ b_{21} & b_{22} & b_{23} & b_{24} & b_{25} & b_{26} \\ b_{31} & b_{32} & b_{33} & b_{34} & b_{35} & b_{36} \\ b_{41} & b_{42} & b_{43} & b_{44} & b_{45} & b_{46} \\ b_{51} & b_{52} & b_{53} & b_{54} & b_{55} & b_{56} \\ b_{61} & b_{62} & b_{63} & b_{64} & b_{65} & b_{66} \end{bmatrix} \begin{bmatrix} \mu oil \\ \mu i \\ \mu m2 \\ \mu cpi \\ \mu rgdp \\ \mu neer \end{bmatrix} = \begin{bmatrix} c_{11} & c_{12} & c_{13} & c_{14} & c_{15} & c_{16} \\ c_{21} & c_{22} & c_{23} & c_{24} & c_{25} & c_{26} \\ c_{31} & c_{32} & c_{33} & c_{34} & c_{35} & c_{36} \\ c_{41} & c_{42} & c_{43} & c_{44} & c_{45} & c_{46} \\ c_{51} & c_{52} & c_{53} & c_{54} & c_{55} & c_{56} \\ c_{61} & c_{62} & c_{63} & c_{64} & c_{65} & c_{66} \end{bmatrix}$$

(3.17)

In the equation above, it is computed was because the coefficient from matrix of A and B cannot be estimated directly and the value of the coefficient does not contain any information of the oil price shock. So, a reduced form of residual called matrix C is formed to capture the shock (Refer to Equation 3.5). In addition, the matrix A must be in an inverse form so that the value of the coefficient makes sense.

3.5 Impulse Response Function (IRF)

The impulse response function measures the responsiveness of each of the macroeconomic variables towards an oil price shock (Enders, 2010). The logic behind the use of IRF is because it reveals the oil price shock contained in the oil price time series data. In addition, the use of this IRF describes the reaction of the endogenous variable which in this case refers to the macroeconomic variables during the time of a shock occur. In other words, each changes of the macroeconomic variable can be observed separately with the existence of shock that occur at a particular point of time. However, the effect of this shock may or may not affect the macroeconomic variables.

3.6 Variance Decomposition

Another method to assess the findings from SVAR can also be obtained from the variance decomposition. It measures the proportion of its own shock as well as towards other variables. Additionally, it also measures how much amount of oil price shock information the macroeconomic variables contain. In this case, the amount of information is in a form of a proportion in percentage which measures how much of the fluctuation of the macroeconomic variable can be explained by the oil price shock.

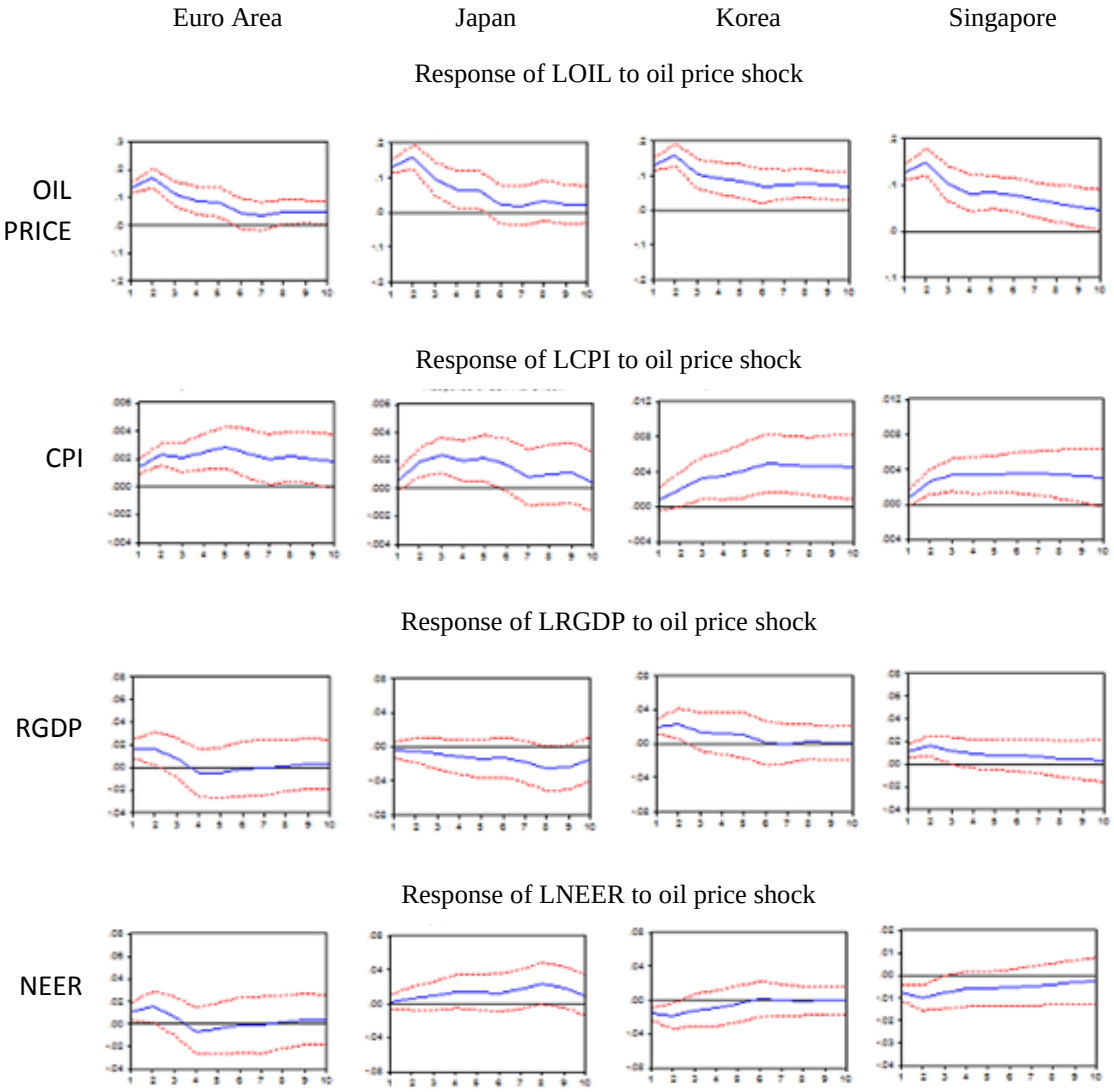
CHAPTER 4: DATA ANALYSIS

4.0 Results

In this section, the findings that have been produced through the methodology are presented. Based on the objectives, the results from this study would answer the question as to how oil price shock will affect the macroeconomic activities without the intervention of monetary policy and also how oil price shock will bring about the changes of macroeconomic activities when there is a monetary policy response with eight restrictions.

4.1 Inspection Responds to Oil Price Shock When Monetary Policy Is Neglected

Figure 4.1: Impulse response function without intervention of monetary policy on macroeconomic activities



Notes: (1) LOIL is oil price in natural logarithm form

(2) LCPI is consumer price index in natural logarithm form

(3) LRGDP is real gross domestic product in natural logarithm form

(4) LNEER is nominal effective exchange rate in logarithm form

Figure 4.1 shows the estimated Impulse Response Function (IRF) for various macroeconomic variables to an oil price shock. The estimate for Euro Area in Figure 4.1 fits well accordingly in the events of an oil price shock. However, this is not the case for Asian countries like Japan, Korea and Singapore which are experiencing at that moment. According to our results, the IRF shows when there is an oil price shock, the CPI increase and it remains positive for a period of time for every country. This finding is consistent with what other researchers have found in their own study as well (Cunado & Perez de Garcia, 2007; Cologni & Manera, 2008). CPI of Euro Area remains stable while Japan decreases over time. On the other hand, when oil price shock comes into the picture, Korea's and Singapore's RGDP both experience a slight growth with immediate effect however it is the inverse for Euro Area and Japan. The movement of RGDP in Euro Area and Japan decline with the presence of oil price shock in which it mimics past researchers of their findings and theoretically (Peersman & Van Robays, 2011; Raymond & Rich, 1997). In addition, it may refer to the lag effect experienced by these two countries. Overall, the trend of RGDP represents a valley while Japan decreases while the effect on the RGDP for Korea and Singapore gradually dies off. The increase of RGDP implies an asymmetry effect whereby the RGDP suppose to decrease but in reality it increases. Moving onto NEER, Euro Area and Japan experience an appreciation when oil price shock arrives. By right, in the event of an oil price increase (decrease), the exchange rate will depreciate (appreciate) instead. Remaining countries like Korea and Singapore records a minor depreciation. In a whole, the NEER for Japan, Korea and Singapore appreciates while Euro Area depreciates.

In determining how the oil price shock can be taken into account of the fluctuations in macroeconomic activities is through the variance decomposition result because through the impulse response function, the trend cannot paint a clearer picture and so variance decomposition is used. As mentioned earlier in this study, variance decomposition can be found and interpreted in percentage from the proportion of the macroeconomics variable which has been affected by an oil price shock. Based on the results computed from the Table 4.1 variance decomposition, CPI can be explained much by the oil price shock in Euro Area.

For instance, during the short, medium and long term, the figures show double digits of percentage of CPI volatility that can be explained by an oil price shock. Among all of the countries included, the CPI of Euro Area is the only country that has been affected the most from an oil price shock. In the near term, it records a 24.75% of CPI volatility and from there onwards the figure increases up to 38.14% in the medium term whereas it falls approximately 8% to 30.90% in the long term. When it comes to countries like Japan, Korea and Singapore, the figure does not matter much in the near term as the CPI of these countries only shows a single digit. However when it comes to medium term, these digits increase dramatically. For Japan, Korea and Singapore, the figure shows 23.45%, 13.41% and 18.17% respectively.

Moving onto long term, Korea continues its momentum by increasing to 20.82%. In contrast, Japan and Singapore decrease slightly in the long term with 16.01% and 17.07% respectively. Besides that, the variance decomposition of RGDP between these countries too shows variations in trend. The RGDP volatility of Euro Area, Korea and Singapore are in a declining state starting from near, short and up to long term. The oil price shock does affect much of the RGDP volatility in these countries in the near term. As it moves towards the medium and long term, the volatility in RGDP cannot be explained much by the oil price shock as the figure declines to single digit.

Japan on the other hand shows a different trend where the figure is climbing from term to term. In addition, figures in the medium and long term starts to increase gradually with 3.48% and 11.01% respectively. In terms of NEER, the figures record at a trend similar to RGDP in every country as well. Japan's NEER volatility percentage explained by the oil price shock is increasing from 0.26% in the near term, 4.39% in the medium term and 10.58% in the long term. Euro Area, Korea and Singapore NEER figure shows differently where their figure continues to decrease in percentage from 6.54%, 13.85% and 12.33% in the near term to 1.99%, 4.24% and 6.55% in the long term respectively.

Table 4.1: Variance Decomposition for 4x4 (without intervention of monetary policy tools)

Variables/countries		Euro Area	Japan	Korea	Singapore
Consumer Price Index	Oil				
	Near-term	24.750	2.027	1.280	1.903
	Medium-term	38.141	23.452	13.414	18.168
	Long-term	30.904	16.012	20.823	17.074
Real GDP	Oil				
	Near-term	10.736	0.502	15.636	11.418
	Medium-term	4.572	3.484	5.752	7.509
	Long-term	2.951	11.012	4.315	4.486
Nominal effective exchange rate	Oil				
	Near-term	6.540	0.257	13.855	12.333
	Medium-term	3.108	4.389	5.535	9.308
	Long-term	1.990	10.582	4.237	6.551

4.2 SVAR Coefficient: Model without the Inclusion of Monetary Policy Tools

By using the equation (3.5), we compute the matrix 'c' after multiplying the inverse of matrix A with B together.

Table 4.2.1: Coefficient of the model without any monetary policy tools

	Euro Area	Japan	Korea	Singapore
c_{11}	0.13541	0.1311	0.13178	0.129
c_{21}	0.00145	0.00056	0.0008	0.00072
	(0.000)***	(0.121)	(0.214)	(0.126)
c_{31}	0.01827	-0.00455	0.02053	0.01186
	(0.0003)***	(0.341)	(0.000)***	(0.0001)***
c_{41}	-0.16639	0.21517	-0.16177	-0.04121
	(0.551)	(0.520)	(0.345)	(0.0625)*

Notes:

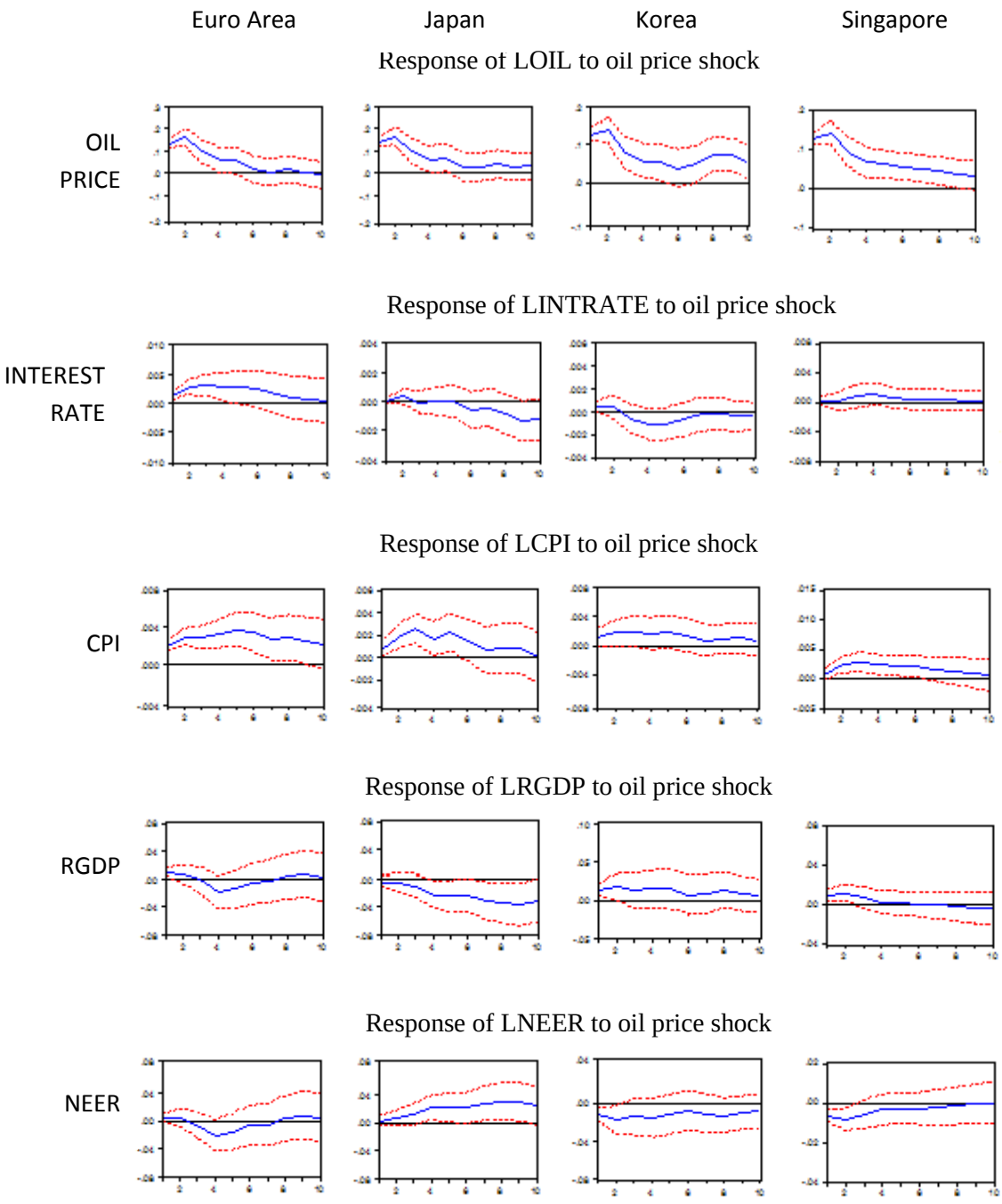
*** represents 1% of significance level
** represents 5% of significance level
* represents 10% of significance level
P-value is in parentheses.

The results from Table 4.2.1 and Appendix XV show that it differs in one way or another. Almost all of the expected sign in Table 4.2.1 and Appendix XV is consistent theoretically. In contrast, the only difference is the coefficient of the response of NEER towards oil price shock (C_{41}) in Euro Area and Japan does not matched theoretically with an insignificant p-value in Table 4.2.1. With reference to Table 4.2.1, in the case of response of RGDP towards oil price shock (C_{31}), the expected sign for Euro Area, Korea and Singapore do not match with theoretically but possess a significant p-value. Similarly, the response of RGDP towards oil price shock (C_{51}) in Appendix XV from the baseline and case one through case nine produce the same result in countries for Euro Area, Korea and Singapore. In addition, almost all of the expected sign of the response of NEER towards oil price shock (C_{61}) for Euro Area and Japan does not match theoretically and insignificant. Likewise, the expected sign of the response of money supply towards oil price shock (C_{31}) from Euro Area and Korea is insignificant and inconsistent theoretically except for case seven which is consistent with the theory. Besides that, the rest of the expected sign for Euro Area, Korea, Japan and Singapore remained consistent with the theory except the case two of Singapore which is opposite and with an insignificant p-value. Since the p-value is insignificant and it is difficult to interpret therefore the coefficient will be deemed meaningless in SVAR. So, this coefficient is not directly explained. Thus, other alternative ways of interpretation is through the Impulse Response Function and Variance Decomposition.

4.3 Interest Rate-based Impulse Response Function Model Result

With the computed results under different restriction within a country, it shows a similar pattern whereas the results under different restriction across countries are diverse. According to the function of this model, Figure 4.3 shows the baseline impulse response function for interest rate where interest rate is the function of CPI and RGDP. No matter whether it is Euro Area or Asian, the CPI for every country increase with immediate effect under the events of an oil price shock. However, the rate of increment in CPI for every country gradually dies off. RGDP on the other hand differs where Euro Area and Japan experience a minor decrease whereas Korea and Singapore records a slight increase when oil price shock arrives. The Euro Area's RGDP starts to decrease at first and then increase back which portrays a valley-like trend. Japan's and Singapore's RGDP records a declining trend where their RGDP slowly decrease. Korea on the other hand, experiences a constant state in its RGDP. In terms of NEER, Euro Area, Korea and Singapore depreciate immediately when oil price shock occur while Japan appreciates. In a nutshell, Japan's and Singapore NEER experienced an appreciation over the period of time. In addition, Euro Area depreciates up to a certain limit and then appreciates back while Korea's NEER remain stable.

Figure 4.3: Interest rate-based impulse response function

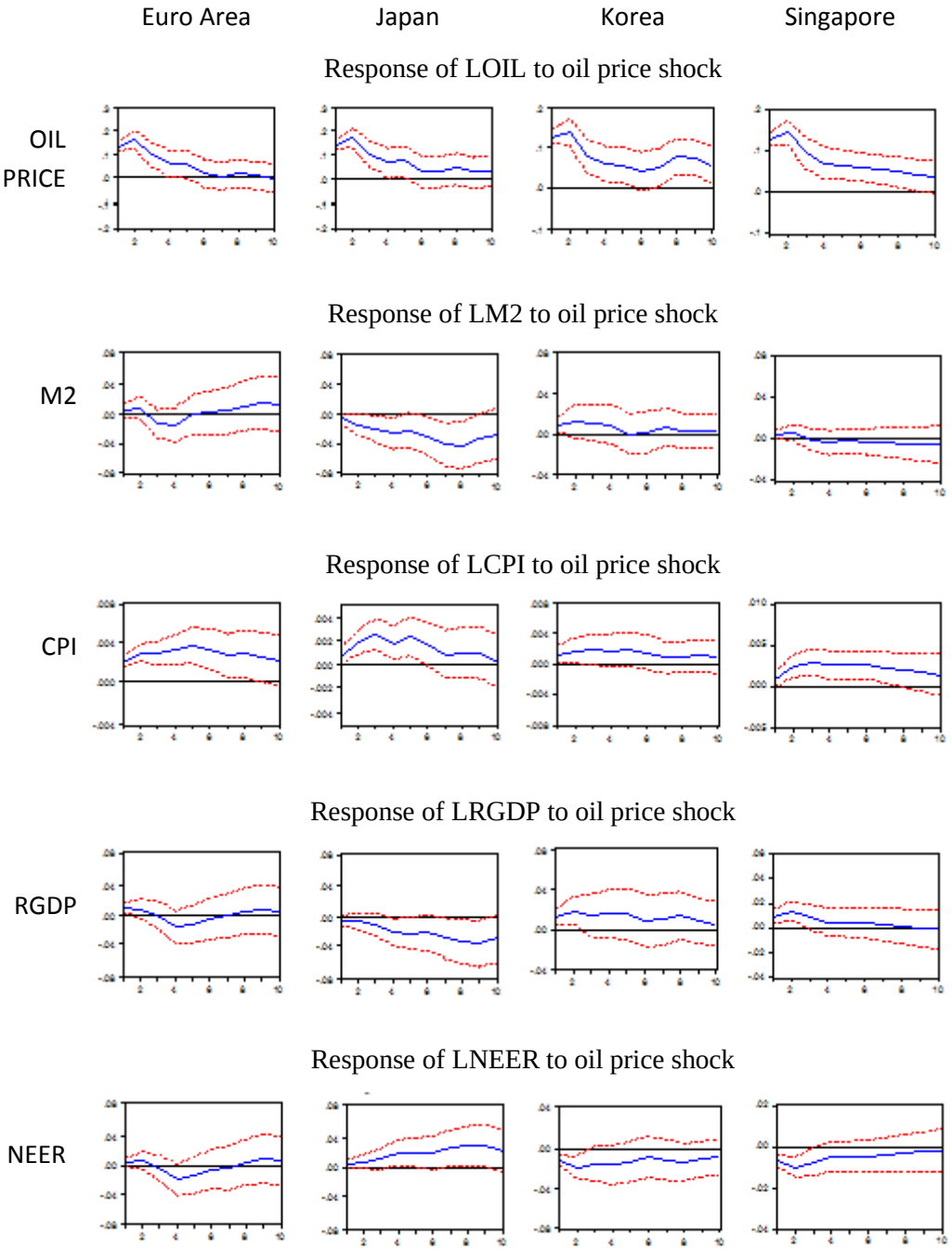


When it comes to case one, two, three and four, refer equation (3.9), (3.10), (3.11) and (3.12), the macroeconomic variables consisting of CPI, RGDP and NEER from the IRF results of Euro Area and Asian countries shows a similar outcome. (Refer to Appendix XVI to XIX).

4.4 M2-based Impulse Response Function Model Result

As shown in Figure 4.4, this model result is based on the M2 as a monetary policy tool. It does not matter which countries or regions are involved, their CPI increased immediately which is consistent theoretically when oil price shock happens. Overall, in the case of Euro Area and Korea, their CPI remained stable while Japan and Singapore decrease. On the other hand when it comes to Euro Area's and Japan's RGDP, both experience a downturn whilst the RGDP of Korea and Singapore enjoy a slight expansion immediately. Essentially, the RGDP of Singapore and Japan experience a slowdown whereas Korea remains relatively stable. In addition, Euro Area's RGDP has a valley-like trend where it experiences a downturn up to a certain period and then starts to climb. When oil price shock arrives, the NEER of Euro Area, Korea and Singapore depreciate while Japan appreciates with immediate effect. In its entirety, the NEER of Singapore and Japan appreciate, Korea remains relatively steady whereas the Euro Area shows a valley-like trend. No matter which variables are involved, case six to nine produces same results in comparison to the baseline model (Refer to Appendix XX to XXIII).

