OIL PRICE SHOCKS: A COMPARATIVE STUDY ON THE IMPACTS OF OIL PRICE MOVEMENTS IN MALAYSIA AND THE UK ECONOMIES

Mohammad Helmi Hidthiir, Mukhriz Izraf Azman Aziz
and Wan Roshidah Fadzim

Faculty of Economics
Universiti Utara Malaysia

Abstract

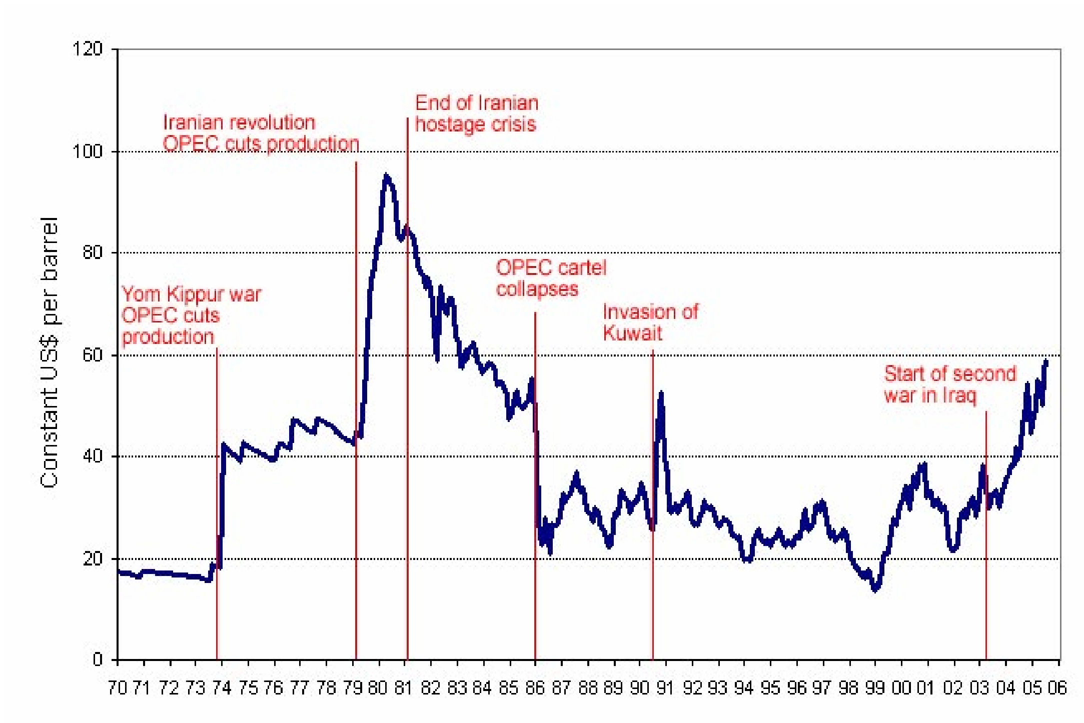
The study investigates the relationship between changes in crude oil prices and Malaysia and the UK macro-economy. A multivariate VAR analysis is carried out among five key macroeconomic variables: real gross domestic product, short term interest rate, real effective exchange rates, long term interest rate and money supply. From the VAR model, the impulse response functions reveal that oil price movements cause significant reduction in aggregate output and increase real exchange rate. The variance decomposition shows that crude oil prices significantly contribute to the variability of real exchange rate long term interest rate in the Malaysia economy while oil price shocks are found to have significant effects on money supply and short term interest rate in the UK economy. Despite these macroeconometric results, caution must be exercised in formulating energy policies since future effects of upcoming oil shocks will not be the same as what happened in the past. Explorations and development of practicable alternatives to imported fuel energy will cushion the economy from the repercussions of oil shocks.

JEL: Q43
Keywords: Oil price fluctuations; Macroeconomic performance, Malaysia, UK

1. General Overview

The 1974-75 US and global recession was triggered by a tripling of the price of oil following the Yom Kippur war, and by the oil embargo that followed (refer to Figure 1). The 1980-81 recessions in the US and the rest of the world was also triggered by a spike in the price of oil following the Iranian revolution in 1979. Similarly, the 1990-91 recessions in the US was partly caused by the spike in the price of oil after the Iraqi invasion of Kuwait in the middle of 1990. The surge in prices in 1999-2000 contributed to the slowdown in global economic activity, international trade and investment in 2000-2001. The disappointing pace of recovery since then is at least partly due to rising oil prices: according to the reports, global GDP growth may have been at least half a percentage point higher in the last two or three years had prices remained at mid-2001 levels.

A permanent oil price shock would clearly have a major impact on the world economy. This should send a message to policymakers around the world to consider ways to tackle demand and improve energy efficiency, in order to reduce the vulnerability of their economies to an oil price shock. Oil price shocks would normally affect macroeconomic performance through a number of channels. First, higher oil prices transfer income from oil-importing countries to oil-exporting countries through a shift in the terms of trade. This results in a loss of real income for oil-importing countries. Second, higher oil prices reduce industry output through higher costs of production. Third, they directly increase inflation via higher prices of imported goods and petroleum products. If higher inflation leads to an upward spiral in wages, central banks would be forced to raise interest rates.



Source*: Federal Reserve Bank of St. Louis, and Bureau of Labor Statistics.*

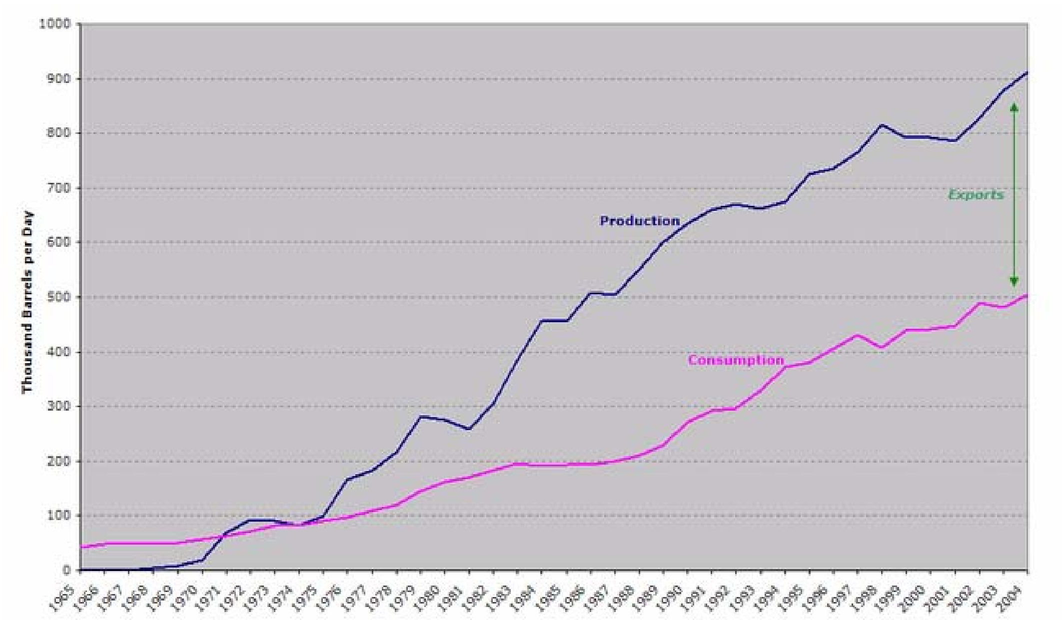
Figure 1: Real Crude Prices - January 1970 to July 2005

Malaysia as a Net Exporter of Oil

Over the last two decades, Malaysia has been a net exporter of natural gas and crude petroleum among the non-OPEC countries. Malaysia becomes important to world energy markets because of its huge oil and natural gas resources. The country has the world's 13th largest natural gas reserves and 24th largest crude oil reserves. In total, Malaysia has six oil refineries, with a total capacity of 514,500 barrels per day. As evident from Figure 2, domestic production consistently exceeds the local consumption of oil in Malaysia since 1971 to 2004. The excess of oil produce in Malaysia was exported to neighboring countries such as Singapore, South Korea, Thailand and Japan.

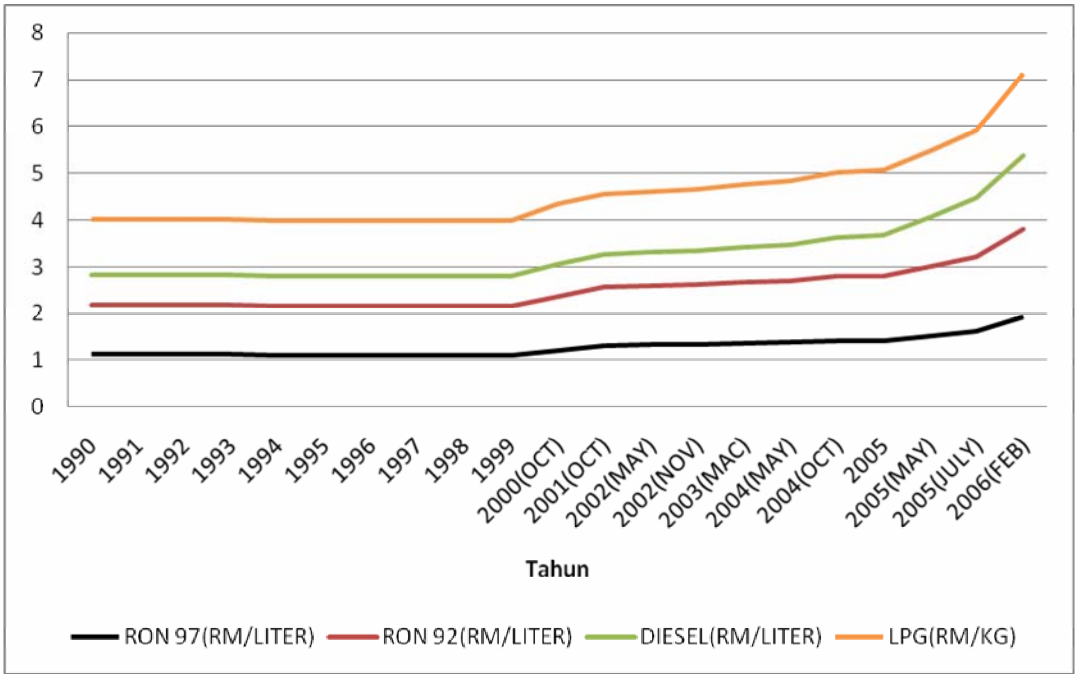
The recent rise in the oil price (of both crude oil and products) is one of series of large shifts in price that have occurred during the last 30 years. From a relative "low" price of RM1.10 in 1999 for fuel price RON 97, it escalated to RM1.92 per liter in 2006 (refer to Figure 3). Although Malaysia is a country produces and exports oil, it is not a member of OPEC, or a major oil producing country. Thus, Malaysia has no influence on how the price of oil is determined in the international market. If there is a large increase in oil prices on the world market, it affects the price of petroleum products such as diesel, petrol and cooking gas (LPG) in our country.

Higher oil price causes different impacts to both net oil importers and net oil exporters in this world (combining both crude and products). The effect of the oil shock is expected to lower world GDP because of the reduced purchasing power by the oil importers to balance higher oil import costs will not fully offset by increased demand for imports from oil exporters. Therefore, GDP of most oil importing countries fall as their exports of other goods will fall as well. As a net exporter of oil, oil price shocks will impede the growth of trade between Malaysia and other countries, especially for oil importing countries like U.S., China, Japan and Europe. Economic slowdown in these countries will limit their demand of consumers' and thus affect Malaysia exports of goods and services.



Source*: BP Statistical Review of World Energy June 2005.*

Figure 2: Domestic Oil Production and Consumption (1965-2004)



Source*: Ministry of Domestic Trade and Consumer Affairs Malaysia*

Figure 3: Fuel Prices (Malaysia)-1990-2006

The United Kingdom as a Net Exporter of Oil

The UK has been a net exporter of crude oil since 1981. According to the British Department of Trade and Industry (DTI), the largest destinations of crude oil exports in 2004 were the United States (28 percent), the Netherlands (21 percent), Germany (17 percent), and France (14 percent). According to *Oil and Gas Journal (OGJ),* the UK had 4.0 billion barrels of proven crude oil reserves in 2006, the most of any EU member country. Since Britain established itself as an oil exporter in 1981, revenues from the North Sea have helped strengthen the country's current account. At their peak, oil-export revenues accounted for more than 20 per cent of total trade goods exports in the early 1980s, according to research from ING Financial Markets.
However, the importance of oil to the UK economy has declined slightly over the past two decades, with oil's contribution to total energy consumption falling from in 37 percent in 1983 to 35 percent in 2003. In June 2006, Britain officially became a net importer of oil for the first time in 11 years when local production was not sufficient to meet local demand for oil (refer to Figure 4). Data published by the UK Department for Trade and Industry (DTI) showed that the UK imported oil during every month in 2006 except for June. DTI forecasts that the UK will export oil for a few months during 2007 and see a decline in domestic oil production. Although oil demand marginally exceeded indigenous production in 2006, the UK is expected to return to self-sufficiency in 2007-2008 and still provide 90 % of its need in 2010. According to the

Office for National Statistics, the surge in oil imports has widened UK's trade deficit to £6.7 billion in 2006. The increase in trade deficit was made worse as fuel price in the UK skyrocketed in the last 5-year period. In 2007, the current price of fuel in the UK is 88 pence per liter compared to just 77 pence per liter in 2000 (refer to Figure 5).

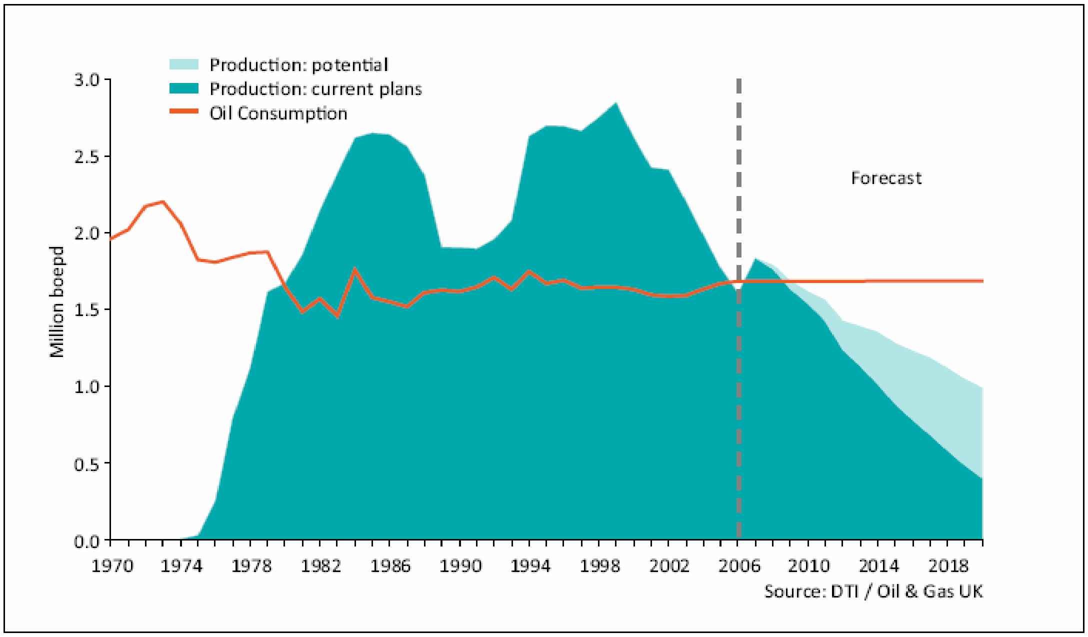


Figure 4: UK Oil Production & Consumption, 1970-2006

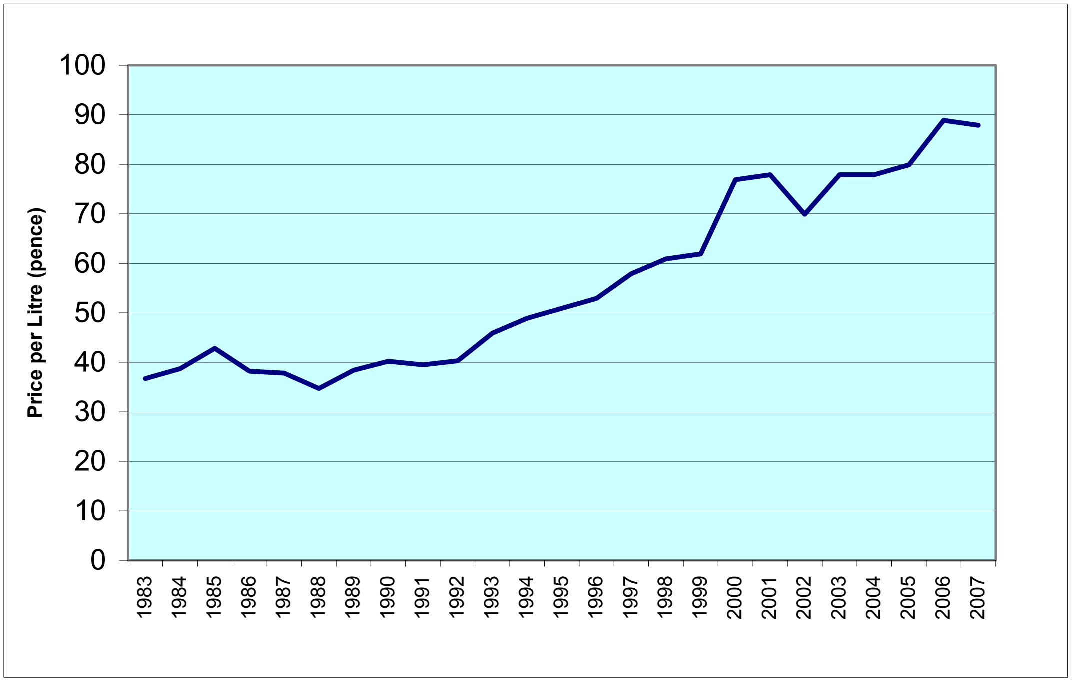


Figure 5: Fuel Prices (UK)-1983-2007

2. Statement of Topic

Today, oil prices remain an important macroeconomic variable: higher prices can still inflict substantial damage on the economies of oil-importing countries and on the global economy as a whole. A clear negative correlation between oil prices and aggregate measures of output or employment has been reported by Hamilton (1983), Burbidge and Harrison (1984), Rotemberg and Woodford (1996), (Abeysinghe, 2001), among others. Analyses of microeconomic data sets at the level of individual industries, firms, or workers also demonstrate significant correlations between oil price shocks and output, employment, or real wages (Steven J. Davis & Haltiwanger, 2001; Steven J Davis, Prakash, & Ramamohan, 1996; Keane & Prasad, 1996; Lee & Ni, 2002). However, the magnitude to which the volatility of oil prices affects the open economies depends on whether the economy is a net importer or exporter of oil (Abeysinghe 2001).