Figure 4.4: M2-based impulse response function



Even though IRF shows the trends of the macroeconomic variables responses towards an oil price shock looks similar among all the restrictions, however in order to obtain a more detailed results, the Variance Decomposition results are discussed below.

4.5 Variance Decomposition Result

The variance decomposition is defined as how much of the percentage of macroeconomic variable that can be explained by the oil price shock. To put it simply, how important are oil shocks in accounting for the observed fluctuations in CPI, RGDP and NEER in Euro Area and selected Asian countries when monetary policy tools are taken into consideration? The variance decomposition of baseline right up to case nine answer the question associated with the six-variable VAR, with quarterly data starting from 1980 to 2010. The results are then reported based on near, medium and long term period.

Based on the interest rate-based variance decomposition for baseline result with reference to table 4.5(a) whereby it shows that among all the countries, Euro Area's CPI can be explained much by the oil price shock by more than 50%. However, for the selected Asian countries, Japan and Singapore record only at a percentage around half of Euro Area's figure. Besides that, Korea reports figures of single digits which give the impression that the oil price shock does not give much impact on its CPI. In terms of RGDP, Japan was affected the most during the medium and long term when there is an oil price shock. Nevertheless, other countries like Euro Area, Korea and Singapore records only single digit which implies that their RGDP does not explain much by the oil price shock. Moving onto NEER, in the case of Japan, its figure does not explain much in the near term but as we move to the medium and long term, the figure rose significantly in the medium term at 12.21% and inflates more than half to 25.50%. Other Asian countries like Korea and Singapore, the NEER figure shows that it only matters in the near term but less important in the medium and long term. Euro Area's NEER figure however is explain less by the oil price shock as it only shows single digit in every term. Overall, based on the figure of variance decomposition, the NEER of Asian Countries like Japan can be explain much by the oil price shock compare to Euro Area's.

Table 4.5 (a): Variance Decomposition for Baseline (interest as monetary policy tool)

Variables/countries		Euro Area	Japan	Korea	Singapore
Consumer Price Index	Oil				
	Near-term	46.945	3.734	3.228	2.007
	Medium-term	61.640	27.991	8.484	16.721
	Long-term	56.618	17.717	6.910	8.846
Real GDP	Oil				
	Near-term	7.639	1.415	10.277	8.820
	Medium-term	4.678	12.466	5.000	4.049
	Long-term	3.121	28.113	4.704	2.011
Nominal effective exchange rate	Oil				
	Near-term	1.514	0.961	12.212	11.456
	Medium-term	5.291	12.207	7.938	5.205
	Long-term	3.371	25.495	8.173	2.672

When restrictions are applied, case one, two and three variance decomposition result is about the same as the baseline figure excluding case four (Refer to Appendix XXIV to XXVI). After all macroeconomic variables are added into the restrictions of case four, the results from Table 4.5(b) shows that percentage of CPI for Euro Area decrease significantly from double digits (61.64% in medium term) to single digit (0.29% in near term) in comparison to baseline results. Peersman and Robays (2009) found that the Euro Central Bank (ECB) focuses more on its inflation objective.

Table 4.5 (b): Variance Decomposition for Case 4 (interest rate as monetary policy tool)

Variables/countries		Euro Area	Japan	Korea	Singapore
Consumer Price Index	Oil				
	Near-term	0.285	3.673	3.227	2.013
	Medium-term	3.387	29.190	8.678	16.747
	Long-term	3.289	19.261	7.075	8.860
Real GDP	Oil				
	Near-term	7.472	1.804	10.345	8.702
	Medium-term	4.826	12.857	5.196	3.964
	Long-term	3.210	25.868	4.973	1.990
Nominal effective exchange rate	Oil				
	Near-term	1.413	1.350	12.331	11.156
	Medium-term	5.477	11.157	8.230	5.060
	Long-term	3.483	23.553	8.578	2.579

Moving onto M2 as a monetary policy tool, the variance decomposition shows similar result in Table 4.5(c) below compare to the interest rate-based variance decomposition result. Results across case six, seven, eight and nine is robust in comparison to baseline in case five (Refer to Appendix XXVII to XXX).

Table 4.5 (c): Variance Decomposition for Case 5 (M2 as monetary policy tool)

Variables/countries		Euro Area	Japan	Korea	Singapore
Consumer Price Index	Oil				
	Near-term	46.516	3.656	3.300	1.991
	Medium-term	60.360	26.687	10.600	16.089
	Long-term	54.715	16.566	7.450	8.057
Real GDP	Oil				
	Near-term	3.940	0.330	8.069	8.080
	Medium-term	7.855	7.478	1.900	3.395
	Long-term	5.409	22.476	2.073	1.887
Nominal effective exchange rate	Oil				
	Near-term	0.064	0.054	7.440	10.217
	Medium-term	9.450	7.038	3.638	4.203
	Long-term	6.122	19.797	4.580	2.077

In general, when there is an oil price shock, people would think that inflation is important and is bad for the economy but our result shows otherwise for Asian countries. Table 4.5(c) shows that the oil price shock contribute less to the CPI of Japan, Korea and Singapore. Conversely, it is the case for Euro Area. After the analysis of the variance decomposition result, it shows that by using interest rate as a monetary policy tool where it include all the macroeconomic variables in case four, only Euro Area has successfully control its CPI but not for Asian countries where its CPI does not show any changes even for other restrictions. In other words, CPI for Euro Area can only be controlled when all macroeconomic variables are included by using interest rate as tools whereas there are no changes no matter interest rate or M2 are used as monetary policy tools for Asian countries.

4.6 Overall Results Between With and Without the Monetary Policy Tools

Comparing between the model where no monetary policy tools are involved with the M2 and interest rate-based model result, the CPI, RGDP and NEER results from selected Asian countries respond to the two monetary policy tools however it gives a less significant effect in comparison to Euro Area.

All the restriction results for Euro Area's CPI figure doubles but drops to single digit when it comes to case four. From here, it shows that under different restrictions, this interest rate tool can act as an efficient tool since it can control the CPI in Euro Area.

4.7 Result Discussion

One of the major finding for the empirical test of the model in which there is no intervention of the monetary policy, it was shown that without the intervention of monetary policy, each countries' variable respond in a similar way. When it comes to intervention of monetary policy, Asian countries responses toward monetary policy tools is less significant compare to Euro Area just like in case four, the CPI of Euro Area does show an obvious change especially when interest rate is used as a monetary policy tool. No matter with or without monetary policy tool intervention, the result from variance decomposition for Japan's RGDP shows that the percentage of this variable that can be explained by the oil price shock is increasing whereas the percentage for other country is the other way round. Apart from that, the results from the variance decomposition show that the percentages of Euro Area's, Korea's and Singapore's NEER that can be explained by the oil price shock are similar. In contrast, the percentage of NEER in Japan that can be explained by the oil price shock is increasing. As a whole, among these two monetary policy tools, we found that the interest rate is a much more effective tool in the case of Euro Area compare to Asian countries.

CHAPTER 5: CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

5.0 Conclusions

In this paper, we first lay out a path to investigate empirically the effect of oil price shock towards macroeconomic variables between Euro Area and selected Asian countries excluding the use of monetary policy tools. Based on the results in general, the response of CPI in Euro Area is higher compared to Asian countries. The responses of RGDP and NEER towards oil price shock for Japan increase the most whereas other countries record a decline in the long run.

Next, we then inspect whether the macroeconomic variables in these two regions are better-off or worse-off after the monetary policy tools are taken into consideration. In Euro Area, the result shows that the response of CPI to oil price shock has doubled up in figure but there are no significant changes for Asian countries. Apart from that, in the case of Japan's RGDP and NEER, their responses to oil price shock double up while responses for other countries remain more or less stagnant. Based on this result, Japan's economy is worse-off after the intervention of monetary policy however for Korea and Singapore, with or without monetary policy intervention, their economy activity does not show much of an impact towards an oil price shock. The results from the baseline model do not change much in comparison to other cases. It shows that the result is robust when it comes to integrating the monetary policy tools in every case. However, under the restriction of case four shows something different where there is a significant change in the responses of Euro Area's CPI towards oil price shock where it dropped to almost zero.

In a nutshell, we can conclude that with the inclusion of all the macroeconomic variables into the restriction, the interest rate is much more of a useful tool in controlling Euro Area's CPI compare to M2 whereas for Asian countries, both of these tools does not give much of an impact.

5.1 Limitations of Study and Recommendations

In this research, the data that was collected was not sufficient enough as we initially planned to conduct this research from the year 1960 quarter one to 2010 quarter four. Some of the data was missing or incomplete as different sources have a different range of collection.

For recommendations to future researchers, to the best of our knowledge, there are few researchers who conduct this research of combining oil price shock and monetary policy together. We suggest that future researchers could conduct more research on this combination of these two criteria in order to obtain a more robust result which paints a clearer picture on the macroeconomic activities after the intervention of monetary policy. Moreover, they should expand the scope of study and compare between different regions as well.

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APPENDIX I

Contemporaneous Response of Macroeconomics Activities towards Oil Price Shocks in Euro Area and selected Asian Countries – Estimated Coefficient for Matrix A and Matrix B (without intervention of monetary policy tools)

	Euro Area	Japan	Korea	Singapore		Euro Area	Japan	Korea	Singapore
a_{11}	-	-	-	-	b_{11}	0.135409	0.131096	0.131782	0.129004
						(0.000)***	(0.000)***	(0.000)***	(0.000)***
a_{12}	-	-	-	-	b_{12}	-	-	-	-
a_{13}	-	-	-	-	b_{13}	-	-	-	-
a_{14}	-	-	-	-	b_{14}	-	-	-	-
a_{21}	-0.0107	-0.0043	-0.0060	-0.0056	b_{21}	-	-	-	-
	(0.000)***	(0.121)	(0.214)	(0.126)					
a_{22}	-	-	-	-	b_{22}	0.002523	0.003898	0.006996	0.005192
						(0.000)***	(0.000)***	(0.000)***	(0.000)***
a_{23}	-	-	-	-	b_{23}	-	-	-	-
a_{24}	-	-	-	-	b_{24}	-	-	-	-
a_{31}	-0.1350	0.0347	-0.1559	-0.0920	b_{31}	-	-	-	-
	(0.0003)***	(0.341)	(0.000)***	(0.0001)***					
a_{32}	1.3308	-1.6104	1.1159	0.2772	b_{32}	-	-	-	-
	(0.438)	(0.184)	(0.0582)*	(0.626)					
a_{33}	-	-	-	-	b_{33}	0.04703	0.050913	0.04497	0.032482
						(0.000)***	(0.000)***	(0.000)***	(0.000)***
a_{34}	-	-	-	-	b_{34}	-	-	-	-
a_{41}	0.0076	0.0079	0.0170	0.0188	b_{41}	-	-	-	-
	(0.551)	(0.520)	(0.345)	(0.0625)*					
a_{42}	0.9459	-0.6467	-0.1847	-0.3798	b_{42}	-	-	-	-
	(0.0927)*	(0.117)	(0.553)	(0.104)					
a_{43}	-0.8314	0.8106	0.7238	0.4820	b_{43}	-	-	-	-
	(0.000)***	(0.000)***	(0.000)***	(0.000)***					
a_{44}	-	-	-	-	b_{44}	0.015379	0.017202	0.023384	0.01331
						(0.000)***	(0.000)***	(0.000)***	(0.000)***

Appendix I: The table shows the estimated coefficient for the Euro Area and the selected Asian countries which is without intervention of Monetary Policy tools.

Notes:

****, **, * indicates 1%, 5% and 10% significant level respectively*

P-value is in parentheses

	APPENDIX II									
	Contemporaneous Response of Macroeconomics Activities towards Oil Price Shocks in Euro Area – Estimated Coefficient for Matrix A (with intervention of monetary policy tools)									
	Baseline	case 1	Case 2	case 3	case 4	case 5	case 6	case 7	case 8	case 9
a_{11}	-	-	-	-	-	-	-	-	-	-
a_{12}	-	-	-	-	-	-	-	-	-	-
a_{13}	-	-	-	-	-	-	-	-	-	-
a_{14}	-	-	-	-	-	-	-	-	-	-
a_{15}	-	-	-	-	-	-	-	-	-	-
a_{16}	-	-	-	-	-	-	-	-	-	-
a_{21}	-	-0.0086 (0.0033)***	-	-	0.0607 (0.0536)*	-0.0082 (0.004)***	-0.0082 (0.0039)***	-0.0082 (0.0039)***	-0.0083 (0.0036)***	-0.0083 (0.0035)***
a_{22}	-	-	-	-	-	-	-	-	-	-
a_{23}	-	-	-	-	-	-0.0218 (0.0021)***	-0.0181 (0.0614)*	-0.0204 (0.0032)***	-0.0149 (0.189)	-0.0144 (0.217)
a_{24}	-0.5220 (0.0001)***	-	-0.5733 (0.000)***	-0.5283 (0.000)***	-3.7775 (0.0395)**	-	-	-	-	-
a_{25}	-0.0174 (0.198)	-	-	-0.0107 (0.631)	-0.0744 (0.633)	-	-	-	-	-
a_{26}	-	-	-	-0.0120 (0.7031)	-0.2061 (0.2621)	-	-	-	-	-
a_{31}	0.0020 (0.959)	0.0076 (0.841)	0.0139 (0.715)	-0.0012 (0.976)	-7373.2370 (1.000)	-	-	-0.0218 (0.565)	-	0.0073 (0.832)
a_{32}	-2.7600 (0.0929)*	-3.4061 (0.0032)***	-4.1398 (0.0008)***	-2.3826 (0.2183)	854852.0000 (0.9999)	-	-	-	-	-
a_{33}	-	-	-	-	-	-	-	-	-	-
a_{34}	-	-	-	-	-	1.8383 (0.299)	2.5746 (0.0446)**	-	0.4591 (0.678)	0.2377 (0.875)
a_{35}	-	-	-	-	-	-	-0.9970 (0.000)***	-	0.1225 (0.510)	0.1122 (0.559)
a_{36}	-	-	-	-	-	-	-	-	-1.5330 (0.000)***	-1.5262 (0.000)***
a_{41}	-0.0155 (0.000)***	-0.0143 (0.000)***	-0.0156 (0.000)***	-0.0155 (0.000)***	-0.0143 (0.000)***	-0.0142 (0.000)***	-0.0141 (0.000)***	-0.0143 (0.000)***	-0.0141 (0.000)***	-0.0142 (0.000)***

a_{42}	-	-0.1508	-	-	-	-0.1345	-0.1518	-0.1508	-0.1441	-0.1426
		(0.0015)***				(0.005)***	(0.0027)***	(0.0015)***	(0.0041)***	(0.0047)***
a_{43}	0.0069	0.0078	0.0084	0.0066	-0.0479	-	-	0.0078	-	-
	(0.0878)*	(0.0351)**	(0.0375)**	(0.108)	(0.244)			(0.0351)**		
a_{44}	-	-	-	-	-	-	-	-	-	-
a_{45}	-	-	-	-	-	-	-	-	-	-
a_{46}	-	-	-	-	-	-	-	-	-	-
a_{51}	-0.0781	-0.0782	-0.0782	-0.0782	-0.0004	-0.0782	-0.1165	-0.0782	-0.1141	-0.1137
	(0.0017)***	(0.0015)***	(0.0015)***	(0.0016)***	(0.993)	(0.0014)***	(0.0006)***	(0.0015)***	(0.0008)***	(0.0008)***
a_{52}	-	-0.7870	-0.7870	-	-	-0.7870	-1.3267	-0.7870	-1.5198	-1.5505
		(0.197)	(0.197)			(0.193)	(0.197)	(0.197)	(0.170)	(0.166)
a_{53}	-0.4390	-0.4318	-0.4318	-0.4405	-0.6179	-0.4318	-	-0.4318	-	-
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***		(0.000)***		
a_{54}	0.7558	1.1892	1.1892	0.7598	-4.0463	1.1892	3.3742	1.1892	3.3218	3.3135
	(0.495)	(0.299)	(0.298)	(0.492)	(0.0717)*	(0.291)	(0.0273)**	(0.299)	(0.0284)**	(0.0287)**
a_{55}	-	-	-	-	-	-	-	-	-	-
a_{56}	-	-	-	-	-	-	-	-	-	-
a_{61}	0.0108	0.0108	0.0108	0.0109	0.0280	0.0108	0.0108	0.0108	0.0167	0.0168
	(0.352)	(0.352)	(0.352)	(0.346)	(0.145)	(0.348)	(0.350)	(0.352)	(0.221)	(0.218)
a_{62}	-0.0927	-0.0927	-0.0927	-	-	-0.0927	-0.0927	-0.0927	-0.1186	-0.1287
	(0.738)	(0.738)	(0.738)			(0.736)	(0.739)	(0.738)	(0.755)	(0.737)
a_{63}	-0.1834	-0.1834	-0.1834	-0.1834	-0.1938	-0.1834	-0.1834	-0.1834	-	-
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***		
a_{64}	0.5806	0.5806	0.5806	0.5285	-0.3441	0.5806	0.5806	0.5806	0.8682	0.8669
	(0.2594)	(0.2626)	(0.2618)	(0.2867)	(0.7175)	(0.2548)	(0.2652)	(0.2626)	(0.1552)	(0.1556)
a_{65}	-0.5518	-0.5518	-0.5518	-0.5535	-0.5984	-0.5518	-0.5518	-0.5518	-0.7379	-0.7377
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
a_{66}	-	-	-	-	-	-	-	-	-	-

Appendix II: The above table is the estimated coefficient for Euro Area which consists of ten different cases with different expectations, known as Matrix A.

Notes:

****, **, * indicates 1%, 5% and 10% significant level respectively*

P-value is in parentheses

	APPENDIX III									
	Contemporaneous Response of Macroeconomics Activities towards Oil Price Shocks in Japan – Estimated Coefficient for Matrix A (with intervention of monetary policy tools)									
	Baseline	case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	case 8	Case 9
a_{11}	-	-	-	-	-	-	-	-	-	-
a_{12}	-	-	-	-	-	-	-	-	-	-
a_{13}	-	-	-	-	-	-	-	-	-	-
a_{14}	-	-	-	-	-	-	-	-	-	-
a_{15}	-	-	-	-	-	-	-	-	-	-
a_{16}	-	-	-	-	-	-	-	-	-	-
a_{21}	-0.0021	-0.0021	-	-	-0.0020	-0.0021	-0.0021	-0.0021	-0.0017	-0.0017
	(0.165)	(0.165)			(0.214)	(0.165)	(0.165)	(0.165)	(0.255)	(0.255)
a_{22}	-	-	-	-	-	-	-	-	-	-
a_{23}	-	-	-	-	-	-	-	-	0.0092	0.0092
									(0.166)	(0.166)
a_{24}	-	-	-0.0300	-0.0338	-0.0162	-	-	-	-	-
			(0.610)	(0.563)	(0.790)					
a_{25}	-	-	-	0.0031	0.0021	-	-	-	-	-
				(0.787)	(0.856)					
a_{26}	-	-	-	-0.0001	0.0019	-	-	-	-	-
				(0.994)	(0.923)					
a_{31}	0.0299	0.0299	0.0298	0.0318	0.0301	-	-	0.0424	-	-0.0013
	(0.422)	(0.422)	(0.422)	(0.391)	(0.430)			(0.265)		(0.952)
a_{32}	6.0280	6.0280	6.1171	5.1333	5.9618	-	-	-	-	-
	(0.0088)***	(0.0088)***	(0.0076)***	(0.219)	(0.166)					
a_{33}	-	-	-	-	-	-	-	-	-	-
a_{34}	-	-	-	-	-	-0.6845	1.2097	-	1.0155	1.0263
					-	(0.636)	(0.242)		(0.197)	(0.204)
a_{35}	-	-	-	-	-	-	-1.0242	-	0.2450	0.2441
							(0.000)***		(0.113)	(0.116)
a_{36}	-	-	-	-	-	-	-	-	1.8459	1.8458
									(0.000)***	(0.000)***
a_{41}	-0.0052	-0.0052	-0.0053	-0.0053	-0.0053	-0.0050	-0.0050	-0.0052	-0.0050	-0.0050

	(0.0331)**	(0.0331)**	(0.0288)**	(0.029)**	(0.0297)**	(0.0378)**	(0.0378)**	(0.0335)**	(0.0401)**	(0.0401)**
a_{42}	-0.0372	-0.0372	-	-	-	-0.0103	-0.0103	-0.0372	-0.0370	-0.0368
	(0.809)	(0.809)				(0.945)	(0.945)	(0.803)	(0.811)	(0.813)
a_{43}	-0.0045	-0.0045	-0.0048	-0.0047	-0.0045	-	-	-0.0045	-	-
	(0.459)	(0.459)	(0.422)	(0.434)	(0.460)			(0.446)		
a_{44}	-	-	-	-	-	-	-	-	-	-
a_{45}	-	-	-	-	-	-	-	-	-	-
a_{46}	-	-	-	-	-	-	-	-	-	-
a_{51}	0.0270	0.0267	0.0267	0.0272	0.0271	0.0267	0.0438	0.0267	0.0499	0.0499
	(0.155)	(0.162)	(0.159)	(0.152)	(0.154)	(0.160)	(0.0976)***	(0.163)	(0.0672)***	(0.0671)***
a_{52}	0.0000	0.1967	0.1967	0.0000	0.0000	0.1967	3.1187	0.1967	0.2551	0.2504
	-	(0.868)	(0.867)	-	-	(0.864)	(0.0511)***	(0.864)	(0.926)	(0.927)
a_{53}	-0.4857	-0.4839	-0.4839	-0.4818	-0.4839	-0.4839	-	-0.4839	-	-
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***		(0.000)***		
a_{54}	-1.7131	-1.7157	-1.7157	0.0167	-1.7129	-1.7157	-2.2257	-1.7157	-2.2552	-2.2551
	(0.0166)**	(0.0165)**	(0.0166)**	-	(0.0166)**	(0.0163)**	(0.0248)**	(0.0165)**	(0.0272)**	(0.0272)**
a_{55}	-	-	-	-	-	-	-	-	-	-
a_{56}	-	-	-	-	-	-	-	-	-	-
a_{61}	0.0003	0.0003	0.0003	0.0004	0.0004	0.0003	0.0003	0.0003	0.0011	0.0011
	(0.966)	(0.966)	(0.966)	(0.958)	(0.956)	(0.966)	(0.966)	(0.966)	(0.913)	(0.913)
a_{62}	0.0450	0.0450	0.0450	-	-	0.0450	0.0450	0.0450	0.0784	0.0789
	(0.923)	(0.923)	(0.922)			(0.920)	(0.922)	(0.920)	(0.923)	(0.923)
a_{63}	0.2330	0.2330	0.2330	0.2326	0.2330	0.2330	0.2330	0.2330	-	-
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***		
a_{64}	0.1861	0.1861	0.1861	0.1868	0.1869	0.1861	0.1861	0.1861	-0.0929	-0.0930
	(0.515)	(0.516)	(0.516)	(0.514)	(0.514)	(0.515)	(0.516)	(0.516)	(0.807)	(0.807)
a_{65}	0.4489	0.4489	0.4489	0.4488	0.4488	0.4489	0.4489	0.4489	0.6878	0.6878
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
a_{66}	-	-	-	-	-	-	-	-	-	-

Appendix III: The above table is the estimated coefficient for Japan which consists of ten different cases with different expectations, known as Matrix A.

Notes:

****, **, * indicates 1%, 5% and 10% significant level respectively*

P-value is in parentheses

APPENDIX IV

Contemporaneous Response of Macroeconomics Activities towards Oil Price Shocks in Korea – Estimated Coefficient for Matrix A (with intervention of monetary policy tools)

	Baseline	case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	case 8	Case 9
a_{11}	-	-	-	-		-	-	-	-	-
a_{12}	-	-	-	-		-	-	-	-	-
a_{13}	-	-	-	-		-	-	-	-	-
a_{14}	-	-	-	-		-	-	-	-	-
a_{15}	-	-	-	-		-	-	-	-	-
a_{16}	-	-	-	-		-	-	-	-	-
a_{21}	-	-0.0024	-	-	0.0290	-0.0027	-0.0029	-0.0027	-0.0029	-0.0032
		(0.444)			(0.018)**	(0.402)	(0.373)	(0.404)	(0.419)	(0.340)
a_{22}	-	-	-	-	-	-	-	-	-	-
a_{23}	-	-	-	-	-	0.0035	0.0066	0.0036	0.0065	0.0111
						(0.549)	(0.303)	(0.516)	(0.568)	(0.372)
a_{24}	-0.2209	-	-0.2322	-0.2193	-1.6015	-	-	-	-	-
	(0.0003)***		(0.0001)***	(0.0004)***	(0.0341)**					
a_{25}	-0.0150	-		-0.0121	-0.0759	-	-	-	-	-
	(0.152)			(0.485)	(0.599)					
a_{26}		-		0.0058	0.0988	-	-	-	-	-
				(0.839)	(0.634)					
a_{31}	-0.0684	-0.0665	-0.0661	-0.0695	-0.2845	-	-	-0.0641	-	0.0852
	(0.198)	(0.208)	(0.211)	(0.197)	(0.455)			(0.225)		(0.0039)***
a_{32}	1.7686	0.9878	0.8323	2.2362	90.3047	-	-	-	-	-
	(0.316)	(0.516)	(0.605)	(0.444)	(0.372)					
a_{33}	-	-	-	-	-	-	-	-	-	-
a_{34}	-	-	-	-	-	0.0669	0.5218	-	1.3014	1.0160
						(0.953)	(0.618)		(0.0278)**	(0.0805)*
a_{35}	-	-	-	-	-	-	-0.7569	-	0.9308	0.8987
							-		-	-
a_{36}	-	-	-	-	-	-	-	-	2.5037	2.5882
									(0.000)***	(0.000)***
a_{41}	-0.0089	-0.0079	-0.0090	-0.0089	0.0050	-0.0078	-0.0078	-0.0079	-0.0078	-0.0078
	(0.0472)**	(0.064)*	(0.0448)**	(0.0487)**	(0.839)	(0.0674)*	(0.0669)*	(0.064)*	(0.0664)*	(0.0667)*

a_{42}	-	-0.4533	-	-	-	-0.4550	-0.4510	-0.4533	-0.4479	-0.4487
		(0.0002)***				(0.0002)***	(0.0002)***	(0.0002)***	(0.0003)***	(0.0003)***
a_{43}	0.0010	0.0022	0.0024	0.0002	-0.2164	-	-	0.0022	-	-
	(0.909)	(0.766)	(0.766)	(0.983)	(0.512)			(0.766)		
a_{44}	-	-	-	-	-	-	-	-	-	-
a_{45}	-	-	-	-	-	-	-	-	-	-
a_{46}	-	-	-	-	-	-	-	-	-	-
a_{51}	-0.0836	-0.0833	-0.0833	-0.0835	-0.0620	-0.0833	-0.0965	-0.0833	-0.0966	-0.0959
	(0.0013)***	(0.0012)***	(0.0012)***	(0.0013)***	(0.0505)*	(0.0011)***	(0.0005)***	(0.0012)***	(0.0005)***	(0.0006)***
a_{52}	-	-1.1416	-1.1416	-	-	-1.1416	-1.3398	-1.1416	-1.2953	-1.5950
		(0.137)	(0.137)			(0.137)	(0.143)	(0.137)	(0.202)	(0.151)
a_{53}	-0.2060	-0.2031	-0.2031	-0.2075	-0.2713	-0.2031	-	-0.2031	-	-
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.0122)**	(0.000)***		(0.000)***		
a_{54}	-0.5205	-0.2553	-0.2553	-0.5218	-2.4839	-0.2553	-0.1849	-0.2553	-0.1844	-0.1835
	(0.319)	(0.640)	(0.641)	(0.318)	(0.101)	(0.640)	(0.756)	(0.640)	(0.756)	(0.759)
a_{55}	-	-	-	-		-	-	-		
a_{56}	-	-	-	-		-	-	-		
a_{61}	0.0314	0.0314	0.0314	0.0313	0.0284	0.0314	0.0314	0.0314	0.0290	0.0279
	(0.0007)***	(0.0007)***	(0.0007)***	(0.0007)***	(0.012)**	(0.0007)***	(0.0007)***	(0.0007)***	(0.0879)*	(0.108)
a_{62}	0.1134	0.1134	0.1134	-	-	0.1134	0.1134	0.1134	0.0830	0.3818
	(0.672)	(0.672)	(0.672)			(0.672)	(0.672)	(0.672)	(0.922)	(0.678)
a_{63}	0.2716	0.2716	0.2716	0.2712	0.2747	0.2716	0.2716	0.2716	-	-
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***		
a_{64}	0.3355	0.3355	0.3355	0.3609	0.5231	0.3355	0.3355	0.3355	0.2024	0.2006
	(0.0758)*	(0.0763)*	(0.0765)*	(0.0448)**	(0.171)	(0.0762)*	(0.0763)*	(0.0763)*	(0.558)	(0.567)
a_{65}	0.4368	0.4368	0.4368	0.4386	0.4505	0.4368	0.4368	0.4368	0.6445	0.6487
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
a_{66}	-	-	-	-	-	-	-	-	-	-

Appendix IV: The above table is the estimated coefficient for Korea which consists of ten different cases with different expectations, known as Matrix A.

Notes:

****, **, * indicates 1%, 5% and 10% significant level respectively*

P-value is in parentheses

	APPENDIX V									
	Contemporaneous Response of Macroeconomics Activities towards Oil Price Shocks in Singapore – Estimated Coefficient for Matrix A (with intervention of monetary policy tools)									
	Baseline	case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	case 8	Case 9
a_{11}	-	-	-	-	-	-	-	-	-	-
a_{12}	-	-	-	-	-	-	-	-	-	-
a_{13}	-	-	-	-	-	-	-	-	-	-
a_{14}	-	-	-	-	-	-	-	-	-	-
a_{15}	-	-	-	-	-	-	-	-	-	-
a_{16}	-	-	-	-	-	-	-	-	-	-
a_{21}	-	-	-0.0028	-	-0.0046	-0.0023	-0.0024	-0.0023	-0.0022	-0.0022
			(0.563)		(0.377)	(0.627)	(0.624)	(0.628)	(0.648)	(0.640)
a_{22}	-	-	-	-	-	-	-	-	-	-
a_{23}	-	-	-	-	-	0.0446	0.0508	0.0439	0.0341	0.0335
						(0.0059)***	(0.0051)***	(0.0063)***	(0.0812)**	(0.0944)*
a_{24}	0.1365	0.1441	0.1550	-	0.1917	-	-	-	-	-
	(0.296)	(0.259)	(0.230)		(0.126)					
a_{25}	-0.0243	-	-	-0.0651	-0.0628	-	-	-	-	-
	(0.298)			(0.0291)**	(0.0333)**					
a_{26}	-	-	-	-0.1086	-0.1219	-	-	-	-	-
				(0.0355)**	(0.0219)**					
a_{31}	-0.0105	-0.0101	-0.0101	-0.0096	-0.0094	-	-	-0.0074	-	0.0580
	(0.687)	(0.700)	(0.700)	(0.711)	(0.719)			(0.783)		(0.0144)**
a_{32}	1.5818	1.3432	1.3460	1.1376	1.0091	-	-	-	-	-
	(0.0038)***	(0.0058)***	(0.0058)***	(0.0523)*	(0.0944)*					
a_{33}	-	-	-	-	-	-	-	-	-	-
a_{34}	-	-	-	0.1677	-	0.2761	0.0165	-	-0.4110	-0.7088
				(0.176)		(0.697)	(0.980)		(0.483)	(0.224)
a_{35}	-	-	-	-	-	-	-0.5110	-	-0.0119	-0.0310
							(0.000)***		(0.934)	(0.824)
a_{36}	-	-	-	-	-	-	-	-	1.0605	1.1816
									(0.000)***	(0.000)***
a_{41}	-0.0056	-0.0056	-0.0056	-0.0056	-0.0056	-0.0057	-0.0058	-0.0058	-0.0057	-0.0057
	(0.112)	(0.113)	(0.113)	(0.113)	(0.113)	(0.103)	(0.103)	(0.101)	(0.103)	(0.103)

a_{42}	-			-	-	0.0805	0.0853	0.0812	0.0828	0.0794
						(0.234)	(0.212)	(0.229)	(0.216)	(0.234)
a_{43}	0.0060	0.0052	0.0054	0.0046	0.0045	-	-	0.0054	-	-
	(0.635)	(0.678)	(0.664)	(0.713)	(0.717)			(0.663)		
a_{44}	-	-	-	-	-	-	-	-	-	-
a_{45}	-	-	-	-	-	-	-	-	-	-
a_{46}	-	-	-	-	-	-	-	-	-	-
a_{51}	-0.0737	-0.0727	-0.0727	-0.0737	-0.0737	-0.0727	-0.0758	-0.0727	-0.0761	-0.0760
	(0.0001)***	(0.0002)***	(0.0002)***	(0.0001)***	(0.0001)***	(0.0001)***	(0.0004)***	(0.0002)***	(0.0003)***	(0.0004)***
a_{52}	-	-0.3388	-0.3388	-	-	-0.3388	-0.3623	-0.3388	-0.1795	-0.2197
		(0.356)	(0.357)			(0.356)	(0.422)	(0.357)	(0.682)	(0.628)
a_{53}	-0.3430	-0.3387	-0.3387	-0.3401	-0.3348	-0.3387	-	-0.3387	-	-
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***		(0.000)***		
a_{54}	0.7560	0.7020	0.7020	0.7540	0.7531	0.7020	0.8115	0.7020	0.8061	0.8046
	(0.124)	(0.154)	(0.154)	(0.125)	(0.125)	(0.154)	(0.139)	(0.154)	(0.139)	(0.140)
a_{55}	-	-	-	-	-	-	-	-	-	-
a_{56}	-	-	-	-	-	-	-	-	-	-
a_{61}	0.0275	0.0275	0.0275	0.0271	0.0270	0.0275	0.0275	0.0275	0.0230	0.0229
	(0.0008)***	(0.0008)***	(0.0008)***	(0.0013)***	(0.0013)***	(0.0008)***	(0.0008)***	(0.0008)***	(0.0105)***	(0.0109)***
a_{62}	-0.3279	-0.3279	-0.3279	-	-	-0.3279	-0.3279	-0.3279	-0.4075	-0.3969
a_{63}	0.1471	0.1471	0.1471	0.1533	0.1533	0.1471	0.1471	0.1471	-	-
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***		
a_{64}	-0.5109	-0.5109	-0.5109	-0.4667	-0.4667	-0.5109	-0.5109	-0.5109	-0.4931	-0.4922
	(0.0106)**	(0.0106)**	(0.0107)**	(0.0217)**	(0.0217)**	(0.0106)**	(0.0106)**	(0.0107)**	(0.0253)**	(0.0257)**
a_{65}	0.3476	0.3476	0.3476	0.3405	0.3406	0.3476	0.3476	0.3476	0.4258	0.4262
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
a_{66}	-	-	-	-	-	-	-	-	-	-

Appendix V: The above table is the estimated coefficient for Singapore which consists of ten different cases with different expectations, known as Matrix A.

Notes:

****, **, * indicates 1%, 5% and 10% significant level respectively*

P-value is in parentheses

	APPENDIX VI									
	Contemporaneous Response of Macroeconomics Activities towards Oil Price Shocks in Euro Area – Estimated Coefficient for Matrix B (with intervention of monetary policy tools)									
	Baseline	case 1	Case 2	case 3	case 4	case 5	case 6	case 7	case 8	case 9
b_{11}	0.131688 (0.000)***	0.131688 (0.000)***	0.131688 (0.000)***	0.131688 (0.000)***	0.131688 (0.000)***	0.131688 (0.000)***	0.131688 (0.000)***	0.131688 (0.000)***	0.131688 (0.000)***	0.131688 (0.000)***
b_{12}	-	-	-	-	-	-	-	-	-	-
b_{13}	-	-	-	-	-	-	-	-	-	-
b_{14}	-	-	-	-	-	-	-	-	-	-
b_{15}	-	-	-	-	-	-	-	-	-	-
b_{16}	-	-	-	-	-	-	-	-	-	-
b_{21}	-	-	-	-	-	-	-	-	-	-
b_{22}	0.003904 (0.000)***	0.004157 (0.000)***	0.004042 (0.000)***	0.003879 (0.000)***	0.010028 (0.000)***	0.004012 (0.000)***	0.00401 (0.000)***	0.00401 (0.000)***	0.004021 (0.000)***	0.004023 (0.000)***
b_{23}	-	-	-	-	-	-	-	-	-	-
b_{24}	-	-	-	-	-	-	-	-	-	-
b_{25}	-	-	-	-	-	-	-	-	-	-
b_{26}	-	-	-	-	-	-	-	-	-	-
b_{31}	-	-	-	-	-	-	-	-	-	-
b_{32}	-	-	-	-	-	-	-	-	-	-
b_{33}	0.051818 (0.000)***	0.051748 (0.000)***	0.051838 (0.000)***	0.051923 (0.000)***	3553.53 (0.000)***	0.039055 (0.000)***	0.05365 (0.000)***	0.05374 (0.000)***	0.032884 (0.000)***	0.03286 (0.000)***
b_{34}	-	-	-	-	-	-	-	-	-	-
b_{35}	-	-	-	-	-	-	-	-	-	-
b_{36}	-	-	-	-	-	-	-	-	-	-

b_{41}	-	-	-	-	-	-	-	-	-	-
b_{42}	-	-	-	-	-	-	-	-	-	-
b_{43}	-	-	-	-	-	-	-	-	-	-
b_{44}	0.002141 (0.000)***	0.00205 (0.000)***	0.002147 (0.000)***	0.00214 (0.000)***	0.003537 (0.000)***	0.002092 (0.000)***	0.00205 (0.000)***	0.002089 (0.000)***	0.00209 (0.000)***	0.00209 (0.000)***
b_{45}	-	-	-	-	-	-	-	-	-	-
b_{46}	-	-	-	-	-	-	-	-	-	-
b_{51}	-	-	-	-	-	-	-	-	-	-
b_{52}	-	-	-	-	-	-	-	-	-	-
b_{53}	-	-	-	-	-	-	-	-	-	-
b_{54}	-	-	-	-	-	-	-	-	-	-
b_{55}	0.025461 (0.000)***	0.025274 (0.000)***	0.025274 (0.000)***	0.025459 (0.000)***	0.028547 (0.000)***	0.033834 (0.000)***	0.025274 (0.000)***	0.025274 (0.000)***	0.033721 (0.000)***	0.033705 (0.000)***
b_{56}	-	-	-	-	-	-	-	-	-	-
b_{61}	-	-	-	-	-	-	-	-	-	-
b_{62}	-	-	-	-	-	-	-	-	-	-
b_{63}	-	-	-	-	-	-	-	-	-	-
b_{64}	-	-	-	-	-	-	-	-	-	-
b_{65}	-	-	-	-	-	-	-	-	-	-
b_{66}	0.011391 (0.000)***	0.011391 (0.000)***	0.011391 (0.000)***	0.011396 (0.000)***	0.011673 (0.000)***	0.011391 (0.000)***	0.011391 (0.000)***	0.011391 (0.000)***	0.013426 (0.000)***	0.013423 (0.000)***

Appendix VI: The above table is the estimated coefficient of Matrix B for Euro Area.

Notes:
****, **, * indicates 1%, 5% and 10% significant level respectively*
P-value is in parentheses

APPENDIX VII

Contemporaneous Response of Macroeconomics Activities towards Oil Price Shocks in Japan – Estimated Coefficient for Matrix B (with intervention of monetary policy tools)

	Baseline	case 1	Case 2	case 3	case 4	case 5	case 6	case 7	case 8	case 9
b_{11}	0.13812 (0.000)***	0.13812 (0.000)***	0.13812 (0.000)***	0.13812 (0.000)***	0.13812 (0.000)***	0.13812 (0.000)***	0.13812 (0.000)***	0.13812 (0.000)***	0.13812 (0.000)***	0.13812 (0.000)***
b_{12}	-	-	-	-	-	-	-	-	-	-
b_{13}	-	-	-	-	-	-	-	-	-	-
b_{14}	-	-	-	-	-	-	-	-	-	-
b_{15}	-	-	-	-	-	-	-	-	-	-
b_{16}	-	-	-	-	-	-	-	-	-	-
b_{21}	-	-	-	-	-	-	-	-	-	-
b_{22}	0.002219 (0.000)***	0.002223 (0.000)***	0.002241 (0.000)***	0.002219 (0.000)***	0.002221 (0.000)***	0.00216 (0.000)***	0.00216 (0.000)***	0.00216 (0.000)***	0.00216 (0.000)***	0.00216 (0.000)***
b_{23}	-	-	-	-	-	-	-	-	-	-
b_{24}	-	-	-	-	-	-	-	-	-	-
b_{25}	-	-	-	-	-	-	-	-	-	-
b_{26}	-	-	-	-	-	-	-	-	-	-
b_{31}	-	-	-	-	-	-	-	-	-	-
b_{32}	-	-	-	-	-	-	-	-	-	-
b_{33}	0.055099 (0.000)***	0.055064 (0.000)***	0.055065 (0.000)***	0.0551 (0.000)***	0.055065 (0.000)***	0.04005 (0.000)***	0.056672 (0.000)***	0.05692 (0.000)***	0.030272 (0.000)***	0.030271 (0.000)***
b_{34}	-	-	-	-	-	-	-	-	-	-
b_{35}	-	-	-	-	-	-	-	-	-	-
b_{36}	-	-	-	-	-	-	-	-	-	-
b_{41}	-	-	-	-	-	-	-	-	-	-
b_{42}	-	-	-	-	-	-	-	-	-	-
b_{43}	-	-	-	-	-	-	-	-	-	-
b_{44}	0.003576 (0.000)***	0.003574 (0.000)***	0.003576 (0.000)***	0.003576 (0.000)***	0.003575 (0.000)***	0.003583 (0.000)***	0.003574 (0.000)***	0.003583 (0.000)***	0.003583 (0.000)***	0.003583 (0.000)***
b_{45}	-	-	-	-	-	-	-	-	-	-

b_{46}	-	-	-	-	-	-	-	-	-	-
b_{51}	-	-	-	-	-	-	-	-	-	-
b_{52}	-	-	-	-	-	-	-	-	-	-
b_{53}	-	-	-	-	-	-	-	-	-	-
b_{54}	-	-	-	-	-	-	-	-	-	-
b_{55}	0.027549 (0.000)***	0.027544 (0.000)***	0.027544 (0.000)***	0.027549 (0.000)***	0.027548 (0.000)***	0.038754 (0.000)***	0.027544 (0.000)***	0.027544 (0.000)***	0.038805 (0.000)***	0.038807 (0.000)***
b_{56}	-	-	-	-	-	-	-	-	-	-
b_{61}	-	-	-	-	-	-	-	-	-	-
b_{62}	-	-	-	-	-	-	-	-	-	-
b_{63}	-	-	-	-	-	-	-	-	-	-
b_{64}	-	-	-	-	-	-	-	-	-	-
b_{65}	-	-	-	-	-	-	-	-	-	-
b_{66}	0.010755 (0.000)***	0.010755 (0.000)***	0.010755 (0.000)***	0.010756 (0.000)***	0.010756 (0.000)***	0.010755 (0.000)***	0.010755 (0.000)***	0.010755 (0.000)***	0.014247 (0.000)***	0.014247 (0.000)***

Appendix VII: The above table is the estimated coefficient of Matrix B for Japan.

Notes:

****, **, * indicates 1%, 5% and 10% significant level respectively*

P-value is in parentheses

APPENDIX VIII

Contemporaneous Response of Macroeconomics Activities towards Oil Price Shocks in Korea – Estimated Coefficient for Matrix B (with intervention of monetary policy tools)

	Baseline	case 1	Case 2	case 3	case 4	case 5	case 6	case 7	case 8	case 9
b_{11}	0.126973	0.126973	0.126973	0.126973	0.126973	0.126973	0.126973	0.126973	0.126973	0.126973
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
b_{12}	-	-	-	-	-	-	-	-	-	-
b_{13}	-	-	-	-	-	-	-	-	-	-
b_{14}	-	-	-	-	-	-	-	-	-	-
b_{15}	-	-	-	-	-	-	-	-	-	-
b_{16}	-	-	-	-	-	-	-	-	-	-
b_{21}	-	-	-	-	-	-	-	-	-	-
b_{22}	0.004137	0.004395	0.004157	0.004148	0.011166	0.004387	0.004387	0.004393	0.004392	0.004421
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
b_{23}	-	-	-	-	-	-	-	-	-	-
b_{24}	-	-	-	-	-	-	-	-	-	-
b_{25}	-	-	-	-	-	-	-	-	-	-
b_{26}	-	-	-	-	-	-	-	-	-	-
b_{31}	-	-	-	-	-	-	-	-	-	-
b_{32}	-	-	-	-	-	-	-	-	-	-
b_{33}	0.072756	0.072675	0.072678	0.072881	0.399194	0.073248	0.072804	0.067174	0.038151	0.036943
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
b_{34}	-	-	-	-	-	-	-	-	-	-
b_{35}	-	-	-	-	-	-	-	-	-	-
b_{36}	-	-	-	-	-	-	-	-	-	-
b_{41}	-	-	-	-	-	-	-	-	-	-

b_{42}	-	-	-	-	-	-	-	-	-	-
b_{43}	-	-	-	-	-	-	-	-	-	-
b_{44}	0.00616	0.005826	0.006157	0.006162	0.017172	0.005828	0.005826	0.005828	0.005828	0.005828
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
b_{45}	-	-	-	-	-	-	-	-	-	-
b_{46}	-	-	-	-	-	-	-	-	-	-
b_{51}	-	-	-	-	-	-	-	-	-	-
b_{52}	-	-	-	-	-	-	-	-	-	-
b_{53}	-	-	-	-	-	-	-	-	-	-
b_{54}	-	-	-	-	-	-	-	-	-	-
b_{55}	0.034904	0.034578	0.034578	0.034906	0.037231	0.034578	0.034578	0.037628	0.037621	0.037693
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
b_{56}	-	-	-	-	-	-	-	-	-	-
b_{61}	-	-	-	-	-	-	-	-	-	-
b_{62}	-	-	-	-	-	-	-	-	-	-
b_{63}	-	-	-	-	-	-	-	-	-	-
b_{64}	-	-	-	-	-	-	-	-	-	-
b_{65}	-	-	-	-	-	-	-	-	-	-
b_{66}	0.011967	0.011967	0.011967	0.011976	0.012034	0.011967	0.011967	0.011967	0.021807	0.021954
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***

Appendix VIII: The above table is the estimated coefficient of Matrix B for Korea.