The UK and Malaysia are net oil exporters among the non-OPEC countries. Over the last several years, the governments of UK and Malaysia have reaped substantial profit brought about by the high world crude oil prices. However, studies have shown that the economy of these countries were not all that resilient to higher oil prices than in the past. The UK revealed a surprising behavior: while it is expected that an oil price shock has positive effects on the GDP growth for a net oil exporting country, an oil price increase of 100% actually leads to a loss of British GDP growth rate of more than 1% after the first year in all specifications (Jiménez-Rodríguez & Sánchez, 2004). An extensive literature has highlighted that this unexpected result has to do with the fact that oil price hikes led to a large real exchange rate appreciation of the pound (Dutch disease). Similarly, (Abeysinghe, 2001) concluded that although the direct impact of high oil prices on Malaysia is positive, it cannot escape the contractionary effect on growth coming through the trading partners. In the long run, Malaysia would also lose out.

3. Objectives of the Study

Generally, this research investigates the impacts of oil price changes to the economies of Malaysia and the UK. This study aims to find out if the volatility of macroeconomics are due to the fluctuations in oil prices. Also it will employ simulation techniques (impulse response functions) to see what will be the results of an oil price shock to the variables in the model, how long will such effects last and when can we expect the maximum repercussions.

4. Significance of the Study

There are several reasons that justify the interest in the oil price and macroeconomic relationship in Malaysia and the UK. First, most of the papers on the effect of oil prices are applied to the US case or OECD countries and only a few papers study the Asian economies (Abeysinghe, 2001; Mehrara & Oskoui, 2007)**.** Second, this study will include only the net oil exporters (Malaysia and UK), which could help us to examine whether the oil price–macroeconomy relationship in net oil exporting countries are different than that of the oil importing countries. Third the results of this study will add to the dearth of existing economic literature on this subject, as this paper tries to employ updated economic specifications on oil price-macroeconomy linkage.

5. Review of Related Literature

Since the first oil shock in 1973/74, much research has been undertaken into the oil price–macroeconomy nexus. These studies have reached different conclusions over time. Earlier works (Hamilton, 1983; Burbidge and Harrison, 1984) have achieved statistically significant empirical relationships between oil prices and aggregate economic performance, principally GDP/ GNP growth. Hamilton (1983) propounded three hypotheses for oil-shock and output correlation: (1) historical coincidence, (2) endogeneity of crude oil prices, and (3) causal influence of an exogenous increase in the price of crude petroleum. Econometric results showed that there was insignificant evidence that the correlation was neither a consequence of coincidence nor a set of influences that triggered oil shocks and recessions. The causal interpretation leads to the conclusion that the characteristics of the pre-1973 recessions would have been different if such energy shocks and disruptions did not come about (Hamilton 1983).

Meanwhile Burbidge and Harrison (1984) tested the effects of increases in oil prices using a seven-variable vector autoregression (VAR) model for five countries (United States, Japan, Germany, United Kingdom and Canada) in the Organization for Economic Cooperation and Development (OECD) using monthly data from January 1961 to June 1982. They found out that substantial effects of oil-price shocks on price level were evident on the U.S. and Canadian economies and with great pressure on industrial production on U.S. and U.K. They also pointed out that the oil shock in 1973 only worsened the incoming recession of that period.

Following the collapse of oil prices in 1986, it was argued that the oil price–macroeconomy relationship has weakened. In addition, an asymmetric oil price–macroeconomy relationship was established (Mork, 1989). Mork (1989) extended Hamilton's study by using a longer data sample and taking into account oil price controls existed during the 1970s. Furthermore, he looked into the possibility of an asymmetric response to oil price increases as well as decreases. The results showed that GNP growth was correlated with the circumstances of the oil market and that oil price declines were not statistically significant as oil price increases.

Mork, Olsen and Mysen (1994) applied essentially the same model as Mork (1989) to the experience of seven OECD countries over the period 1967:3-1992:4. Their model also included the contemporaneous oil price and five quarterly lags for price increases and decreases separately. For the United States, the contemporaneous price increase and the first and second lags were significant, and of negative sign. Five of the other six countries; Japan, West Germany, France, Canada, and the United Kingdom had roughly similar patterns of coefficients, while Norway had positive, statistically significant elasticities for both price increases and decreases.

Later studies from 1995 onwards devoted much attention to investigate the weakening of the oil price–macroeconomy relationship. Particularly, (Lee & Ni, 1995) and Hooker (1996, 1999) argued strongly that the fundamental oil price–macroeconomic relationship identified in earlier studies had eroded. It is noted that much of the research on oil price– macroeconomy relationship have been done concentrating on either the United States (US) or Organization for Economic Cooperation and Development economies. However, a recent study by (Hui & Kliesen, 2005) proved the opposite. They found that a volatility measure constructed using daily crude oil futures prices had a negative and significant effect on future gross domestic product (GDP) growth of the US over the period 1984-2004. This finding, which is consistent with the nonlinear effect documented by Hamilton (2002), means that an increase in the price of crude oil from, say, $40 to $50 per barrel generally matters less than increased uncertainty about the future direction of prices (increased volatility). This finding implies that crude oil price volatility is mainly driven by exogenous (random) events such as significant terrorist attacks and military conflicts in the Middle East.

When almost all researches dealt with the effects of oil prices, as measured in levels or in logarithmic form, on key macroeconomic variables, (Ferderer, 1996) used oil price volatility (monthly standard deviations of daily oil prices) to assess movements in U.S. aggregate output. He also took note of the monetary channel through which oil prices affect the economy by including federal funds rate and non-borrowed reserves to capture the monetary policy stance during oil shocks. Results showed that contractionary monetary policy in reaction to oil price increases partly explains the correlation between oil and output. However, sectoral shocks and uncertainty channels, but not monetary policy channel, provide partial explanation to the asymmetric relationship between oil price changes and output growth (Ferderer, 1996).

To date, most of the empirical studies carried out were focused on the oil importing economies, particularly the developed economies. Few studies exist yet on the effect of oil price shock on key macroeconomic variables for oil exporting countries. Generally, studies conducted on oil exporting countries found that the effects of oil price shocks exerts positive impacts on GDP in the short run although the adverse consequences are more likely to be felt in the long run ((Abeysinghe, 2001; Mehrara & Oskoui, 2007; Olomola & Adejumo, 2006). In fact, some countries like Kuwait, Indonesia and Nigeria were less prone to macroeconomic instability brought about by the oil price disturbances. The results could be attributed to the relatively successful experience of in the use of stabilization and savings fund and the right structural reforms (Mehrara & Oskoui, 2007).

6. Theoretical Framework

Volatility of oil prices has negative repercussions on the aggregate economy as abundantly shown by economic literature. An oil price shock, as a classic example of an adverse supply shock, i.e. an increase in oil prices shifts the aggregate supply upward, results to a rise in price level and a reduction in output and employment (Dornbusch, Fisher and Startz 2001). On the other hand, aggregate demand decreases as higher commodity prices translate to lower demand for goods and services, resulting to contraction in aggregate output and employment level. The macroeconomic effects of oil shocks are transmitted via supply and demand side channels and are potentially minimized by economic policy reactions.

Supply Side Channel

Since oil is a factor of production in most sectors and industries, a rise in oil prices increases the companies' production costs and thus, stimulates contraction in output (Jimenez-Rodriguez and Sanchez 2004). Given a firm's resource constraints, the increase in the prices of oil as an input of production reduces the quantity it can produce. Hunt, Isard and Laxton (2001) add that an increase in input costs can drive down non-oil potential output supplied in the short run given existing capital stock and sticky wages. Moreover, workers and producers will counter the declines in their real wages and profit margins, putting upward pressure on unit labor costs and prices of finished goods and services.

In addition, oil price volatility shrinks investment activities in production of oil and gas (Verleger 1994 as cited from Raguindin & Reyes, 2005). Verleger (1994) as cited from Raguindin & Reyes (2005) adds that a "permanent increase in volatility might lead to a situation where future capacity will always be a little lower than in a world of zero price volatility and prices a little higher". Hamilton (1996) shares the same point and stresses that concerns on oil prices variability and oil supply disruptions could cause postponement of investment decisions in the economy.