Notes:

****, **, * indicates 1%, 5% and 10% significant level respectively*

P-value is in parentheses

	APPENDIX IX									
	Contemporaneous Response of Macroeconomics Activities towards Oil Price Shocks in Singapore – Estimated Coefficient for Matrix B (with intervention of monetary policy tools)									
	Baseline	case 1	Case 2	case 3	case 4	case 5	case 6	case 7	case 8	case 9
b_{11}	0.126814	0.126814	0.126814	0.126814	0.126814	0.126814	0.126814	0.126814	0.126814	0.126814
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
b_{12}	-	-	-	-	-	-	-	-	-	-
b_{13}	-	-	-	-	-	-	-	-	-	-
b_{14}	-	-	-	-	-	-	-	-	-	-
b_{15}	-	-	-	-	-	-	-	-	-	-
b_{16}	-	-	-	-	-	-	-	-	-	-
b_{21}	-	-	-	-	-	-	-	-	-	-
b_{22}	0.006845	0.006822	0.006796	0.006587	0.006536	0.006626	0.006621	0.006621	0.006632	0.006633
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
b_{23}	-	-	-	-	-	-	-	-	-	-
b_{24}	-	-	-	-	-	-	-	-	-	-
b_{25}	-	-	-	-	-	-	-	-	-	-
b_{26}	-	-	-	-	-	-	-	-	-	-
b_{31}	-	-	-	-	-	-	-	-	-	-
b_{32}	-	-	-	-	-	-	-	-	-	-
b_{33}	0.03637	0.036327	0.036328	0.036349	0.03639	0.034321	0.03743	0.037454	0.031165	0.030373
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
b_{34}	-	-	-	-	-	-	-	-	-	-
b_{35}	-	-	-	-	-	-	-	-	-	-
b_{36}	-	-	-	-	-	-	-	-	-	-
b_{41}	-	-	-	-	-	-	-	-	-	-

b_{42}	-	-	-	-	-	-	-	-	-	-
b_{43}	-	-	-	-	-	-	-	-	-	-
b_{44}	0.004943	0.004911	0.004942	0.004942	0.004942	0.004916	0.004911	0.004915	0.004915	0.004915
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
b_{45}	-	-	-	-	-	-	-	-	-	-
b_{46}	-	-	-	-	-	-	-	-	-	-
b_{51}	-	-	-	-	-	-	-	-	-	-
b_{52}	-	-	-	-	-	-	-	-	-	-
b_{53}	-	-	-	-	-	-	-	-	-	-
b_{54}	-	-	-	-	-	-	-	-	-	-
b_{55}	0.026702	0.026599	0.026599	0.026699	0.026695	0.029485	0.026599	0.026599	0.029373	0.029393
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
b_{56}	-	-	-	-	-	-	-	-	-	-
b_{61}	-	-	-	-	-	-	-	-	-	-
b_{62}	-	-	-	-	-	-	-	-	-	-
b_{63}	-	-	-	-	-	-	-	-	-	-
b_{64}	-	-	-	-	-	-	-	-	-	-
b_{65}	-	-	-	-	-	-	-	-	-	-
b_{66}	0.010717	0.010717	0.010717	0.010938	0.010938	0.010717	0.010717	0.010717	0.011786	0.011791
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***

Appendix VIII: The above table is the estimated coefficient of Matrix B for Singapore.

Notes:

****, **, * indicates 1%, 5% and 10% significant level respectively*

P-value is in parentheses

APPENDIX X

Contemporaneous Response of Macroeconomics Activities towards Oil Price Shocks in Euro Area – Estimated Coefficient for Matrix C (with intervention of monetary policy tools)

	Baseline	case 1	Case 2	case 3	case 4	case 5	case 6	case 7	case 8	case 9
c_{11}	0.13169	0.13169	0.13169	0.13169	0.13169	0.13169	0.13169	0.13169	0.13169	0.13169
c_{12}	-	-	-	-	-	-	-	-	-	-
c_{13}	-	-	-	-	-	-	-	-	-	-
c_{14}	-	-	-	-	-	-	-	-	-	-
c_{15}	-	-	-	-	-	-	-	-	-	-
c_{16}	-	-	-	-	-	-	-	-	-	-
c_{21}	0.00123	0.00114	0.00116	0.00122	0.00114	0.00117	0.00114	0.00099	0.00114	0.00114
		(0.0033)*			(0.0536)***	(0.004)*	(0.0039)*	(0.0039)*	(0.0036)*	(0.0035)*
c_{22}	0.00395	0.00416	0.00396	0.00394	-	0.00404	0.00401	0.003	0.00408	0.00409
c_{23}	0.00022	-	-0.00024	0.00034	-	0.00071	0.0011	0.00117	0.0005	0.00048
						(0.0021)*	(0.0614)***	(0.0032)*	(0.189)	(0.217)
c_{24}	0.0011	-	0.00121	0.00111	-	-0.00023	-	-0.00008	-0.00016	-0.00015
	(0.0001)*		(0.000)*	(0.000)*	(0.0395)**					
c_{25}	0.00045	-	-	0.00045	-	0.00061	-	-	0.00051	0.005
	(0.198)			(0.631)	(0.633)					
c_{26}	-	-	-	0.00014	-	-	-	-	0.00031	0.0003
				-0.7031	-0.2621					
c_{31}	0.00314	0.00287	0.002997	0.00307	0.00287	0.00479	0.00287	-0.00369	0.00331	0.00287
	(0.959)	(0.841)	(0.715)	(0.976)	(1.000)			(0.565)		(0.832)
c_{32}	0.0109	0.01416	0.01641	0.00939	-0.02607	0.0017	-	-0.00099	0.00397	0.00436
	(0.0929)***	(0.0032)*	(0.0008)*	-0.2183	-0.9999					
c_{33}	0.05241	0.05175	0.05083	0.05273	-	0.03935	0.05365	0.05346	0.03337	0.03337
c_{34}	0.00304	-	0.005	0.00263	-0.04275	-0.01252	-	-0.00382	-0.0109	-0.01044
						(0.299)	(0.0446)**		(0.678)	(0.875)
c_{35}	0.00124	-	-	0.00107	-0.02093	0.03399	-	-	0.03452	0.0347
							(0.000)*		(0.510)	(0.559)
c_{36}	-	-	-	0.00033	-	-	-	-	0.02089	0.0208
									(0.000)*	(0.000)*
c_{41}	0.00202	0.00203	0.00203	0.00203	0.00203	0.00203	0.00203	0.00201	0.00203	0.00203
	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*

c_{42}	-0.00008	0.00052	-0.00014	-0.0006	-0.00125	0.00061	0.006	0.00054	0.00059	0.00058
		(0.0015)*				(0.005)*	(0.0027)*	(0.0015)*	(0.0041)*	(0.0047)*
c_{43}	-0.00036	-0.0004	-0.00043	-0.00035	-	0.00011	-0.00025	0.00016	0.00007	0.00007
	(0.0878)***	(0.0351)**	(0.0375)**	(0.108)	(0.244)			(0.0351)**		
c_{44}	0.00212	0.00205	0.00211	0.00212	0.00149	0.00206	0.00205	0.00208	0.00207	0.00207
c_{45}	-0.00001	-	-	-0.00001	-0.001	0.00009	-	-	0.00007	0.00007
c_{46}	-	-	-	-	-	-	-	-	0.00004	0.00004
c_{51}	0.01014	0.01002	0.01008	0.01011	0.01002	0.01005	0.01002	0.0071	0.01002	0.01002
	(0.0017)*	(0.0015)*	(0.0015)*	(0.0016)*	(0.993)	(0.0014)*	(0.0006)*	(0.0015)*	(0.0008)*	(0.0008)*
c_{52}	0.00484	0.00877	0.01037	0.00418	-0.02116	0.00329	0.00244	0.00208	0.00425	0.0044
		(0.197)	(0.197)			(0.193)	(0.197)	(0.197)	(0.170)	(0.166)
c_{53}	0.002328	0.02282	0.02226	0.02349	-	0.0058	0.02433	0.02381	0.00052	0.00052
	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*		(0.000)*		
c_{54}	-0.00027	-0.00244	0.0006	-0.00045	-0.02038	-0.00724	-0.00244	-0.00419	-0.00711	-0.00709
	(0.495)	(0.299)	(0.298)	(0.492)	(0.0717)***	(0.291)	(0.0273)**	(0.299)	(0.0284)**	(0.0287)**
c_{55}	0.02601	0.02527	0.02527	0.02593	0.01156	0.03433	0.02527	0.02527	0.03426	0.03424
c_{56}	-	-	-	0.00015	-	-	-	-	0.00032	0.00032
c_{61}	0.00369	0.00356	0.00362	0.00365	0.00356	0.00393	0.00356	0.00075	0.00257	0.00356
	(0.352)	(0.352)	(0.352)	(0.346)	(0.145)	(0.348)	(0.350)	(0.352)	(0.221)	(0.218)
c_{62}	0.00508	0.00752	0.00918	0.00407	-0.01814	0.00215	0.00136	0.00102	0.00311	0.00327
	(0.738)	(0.738)	(0.738)			(0.736)	(0.739)	(0.738)	(0.755)	(0.737)
c_{63}	0.02269	-0.02232	0.02183	0.02286	-	0.00754	0.02351	0.02296	0.00038	0.00038
	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*		
c_{64}	-0.00072	-0.00254	0.00014	-0.00089	-0.01997	-0.00751	-0.00254	-0.00422	-0.00706	-0.00704
	-0.2594	-0.2626	-0.2618	-0.2867	-0.7175	-0.2548	-0.2652	-0.2626	-0.1552	-0.1556
c_{65}	0.01463	0.02534	0.01395	0.01455	0.01419	0.02518	0.01395	0.02534	0.02528	0.02526
	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*
c_{66}	0.01139	-	0.01139	0.01154	-	0.01139	0.01139	-	0.01366	0.01366

Appendix X: The above results which are Matrix C that obtained from the multiplication of the inverse of Matrix A with Matrix B for Euro Area.

Notes:

****, **, * indicates 1%, 5% and 10% significant level respectively*

P-value is in parentheses

APPENDIX XI

Contemporaneous Response of Macroeconomics Activities towards Oil Price Shocks in Japan – Estimated Coefficient for Matrix C (with intervention of monetary policy tools)

	Baseline	case 1	case 2	case 3	case 4	case 5	case 6	case 7	case 8	case 9
c_{11}	0.13812	0.13812	0.13812	0.13812	0.13812	0.13812	0.13812	0.13812	0.13812	0.13812
c_{12}	-	-	-	-	-	-	-	-	-	-
c_{13}	-	-	-	-	-	-	-	-	-	-
c_{14}	-	-	-	-	-	-	-	-	-	-
c_{15}	-	-	-	-	-	-	-	-	-	-
c_{16}	-	-	-	-	-	-	-	-	-	-
c_{21}	0.00004	0.00029	0.00002	0.00004	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029
	(0.165)	(0.165)			(0.214)	(0.165)	(0.165)	(0.165)	(0.255)	(0.255)
c_{22}	0.00224	0.00222	0.00224	0.00224	0.00222	0.00217	0.00222	0.00216	0.00216	0.00216
c_{23}	-0.00008	-	0.00001	-0.00008	-0.00001	-0.00035	-0.00001	-0.00053	-0.00028	-0.00028
									(0.166)	(0.166)
c_{24}	0.0001	-	0.00011	0.0001	0.00005	-0.00004	0.00005	-	-0.00004	-0.00004
			(0.610)	(0.563)	(0.790)					
c_{25}	-0.00009	-	-	-0.00009	-0.00004	-0.00035	-0.00004	-	-0.00036	-0.00012
				(0.787)	(0.856)					
c_{26}	-	-	-	-	-0.00002	-	-0.00002	-	0.00024	-
				(0.994)	(0.923)					
c_{31}	-0.00459	-0.00586	-0.00424	-0.00459	-0.00586	-0.00631	-0.00586	-0.00586	-0.00603	-0.00586
	(0.422)	(0.422)	(0.422)	(0.391)	(0.430)			(0.265)		(0.952)
c_{32}	-0.01152	-0.0134	-0.0137	-0.01148	-0.01325	-0.00079	-0.01325	-	-0.00016	-0.00015
	(0.0088)***	(0.0088)***	(0.0076)***	(0.219)	(0.166)					
c_{33}	0.0222	0.05506	0.05502	0.05551	0.0551	0.04018	0.0551	0.05692	0.03029	0.03029
c_{34}	-0.00053	-	-0.00066	-0.00052	-0.00031	0.00408	-0.00031	-	0.00401	0.004
					-	(0.636)	(0.242)		(0.197)	(0.204)
c_{35}	0.00046	-	-	0.00045	0.00021	0.03968	0.00021	-	0.03979	0.01351
							(0.000)***		(0.113)	(0.116)
c_{36}	-	-	-	-	0.00012	-	0.00012	-	-0.02632	-
									(0.000)***	(0.000)***
c_{41}	0.00071	0.0007	0.00071	0.00071	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
	(0.0331)**	(0.0331)**	(0.0288)**	(0.029)**	(0.0297)**	(0.0378)**	(0.0378)**	(0.0335)**	(0.0401)**	(0.0401)**

c_{42}	-0.00005	0.00002	-0.00007	-0.00005	-0.00006	0.00008	-0.00006	0.00008	0.00008	0.00008
	(0.809)	(0.809)				(0.945)	(0.945)	(0.803)	(0.811)	(0.813)
c_{43}	0.00026	0.00025	0.00027	0.00026	0.00025	-0.00001	0.00025	0.00023	-0.00001	-0.00001
	(0.459)	(0.459)	(0.422)	(0.434)	(0.460)			(0.446)		
c_{44}	0.00357	0.00357	0.00357	0.00357	0.00357	0.00358	0.00357	0.00358	0.00358	0.00358
c_{45}	-	-	-	-	-	-0.00001	-	-	-0.00001	-
c_{46}	-	-	-	-	-	-	-	-	0.00001	-
c_{51}	-0.00476	-0.00538	-0.00453	-0.00476	-0.00538	-0.00538	-0.00538	-0.00671	-0.00538	-0.00538
	(0.155)	(0.162)	(0.159)	(0.152)	(0.154)	(0.160)	(0.0976)*	(0.163)	(0.0672)*	(0.0671)*
c_{52}	-0.00564	-0.00688	-0.00718	-0.00562	-0.00651	-0.00069	-0.00651	-0.00044	-0.00037	-0.00036
	-	(0.868)	(0.867)	-	-	(0.864)	(0.0511)*	(0.864)	(0.926)	(0.927)
c_{53}	0.02719	0.02707	0.02708	0.02719	0.02708	0.00011	0.02708	0.0276	0.00005	0.00005
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***		(0.000)***		
c_{54}	0.00587	0.00613	0.00579	0.00587	0.00597	0.00808	0.00597	-0.00067	0.00809	0.00809
	(0.0166)**	(0.0165)**	(0.0166)**	-	(0.0166)**	(0.0163)**	(0.0248)**	(0.0165)**	(0.0272)**	(0.0272)**
c_{55}	0.02777	0.02754	0.02754	0.02777	0.02765	0.03886	0.02765	0.02754	0.03887	0.03883
c_{56}	-	-	-	-	0.00006	-	0.00006	-	-0.00004	-
c_{61}	0.00303	-0.00359	0.00284	0.00302	0.00359	0.0037	0.00359	0.00419	0.00359	0.00359
	(0.966)	(0.966)	(0.966)	(0.958)	(0.956)	(0.966)	(0.966)	(0.966)	(0.913)	(0.913)
c_{62}	0.00513	0.00611	0.00633	0.0052	0.00602	0.00038	0.00602	0.00009	0.00009	0.00009
	(0.923)	(0.923)	(0.922)			(0.920)	(0.922)	(0.920)	(0.923)	(0.923)
c_{63}	-0.02518	-0.02501	-0.02502	-0.02516	-0.02504	-0.00939	-0.02504	-0.02567	-0.00001	-0.00001
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***		
c_{64}	-0.00318	-0.00342	-0.00312	-0.00318	-0.00328	-0.00524	-0.00328	-0.00037	-0.00523	-0.00523
	(0.515)	(0.516)	(0.516)	(0.514)	(0.514)	(0.515)	(0.516)	(0.516)	(0.807)	(0.807)
c_{65}	-0.00181	-0.00161	-0.00161	-0.00181	-0.01246	-0.01592	-0.01246	-0.01236	-0.02671	-0.01245
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
c_{66}	-	-	-	-	0.0107	-	0.0107	0.01076	0.01426	-

Appendix XII: The above results which are Matrix C that obtained from the multiplication of the inverse of Matrix A with Matrix B for Japan.

Notes:

****, **, * indicates 1%, 5% and 10% significant level respectively*

P-value is in parentheses

APPENDIX XII

Contemporaneous Response of Macroeconomics Activities towards Oil Price Shocks in Korea – Estimated Coefficient for Matrix C (with intervention of monetary policy tools)

	Baseline	case 1	Case 2	case 3	case 4	case 5	case 6	case 7	case 8	case 9
c_{11}	0.12697	0..12697	0.12697	0.12697	0.12697	0.12697	0.12697	0.12697	0.12697	0.12697
c_{12}	-	-	-	-	-	-	-	-	-	-
c_{13}	-	-	-	-	-	-	-	-	-	-
c_{14}	-	-	-	-	-	-	-	-	-	-
c_{15}	-	-	-	-	-	-	-	-	-	-
c_{16}	-	-	-	-	-	-	-	-	-	-
c_{21}	0.00044	0.00031	0.00026	0.00047	0.00031	0.0003	0.00031	0.00034	0.00025	0.00031
		(0.444)			(0.018)**	(0.402)	(0.373)	(0.404)	(0.419)	(0.340)
c_{22}	0.00412	0.0044	0.00416	0.00411	0.00025	0.00437	0.00439	0.00439	0.00436	0.00432
c_{23}	0.00021	-	-0.00004	0.00033	0.00432	-0.00044	-0.00026	-0.00026	-0.00024	-0.0004
						(0.549)	(0.303)	(0.516)	(0.568)	(0.372)
c_{24}	0.0014	-	0.00143	0.0014	0.00076	0.00001	-	-	0.00003	0.00002
	(0.0003)***		(0.0001)***	(0.0004)***	(0.0341)**					
c_{25}	0.00052	-	-	0.00051	0.0001	-0.00019	-	-	0.00019	-0.00032
	(0.152)			(0.485)	(0.599)					
c_{26}	-	-	-	-0.00007	-0.00003	-	-	-	-	0.00062
				(0.839)	(0.634)					
c_{31}	0.00791	0.00814	0.00818	0.00777	0.00814	0.00915	0.00814	-0.0008	0.01721	0.00814
	(0.198)	(0.208)	(0.211)	(0.197)	(0.455)			(0.225)		(0.0039)***
c_{32}	-0.00728	-0.00434	-0.00346	-0.00918	-0.02264	0.00368	-	-0.00013	0.00474	0.00896
	(0.316)	(0.516)	(0.605)	(0.444)	(0.372)					
c_{33}	0.07239	0.07268	0.07271	0.07214	0.00896	0.0668	0.0728	0.07326	0.03788	0.03611
c_{34}	-0.00248	-	-0.00119	-0.00312	-0.06797	-0.00221	-	-0.00039	-0.00387	-0.00201
c_{35}	-0.00092	-	-	-0.00113	-0.00909	0.02832	-	-	-0.02871	0.02875
c_{36}	-	-	-	0.00015	0.00241	-	-	-	-	-0.05555
									(0.000)***	(0.000)***
c_{41}	0.00112	0.00112	0.00112	0.00112	0.00112	0.00112	0.00112	0.00114	0.00099	0.00112
	(0.0472)**	(0.064)*	(0.0448)**	(0.0487)**	(0.839)	(0.0674)*	(0.0669)*	(0.064)*	(0.0664)*	(0.0667)*

c_{42}	0.00001	0.002	0.00001	-	-0.00491	0.00197	0.00199	0.002	0.00003	0.00194
		(0.0002)***				(0.0002)***	(0.0002)***	(0.0002)***	(0.0003)***	(0.0003)***
c_{43}	-0.00007	-0.00016	-0.00018	-0.00001	0.00194	-0.0002	-0.00028	-0.00012	-	-0.00018
	(0.909)	(0.766)	(0.766)	(0.983)	(0.512)			(0.766)		
c_{44}	0.00616	-	0.00616	0.00616	0.00247	0.00583	0.00583	0.00583	0.00583	0.00584
c_{45}	-	0.00583	-	-	-0.00197	-0.00009	-	-	-	-0.00014
c_{46}	-	-	-	-	0.00052	-	-	-	-	0.00028
c_{51}	0.01283	0.01287	0.01283	0.0128	0.01287	0.001286	0.01287	0.01124	0.01277	0.01287
	(0.0013)***	(0.0012)***	(0.0012)***	(0.0013)***	(0.0505)*	(0.0011)***	(0.0005)***	(0.0012)***	(0.0005)***	(0.0006)***
c_{52}	-0.0015	0.00465	0.00405	-0.0019	-0.01831	0.00622	0.00552	0.00549	0.00566	0.00725
		(0.137)	(0.137)			(0.137)	(0.143)	(0.137)	(0.202)	(0.151)
c_{53}	0.01488	0.01472	0.01467	0.01496	0.00725	-0.00063	0.01441	0.01456	-0.00032	-0.00067
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.0122)**	(0.000)***		(0.000)***		
c_{54}	0.00271	-	0.00296	0.00257	-0.01231	0.0011	0.00149	0.00141	0.00111	0.00111
	(0.319)	(0.640)	(0.641)	(0.318)	(0.101)	(0.640)	(0.756)	(0.640)	(0.756)	(0.759)
c_{55}	0.03472	0.03607	0.03458	0.03467	0.02988	0.03736	0.03458	0.03458	0.03789	0.03716
c_{56}	-	-	-	0.00003	0.00195	-	-	-	-	0.00103
c_{61}	-0.01217	-0.01223	-0.01222	-0.0121	-0.01223	-0.0125	-0.01223	-0.0093	-0.01214	-0.01223
	(0.0007)***	(0.0007)***	(0.0007)***	(0.0007)***	(0.012)**	(0.0007)***	(0.0007)***	(0.0007)***	(0.0879)***	(0.108)
c_{62}	0.00216	-0.00202	-0.0013	0.00332	0.01703	-0.00487	-0.00357	-0.00353	0.00401	-0.00674
	(0.672)	(0.672)	(0.672)			(0.672)	(0.672)	(0.672)	(0.922)	(0.678)
c_{63}	-0.02616	-0.02611	-0.02609	-0.02612	-0.00674	-0.01775	-0.02594	-0.02618	0.00023	0.00062
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***		
c_{64}	-0.00273	-	-0.0032	-0.0025	0.02292	-0.00184	-0.0026	-0.00247	-0.0019	-0.0019
	(0.0758)*	(0.0763)*	(0.0765)*	(0.0448)**	(0.171)	(0.0762)*	(0.0763)*	(0.0763)*	(0.558)	(0.567)
c_{65}	-0.00301	-0.01771	-0.00314	-0.0149	-0.00994	-0.02396	-0.0151	-0.00314	-0.00261	-0.02395
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
c_{66}	-	0.01197	-	0.01192	0.01022	0.01197	0.01197	-	-	0.02099

Appendix XI: The above results which are Matrix C that obtained from the multiplication of the inverse of Matrix A with Matrix B for Korea.