Demand Side Channel

As presented earlier, oil price increases translate to higher production costs, leading to commodity price increases at which firms sell their products in the market. Higher commodity prices then translate to lower demand for goods and services, therefore shrinking aggregate output and employment level.

Furthermore, higher oil prices affect aggregate demand and consumption in the economy. The transfer of income and resources from an oil-importing to oil-exporting economies is projected to reduce worldwide demand as demand in the former is likely to decline more than it will rise in the latter (Hunt, Isard and Laxton 2001). The resulting lower purchasing power of the oil-importing economy translates to a lower demand. Also, oil price shocks pose economic uncertainty on future performance of the macroeconomy. People may postpone consumption and investment decisions until they see an improvement in the economic situation. In sum, an increase in oil prices causes a leftward shift in both the demand and supply curve, resulting to higher prices and lower output.

Economic Policy Reactions

The effects of oil price increases on headline and core inflation may stimulate the tightening of monetary policy (Hunt, Isard and Laxton 2001). Authorities have the policy tools to minimize, if not totally eliminate, the adverse effects of such shock. The Central Bank (CB) has its key policy interest rates that can influence demand and inflation directions in the economy. However, pursuing one policy can be counterproductive; when CB cuts its interest rate, demand rises, but at the expense of higher inflation, and vice versa.

The credibility of the monetary authorities in responding to oil shocks is at stake when monetary policy reactions appeared inconsistent with the announced policy objectives. As a result, inflation expectation and process are disrupted (Hunt, Isard and Laxton 2001). Money supply plays a role on the negative correlation between oil prices and economic activity. By means of the real money balances channel, increases in oil prices cause inflation which, in turn, reduces the quantity of real balances in the economy (Ferderer 1996). Ferderer (1996) further noted that "counterinflationary monetary policy responses to oil price shocks are responsible for the real output losses associated with these shocks".

7. Empirical Method

This section presents the empirical method used in this paper to assess the oil price- macroeconomy relationship of the Malaysia and the UK economies. First, data definition and limitation are discussed. Second, a vector autoregression (VAR) model was constructed using historical data to capture the behavior of the macroeconomy given oil price fluctuations. Impulse response functions were examined to trace out the response of the dependent variable in the VAR model to shocks in the error terms. Variance decomposition technique was done to evaluate the relative importance of oil price fluctuations on the volatility of the other variables in the model.

The Data

This paper used quarterly data for the period 1992:2 to 2006:4 of five macroeconomic variables and oil price variables to capture economic behavior. The model includes output and exchange rate variables (real gross domestic product (RGDP) and real effective exchange rate (REER), three monetary variables namely money supply (M1), long term interest rate (GBOND5) and short term interest rate (TBILLS3) and the oil price variable (ROIL). RGDP, ROIL and REER were expressed in logarithmic form while M1, GBONDS5 and TBILLS3 were expressed in levels. The data sets were obtained from the International Finance Statistics (IFS), Economic Planning Unit (EPU), Statistics Department of Malaysia and the Economic and Social Research Council (ESRC) of the UK.

Definition of Terms

Five of the most commonly used terms in this research are defined as follows:

1. Gross Domestic Product (RGDP) is a measure of total output within the geographic limits of the country, regardless of the nationality of the producers of output.
2. Real Effective Exchange Rate (REER) index of the Ringgit Malaysia

(RM) and the British Pound Sterling are the Nominal Effective Exchange Rate Index (NEERI) of the RM and Pound adjusted for inflation rate differentials with the countries whose currencies comprise the NEERI basket.

3. Short Term Interest Rate (TBILLS) interest rates on loan contracts-or debt

4. Long Term Interest Rate (GBONDS) is the interest rate earned by a note or bond that matures in 10 or more years.

5. Money supply (M1) is currency plus demand deposits.

Oil Price Variable

A number of studies used different oil price variables to account for the effects of these shocks on economic activity. Hamilton (1983) used the quarterly changes in nominal Producer's Price Index (PPI) for crude petroleum. Burbidge and Harrison (1984) employed a relative price of oil computed as the ratio of Saudi Arabian crude cost (US$) to the CPI of the country under studied. Mork (1989) used the refiner acquisition cost (RAC) for crude oil and PPI. Ferderer (1996) used the monthly means and standard deviations of prices for refined petroleum products (deflated by CPI) as the real oil price and oil price volatility, respectively. Abeysinghe (2001) proposed different definitions of oil price variables4 and finally modeled the oil price in first-log-difference of oil price (in US$) multiplied by the country's exchange rate. He pointed out that the other real oil price definition appears to be a poor proxy for the relative oil price because of the direct dependence of CPI to oil price. Hooker (1996a) and Jimenez-Rodriguez and Sanchez (2004) both used oil prices in real terms but the former also included nominal PPI for crude petroleum in his regression model.

Most of the international cross-country analysis used the US$ world oil price in real terms (PPI for crude oil divided by PPI for all commodities) or the world oil price transformed into each country's currency through the exchange rate. However, only the latter recognizes the different effects of oil prices on each country due to exchange rate volatility or level of inflation. Furthermore, as noted by Cunado and de Gracia (2004), oil prices converted into each country's currency produced more significant impacts on variables under study.

The Vector Autoregression (VAR) Model

A number of the studies cited made use of vector autoregression models. This technique treats all variables in the system as endogenous and regresses each current (non-lagged) variable in the model on all the variables in the model lagged a certain number of times.

The study employs the following VAR model of order p (VAR (p)):

$$\mathbf{Yt = c + \Sigma\ AiYt\text{-}1 + \varepsilon t\ ,}$$

where Yt is a (n x 1) vector of endogenous variables, c is the intercept vector of the VAR, Ai is the i^{th} matrix of autoregressive coefficients and εt is the generalization of a white noise process. The study estimated two sets of VAR models which incorporated the linear and nonlinear specifications of oil price response to economic activity. The first VAR model used the oil price variable measured as the log - first-difference of crude oil.

VAR Applications

A six-variable vector autoregression model is presented to examine the sources of variations and fluctuations in the Malaysian and British economies triggered by oil prices. The first step of our analysis is to test for stationarity – to investigate the existence of unit roots in our statistical series by calculating the Augmented Dickey-Fuller Test (ADF Test). This test is based on autoregressive models that always include an intercept and generally a trend component. A large negative test statistic rejects the null hypothesis and implies that the time series is stationary.

The Akaike information criterion (AIC) will be used to compare the performance of the VAR with various lag length specifications. Both variance decomposition and impulse responses will be utilized to assess the relationship between oil price shocks and aggregate economic activity. A variance decomposition provide the variance of forecast errors in a given variable to its own shocks and those of the other variables in the VAR. It allows us to assess the relative importance of oil price shocks to the volatility of the other variables. Impulse response functions allow us to examine the dynamic effects of oil price shocks on Malaysian and the British macroeconomies. It traces over time the expected responses of current and future values of each of the variables to a shock in one of the VAR equations.

8. Results and Discussion

In this section, the preliminary tests and data transformations are presented. Moreover, the empirical results obtained from the estimated VAR models using linear oil price specifications are discussed. The impulse response functions and variance decompositions obtained from the estimated VAR models are also expounded.

Presentation of Results

Tests of Stationarity

Econometric analysis using time-series data necessitates stationarity. To have stationary representations of the VAR models, each variable was tested for unit roots specification using the augmented Dickey-Fuller (ADF) test. Table 1 and 2 provide the unit root regression results in levels and first-differences of the variables entered in the model and the corresponding critical value of 10%, 5% or 1% to reject the null hypothesis of the presence of a unit root.

Integration Test for Malaysia

The ADF statistics in Table 1 suggest that all six variables are integrated of order one, whereas the first-differenced are integrated of order zero. These non-stationary variables were transformed by taking their first differences in order to exhibit stationarity, indicating that the mean, variance and covariance of the time series are independent of time.

Table 1: Unit Root tests for Malaysia

	Level		**First Difference**	
	Lag	ADF Statistics	Lag	ADF Statistics
REER(log)	3	-2.48	1	-5.19***
RGDP(log)	8	-1.57	6	-3.89**
ROIL(log)	5	-1.34	4	-4.57***
BOND5	1	-2.43	0	-5.59***
TBILLS3	3	-3.13	4	-3.70**
M1	7	0.86	6	-4.23***

Notes: We denote with one/two/three asterisks the rejection of the null hypothesis of the presence of unit root at a 10% / 5% / 1% critical levels. The calculated statistics are those computed in MacKinnon (1991).

Integration Test for the UK

Table 2 provides the unit root regression results for the UK. Only TBILLS was stationary in levels. The remaining variables, namely REER, RGDP, ROIL, GBONDS and M1 are observed to be non-stationary at all significance levels but exhibit stationarity after the variables were transformed by taking their first difference, indicating that the mean, variance and covariance of the time series are independent time

Table 2. Unit Root Tests for the UK

	Level		First Difference	
	Lag	ADF Statistics	Lag	ADF Statistics
REER(log)	1	-3.468220	0	-5.028596***
RGDP(log)	4	-1.793612	2	-6.685978***
ROIL(log)	6	-1.877920	8	-4.004531**
GBONDS	0	-1.415146	9	-3.398853*
TBILLS	1	-5.112596***	3	-4.097873**
M1	4	-0.181758	2	-6.287692***

Notes: We denote with one/two/three asterisks the rejection of the null hypothesis of the presence of unit root at a 10% / 5% / 1% critical levels. The calculated statistics are those computed in MacKinnon (1991).