Notes:

****, **, * indicates 1%, 5% and 10% significant level respectively*

P-value is in parentheses

APPENDIX XIII

Contemporaneous Response of Macroeconomics Activities towards Oil Price Shocks in Singapore – Estimated Coefficient for Matrix C (with intervention of monetary policy tools)

	Baseline	case 1	case 2	case 3	case 4	case 5	case 6	case 7	case 8	case 9
c_{11}	0.12681	0.12681	0.12681	0.12681	0.12681	0.12681	0.12681	0.12681	0.12681	0.12681
c_{12}	-	-	-	-	-	-	-	-	-	-
c_{13}	-	-	-	-	-	-	-	-	-	-
c_{14}	-	-	-	-	-	-	-	-	-	-
c_{15}	-	-	-	-	-	-	-	-	-	-
c_{16}	-	-	-	-	-	-	-	-	-	-
c_{21}	0.00013	0.00025	-0.0001	-0.00022	0.00025	0.00006	0.00025	0.0003	0.00004	0.00025
			(0.563)		(0.377)	(0.627)	(0.624)	(0.628)	(0.648)	(0.640)
c_{22}	0.00675	0.00682	0.00679	0.00662	0.00661	0.00655	0.00662	0.00661	0.0067	0.00671
c_{23}	0.00033	-	0.00003	-0.00024	-0.0004	-0.00172	-0.00164	-0.00167	-0.00107	-0.00103
						(0.0059)***	(0.0051)***	(0.0063)***	(0.0812)**	(0.0944)*
c_{24}	-0.00075	-	-0.00071	-0.00069	-0.00075	0.00011	-	0.00006	0.00008	0.00005
	(0.296)	(0.259)	(0.230)		(0.126)					
c_{25}	0.00064	-	-	0.0012	0.00135	-	-	-	0.00043	0.00047
	(0.298)			(0.0291)**	(0.0333)**					
c_{26}	-	-	-	-	-	-	-	-	-	-
c_{31}	0.00071	0.00094	0.00141	0.00147	0.00094	0.00461	0.00094	-0.00019	0.0072	0.00094
	(0.687)	(0.700)	(0.700)	(0.711)	(0.719)			(0.783)		(0.0144)**
c_{32}	0.00006	-0.00902	-0.00912	-0.00755	-0.00667	0.00145	-	0.00015	-0.00207	-0.0022
	(0.0038)***	(0.0058)***	(0.0058)***	(0.0523)*	(0.0944)*					
c_{33}	-0.00022	0.03633	0.03629	0.03662	0.03679	0.03394	0.03743	0.03742	0.0315	0.03071
c_{34}	0.00494	-	0.00096	0.00078	0.00076	-0.0021	-	-0.00136	-0.00241	-0.00151
				(0.176)		(0.697)	(0.980)		(0.483)	(0.224)
c_{35}	0.00001	-	-	-0.00136	-0.00136	-	-	-	-0.01263	-0.01409
									(0.000)*	(0.000)*
c_{36}	-	-	-	-	-	-	-	-	-	-

c_{41}	0.00071	0.00071	0.00071	0.00071	0.00071	0.00072	0.00071	0.0007	0.00073	0.00913
	(0.112)	(0.113)	(0.113)	(0.113)	(0.113)	(0.103)	(0.103)	(0.101)	(0.103)	(0.103)
c_{42}	0.00006	-0.00051	0.00005	0.00003	0.00003	-0.00056	-0.00054	-0.00053	-0.00055	0.0019
						(0.234)	(0.212)	(0.229)	(0.216)	(0.234)
c_{43}	-0.00022	-0.00019	-0.00019	-0.00017	-0.00016	0.00015	-0.00007	0.00013	0.00009	-0.00029
	(0.635)	(0.678)	(0.664)	(0.713)	(0.717)			(0.663)		
c_{44}	0.00494	0.00491	0.00494	0.00494	0.00494	0.00491	0.00491	0.00491	0.00491	-0.00394
c_{45}	0.00001	-	-	0.00001	0.00001	-	-	-	-0.00004	0.00013
c_{46}	-	-	-	-	-	-	-	-	-	-
c_{51}	0.0092	0.00913	0.00917	0.00931	0.00913	0.00905	0.00913	0.00877	0.00908	0.00913
	(0.0001)***	(0.0001)***	(0.0001)***	(0.0001)***	(0.0001)***	(0.0002)***	(0.0004)***	(0.0002)***	(0.0003)***	(0.0004)***
c_{52}	-0.00371	-0.00039	-0.00082	-0.00259	-0.00226	0.00283	0.00262	0.00266	0.00165	0.0019
		(0.356)	(0.357)			(0.356)	(0.422)	(0.357)	(0.682)	(0.628)
c_{53}	0.01246	0.01244	0.01243	0.01258	0.01244	-0.00074	0.01217	0.01201	-0.00026	-0.00029
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***		(0.000)***		
c_{54}	-0.00332	-0.00345	-0.00338	-0.00346	-0.00346	-0.00394	-0.00345	-0.00389	-0.00394	-0.00394
	(0.124)	(0.154)	(0.154)	(0.125)	(0.125)	(0.154)	(0.139)	(0.154)	(0.139)	(0.140)
c_{55}	0.02635	-	-	-0.00047	-0.00046	-	-	-	0.00011	0.00013
c_{56}	-	-	-	-	-	-	-	-	-	-
c_{61}	-0.00645	-0.00635	-0.00655	-0.00651	-0.00635	-0.00692	-0.00634	-0.00605	-0.00641	-0.00635
	(0.0008)***	(0.0008)***	(0.0008)***	(0.0013)***	(0.0013)***	(0.0008)***	(0.0008)***	(0.0008)***	(0.0105)***	(0.0109)***
c_{62}	0.0051	0.00344	0.00388	0.00206	0.0018	0.00067	0.00099	0.00095	0.00175	0.00259
	(0.0272)**	(0.0271)**	(0.0273)**			(0.0273)**	(0.0272)**	(0.0273)**	(0.0171)**	(0.0228)**
c_{63}	-0.0096	-0.00977	-0.00975	-0.00997	-0.00995	-0.00522	-0.01031	-0.01016	-0.00028	-0.00024
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***		
c_{64}	0.00325	0.00371	0.00332	0.00336	0.00337	0.00422	0.00371	0.00408	0.00413	0.00412
	(0.0106)**	(0.0106)**	(0.0107)**	(0.0217)**	(0.0217)**	(0.0106)**	(0.0106)**	(0.0107)**	(0.0253)**	(0.0257)**
c_{65}	-0.0088	0.01072	0.01072	0.01131	0.01131	0.01072	0.01072	0.01072	0.00119	0.0119
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
c_{66}	0.01072	-	-	-	-	-	-	-	-	-

Appendix XIII: The above results which are Matrix C that obtained from the multiplication of the inverse of Matrix A with Matrix B for Singapore.

Notes:

****, **, * indicates 1%, 5% and 10% significant level respectively*

P-value is in parentheses

	APPENDIX XIV Contemporaneous Response of Macroeconomics Activities towards Oil Price Shocks in Euro Area and selected Asian Countries – Estimated Coefficient for Matrix C (without intervention of monetary policy tools)			
	Euro Area	Japan	Korea	Singapore
c_{11}	0.13541	0.1311	0.13178	0.129
c_{12}	-	-	-	-
c_{13}	-	-	-	-
c_{14}	-	-	-	-
c_{21}	0.00145	0.00056	0.0008	0.00072
	(0.000)***	(0.121)	(0.214)	(0.126)
c_{22}	0.00252	0.0039	0.007	0.00519
c_{23}	-	-	-	-
c_{24}	-	-	-	-
c_{31}	0.01827	-0.00455	0.02053	0.01186
	(0.0003)***	(0.341)	(0.000)***	(0.0001)***
c_{32}	-0.00002	-0.00003	-0.00012	-0.0001
	(0.438)	(0.184)	(0.0582)*	(0.626)
c_{33}	0.04703	0.05091	0.04497	0.03248
c_{34}	-	-	-	-
c_{41}	-0.16639	0.21517	-0.16177	-0.04121
	(0.551)	(0.520)	(0.345)	(0.0625)*
c_{42}	0.0024	0.00255	0.00138	0.00202
	(0.0927)*	(0.117)	(0.553)	(0.104)
c_{43}	0.0391	-0.04127	-0.03255	-0.01566
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
c_{44}	0.01538	0.0172	0.02338	0.01331

Appendix XIII: The above results which are Matrix C that obtained from the multiplication of the inverse of Matrix A with Matrix B for Euro Area and Asian countries without the inclusion of monetary policy tools.

Notes:

****, **, * indicates 1%, 5% and 10% significant level respectively*

P-value is in parentheses

	APPENDIX XV Coefficient of the model without any monetary policy tools for Euro Area and selected Asian Countries									
	Baseline	case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	case 8	Case 9
	Euro Area									
c_{11}	0.13169	0.13169	0.13169	0.13169	0.13169	0.13169	0.13169	0.13169	0.13169	0.13169
	-	-	-	-	-	-	-	-	-	-
c_{21}	0.00123	0.00114	0.00116	0.00122	0.00114	0.00117	0.00114	0.00099	0.00114	0.00114
	-	(0.0033)***	-	-	(0.0536)*	(0.004)***	(0.0039)***	(0.0039)***	(0.0036)***	(0.0035)***
c_{31}	0.00314	0.00287	0.002997	0.00307	0.00287	0.00479	0.00287	-0.00369	0.00331	0.00287
	(0.959)	(0.841)	(0.715)	(0.976)	(1.000)	-	-	(0.565)	-	(0.832)
c_{41}	0.00202	0.00203	0.00203	0.00203	0.00203	0.00203	0.00203	0.00201	0.00203	0.00203
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
c_{51}	0.01014	0.01002	0.01008	0.01011	0.01002	0.01005	0.01002	0.0071	0.01002	0.01002
	(0.0017)***	(0.0015)***	(0.0015)***	(0.0016)***	(0.993)	(0.0014)***	(0.0006)***	(0.0015)***	(0.0008)***	(0.0008)***
c_{61}	0.00369	0.00356	0.00362	0.00365	0.00356	0.00393	0.00356	0.00075	0.00257	0.00356
	(0.352)	(0.352)	(0.352)	(0.346)	(0.145)	(0.348)	(0.350)	(0.352)	(0.221)	(0.218)
	Japan									
c_{11}	0.13812	0.13812	0.13812	0.13812	0.13812	0.13812	0.13812	0.13812	0.13812	0.13812
	-	-	-	-	-	-	-	-	-	-
c_{21}	0.00004	0.00029	0.00002	0.00004	0.00029	0.00029	0.00029	0.00029	0.00029	0.00029
	(0.165)	(0.165)	-	-	(0.214)	(0.165)	(0.165)	(0.165)	(0.255)	(0.255)
c_{31}	-0.00459	-0.00586	-0.00424	-0.00459	-0.00586	-0.00631	-0.00586	-0.00586	-0.00603	-0.00586
	(0.422)	(0.422)	(0.422)	(0.391)	(0.430)	-	-	(0.265)	-	(0.952)
c_{41}	0.00071	0.0007	0.00071	0.00071	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
	(0.0331)**	(0.0331)**	(0.0288)**	(0.029)**	(0.0297)**	(0.0378)**	(0.0378)**	(0.0335)**	(0.0401)**	(0.0401)**
c_{51}	-0.00476	-0.00538	-0.00453	-0.00476	-0.00538	-0.00538	-0.00538	-0.00671	-0.00538	-0.00538
	(0.155)	(0.162)	(0.159)	(0.152)	(0.154)	(0.160)	(0.0976)*	(0.163)	(0.0672)*	(0.0671)*
c_{61}	0.00303	-0.00359	0.00284	0.00302	0.00359	0.0037	0.00359	0.00419	0.00359	0.00359
	(0.966)	(0.966)	(0.966)	(0.958)	(0.956)	(0.966)	(0.966)	(0.966)	(0.913)	(0.913)
	Korea									
c_{11}	0.12697	0..12697	0.12697	0.12697	0.12697	0.12697	0.12697	0.12697	0.12697	0.12697
	-	-	-	-	-	-	-	-	-	-
c_{21}	0.00044	0.00031	0.00026	0.00047	0.00031	0.0003	0.00031	0.00034	0.00025	0.00031
	-	(0.444)	-	-	(0.018)**	(0.402)	(0.373)	(0.404)	(0.419)	(0.340)
c_{31}	0.00791	0.00814	0.00818	0.00777	0.00814	0.00915	0.00814	-0.0008	0.01721	0.00814
	(0.198)	(0.208)	(0.211)	(0.197)	(0.455)	-	-	(0.225)	-	(0.0039)***
c_{41}	0.00112	0.00112	0.00112	0.00112	0.00112	0.00112	0.00112	0.00114	0.00099	0.00112
	(0.0472)**	(0.064)*	(0.0448)**	(0.0487)**	(0.839)	(0.0674)*	(0.0669)*	(0.064)*	(0.0664)*	(0.0667)*
c_{51}	0.01283	0.01287	0.01283	0.0128	0.01287	0.001286	0.01287	0.01124	0.01277	0.01287
	(0.0013)***	(0.0012)***	(0.0012)***	(0.0013)***	(0.0505)*	(0.0011)***	(0.0005)***	(0.0012)***	(0.0005)***	(0.0006)***

c_{61}	-0.01217	-0.01223	-0.01222	-0.0121	-0.01223	-0.0125	-0.01223	-0.0093	-0.01214	-0.01223
	(0.0007)***	(0.0007)***	(0.0007)***	(0.0007)***	(0.012)**	(0.0007)***	(0.0007)***	(0.0007)***	(0.0879)*	(0.108)
					Singapore					
c_{11}	0.12681	0.12681	0.12681	0.12681	0.12681	0.12681	0.12681	0.12681	0.12681	0.12681
	-	-	-	-	-	-	-	-	-	-
c_{21}	0.00013	0.00025	-0.0001	-0.00022	0.00025	0.00006	0.00025	0.0003	0.00004	0.00025
	-	-	(0.563)	-	(0.377)	(0.627)	(0.624)	(0.628)	(0.648)	(0.640)
c_{31}	0.00071	0.00094	0.00141	0.00147	0.00094	0.00461	0.00094	-0.00019	0.0072	0.00094
	(0.687)	(0.700)	(0.700)	(0.711)	(0.719)	-	-	(0.783)	-	(0.0144)**
c_{41}	0.00071	0.00071	0.00071	0.00071	0.00071	0.00072	0.00071	0.0007	0.00073	0.00913
	(0.112)	(0.113)	(0.113)	(0.113)	(0.113)	(0.103)	(0.103)	(0.101)	(0.103)	(0.103)
c_{51}	0.0092	0.00913	0.00917	0.00931	0.00913	0.00905	0.00913	0.00877	0.00908	0.00913
	(0.0001)***	(0.0002)***	(0.0002)***	(0.0001)***	(0.0001)***	(0.0002)***	(0.0004)***	(0.0002)***	(0.0003)***	(0.0004)***
c_{61}	-0.00645	-0.00635	-0.00655	-0.00651	-0.00635	-0.00692	-0.00634	-0.00605	-0.00641	-0.00635
	(0.0008)***	(0.0008)***	(0.0008)***	(0.0013)***	(0.0013)***	(0.0008)***	(0.0008)***	(0.0008)***	(0.0105)***	(0.0109)***

Appendix XV: Coefficient of the model with the inclusion of the monetary policy tool.

Notes: C_{11} = The impact of oil price towards oil price shock

C_{21} = The impact of interest rate towards oil price shock

C_{31} = The impact of money supply towards oil price shock

C_{41} = The impact of consumer price index towards oil price shock

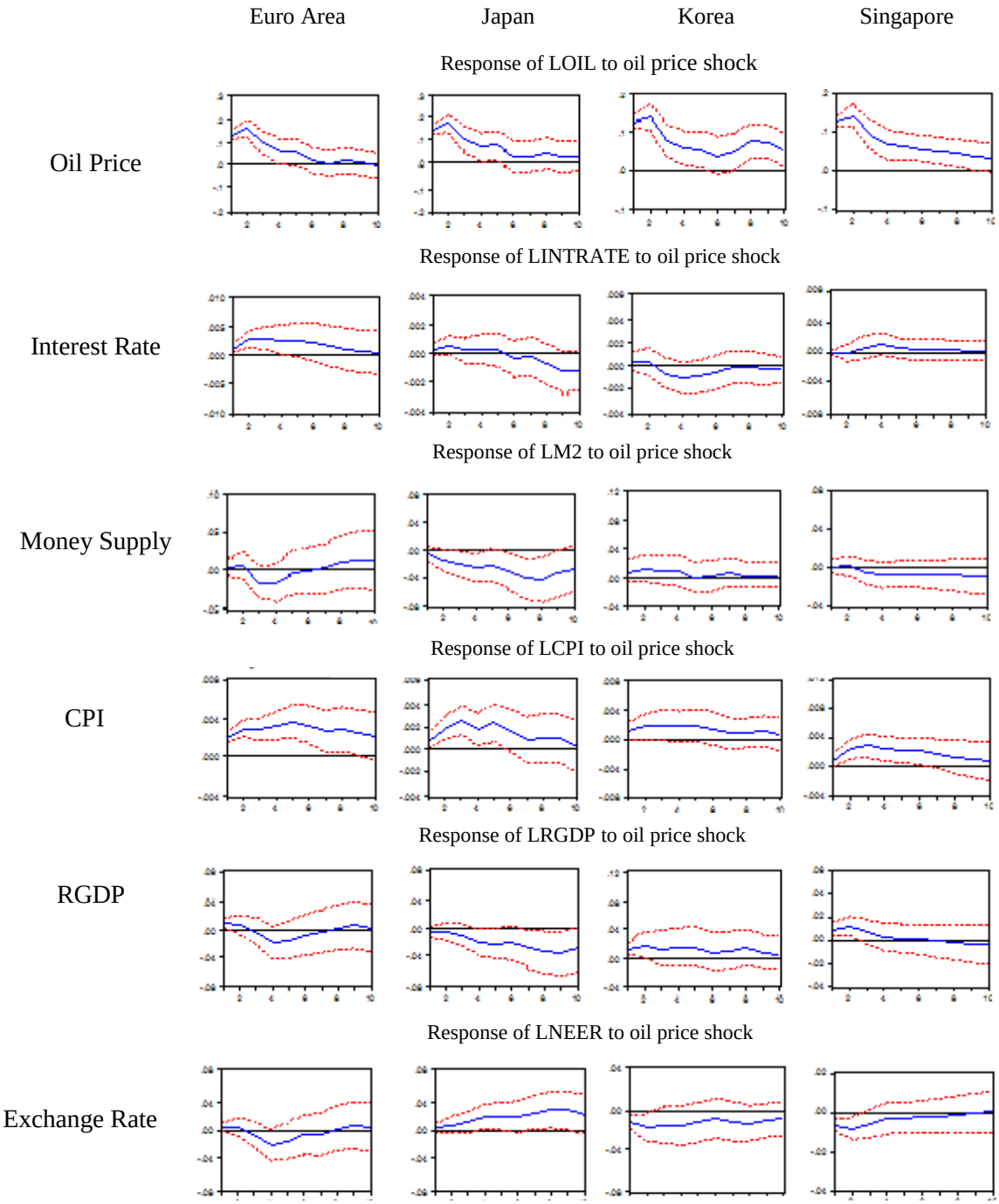
C_{51} = The impact of real gross domestic product towards oil price shock

C_{61} = The impact of nominal effective exchange rate towards oil price shock

****, **, * indicates 1%, 5% and 10% significant level respectively*

P-value is in parenthesis

APPENDIX XVI
Impulse Response - Case 1



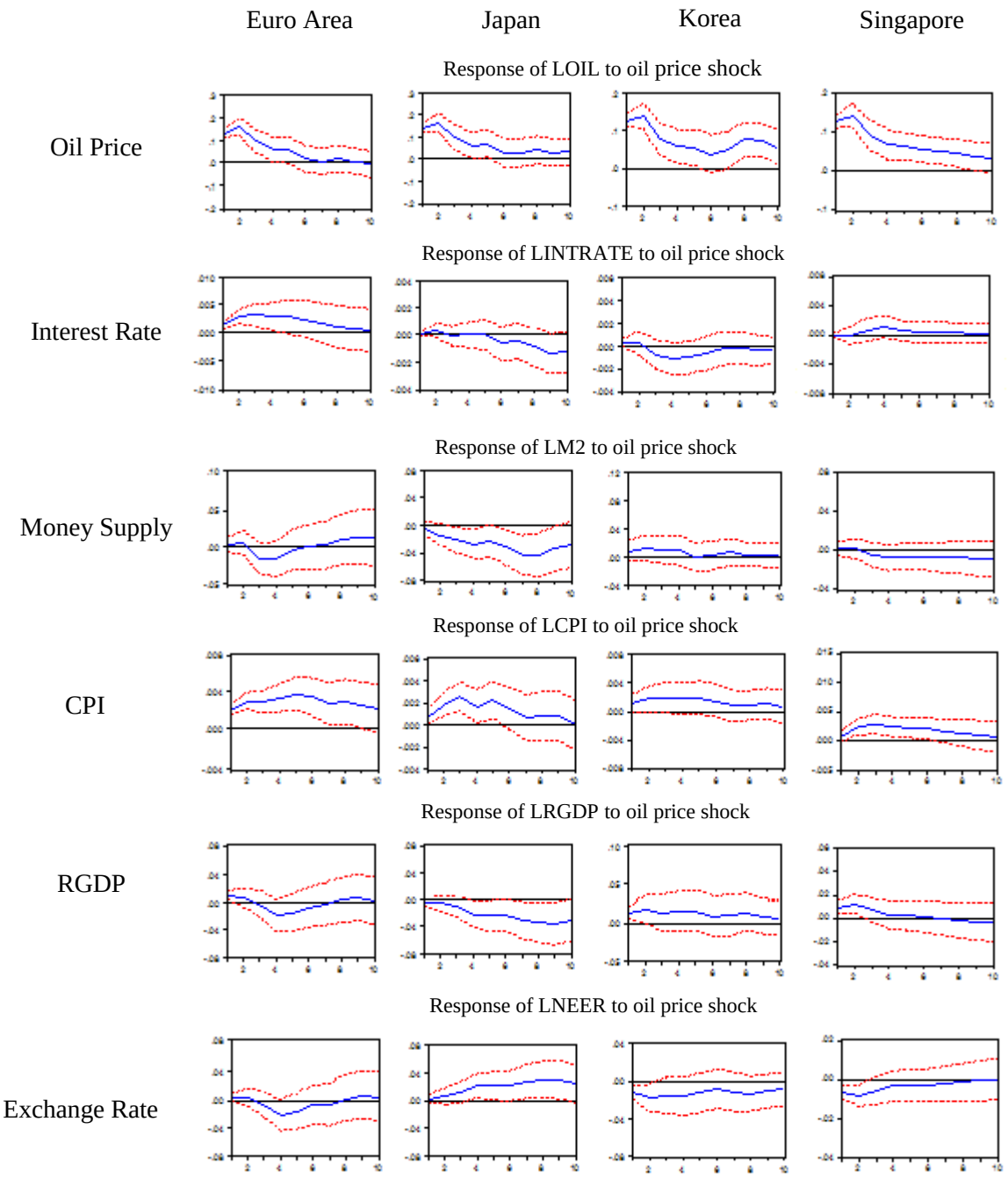
Appendix XVI: The figures shows that the response of macroeconomic variables to oil price shock when interest rate is expect to response only to Oil Price fluctuation.

Note: (1) LOIL is oil price in natural logarithm form *(2) LINTRATE is interest rate in natural logarithm form*

(3) LM2 is money supply in logarithm form *(4) LCPI is consumer price index in natural logarithm form*

(5) LRGDP is real gross domestic product in natural logarithm form *(6) LNEER is nominal effective exchange rate in logarithm form*

APPENDIX XVII
Impulse Response - Case 2



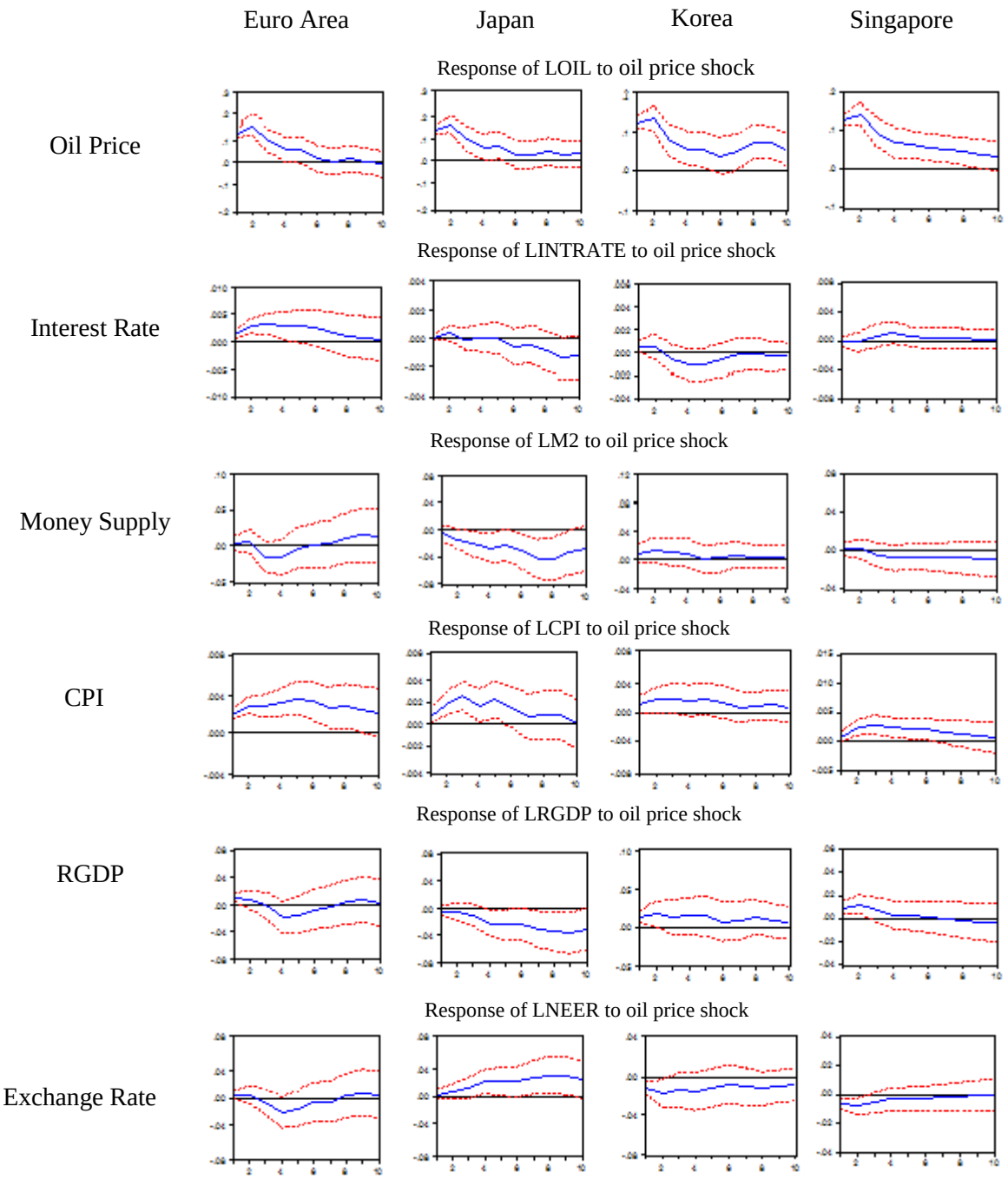
Appendix XVII: The figures shows that the response of macroeconomic variables to oil price shock when interest rate is expect to response only to Consumer Price Index.

Note: (1) LOIL is oil price in natural logarithm form *(2) LINTRATE is interest rate in natural logarithm form*

(3) LM2 is money supply in logarithm form *(4) LCPI is consumer price index in natural logarithm form*

(5) LRGDP is real gross domestic product in natural logarithm form *(6) LNEER is nominal effective exchange rate in logarithm form*

APPENDIX XVIII
Impulse Response - Case 3



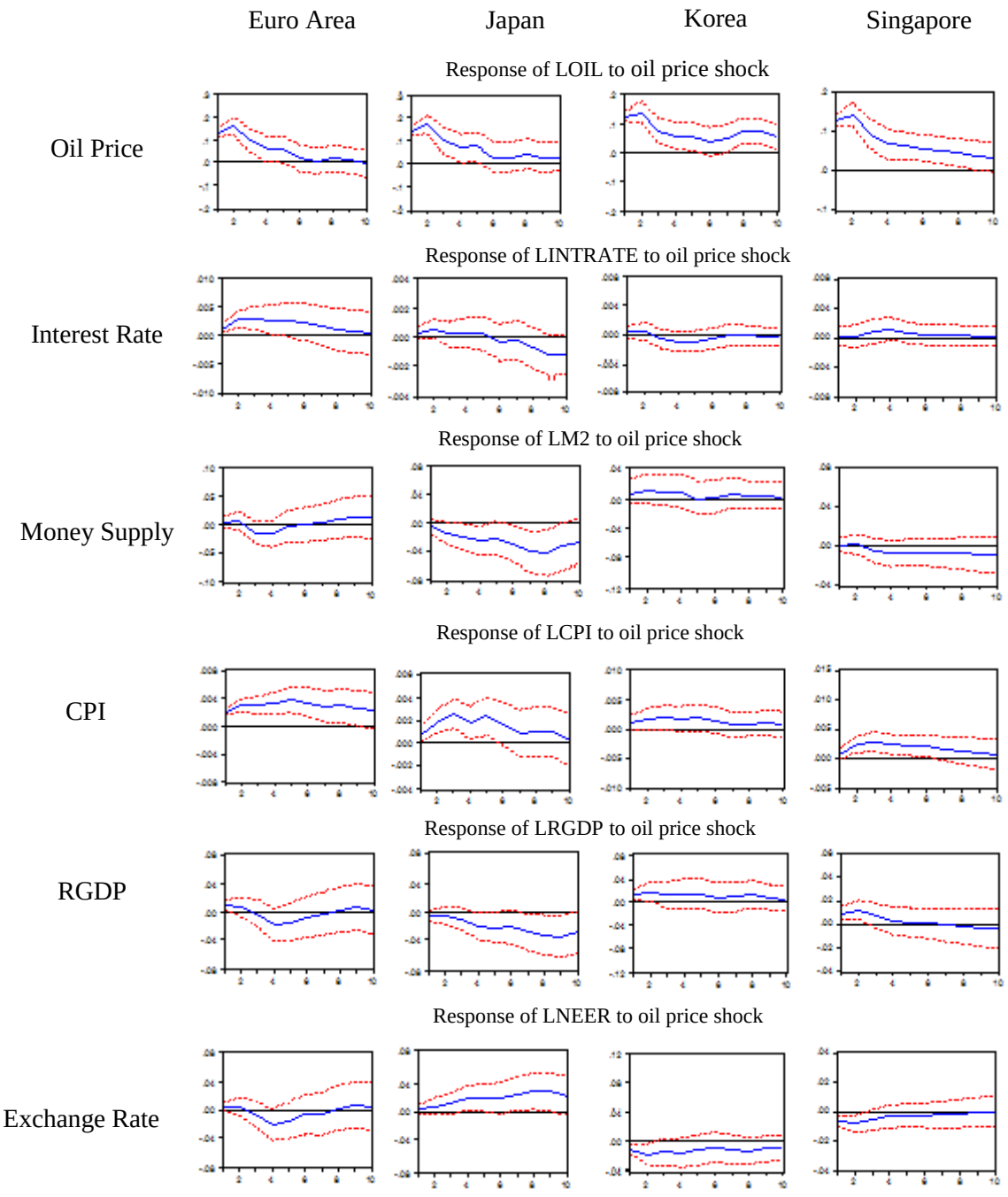
Appendix XVIII: The figures shows that the response of macroeconomic variables to oil price shock when interest rate is expect to response only to Consumer Price Index, Real Gross Domestic Product and Nominal Effective Exchange Rate.

Note: (1) LOIL is oil price in natural logarithm form *(2) LINTRATE is interest rate in natural logarithm form*

(3) LM2 is money supply in logarithm form *(4) LCPI is consumer price index in natural logarithm form*

(5) LRGDP is real gross domestic product in natural logarithm form *(6) LNEER is nominal effective exchange rate in logarithm form*

APPENDIX XIX
Impulse Response - Case 4



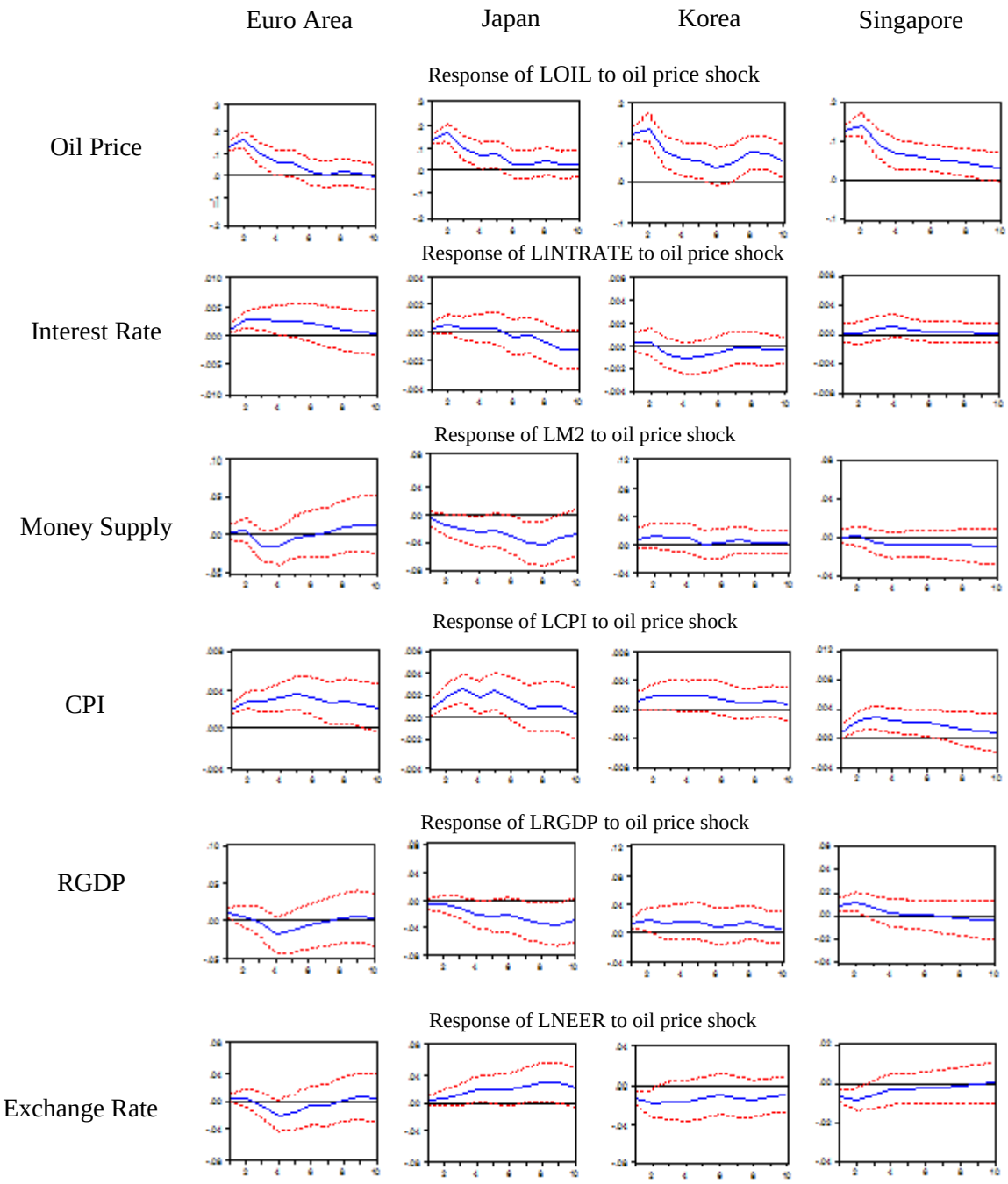
Appendix XIX: The figures shows that the response of macroeconomic variables to oil price shock when interest rate is expect to response to Oil Price, Consumer Price Index, Real Gross Domestic Product and Nominal Effective Exchange Rate.

Note: (1) LOIL is oil price in natural logarithm form *(2) LINTRATE is interest rate in natural logarithm form*

(3) LM2 is money supply in logarithm form *(4) LCPI is consumer price index in natural logarithm form*

(5) LRGDP is real gross domestic product in natural logarithm form *(6) LNEER is nominal effective exchange rate in logarithm form*

APPENDIX XX
Impulse Response - Case 6



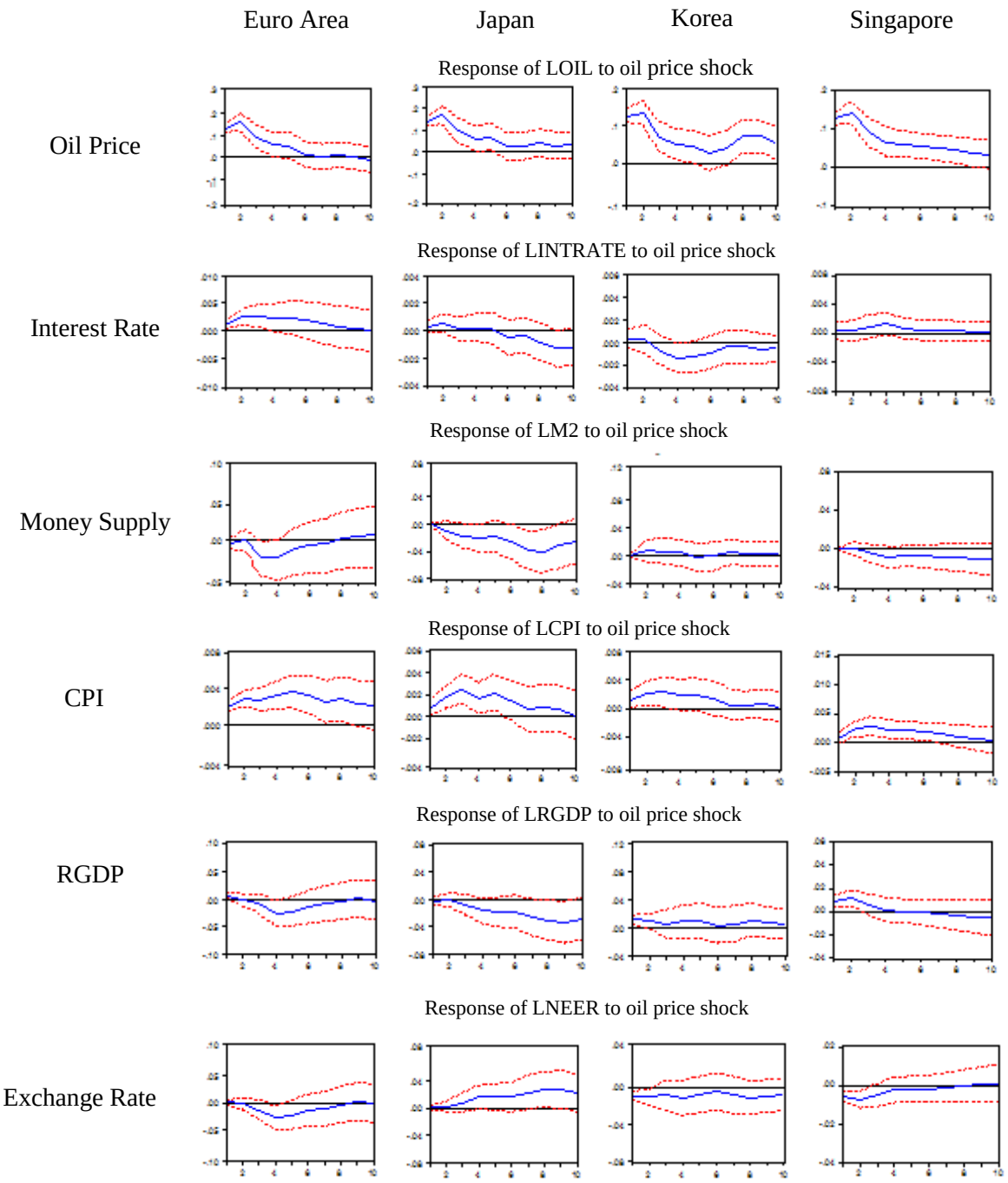
Appendix XX: The figures shows that the response of macroeconomic variables to oil price shock when money supply is expect to response to Oil Price fluctuation.

Note: (1) LOIL is oil price in natural logarithm form *(2) LINTRATE is interest rate in natural logarithm form*

(3) LM2 is money supply in logarithm form *(4) LCPI is consumer price index in natural logarithm form*

(5) LRGDP is real gross domestic product in natural logarithm form *(6) LNEER is nominal effective exchange rate in logarithm form*

APPENDIX XXI
Impulse Response - Case 7



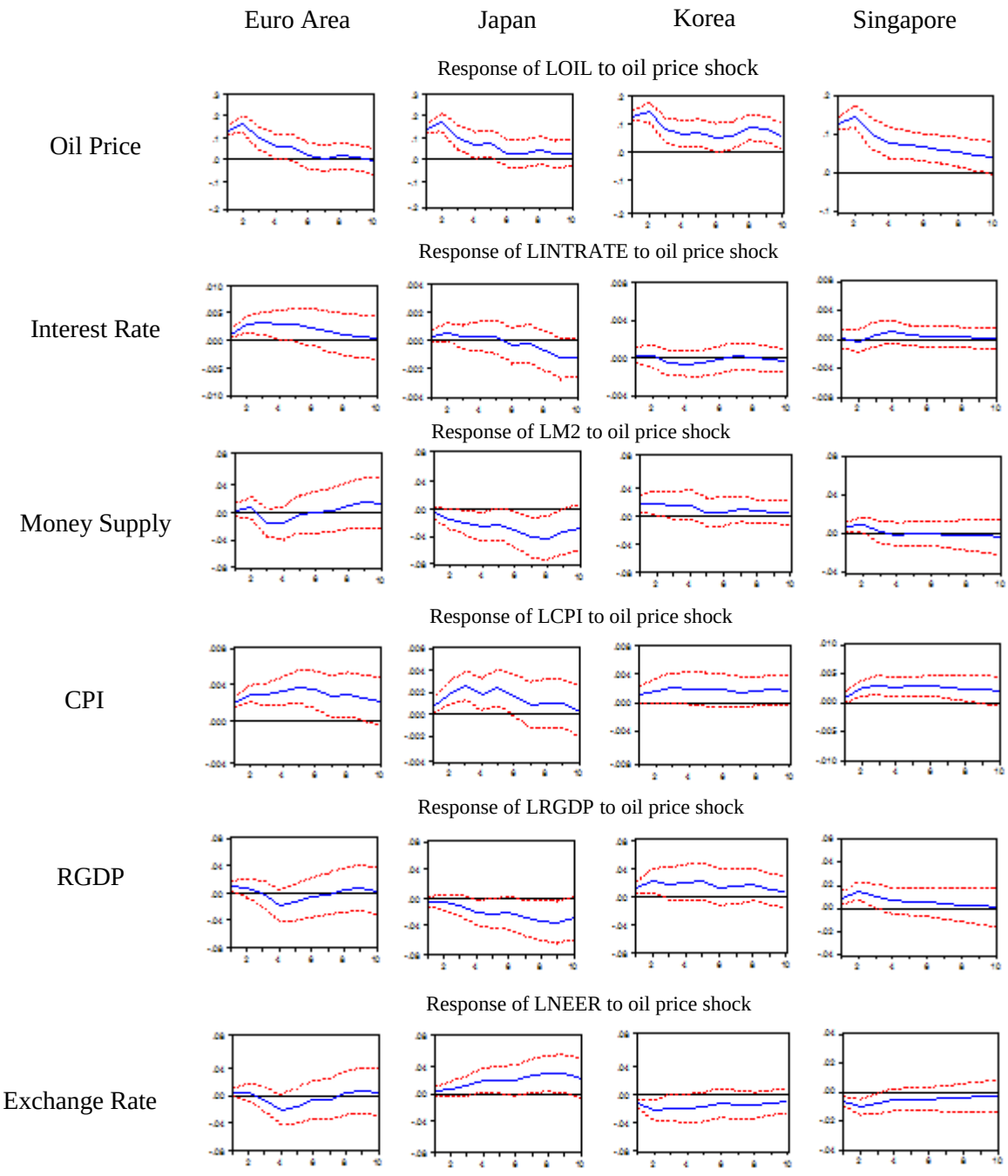
Appendix XXI: The figures shows that the response of macroeconomic variables to oil price shock when money supply is expect to response to Consumer Price Index.