Optimal Lag Length

Next, the Akaike Information Criterion (AIC) was used to assess the performance of the VAR model with varying lag length specifications. The optimal lag length is the one that minimizes the AIC. The AIC showed that the optimal lag length is six (6) for VAR models of Malaysia and the UK (refer to Table 3 and Table 4)

Table 3. Identifying the Optimal Lag Length using the Akaike Information Criterion (AIC) for Malaysia

VAR order *p* (VAR(*p*))	**AIC using Linear Oil Price Specification**
1	12.800
2	12.468
3	12.153
4	11.055
5	10.448
6	9.423*

** optimal lag length*

Table 4. Identifying the Optimal Lag Length using the Akaike Information Criterion (AIC) for the UK

VAR order *p* (VAR(*p*))	AIC using Linear Oil Price Specification
1	8.439174
2	8.412971
3	8.125289
4	8.250974
5	7.871888
6	6.088328*

** optimal lag length*

9. Impulse Response Function

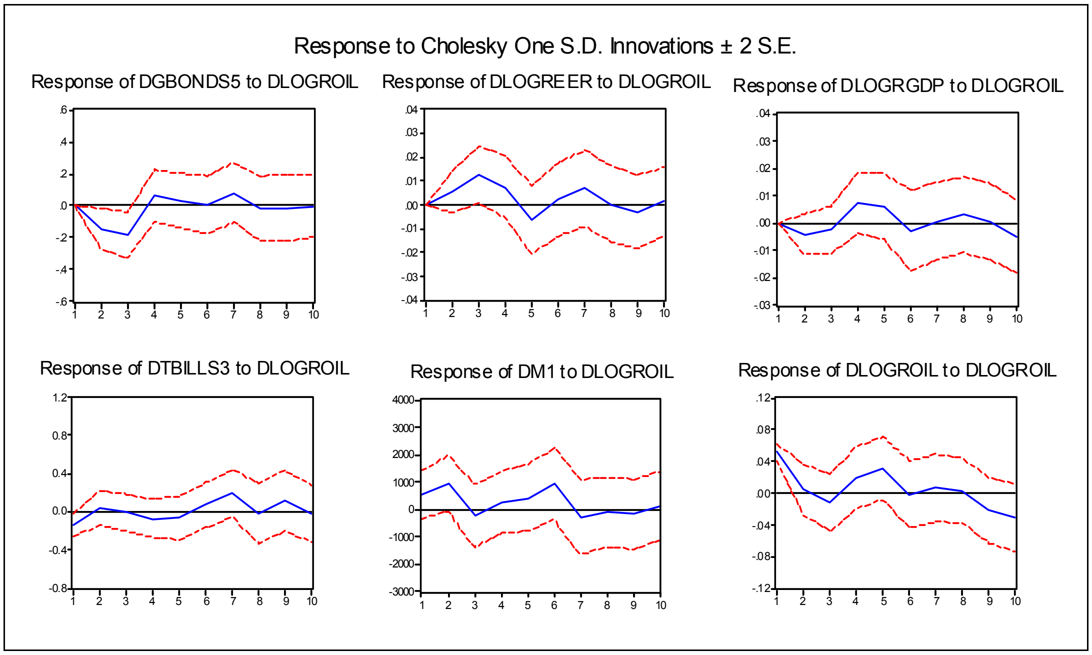
An impulse response function (IRF) was computed from the coefficients of vector regression using orthogonalized set of residuals. IRF traces the effect of one standard deviation shock to one of the innovations on current and future values of each of the endogenous variables in the system.

IRF: Malaysia

Generally, most of the variables show an increase during the first few quarters, with the exception of real GDP, GBONDS and ROIL. Chart 1 presents the IRFs generated from the VAR model using the linear specification of crude oil prices and show that a positive oil price shock leads to a decline in real GDP, long term interest rate and real oil price, persisting for three (3) quarters after which, the three variables recover. Money supply and short term interest rate increase a quarter (with the exception of real exchange rate which increases for three consecutive periods) after an oil price shock. However, such increase do not last long (i.e., M1 and TBILLS3 go back to its pre-shock level between

the third and fourth quarters) while REER goes back to pre-shock level between four and fifth quarter.

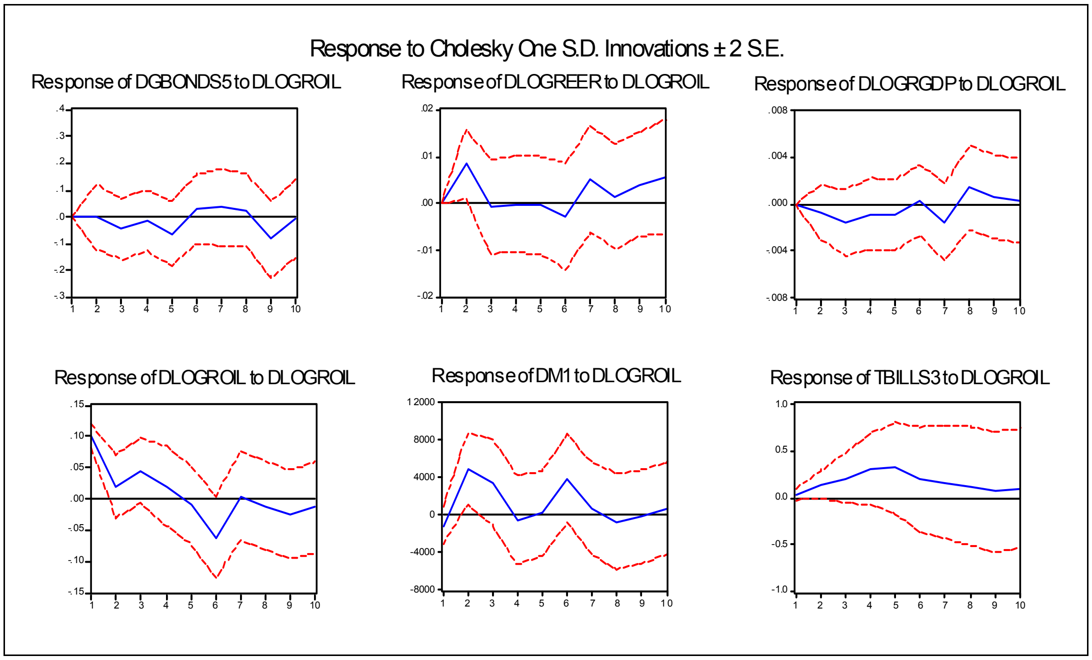
Chart 1 : Multiple Graphs of IRFs for the Malaysia



IRF: The United Kingdom

Chart 2 shows that a positive oil price shock leads to an increase in money supply and real exchange rate that continues for two (2) quarters after which, the two variables start to decline. The effects on short term interest rates are more pronounced for five quarters after which the variable starts to decrease. In contrast, real GDP and long term interest rates decrease continuously for the first three quarters return to the pre-shock level after the sixth quarter.

Chart 2 : Multiple Graphs of IRFs for the United Kingdom



10. Variance Decomposition Analysis

Variance decomposition (VCOM) represents the VAR system dynamics by giving information about the relative importance of each random innovation to the variables in the model. It shows how much of the unanticipated changes or variations of the variables in the model are explained by different shocks.

VCOM: Malaysia

Table 5 shows the variance decomposition of the VAR model specification for Malaysia. It suggests that oil price shocks contribute a relatively large share on the long-term interest rate and reel effective exchange rate. In most cases, if not at all times, the variable itself are the largest source of its own variation in succeeding periods.

The largest effect of an oil shock to a variable's variation is on long-term interest rate (GBONDS5), accounting for approximately 18 percent in the third, fourth and the fifth period. Likewise, crude oil prices account for 11 percent of real exchange rate volatility.

Meanwhile, crude oil prices are marginal sources of variation of short-term interest rate (TBILLS3). Volatility of money supply (M1) due to oil price fluctuations is accounted for 8 percent. Changes in real GDP and TBILLS3 are nominal, accounting for only 5 percent and 4 percent respectively.

.