Note: (1) LOIL is oil price in natural logarithm form *(2) LINTRATE is interest rate in natural logarithm form*

(3) LM2 is money supply in logarithm form *(4) LCPI is consumer price index in natural logarithm form*

(5) LRGDP is real gross domestic product in natural logarithm form *(6) LNEER is nominal effective exchange rate in logarithm form*

APPENDIX XXII
Impulse Response - Case 8



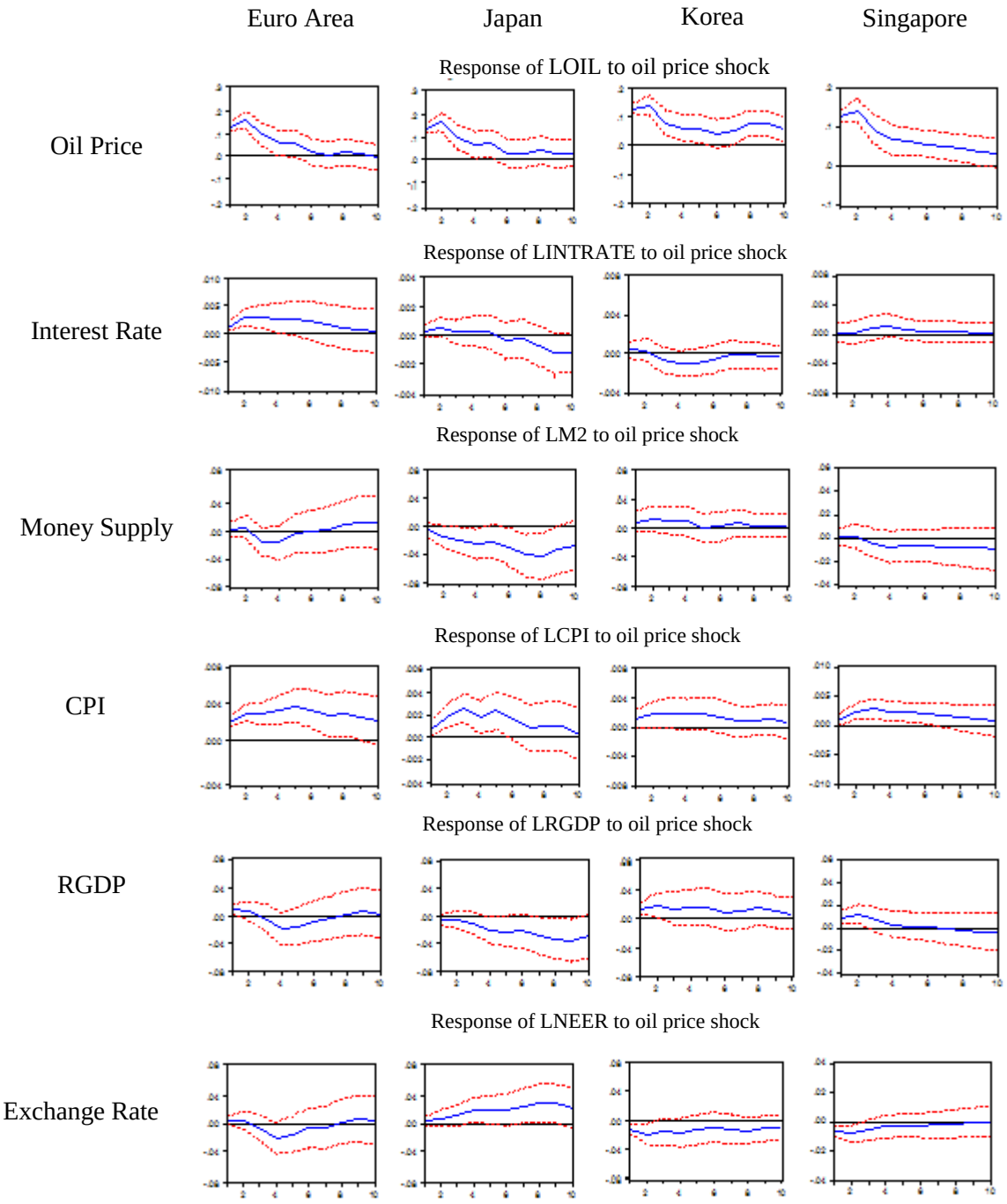
Appendix XXII: The figures shows that the response of macroeconomic variables to oil price shock when money supply is expect to response only to Consumer Price Index, Real Gross Domestic Product and Nominal Effective Exchange Rate.

Note: (1) LOIL is oil price in natural logarithm form *(2) LINTRATE is interest rate in natural logarithm form*

(3) LM2 is money supply in logarithm form *(4) LCPI is consumer price index in natural logarithm form*

(5) LRGDP is real gross domestic product in natural logarithm form *(6) LNEER is nominal effective exchange rate in logarithm form*

APPENDIX XXIII
Impulse Response - Case 9



Appendix XXIII: The figures shows that the response of macroeconomic variables to oil price shock when money is expect to response to Oil Price, Consumer Price Index, Real Gross Domestic Product and Nominal Effective Exchange Rate.

Note: (1) LOIL is oil price in natural logarithm form *(2) LINTRATE is interest rate in natural logarithm form*

(3) LM2 is money supply in logarithm form *(4) LCPI is consumer price index in natural logarithm form*

(5) LRGDP is real gross domestic product in natural logarithm form *(6) LNEER is nominal effective exchange rate in logarithm form*

Appendix XXIV

Variance Decomposition - Case 1

Variables/countries		Euro Area	Japan	Korea	Singapore
Oil price	*oil*				
	Near-term	100.000	100.000	100.000	100.000
	Medium-term	81.814	81.706	65.481	71.707
	Long-term	73.608	74.417	58.791	59.546
	i				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	1.653	3.059	0.713	0.313
	Long-term	1.896	4.082	1.003	1.665
	m2				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	1.222	2.841	30.018	10.647
	Long-term	4.211	4.169	34.775	13.402
	cpi				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.571	8.181	0.987	1.715
	Long-term	5.622	8.076	2.229	7.094
	rgdp				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.411	2.369	0.607	4.341
	Long-term	0.547	4.401	1.074	3.010
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	14.329	1.845	2.192	11.276
	Long-term	14.115	4.854	2.128	15.283
Interest rate	*oil*				
	Near-term	6.947	1.633	0.495	0.135
	Medium-term	16.386	1.932	4.791	2.123
	Long-term	12.685	9.196	4.586	1.914
	i				
	Near-term	93.053	98.367	99.505	99.865
	Medium-term	72.876	83.097	68.395	74.786
	Long-term	67.602	70.128	51.792	58.190
	m2				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	5.783	7.523	22.041	3.153
	Long-term	10.606	7.922	31.656	3.422
	cpi				
	Near-term	0.000	0.000	0.000	0.000

	Medium-term	0.544	5.328	0.799	10.094
	Long-term	3.218	9.809	2.678	19.110
	rgdp				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.324	0.472	1.618	3.454
	Long-term	1.816	1.179	4.318	11.626
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	4.088	1.648	2.356	6.389
	Long-term	4.074	1.766	4.971	5.738
Money supply	*oil*				
	Near-term	0.285	1.059	1.234	0.063
	Medium-term	3.378	14.920	3.083	1.304
	Long-term	3.237	31.373	2.617	2.198
	i				
	Near-term	6.945	5.533	0.351	5.804
	Medium-term	11.002	4.652	0.933	0.999
	Long-term	18.820	5.594	0.864	0.491
	m2				
	Near-term	92.770	93.409	98.415	94.133
	Medium-term	75.518	66.761	90.625	96.154
	Long-term	66.057	40.736	70.869	92.334
	cpi				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	6.681	1.346	2.353	0.815
	Long-term	5.881	0.900	6.821	2.729
	rgdp				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.332	1.326	1.270	0.666
	Long-term	0.602	1.241	14.170	2.188
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	3.089	10.995	1.736	0.062
	Long-term	5.402	20.156	4.660	0.060
Consumer Price Index	*oil*				
	Near-term	46.991	3.673	3.227	2.013
	Medium-term	61.275	29.190	8.678	16.747
	Long-term	56.041	19.261	7.075	8.860
	i				
	Near-term	3.063	0.004	10.209	1.026
	Medium-term	7.975	4.305	3.950	0.967

	Long-term	12.866	10.933	3.837	0.569
	m2				
	Near-term	1.842	0.453	0.065	0.152
	Medium-term	0.802	5.076	14.044	14.221
	Long-term	0.482	10.418	29.510	62.822
	cpi				
	Near-term	48.104	95.870	86.499	96.809
	Medium-term	20.489	52.527	63.329	63.260
	Long-term	15.901	40.640	46.841	24.661
	rgdp				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	5.474	7.128	3.187	3.605
	Long-term	8.930	17.336	3.484	2.533
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	3.985	1.775	6.811	1.200
	Long-term	5.780	1.412	9.253	0.555
Real GDP	*oil*				
	Near-term	7.472	1.804	10.345	8.702
	Medium-term	4.808	10.940	5.196	3.964
	Long-term	3.172	25.868	4.973	1.990
	i				
	Near-term	5.728	2.951	1.348	0.016
	Medium-term	11.785	6.826	0.694	1.192
	Long-term	17.222	7.703	0.914	2.038
	m2				
	Near-term	38.789	45.637	13.523	16.163
	Medium-term	73.396	57.937	78.710	57.436
	Long-term	68.776	38.137	63.805	70.878
	cpi				
	Near-term	0.443	2.343	0.138	1.241
	Medium-term	4.440	2.741	1.138	1.134
	Long-term	5.179	2.087	4.309	2.366
	rgdp				
	Near-term	47.568	47.265	74.645	73.878
	Medium-term	4.457	8.815	12.783	36.088
	Long-term	3.088	5.974	23.291	22.189
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	1.114	12.741	1.478	0.187
	Long-term	2.564	20.231	2.708	0.538

Nominal effective exchange rate	*oil*				
	Near-term	1.413	1.350	12.331	11.156
	Medium-term	5.460	11.157	8.230	5.060
	Long-term	3.426	23.553	8.578	2.579
	i				
	Near-term	6.299	3.899	0.336	3.275
	Medium-term	10.935	4.752	1.080	2.510
	Long-term	19.907	6.467	1.263	3.320
	m2				
	Near-term	55.463	65.461	56.178	26.381
	Medium-term	74.710	71.374	80.136	63.200
	Long-term	67.834	46.988	64.045	69.763
	cpi				
	Near-term	0.716	1.221	0.559	3.800
	Medium-term	4.537	1.662	1.440	0.979
	Long-term	4.910	1.358	5.998	0.668
	rgdp				
	Near-term	21.658	15.977	18.796	23.630
	Medium-term	1.412	2.386	5.221	13.671
	Long-term	0.844	2.571	17.074	9.164
	neer				
	Near-term	14.450	12.091	11.799	31.758
	Medium-term	2.945	8.669	3.894	14.581
	Long-term	3.078	19.064	3.041	14.506

Appendix XXIV: The above results shows the variance decomposition for all the variables when interest rate is the policy tool and only response to Oil Price fluctuation.

Appendix XXV

Variance Decomposition - Case 2

Variables/countries		Euro Area	Japan	Korea	Singapore
Oil price	*oil*				
	Near-term	100.000	100.000	100.000	100.000
	Medium-term	81.824	81.326	65.517	71.647
	Long-term	73.600	73.986	58.861	59.397
	i				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	2.089	3.472	0.519	0.171
	Long-term	2.612	4.501	1.449	0.967
	m2				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	1.195	2.954	30.069	10.676
	Long-term	4.246	4.279	34.810	13.473
	cpi				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.163	7.913	1.098	1.844
	Long-term	4.894	7.781	1.683	7.773
	rgdp				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.410	2.436	0.607	4.353
	Long-term	0.547	4.495	1.072	3.026
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	14.318	1.898	2.190	11.309
	Long-term	14.101	4.958	2.124	15.365
Interest rate	*oil*				
	Near-term	7.259	0.009	0.352	0.022
	Medium-term	16.779	0.350	4.730	1.577
	Long-term	13.022	10.055	4.536	1.463
	i				
	Near-term	84.578	99.761	89.104	98.890
	Medium-term	71.334	83.146	59.286	72.068
	Long-term	70.374	68.004	44.702	55.480
	m2				
	Near-term	0.322	0.001	0.009	0.002
	Medium-term	3.816	7.259	22.072	3.098
	Long-term	8.025	7.449	31.725	3.380
	cpi				
	Near-term	7.840	0.229	10.536	1.087

	Medium-term	3.669	7.136	9.940	13.352
	Long-term	2.703	11.639	9.751	22.216
	rgdp				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.323	0.470	1.617	3.476
	Long-term	1.812	1.142	4.316	11.690
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	4.078	1.639	2.355	6.430
	Long-term	4.064	1.710	4.969	5.770
Money supply	*oil*				
	Near-term	0.306	0.556	1.246	0.142
	Medium-term	3.340	16.078	3.118	1.313
	Long-term	3.263	33.060	2.648	2.178
	i				
	Near-term	9.326	5.802	0.223	5.927
	Medium-term	8.624	4.729	1.465	1.038
	Long-term	15.523	5.493	1.305	0.547
	m2				
	Near-term	89.504	93.629	98.505	93.866
	Medium-term	72.138	65.863	90.726	96.128
	Long-term	62.122	39.725	70.931	92.339
	cpi				
	Near-term	0.864	0.013	0.026	0.065
	Medium-term	12.474	1.166	1.686	0.792
	Long-term	13.084	0.870	6.292	2.687
	rgdp				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.333	1.309	1.270	0.666
	Long-term	0.603	1.210	14.166	2.189
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	3.092	10.855	1.736	0.062
	Long-term	5.405	19.642	4.658	0.060
Consumer Price Index	*oil*				
	Near-term	46.970	3.753	3.226	2.000
	Medium-term	61.377	27.825	8.744	16.595
	Long-term	56.199	17.487	7.123	8.735
	i				
	Near-term	0.217	0.033	0.000	0.009
	Medium-term	2.514	4.021	1.288	0.597

	Long-term	5.888	10.556	1.688	0.413
	m2				
	Near-term	2.084	0.533	0.081	0.141
	Medium-term	1.010	4.998	14.124	14.292
	Long-term	0.612	10.309	29.460	62.933
	cpi				
	Near-term	50.729	95.681	96.693	97.850
	Medium-term	25.645	54.123	65.850	63.707
	Long-term	22.602	42.649	48.997	24.828
	rgdp				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	5.471	7.232	3.186	3.608
	Long-term	8.924	17.568	3.483	2.535
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	3.983	1.800	6.808	1.201
	Long-term	5.776	1.431	9.250	0.556
Real GDP	*oil*				
	Near-term	7.565	1.285	10.277	8.777
	Medium-term	4.766	12.369	5.224	4.070
	Long-term	3.154	28.022	5.023	2.001
	i				
	Near-term	7.998	3.228	1.023	0.071
	Medium-term	9.995	6.973	0.885	1.498
	Long-term	14.400	7.629	2.045	2.630
	m2				
	Near-term	36.879	45.894	13.452	16.131
	Medium-term	69.958	57.067	78.756	57.290
	Long-term	64.868	37.064	63.861	70.735
	cpi				
	Near-term	0.027	2.099	0.549	1.194
	Medium-term	9.704	2.351	0.878	0.906
	Long-term	11.922	1.834	3.084	1.907
	rgdp				
	Near-term	47.532	47.494	74.699	73.827
	Medium-term	4.462	8.685	12.779	36.050
	Long-term	3.091	5.802	23.280	22.188
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	1.115	12.554	1.478	0.186
	Long-term	2.566	19.648	2.707	0.538

Nominal effective exchange rate	*oil*				
	Near-term	1.460	0.849	12.303	11.787
	Medium-term	5.403	12.084	8.291	5.343
	Long-term	3.404	25.405	8.670	2.771
	i				
	Near-term	9.376	4.202	0.140	4.127
	Medium-term	9.257	4.878	1.559	2.542
	Long-term	16.920	6.360	2.955	3.533
	m2				
	Near-term	53.061	65.737	56.109	26.076
	Medium-term	71.358	70.655	80.210	62.919
	Long-term	63.761	45.845	64.111	69.496
	cpi				
	Near-term	0.002	1.020	0.844	3.033
	Medium-term	9.620	1.433	0.832	1.033
	Long-term	11.988	1.299	4.167	0.580
	rgdp				
	Near-term	21.654	16.048	18.802	23.455
	Medium-term	1.414	2.363	5.217	13.628
	Long-term	0.845	2.506	17.059	9.145
	neer				
	Near-term	14.447	12.145	11.803	31.523
	Medium-term	2.948	8.586	3.891	14.536
	Long-term	3.082	18.584	3.039	14.476

Appendix XXV: The above results shows the variance decomposition for all the variables when interest rate is the policy tool and only response to Consumer Price Index.

Appendix XXVI

Variance Decomposition - Case 3

Variables/countries		Euro Area	Japan	Korea	Singapore
Oil price	*oil*				
	Near-term	100.000	100.000	100.000	100.000
	Medium-term	81.867	81.454	65.285	71.787
	Long-term	73.603	74.124	58.505	59.634
	i				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	2.490	3.309	1.184	0.280
	Long-term	3.443	4.272	2.182	0.385
	m2				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	1.256	3.182	29.307	10.454
	Long-term	4.161	4.611	34.073	13.034
	cpi				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.213	7.943	1.324	1.882
	Long-term	4.749	7.815	1.713	7.840
	rgdp				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.254	2.218	0.736	4.369
	Long-term	0.351	4.222	1.390	3.052
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	13.920	1.895	2.164	11.227
	Long-term	13.693	4.956	2.137	16.054
Interest rate	*oil*				
	Near-term	8.032	0.031	1.151	0.102
	Medium-term	17.703	0.384	5.156	1.590
	Long-term	13.807	9.911	4.908	1.489
	i				
	Near-term	83.575	99.477	86.879	94.468
	Medium-term	65.214	81.580	59.530	63.555
	Long-term	61.638	66.521	45.275	48.588
	m2				
	Near-term	0.625	0.128	0.564	0.120
	Medium-term	9.205	9.089	22.050	4.024
	Long-term	14.680	9.120	31.193	4.015
	cpi				
	Near-term	6.585	0.207	10.055	1.015

	Medium-term	2.649	7.017	9.678	13.263
	Long-term	2.188	11.522	9.851	22.190
	rgdp				
	Near-term	1.079	0.158	1.326	1.225
	Medium-term	2.017	0.276	1.106	5.762
	Long-term	4.466	1.206	3.655	13.658
	neer				
	Near-term	0.104	0.000	0.025	3.070
	Medium-term	3.212	1.655	2.480	11.807
	Long-term	3.220	1.720	5.119	10.059
Money supply	*oil*				
	Near-term	0.327	0.652	1.127	0.154
	Medium-term	3.287	16.162	2.865	1.345
	Long-term	3.318	33.061	2.415	2.204
	i				
	Near-term	3.052	4.071	1.573	4.061
	Medium-term	3.394	5.089	3.689	0.945
	Long-term	8.701	6.219	3.697	0.492
	m2				
	Near-term	96.337	95.262	97.093	95.557
	Medium-term	79.975	65.427	89.220	96.091
	Long-term	71.448	39.119	69.898	92.257
	cpi				
	Near-term	0.240	0.008	0.182	0.044
	Medium-term	10.004	1.148	1.430	0.792
	Long-term	10.484	0.862	5.866	2.770
	rgdp				
	Near-term	0.039	0.006	0.024	0.053
	Medium-term	0.376	1.356	1.011	0.715
	Long-term	1.040	1.153	13.359	2.203
	neer				
	Near-term	0.004	0.000	0.000	0.132
	Medium-term	2.963	10.817	1.785	0.112
	Long-term	5.009	19.585	4.766	0.074
Consumer Price Index	*oil*				
	Near-term	46.958	3.734	3.227	2.000
	Medium-term	61.628	27.982	8.480	16.668
	Long-term	56.592	17.707	6.893	8.715
	i				
	Near-term	0.044	0.022	0.000	0.005
	Medium-term	2.129	3.868	1.373	0.371

	Long-term	4.765	10.273	1.779	0.441
	m2				
	Near-term	1.399	0.510	0.001	0.112
	Medium-term	0.556	5.434	13.296	14.275
	Long-term	0.427	11.314	29.733	62.608
	cpi				
	Near-term	51.598	95.734	96.772	97.884
	Medium-term	25.606	54.076	67.213	63.477
	Long-term	22.272	42.676	49.218	24.760
	rgdp				
	Near-term	0.001	0.000	0.000	0.000
	Medium-term	6.293	6.838	2.747	3.841
	Long-term	10.520	16.592	3.027	2.783
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	3.788	1.802	6.891	1.369
	Long-term	5.424	1.438	9.350	0.692
Real GDP	*oil*				
	Near-term	7.599	1.417	10.237	9.023
	Medium-term	4.700	12.461	4.910	4.185
	Long-term	3.131	28.060	4.612	2.051
	i				
	Near-term	1.301	1.976	0.227	0.700
	Medium-term	3.796	7.611	3.392	1.914
	Long-term	7.164	8.694	5.868	2.260
	m2				
	Near-term	41.055	46.231	13.988	16.468
	Medium-term	77.970	56.453	77.727	58.124
	Long-term	74.174	36.247	62.763	71.872
	cpi				
	Near-term	0.015	2.152	0.412	1.244
	Medium-term	7.480	2.345	0.607	0.969
	Long-term	9.405	1.829	2.688	2.013
	rgdp				
	Near-term	50.028	48.225	75.137	72.543
	Medium-term	4.941	8.589	11.918	34.646
	Long-term	3.748	5.537	21.292	20.922
	neer				
	Near-term	0.002	0.000	0.000	0.023
	Medium-term	1.113	12.542	1.446	0.162
	Long-term	2.379	19.633	2.776	0.882

Nominal effective exchange rate	*oil*				
	Near-term	1.484	0.956	12.099	11.612
	Medium-term	5.324	12.206	7.800	5.203
	Long-term	3.384	25.456	8.027	2.688
	i				
	Near-term	1.843	2.839	0.914	1.163
	Medium-term	3.508	5.176	4.724	0.824
	Long-term	9.555	7.253	7.432	1.096
	m2				
	Near-term	58.181	66.426	56.388	27.365
	Medium-term	79.142	70.270	78.750	64.234
	Long-term	73.523	45.124	62.747	70.998
	cpi				
	Near-term	0.088	1.060	0.517	3.109
	Medium-term	7.427	1.424	0.549	0.999
	Long-term	9.439	1.295	3.758	0.579
	rgdp				
	Near-term	23.579	16.576	18.343	21.573
	Medium-term	1.554	2.357	4.369	12.587
	Long-term	1.178	2.321	15.013	8.222
	neer				
	Near-term	14.825	12.143	11.739	35.179
	Medium-term	3.044	8.567	3.807	16.153
	Long-term	2.921	18.552	3.023	16.417

Appendix XXVI: The above results shows the variance decomposition for all the variables when interest rate is the policy tool and only response to Consumer Price Index, Real Gross Domestic Product and Nominal Effective Exchange Rate.

Appendix XXVII

Variance Decomposition - Case 6

Variables/countries		Euro Area	Japan	Korea	Singapore
Oil price	*oil*				
	Near-term	100.000	100.000	100.000	100.000
	Medium-term	81.814	81.706	65.481	71.707
	Long-term	73.608	74.417	58.791	59.546
	i				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	1.510	1.860	0.281	1.649
	Long-term	2.203	2.344	0.526	4.131
	m2				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	1.366	4.040	30.451	9.311
	Long-term	3.904	5.907	35.252	10.937
	cpi				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.571	8.181	0.987	1.715
	Long-term	5.622	8.076	2.229	7.094
	rgdp				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.411	2.369	0.607	4.341
	Long-term	0.547	4.401	1.074	3.010
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	14.329	1.845	2.192	11.276
	Long-term	14.115	4.854	2.128	15.283
Interest rate	*oil*				
	Near-term	6.947	1.633	0.495	0.135
	Medium-term	16.386	1.932	4.791	2.123
	Long-term	12.685	9.196	4.586	1.914
	i				
	Near-term	86.572	98.367	99.151	94.065
	Medium-term	58.735	83.097	67.989	65.694
	Long-term	51.760	70.128	51.221	51.790
	m2				
	Near-term	6.481	0.000	0.354	5.800
	Medium-term	19.924	7.523	22.447	12.246
	Long-term	26.448	7.922	32.227	9.823
	cpi				
	Near-term	0.000	0.000	0.000	0.000

	Medium-term	0.544	5.328	0.799	10.094
	Long-term	3.218	9.809	2.678	19.110
	rgdp				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.324	0.472	1.618	3.454
	Long-term	1.816	1.179	4.318	11.626
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	4.088	1.648	2.356	6.389
	Long-term	4.074	1.766	4.971	5.738
Money supply	*oil*				
	Near-term	0.285	1.059	1.234	0.063
	Medium-term	3.378	14.920	3.083	1.304
	Long-term	3.237	31.373	2.617	2.198
	i				
	Near-term	0.000	5.533	0.000	0.000
	Medium-term	1.208	4.652	0.380	5.854
	Long-term	5.264	5.594	0.574	5.575
	m2				
	Near-term	99.715	93.409	98.766	99.937
	Medium-term	85.312	66.761	91.178	91.300
	Long-term	79.613	40.736	71.158	87.250
	cpi				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	6.681	1.346	2.353	0.815
	Long-term	5.881	0.900	6.821	2.729
	rgdp				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.332	1.326	1.270	0.666
	Long-term	0.602	1.241	14.170	2.188
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	3.089	10.995	1.736	0.062
	Long-term	5.402	20.156	4.660	0.060
Consumer Price Index	*oil*				
	Near-term	46.991	3.673	3.227	2.013
	Medium-term	61.275	29.190	8.678	16.747
	Long-term	56.041	19.261	7.075	8.860
	i				
	Near-term	4.187	0.004	10.076	1.160
	Medium-term	8.337	4.305	3.416	1.878

	Long-term	12.425	10.933	4.172	5.863
	m2				
	Near-term	0.718	0.453	0.198	0.018
	Medium-term	0.441	5.076	14.578	13.310
	Long-term	0.923	10.418	29.175	57.528
	cpi				
	Near-term	48.104	95.870	86.499	96.809
	Medium-term	20.489	52.527	63.329	63.260
	Long-term	15.901	40.640	46.841	24.661
	rgdp				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	5.474	7.128	3.187	3.605
	Long-term	8.930	17.336	3.484	2.533
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	3.985	1.775	6.811	1.200
	Long-term	5.780	1.412	9.253	0.555
Real GDP	*oil*				
	Near-term	7.472	1.804	10.345	8.702
	Medium-term	4.808	10.940	5.196	3.964
	Long-term	3.172	25.868	4.973	1.990
	i				
	Near-term	0.442	2.951	1.899	0.717
	Medium-term	1.514	6.826	0.506	0.895
	Long-term	4.041	7.703	0.577	0.590
	m2				
	Near-term	44.075	45.637	12.972	15.462
	Medium-term	83.667	57.937	78.898	57.733
	Long-term	81.957	38.137	64.142	72.326
	cpi				
	Near-term	0.443	2.343	0.138	1.241
	Medium-term	4.440	2.741	1.138	1.134
	Long-term	5.179	2.087	4.309	2.366
	rgdp				
	Near-term	47.568	47.265	74.645	73.878
	Medium-term	4.457	8.815	12.783	36.088
	Long-term	3.088	5.974	23.291	22.189
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	1.114	12.741	1.478	0.187
	Long-term	2.564	20.231	2.708	0.538

Nominal effective exchange rate	*oil*				
	Near-term	1.413	1.350	12.331	11.156
	Medium-term	5.460	11.157	8.230	5.060
	Long-term	3.426	23.553	8.578	2.579
	i				
	Near-term	0.207	3.899	1.052	0.269
	Medium-term	1.180	4.752	0.531	0.448
	Long-term	5.671	6.467	0.691	0.226
	m2				
	Near-term	61.555	65.461	55.462	29.387
	Medium-term	84.465	71.374	80.685	65.261
	Long-term	82.071	46.988	64.617	72.857
	cpi				
	Near-term	0.716	1.221	0.559	3.800
	Medium-term	4.537	1.662	1.440	0.979
	Long-term	4.910	1.358	5.998	0.668
	rgdp				
	Near-term	21.658	15.977	18.796	23.630
	Medium-term	1.412	2.386	5.221	13.671
	Long-term	0.844	2.571	17.074	9.164
	neer				
	Near-term	14.450	12.091	11.799	31.758
	Medium-term	2.945	8.669	3.894	14.581
	Long-term	3.078	19.064	3.041	14.506

Appendix XXVII: The above results shows the variance decomposition for all the variables when money supply is the policy tool and only response to Oil Price fluctuation.

Appendix XXVIII

Variance Decomposition - Case 7

Variables/countries		Euro Area	Japan	Korea	Singapore
Oil price	*oil*				
	Near-term	100.000	100.000	100.000	100.000
	Medium-term	81.910	81.741	65.809	72.604
	Long-term	74.031	74.449	59.208	60.774
	i				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	1.498	1.916	0.081	1.880
	Long-term	2.107	2.429	0.313	4.497
	m2				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	1.254	5.199	27.487	3.545
	Long-term	3.111	8.324	33.343	5.457
	cpi				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.902	8.901	1.157	2.055
	Long-term	4.259	8.780	2.114	7.657
	rgdp				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.231	0.404	3.290	8.890
	Long-term	2.450	1.174	2.911	6.760
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	14.206	1.839	2.176	11.027
	Long-term	14.042	4.845	2.111	14.855
Interest rate	*oil*				
	Near-term	7.348	1.677	0.474	0.009
	Medium-term	17.253	2.027	4.541	1.362
	Long-term	13.435	9.243	4.327	1.252
	i				
	Near-term	87.638	93.447	98.327	92.341
	Medium-term	60.117	69.891	67.614	64.157
	Long-term	53.336	58.245	50.831	50.565
	m2				
	Near-term	2.714	2.455	1.016	6.393
	Medium-term	6.972	13.820	19.886	15.791
	Long-term	6.847	12.351	23.453	12.551
	cpi				
	Near-term	0.275	0.025	0.001	0.024

	Medium-term	2.742	3.993	0.905	9.538
	Long-term	7.595	8.145	3.074	18.861
	rgdp				
	Near-term	2.025	2.395	0.183	1.232
	Medium-term	8.870	8.622	4.692	2.701
	Long-term	14.752	10.251	13.325	10.988
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	4.046	1.647	2.363	6.452
	Long-term	4.036	1.766	4.990	5.782
Money supply	*oil*				
	Near-term	0.793	1.226	1.560	1.517
	Medium-term	2.935	15.304	3.508	0.833
	Long-term	3.440	31.631	2.930	0.900
	i				
	Near-term	0.100	0.019	0.252	0.151
	Medium-term	1.885	8.844	0.416	7.744
	Long-term	6.586	10.137	0.718	7.506
	m2				
	Near-term	53.653	49.731	83.150	82.180
	Medium-term	52.620	37.098	72.626	71.147
	Long-term	44.665	19.567	53.643	63.191
	cpi				
	Near-term	5.429	0.512	0.091	0.313
	Medium-term	1.388	0.968	1.894	1.104
	Long-term	0.997	0.873	6.200	4.181
	rgdp				
	Near-term	40.025	48.511	14.946	15.838
	Medium-term	38.004	26.825	19.820	19.108
	Long-term	38.820	17.692	31.848	24.160
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	3.168	10.961	1.736	0.064
	Long-term	5.493	20.099	4.660	0.062
Consumer Price Index	*oil*				
	Near-term	47.121	3.675	3.210	2.103
	Medium-term	60.696	29.510	8.399	18.462
	Long-term	55.329	19.628	7.022	11.697
	i				
	Near-term	4.301	0.046	9.892	1.254
	Medium-term	8.606	2.401	3.022	2.107

	Long-term	12.865	6.468	4.592	7.146
	m2				
	Near-term	0.133	0.001	0.102	0.087
	Medium-term	1.214	15.824	15.067	7.337
	Long-term	1.347	34.009	23.420	38.426
	cpi				
	Near-term	48.345	96.277	86.777	96.540
	Medium-term	19.965	50.354	64.784	60.823
	Long-term	14.964	37.749	47.108	23.880
	rgdp				
	Near-term	0.099	0.001	0.018	0.017
	Medium-term	5.534	0.142	1.906	10.084
	Long-term	9.717	0.739	8.593	18.303
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	3.985	1.769	6.822	1.188
	Long-term	5.778	1.407	9.265	0.547
Real GDP	*oil*				
	Near-term	7.511	1.805	10.332	8.562
	Medium-term	4.287	11.163	5.653	5.343
	Long-term	2.925	26.037	5.333	2.607
	i				
	Near-term	0.807	0.029	2.413	0.836
	Medium-term	2.274	11.603	0.780	1.357
	Long-term	5.286	13.220	0.645	1.080
	m2				
	Near-term	0.025	0.001	0.025	0.058
	Medium-term	43.982	19.024	50.176	20.703
	Long-term	41.662	10.419	37.787	35.450
	cpi				
	Near-term	3.905	4.071	0.075	1.626
	Medium-term	0.603	2.412	0.746	2.011
	Long-term	0.658	1.837	3.706	3.935
	rgdp				
	Near-term	87.752	94.094	87.155	88.918
	Medium-term	47.713	43.075	41.167	70.398
	Long-term	46.850	28.286	49.821	56.382
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	1.141	12.723	1.478	0.188
	Long-term	2.619	20.202	2.709	0.547

Nominal effective exchange rate	*oil*				
	Near-term	1.722	1.430	12.858	13.091
	Medium-term	4.661	11.496	8.858	7.814
	Long-term	3.059	23.785	9.063	4.575
	i				
	Near-term	0.514	0.015	1.951	0.121
	Medium-term	1.851	8.736	0.510	0.771
	Long-term	7.097	11.760	0.563	0.487
	m2				
	Near-term	6.337	9.224	25.909	7.467
	Medium-term	49.805	34.362	55.337	33.465
	Long-term	46.705	18.865	41.580	42.514
	cpi				
	Near-term	6.284	2.874	0.278	4.872
	Medium-term	0.805	1.506	0.958	0.839
	Long-term	0.718	1.418	5.298	1.038
	rgdp				
	Near-term	70.681	74.365	47.225	43.027
	Medium-term	39.852	35.252	30.451	42.599
	Long-term	39.275	25.146	40.458	36.852
	neer				
	Near-term	14.463	12.091	11.779	31.421
	Medium-term	3.026	8.648	3.886	14.513
	Long-term	3.146	19.025	3.037	14.534

Appendix XXVIII: The above results shows the variance decomposition for all the variables when money supply is the policy tool and only response to Consumer Price Index.

Appendix XXIX

Variance Decomposition - Case 8

Variables/countries		Euro Area	Japan	Korea	Singapore
Oil price	*oil*				
	Near-term	100.000	100.000	100.000	100.000
	Medium-term	81.877	81.717	67.390	73.678
	Long-term	73.766	74.434	62.186	62.385
	i				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	1.543	1.870	0.088	1.195
	Long-term	2.075	2.359	0.302	3.278
	m2				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	7.800	5.579	4.312	9.905
	Long-term	8.645	6.424	8.254	14.158
	cpi				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.864	8.911	1.233	2.098
	Long-term	4.418	8.785	1.897	7.487
	rgdp				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.262	0.406	2.861	7.775
	Long-term	2.587	1.180	2.335	5.766
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	7.655	1.517	24.115	5.350
	Long-term	8.509	6.819	25.026	6.926
Interest rate	*oil*				
	Near-term	7.023	1.650	0.327	0.003
	Medium-term	16.646	1.956	1.943	1.572
	Long-term	12.916	9.195	1.699	1.457
	i				
	Near-term	89.562	92.982	98.579	96.623
	Medium-term	63.209	69.097	69.934	69.217
	Long-term	56.555	57.532	52.921	54.236
	m2				
	Near-term	1.330	1.535	0.311	2.486
	Medium-term	9.246	4.583	13.744	5.885
	Long-term	8.899	5.653	20.772	4.585
	cpi				
	Near-term	0.142	0.027	0.003	0.015

	Medium-term	2.263	3.993	1.162	9.678
	Long-term	6.889	8.136	3.775	19.021
	rgdp				
	Near-term	1.423	2.648	0.141	0.474
	Medium-term	7.952	9.053	3.917	2.291
	Long-term	13.737	10.669	11.648	10.923
	neer				
	Near-term	0.521	1.158	0.638	0.400
	Medium-term	0.684	11.317	9.300	11.356
	Long-term	1.004	8.815	9.186	9.778
Money supply	*oil*				
	Near-term	0.380	1.119	5.473	3.697
	Medium-term	3.247	15.136	8.370	1.577
	Long-term	3.287	31.591	7.211	0.858
	i				
	Near-term	0.547	0.001	0.224	0.305
	Medium-term	2.844	9.216	0.396	3.914
	Long-term	8.164	10.444	0.691	3.657
	m2				
	Near-term	38.574	28.269	26.853	70.717
	Medium-term	43.573	39.135	27.987	65.636
	Long-term	42.759	30.842	24.477	59.157
	cpi				
	Near-term	4.119	0.500	0.280	0.415
	Medium-term	1.519	0.970	1.571	1.220
	Long-term	1.119	0.873	5.578	4.559
	rgdp				
	Near-term	41.269	48.774	12.173	13.490
	Medium-term	38.075	26.841	16.503	17.614
	Long-term	38.653	17.611	28.337	22.849
	neer				
	Near-term	15.111	21.337	54.997	11.375
	Medium-term	10.743	8.701	45.174	10.039
	Long-term	6.017	8.638	33.707	8.920
Consumer Price Index	*oil*				
	Near-term	47.014	3.674	3.084	2.113
	Medium-term	61.289	29.276	8.825	20.429
	Long-term	56.061	19.371	10.108	14.719
	i				
	Near-term	3.954	0.048	9.775	1.234
	Medium-term	8.392	2.321	2.993	1.509

	Long-term	12.772	6.278	4.499	3.903
	m2				
	Near-term	0.059	0.001	0.031	0.032
	Medium-term	0.184	7.423	1.243	8.929
	Long-term	0.244	15.670	16.562	36.887
	cpi				
	Near-term	48.888	96.275	87.033	96.610
	Medium-term	19.913	50.524	64.554	59.541
	Long-term	14.884	37.892	45.668	23.415
	rgdp				
	Near-term	0.063	0.001	0.014	0.006
	Medium-term	5.058	0.151	1.760	9.363
	Long-term	8.947	0.735	6.883	16.810
	neer				
	Near-term	0.023	0.001	0.063	0.005
	Medium-term	5.163	10.304	20.625	0.229
	Long-term	7.092	20.054	16.280	4.266
Real GDP	*oil*				
	Near-term	7.482	1.804	10.230	8.610
	Medium-term	4.661	11.097	9.077	6.855
	Long-term	3.095	26.052	8.913	3.621
	i				
	Near-term	1.344	0.009	2.266	0.285
	Medium-term	3.317	11.968	0.722	0.304
	Long-term	6.776	13.555	0.620	0.143
	m2				
	Near-term	0.020	0.000	0.007	0.007
	Medium-term	29.570	27.074	10.994	19.542
	Long-term	33.624	23.156	11.737	29.490
	cpi				
	Near-term	3.768	4.075	0.077	1.624
	Medium-term	0.612	2.417	0.579	2.136
	Long-term	0.743	1.839	3.288	4.185
	rgdp				
	Near-term	87.379	94.112	87.405	89.472
	Medium-term	47.516	42.966	38.679	68.646
	Long-term	46.478	28.096	46.926	54.824
	neer				
	Near-term	0.008	0.000	0.015	0.001
	Medium-term	14.325	4.478	39.949	2.517
	Long-term	9.284	7.302	28.515	7.738

Nominal effective exchange rate	*oil*				
	Near-term	1.417	1.350	12.222	11.332
	Medium-term	5.253	11.334	12.128	8.539
	Long-term	3.321	23.750	12.221	5.274
	i				
	Near-term	1.076	0.001	1.775	0.850
	Medium-term	2.812	9.109	0.484	0.262
	Long-term	8.743	12.117	0.566	0.219
	m2				
	Near-term	0.016	0.000	0.006	0.022
	Medium-term	29.879	32.479	7.939	15.976
	Long-term	35.168	27.702	7.458	21.110
	cpi				
	Near-term	5.556	2.856	0.298	4.712
	Medium-term	0.764	1.506	0.774	0.824
	Long-term	0.745	1.417	4.931	1.071
	rgdp				
	Near-term	71.145	74.546	47.799	44.013
	Medium-term	39.851	35.265	28.492	42.281
	Long-term	39.003	25.021	38.369	36.381
	neer				
	Near-term	20.790	21.248	37.900	39.072
	Medium-term	21.441	10.307	50.184	32.118
	Long-term	13.020	9.993	36.454	35.944

Appendix XXIX: The above results shows the variance decomposition for all the variables when money supply is the policy tool and only response to Consumer Price Index, Real Gross Domestic Product and Nominal Effective Exchange Rate.

Appendix XXX

Variance Decomposition - Case 9

Variables/countries		Euro Area	Japan	Korea	Singapore
Oil price	*oil*				
	Near-term	100.000	100.000	100.000	100.000
	Medium-term	81.814	81.706	65.481	71.707
	Long-term	73.608	74.417	58.791	59.546
	i				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	1.558	1.873	0.070	1.230
	Long-term	2.079	2.362	0.327	3.438
	m2				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	7.811	5.586	4.076	10.246
	Long-term	8.655	6.431	8.052	14.996
	cpi				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.802	8.908	1.147	2.020
	Long-term	4.439	8.780	2.136	7.711
	rgdp				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	0.267	0.408	3.481	9.681
	Long-term	2.624	1.184	3.099	7.573
	neer				
	Near-term	0.000	0.000	0.000	0.000
	Medium-term	7.747	1.519	25.744	5.115
	Long-term	8.594	6.826	27.594	6.737
Interest rate	*oil*				
	Near-term	6.947	1.633	0.495	0.135
	Medium-term	16.386	1.932	4.791	2.123
	Long-term	12.685	9.196	4.586	1.914
	i				
	Near-term	89.878	92.987	96.207	96.498
	Medium-term	63.836	69.085	66.133	68.565
	Long-term	57.192	57.501	49.622	53.859
	m2				
	Near-term	1.236	1.537	0.824	2.274
	Medium-term	9.078	4.586	12.624	5.440
	Long-term	8.744	5.654	18.705	4.251
	cpi				
	Near-term	0.121	0.027	0.003	0.005

	Medium-term	2.119	4.002	0.906	9.756
	Long-term	6.687	8.147	3.043	19.058
	rgdp				
	Near-term	1.336	2.656	0.522	0.609
	Medium-term	7.885	9.073	5.347	2.394
	Long-term	13.674	10.688	13.961	10.838
	neer				
	Near-term	0.481	1.160	1.949	0.479
	Medium-term	0.697	11.321	10.199	11.723
	Long-term	1.019	8.815	10.082	10.081
Money supply	*oil*				
	Near-term	0.285	1.059	1.234	0.063
	Medium-term	3.378	14.920	3.083	1.304
	Long-term	3.237	31.373	2.617	2.198
	i				
	Near-term	0.658	0.001	1.497	0.344
	Medium-term	3.014	9.238	1.283	3.689
	Long-term	8.419	10.475	1.565	3.395
	m2				
	Near-term	38.579	28.266	24.302	67.272
	Medium-term	43.227	39.202	25.608	60.255
	Long-term	42.432	30.918	22.180	53.493
	cpi				
	Near-term	3.778	0.492	0.076	0.162
	Medium-term	1.598	0.974	1.925	0.962
	Long-term	1.195	0.873	6.235	3.684
	rgdp				
	Near-term	41.705	48.850	15.400	18.004
	Medium-term	38.215	26.950	20.339	21.679
	Long-term	38.800	17.699	32.097	26.615
	neer				
	Near-term	14.995	21.333	57.492	14.156
	Medium-term	10.568	8.716	47.761	12.112
	Long-term	5.917	8.662	35.306	10.616
Consumer Price Index	*oil*				
	Near-term	46.991	3.673	3.227	2.013
	Medium-term	61.275	29.190	8.678	16.747
	Long-term	56.041	19.261	7.075	8.860
	i				
	Near-term	3.883	0.048	9.581	1.139
	Medium-term	8.345	2.321	2.572	1.523

	Long-term	12.744	6.280	5.421	3.963
	m2				
	Near-term	0.053	0.001	0.082	0.027
	Medium-term	0.178	7.430	1.177	8.698
	Long-term	0.234	15.685	15.040	36.268
	cpi				
	Near-term	48.994	96.276	86.863	96.808
	Medium-term	19.993	50.594	64.590	61.887
	Long-term	14.965	37.965	47.050	24.308
	rgdp				
	Near-term	0.058	0.001	0.052	0.007
	Medium-term	5.007	0.152	1.930	10.860
	Long-term	8.865	0.736	8.525	20.967
	neer				
	Near-term	0.021	0.001	0.194	0.006
	Medium-term	5.202	10.313	21.053	0.285
	Long-term	7.151	20.073	16.889	5.634
Real GDP	*oil*				
	Near-term	7.472	1.804	10.345	8.702
	Medium-term	4.808	10.940	5.196	3.964
	Long-term	3.172	25.868	4.973	1.990
	i				
	Near-term	1.445	0.008	3.280	0.378
	Medium-term	3.503	11.988	1.880	0.339
	Long-term	7.021	13.586	1.312	0.156
	m2				
	Near-term	0.020	0.000	0.028	0.009
	Medium-term	29.358	27.098	9.812	18.340
	Long-term	33.345	23.194	10.585	27.203
	cpi				
	Near-term	3.741	4.074	0.076	1.621
	Medium-term	0.647	2.427	0.772	1.794
	Long-term	0.803	1.847	3.735	3.483
	rgdp				
	Near-term	87.315	94.113	86.204	89.289
	Medium-term	47.550	43.063	41.586	72.420
	Long-term	46.518	28.188	50.258	58.273
	neer				
	Near-term	0.008	0.000	0.066	0.002
	Medium-term	14.135	4.484	40.754	3.143
	Long-term	9.141	7.317	29.138	8.895

Nominal effective exchange rate	*oil*				
	Near-term	1.413	1.350	12.331	11.156
	Medium-term	5.460	11.157	8.230	5.060
	Long-term	3.426	23.553	8.578	2.579
	i				
	Near-term	1.191	0.001	3.744	0.698
	Medium-term	2.988	9.127	1.203	0.245
	Long-term	9.010	12.146	0.953	0.195
	m2				
	Near-term	0.016	0.000	0.032	0.016
	Medium-term	29.663	32.517	7.145	14.958
	Long-term	34.867	27.753	6.749	19.554
	cpi				
	Near-term	5.521	2.855	0.297	4.685
	Medium-term	0.796	1.510	0.992	0.845
	Long-term	0.795	1.417	5.337	0.902
	rgdp				
	Near-term	71.070	74.549	47.279	44.270
	Medium-term	39.907	35.369	31.078	45.191
	Long-term	39.064	25.117	41.069	39.189
	neer				
	Near-term	20.788	21.246	36.318	39.174
	Medium-term	21.186	10.319	51.351	33.700
	Long-term	12.837	10.014	37.314	37.582

Appendix XXX: The above results shows the variance decomposition for all the variables when money supply is the policy tool and only response to Oil Price fluctuation, Consumer Price Index, Real Gross Domestic Product and Nominal Effective Exchange Rate.