Table 5: Variance Decomposition of Malaysia

Variance Decomposition of DGBONDS5:

Period	S.E.	DGBONDS5	DLOGREER	DLOGRGDP	DLOGROIL	DM1	DTBILLS3
1	0.387060	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.452598	73.36755	8.405591	0.392457	10.32563	7.305384	0.203387
3	0.551273	55.68356	14.23091	1.389421	18.35258	8.936622	1.406901
4	0.576996	51.57630	13.00661	1.426504	17.89365	11.78292	4.314011
5	0.595348	49.68548	15.86917	1.780212	17.08974	11.14166	4.433740
6	0.613694	47.67375	15.84813	2.058740	16.08744	12.46156	5.870373
7	0.721995	35.41632	26.78769	9.434622	12.90560	10.33838	5.117391
8	0.735914	37.22048	25.96283	9.081654	12.47635	10.33249	4.926195
9	0.754609	35.44578	26.30599	10.29315	11.89478	10.67045	5.389840
10	0.760375	34.99902	25.92424	10.15663	11.71640	11.80470	5.399011

Variance Decomposition of DLOGREER:

Period	S.E.	DGBONDS5	DLOGREER	DLOGRGDP	DLOGROIL	DM1	DTBILLS3
1	0.027329	0.420084	99.57992	0.000000	0.000000	0.000000	0.000000
2	0.037224	7.207481	84.04267	1.480140	2.106084	0.061265	5.102355
3	0.042560	7.707934	67.13180	6.911585	10.53874	0.490966	7.218970
4	0.046660	6.990419	55.88171	17.21988	11.26861	1.615689	7.023693
5	0.048630	8.554091	53.35681	16.33308	12.03733	2.748102	6.970590
6	0.049888	9.475787	52.77477	16.46513	11.64162	2.612706	7.029985
7	0.051304	9.120086	49.92779	17.63943	12.81156	3.147054	7.354084
8	0.053761	8.539151	48.05806	20.38061	11.66936	4.645253	6.707572
9	0.054448	8.335549	46.85604	21.13907	11.65806	5.367985	6.643295
10	0.055322	9.219322	45.39311	21.68875	11.35319	5.395117	6.950512

Variance Decomposition of DLOGRGDP:

Period	S.E.	DGBONDS5	DLOGREER	DLOGRGDP	DLOGROIL	DM1	DTBILLS3
1	0.023747	25.35844	1.855485	72.78608	0.000000	0.000000	0.000000
2	0.024686	23.53049	1.725629	68.90299	2.963048	0.187889	2.689948
3	0.031039	15.90507	2.863959	47.42554	2.528568	20.20145	11.07541
4	0.038064	10.67423	4.599596	35.50117	5.276667	36.52410	7.424234
5	0.043533	11.48197	8.428186	39.69090	5.938410	28.23685	6.223681
6	0.043830	11.36416	8.784818	39.51971	6.294759	27.85612	6.180428
7	0.044276	11.15092	9.412440	38.76488	6.193436	27.48247	6.995852
8	0.045414	12.40343	9.033758	37.47316	6.297613	26.70395	8.088090
9	0.046006	12.71277	8.868857	37.77316	6.148196	26.55470	7.942321
10	0.047706	12.49818	8.545409	39.68916	6.826758	24.91470	7.525795

Variance Decomposition of DLOGROIL:

Period	S.E.	DGBONDS5	DLOGREER	DLOGRGDP	DLOGROIL	DM1	DTBILLS3
1	0.104360	16.22930	9.375746	49.72110	24.67386	0.000000	0.000000
2	0.110585	14.69785	11.51660	47.96505	22.16008	0.412675	3.247751
3	0.121006	13.28934	9.756355	40.06452	19.51155	13.30922	4.069022
4	0.134012	11.69204	14.00016	34.14546	18.13640	18.42067	3.605275
5	0.141290	12.68851	12.66521	31.01807	21.17845	19.12566	3.324112
6	0.152308	15.22940	14.53969	31.21164	18.23206	17.45417	3.333036
7	0.156323	14.79078	14.45366	30.00165	17.47983	17.30513	5.968954
8	0.160911	14.26585	16.56483	29.41947	16.52926	17.57194	5.648652
9	0.171160	12.82524	17.20926	29.52281	16.22376	18.95567	5.263257
10	0.180343	12.09190	18.82829	28.76068	17.58036	17.08703	5.651748

Variance Decomposition of DM1:

Period	S.E.	DGBONDS5	DLOGREER	DLOGRGDP	DLOGROIL	DM1	DTBILLS3
1	3173.314	0.410160	0.122443	0.164949	2.675519	96.62693	0.000000
2	3781.515	2.434399	11.94742	2.298119	8.086050	68.30473	6.929282
3	3953.647	2.228720	11.69133	4.932238	7.805233	66.77084	6.571647
4	4149.506	3.360047	13.96155	5.939803	7.437183	61.61016	7.691261
5	4437.369	2.945044	12.48326	7.547085	7.344196	61.66425	8.016159
6	4621.168	3.537306	11.63200	7.473340	10.85408	57.22430	9.278977
7	4731.851	4.044121	11.24063	7.728814	10.73072	55.26502	10.99069
8	4783.201	3.971602	11.43772	9.137297	10.57190	54.10469	10.77679
9	4866.620	4.026767	11.65524	10.28346	10.35752	53.19159	10.48542
10	4951.189	3.892343	11.26306	11.72932	10.05870	52.31191	10.74466

Variance Decomposition of DTBILLS3:

Period	S.E.	DGBONDS5	DLOGREER	DLOGRGDP	DLOGROIL	DM1	DTBILLS3
1	0.564874	32.25162	1.773093	2.021081	5.934930	13.65581	44.36346
2	0.636540	28.11644	3.168592	1.954189	5.050826	11.12939	50.58056
3	0.722571	37.00004	6.429786	2.307933	3.943642	8.709978	41.60862
4	0.771008	40.59434	5.652772	2.097676	4.326100	8.071199	39.25791
5	0.839632	36.62706	7.879996	1.780582	4.206408	7.620308	41.88565
6	0.919246	30.59014	8.874240	6.630448	4.073321	14.82115	35.01070
7	1.100322	21.95222	21.25557	13.86817	5.806236	12.66052	24.45729
8	1.166955	20.55892	20.21157	12.91157	5.184751	19.37900	21.75420
9	1.228963	18.53694	22.50739	15.35915	5.534653	18.43696	19.62491
10	1.235854	18.51414	22.25928	15.19807	5.492101	18.50901	20.02741

VCOM: The United Kingdom

Table 6 shows the variance decomposition of the VAR model specification for United Kingdom. The results represent the proportion of forecast error variance of a variable due to one standard deviation shock of ROIL and its own and the rest of the variables. An innovation to ROIL is an important source of variation in M1, TBILLS3 and REER respectively.

The largest effect of an oil shock to a variable's variation is on money supply, accounting for about 28 percent. Variation in M1 occurs in the third period due to innovation in ROIL but converge to about 26 percent after seven years. Meanwhile, the ROIL innovation has dominant effect on TBILLS3 and REER, accounting for 19 percent variation and 10 percent in the fifth period respectively. Crude oil prices are marginal sources of variation of RGDP and GBONDS5. Volatility of RGDP and GBONDS5 due to oil price fluctuations is accounted for 7 percent and 6 percent respectively.

Table 6 Variance Decomposition of the UK

Variance Decomposition of DGBONDS5:

Period	S.E.	DGBONDS5	DLOGREER	DLOGRGDP	DLOGROIL	DM1	TBILLS3
1	0.263930	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.267665	97.27079	0.153755	0.218870	0.010039	2.236817	0.109729
3	0.289514	83.59062	4.733056	0.552863	2.496286	7.295558	1.331618
4	0.300440	79.35807	8.810001	1.161661	2.533169	6.862612	1.274484
5	0.324501	69.55347	11.32235	5.122739	5.919066	6.096128	1.986237
6	0.357257	58.62029	10.23116	6.621515	5.470334	17.26298	1.793728
7	0.362402	57.89647	10.50603	6.437179	6.270863	17.12391	1.765554
8	0.373351	57.02995	12.55629	6.135891	6.327215	16.16429	1.786369
9	0.394295	52.24491	11.38789	5.516886	10.16145	18.75158	1.937283
10	0.395925	51.85968	11.36423	6.006886	10.10240	18.72729	1.939512

Variance Decomposition of DLOGREER:

Period	S.E.	DGBONDS5	DLOGREER	DLOGRGDP	DLOGROIL	DM1	TBILLS3
1	0.015299	16.01903	83.98097	0.000000	0.000000	0.000000	0.000000
2	0.021772	30.34249	44.98215	1.756106	14.75219	7.352159	0.814904
3	0.023326	32.15865	40.35253	1.784668	12.93054	10.64523	2.128377
4	0.024136	30.68346	38.25627	2.033075	12.08247	14.72237	2.222363
5	0.026671	37.81461	31.52156	3.068862	9.921183	12.28484	5.388952
6	0.027347	36.02869	30.71183	3.327989	10.46923	12.23065	7.231613
7	0.028410	34.09901	29.30146	3.084465	12.97375	13.56690	6.974427
8	0.029028	33.21677	29.46962	3.172201	12.66216	14.03727	7.441978
9	0.030947	34.54754	25.99561	6.335030	12.91572	12.77123	7.434863
10	0.032236	33.29673	23.99084	5.900460	15.12190	13.96378	7.726292

Variance Decomposition of DLOGRGDP:

Period	S.E.	DGBONDS5	DLOGREER	DLOGRGDP	DLOGROIL	DM1	TBILLS3
1	0.004799	2.005915	1.934003	96.06008	0.000000	0.000000	0.000000
2	0.006523	2.836313	2.005086	87.82251	1.034704	6.291020	0.010363
3	0.007573	4.134765	5.875766	65.30586	5.168586	12.12440	7.390620
4	0.007768	5.362197	7.218849	62.44451	6.010872	11.89523	7.068336
5	0.007911	5.239766	7.520838	60.95905	7.165134	11.99524	7.119979
6	0.008424	4.630422	7.435686	57.98504	6.486057	15.72572	7.737075
7	0.009375	15.19091	6.031284	48.16119	7.870015	16.20843	6.538166
8	0.009683	14.98206	7.692894	46.06749	9.454242	15.48081	6.322497
9	0.009725	14.87150	7.984639	45.67354	9.803840	15.35147	6.315011
10	0.009991	14.89508	7.993634	43.33066	9.383545	18.27512	6.121968

Variance Decomposition of DLOGROIL:

Period	S.E.	DGBONDS5	DLOGREER	DLOGRGDP	DLOGROIL	DM1	TBILLS3
1	0.108431	3.201290	0.050771	10.62713	86.12081	0.000000	0.000000
2	0.116096	3.238757	0.071480	16.31252	78.12255	2.221655	0.033043
3	0.140850	4.296323	1.919305	24.63135	63.47996	2.155618	3.517442
4	0.146739	3.990683	2.428011	24.19261	60.46869	2.024565	6.895440
5	0.152568	3.900287	5.243734	25.18562	56.36088	2.709636	6.599838
6	0.173222	5.731159	7.131963	20.61606	56.24037	5.154639	5.125807
7	0.174870	5.919596	7.259947	20.91704	55.26480	5.079452	5.559161
8	0.176205	5.878874	7.572502	21.07919	54.85390	5.003133	5.612400
9	0.184689	6.252709	6.923919	23.18487	51.73932	5.745090	6.154093
10	0.193004	6.188445	8.081240	26.62606	47.87598	5.533337	5.694943

Variance Decomposition of DM1:

Period	S.E.	DGBONDS5	DLOGREER	DLOGRGDP	DLOGROIL	DM1	TBILLS3
1	7605.364	1.672856	3.974970	5.195018	2.415294	86.74186	0.000000
2	10530.82	6.958169	9.187002	2.731246	23.18020	54.45733	3.486051
3	11523.87	8.169628	7.685194	2.613655	28.37244	49.96367	3.195404
4	11705.98	8.378402	7.895441	2.616655	27.75229	49.99946	3.357752
5	12354.82	10.80641	7.962793	4.573446	24.93448	48.37945	3.343426
6	13302.83	11.13886	6.890825	4.001481	30.07731	42.55883	5.332697
7	14098.59	12.67783	6.141567	9.505815	26.94910	38.76339	5.962307
8	14404.72	13.28711	7.609457	9.122226	26.06177	38.19817	5.721268
9	14632.56	13.24792	7.374333	8.841959	25.27688	38.15379	7.105115
10	14756.28	13.02830	7.261916	8.985993	25.07346	37.98804	7.662289

Variance Decomposition of TBILLS3:

Period	S.E.	DGBONDS5	DLOGREER	DLOGRGDP	DLOGROIL	DM1	TBILLS3
1	0.227389	5.787912	2.800180	0.435810	2.166916	12.97446	75.83472
2	0.486955	4.334319	6.729335	0.160799	9.017336	18.32595	61.43226
3	0.735760	2.140633	9.555577	0.800366	11.94014	23.68239	51.88089
4	0.963813	1.562815	13.86019	0.921096	17.20927	26.45384	39.99279
5	1.161897	3.174902	14.22448	1.031478	19.27417	29.95179	32.34319
6	1.277640	5.219096	14.18582	1.445341	18.15953	32.65434	28.33587
7	1.371040	6.660635	13.08940	1.888853	17.27286	35.96981	25.11845
8	1.426010	8.008718	12.12104	2.263946	16.72499	37.33873	23.54257
9	1.442073	8.197622	11.95875	2.233100	16.54557	37.77846	23.28650
10	1.454673	8.075042	11.96663	2.209885	16.70644	37.76017	23.28184

11. Conclusion

The study estimated the relationship between crude oil price movements and key macroeconomic variables in the Malaysia and the UK economies using linear vector auto regression model. Impulse Response functions and variance decomposition are obtained for both countries to assess how oil price shocks move through major channels of the Malaysia and UK economies and how much shocks contribute to the variability of the variables in the system. Five macroeconomics variables were taken into consideration: Real Effective Exchange Rate (REER), Real Gross Domestic Product (RGDP), Short Term Interest rate (TBILLS3), long term interest rate (GBONDS5) and money supply (M1), together with world crude oil prices.

The accumulated impulse responses obtained from the linear oil price specification indicate that oil price movements lead to decline in real GDP, long term interest rate for both countries. However, only marginal impacts are seen in short-term interest rate, money supply and REER for Malaysia and the UK.

The variance decomposition estimated from the VAR model of the UK shows that oil price fluctuations significantly contribute to the variability of money supply, short-term interest rate and REER. In the case of Malaysia oil price movements played are greater role in variability of long-term interest rate and REER. However crude oil prices are only marginal sources of the variation of RGDP for both Malaysia and the UK.

Nevertheless, given these results obtained from the study, energy policies to be formulated must not assume that future effects of upcoming oil shocks will be the same as what happened from the past. Therefore the manner by which oil price fluctuations passed through the major economic channels in the past will not essentially provide how Malaysia economy will be affected by future oil price shocks. Nevertheless, analyzing how economic policy reactions that were previously done amidst these shocks will show how effective a certain monetary or fiscal policy in minimizing their adverse effects.

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Appendix 1
VAR Output Table : Malaysia

VECTOR AUTOREGRESSION ESTIMATES
Date: 11/14/07 Time: 11:47
Sample (adjusted): 1994Q1 2006Q4
Included observations: 52 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	DGBONDS5	DLOGREER	DLOGRGDP	DLOGROIL	DM1	DTBILLS3
DGBONDS5(-1)	0.146959	0.031698	-4.14E-05	-0.01162	2405.515	0.674996
	-0.2876	-0.02031	-0.01765	-0.07754	-2357.92	-0.41973
	[0.51098]	[1.56097]	[-0.00235]	[-0.14980]	[1.02018]	[1.60818]
DGBONDS5(-2)	0.421467	-0.02092	0.031438	0.066871	2183.439	0.94199
	-0.25332	-0.01789	-0.01554	-0.0683	-2076.81	-0.36969
	[1.66380]	[-1.16945]	[2.02284]	[0.97908]	[1.05135]	[2.54808]
DGBONDS5(-3)	-0.21954	-0.02884	0.009168	-0.05041	346.274	-0.51171
	-0.25628	-0.0181	-0.01572	-0.0691	-2101.14	-0.37402
	[-0.85663]	[-1.59377]	[0.58311]	[-0.72949]	[0.16480]	[-1.36815]
DGBONDS5(-4)	-0.59152	-0.01467	-0.02146	-0.006	-1585.8	-0.02714
	-0.26116	-0.01844	-0.01602	-0.07042	-2141.14	-0.38114
	[-2.26495]	[-0.79539]	[-1.33954]	[-0.08514]	[-0.74064]	[-0.07120]
DGBONDS5(-5)	0.095046	0.028222	0.007114	-0.01454	838.0551	0.933999
	-0.3003	-0.0212	-0.01842	-0.08097	-2462.05	-0.43826
	[0.31650]	[1.33102]	[0.38614]	[-0.17963]	[0.34039]	[2.13114]
DGBONDS5(-6)	0.290597	-0.00867	0.01984	0.108914	2327.779	0.317407
	-0.28403	-0.02005	-0.01743	-0.07658	-2328.61	-0.41451
	[1.02313]	[-0.43251]	[1.13854]	[1.42222]	[0.99964]	[0.76574]
DLOGREER(-1)	-0.90526	0.744244	0.231037	0.982128	37082.78	6.02119
	-3.34581	-0.23624	-0.20527	-0.9021	-27430.6	-4.88285
	[-0.27057]	[3.15042]	[1.12552]	[1.08871]	[1.35188]	[1.23313]
DLOGREER(-2)	2.451311	-0.58803	0.312714	0.540236	13069.22	-6.0418

	-4.25241	-0.30025	-0.26089	-1.14654	-34863.4	-6.20594
	[0.57645]	[-1.95847]	[1.19863]	[0.47119]	[0.37487]	[-0.97355]
DLOGREER(-3)	-2.26435	-0.25099	-0.13446	0.094452	-3733.01	1.605754
	-4.44594	-0.31391	-0.27277	-1.19873	-36450.1	-6.48838
	[-0.50931]	[-0.79955]	[-0.49296]	[0.07879]	[-0.10241]	[0.24748]
DLOGREER(-4)	4.270233	0.138666	0.156144	-1.61185	3196.65	11.11622
	-3.9058	-0.27578	-0.23963	-1.05309	-32021.7	-5.7001
	[1.09331]	[0.50282]	[0.65161]	[-1.53059]	[0.09983]	[1.95018]
DLOGREER(-5)	-5.30607	0.030189	-0.19281	0.290391	22829.51	4.660494
	-3.61815	-0.25547	-0.22198	-0.97553	-29663.4	-5.28031
	[-1.46652]	[0.11817]	[-0.86860]	[0.29767]	[0.76962]	[0.88262]
DLOGREER(-6)	2.261611	0.271423	0.14269	-0.82957	4214.111	10.83095
	-3.5273	-0.24905	-0.21641	-0.95104	-28918.6	-5.14772
	[0.64117]	[1.08983]	[0.65936]	[-0.87227]	[0.14572]	[2.10403]
DLOGRGDP(-1)	8.24329	0.095353	0.584663	1.259738	-9585.38	6.539045
	-6.54479	-0.46211	-0.40154	-1.76462	-53657.4	-9.55143
	[1.25952]	[0.20634]	[1.45607]	[0.71389]	[-0.17864]	[0.68461]
DLOGRGDP(-2)	6.473658	-0.93578	0.14014	1.292619	-21185.8	-11.5651
	-5.05623	-0.357	-0.31021	-1.36327	-41453.5	-7.37904
	[1.28033]	[-2.62121]	[0.45176]	[0.94817]	[-0.51107]	[-1.56729]
DLOGRGDP(-3)	-6.46742	0.179064	-0.64356	-0.53644	-41120.8	-9.87478
	-3.59854	-0.25408	-0.22078	-0.97025	-29502.6	-5.25168
	[-1.79724]	[0.70475]	[-2.91498]	[-0.55290]	[-1.39380]	[-1.88031]
DLOGRGDP(-4)	4.943162	0.009045	0.727893	-0.56516	-8707.6	8.149195
	-4.1719	-0.29456	-0.25595	-1.12484	-34203.4	-6.08845
	[1.18487]	[0.03071]	[2.84384]	[-0.50243]	[-0.25458]	[1.33847]
DLOGRGDP(-5)	0.063041	-0.21418	-0.41646	-0.09184	23234.13	-6.83816
	-5.2623	-0.37155	-0.32285	-1.41883	-43143	-7.67977
	[0.01198]	[-0.57643]	[-1.28994]	[-0.06473]	[0.53854]	[-0.89041]
DLOGRGDP(-6)	-2.22428	0.452025	-0.15187	-2.50868	-5270.63	5.892895
	-4.67986	-0.33043	-0.28712	-1.26179	-38367.8	-6.82976
	[-0.47529]	[1.36799]	[-0.52895]	[-1.98819]	[-0.13737]	[0.86283]
DLOGROIL(-1)	-2.52054	0.062816	-0.10677	0.009605	13535.38	-0.44883
	-1.17417	-0.0829	-0.07204	-0.31658	-9626.45	-1.71358
	[-2.14665]	[0.75769]	[-1.48208]	[0.03034]	[1.40606]	[-0.26193]
DLOGROIL(-2)	-1.72902	0.334015	-0.09411	-0.34966	-3877.43	2.932521
	-1.1946	-0.08435	-0.07329	-0.32209	-9793.96	-1.7434

	[-1.44736]	[3.96001]	[-1.28403]	[-1.08559]	[-0.39590]	[1.68207]
DLOGROIL(-3)	2.041461	-0.02975	0.083769	0.206307	9453.997	2.197446
	-0.9196	-0.06493	-0.05642	-0.24794	-7539.31	-1.34205
	[2.21995]	[-0.45812]	[1.48477]	[0.83207]	[1.25396]	[1.63738]
DLOGROIL(-4)	0.232851	-0.15633	-0.00011	0.168225	-641.091	-1.97789
	-1.04035	-0.07346	-0.06383	-0.2805	-8529.27	-1.51827
	[0.22382]	[-2.12828]	[-0.00168]	[0.59973]	[-0.07516]	[-1.30272]
DLOGROIL(-5)	-0.87144	0.010286	-0.06651	-0.45978	-8326.68	-2.0717
	-0.9496	-0.06705	-0.05826	-0.25603	-7785.33	-1.38585
	[-0.91769]	[0.15340]	[-1.14155]	[-1.79579]	[-1.06954]	[-1.49490]
DLOGROIL(-6)	-0.35321	-0.01813	-0.00691	0.401742	-201.005	0.586552
	-0.95824	-0.06766	-0.05879	-0.25836	-7856.12	-1.39845
	[-0.36860]	[-0.26802]	[-0.11747]	[1.55495]	[-0.02559]	[0.41943]
DM1(-1)	-4.28E-05	-1.79E-06	-3.77E-07	-5.82E-06	-0.2389	-5.73E-05
	-3.50E-05	-2.40E-06	-2.10E-06	-9.30E-06	-0.28361	-5.00E-05
	[-1.23862]	[-0.73323]	[-0.17768]	[-0.62421]	[-0.84236]	[-1.13467]
DM1(-2)	2.62E-05	3.67E-06	2.07E-06	8.83E-06	0.264471	1.01E-06
	-3.50E-05	-2.50E-06	-2.10E-06	-9.40E-06	-0.28466	-5.10E-05
	[0.75502]	[1.49796]	[0.97330]	[0.94300]	[0.92908]	[0.01985]
DM1(-3)	4.79E-05	-2.38E-06	5.33E-06	8.64E-06	-0.19759	8.07E-06
	-3.30E-05	-2.30E-06	-2.00E-06	-8.90E-06	-0.27191	-4.80E-05
	[1.44378]	[-1.01758]	[2.61981]	[0.96630]	[-0.72668]	[0.16679]
DM1(-4)	-5.14E-05	7.17E-08	-2.16E-06	-3.40E-06	0.382333	-7.79E-05
	-3.90E-05	-2.70E-06	-2.40E-06	-1.00E-05	-0.3186	-5.70E-05
	[-1.32162]	[0.02614]	[-0.90611]	[-0.32433]	[1.20003]	[-1.37330]
DM1(-5)	3.63E-05	1.40E-06	-2.72E-07	1.64E-06	0.204201	9.90E-05
	-3.40E-05	-2.40E-06	-2.10E-06	-9.30E-06	-0.28249	-5.00E-05
	[1.05421]	[0.57648]	[-0.12864]	[0.17700]	[0.72287]	[1.96877]
DM1(-6)	1.59E-05	4.11E-07	1.19E-06	1.29E-05	-0.02444	3.96E-05
	-3.80E-05	-2.70E-06	-2.30E-06	-1.00E-05	-0.30956	-5.50E-05
	[0.42089]	[0.15419]	[0.51491]	[1.27054]	[-0.07894]	[0.71930]
DTBILLS3(-1)	-0.05425	-0.02235	-0.01076	-0.05297	-2645.73	-0.66917
	-0.19582	-0.01383	-0.01201	-0.0528	-1605.41	-0.28577
	[-0.27705]	[-1.61641]	[-0.89575]	[-1.00326]	[-1.64801]	[-2.34161]
DTBILLS3(-2)	-0.04162	0.02361	-0.02766	-0.05293	-1336.27	-0.08681
	-0.18647	-0.01317	-0.01144	-0.05028	-1528.8	-0.27214
	[-0.22318]	[1.79324]	[-2.41773]	[-1.05266]	[-0.87406]	[-0.31900]

DTBILLS3(-3)	-0.06725	0.02125	-0.00127	0.006455	994.0692	0.310156
	-0.21862	-0.01544	-0.01341	-0.05895	-1792.39	-0.31906
	[-0.30760]	[1.37664]	[-0.09500]	[0.10951]	[0.55460]	[0.97210]
DTBILLS3(-4)	0.067281	0.02034	0.015084	0.052714	2345.907	-0.1802
	-0.18942	-0.01337	-0.01162	-0.05107	-1552.96	-0.27644
	[0.35520]	[1.52083]	[1.29798]	[1.03215]	[1.51061]	[-0.65186]
DTBILLS3(-5)	0.27818	-0.01837	-0.00213	-0.01178	-1254	-0.39611
	-0.20555	-0.01451	-0.01261	-0.05542	-1685.21	-0.29998
	[1.35333]	[-1.26551]	[-0.16862]	[-0.21246]	[-0.74412]	[-1.32046]
DTBILLS3(-6)	-0.15567	-0.02079	-0.01072	-0.03109	-641.559	-0.39346
	-0.22406	-0.01582	-0.01375	-0.06041	-1836.92	-0.32699
	[-0.69478]	[-1.31442]	[-0.78014]	[-0.51460]	[-0.34926]	[-1.20329]
C	-0.1808	-0.00467	0.007956	-0.00189	2588.503	0.224938
	-0.18268	-0.0129	-0.01121	-0.04925	-1497.68	-0.2666
	[-0.98974]	[-0.36232]	[0.70988]	[-0.03833]	[1.72834]	[0.84373]
R-squared	0.797278	0.809538	0.910507	0.777126	0.768087	0.832683
Adj. R-squared	0.310745	0.352428	0.695725	0.242229	0.211496	0.431122
Sum sq. resids	2.247236	0.011203	0.008459	0.163366	1.51E+08	4.786233
S.E. equation	0.38706	0.027329	0.023747	0.10436	3173.314	0.564874
F-statistic	1.638693	1.770991	4.239204	1.452852	1.379986	2.073615
Log likelihood	7.895309	145.7281	153.0341	76.05343	-460.713	-11.7618
Akaike AIC	1.119411	-4.18185	-4.46285	-1.50206	19.14282	1.875454
Schwarz SC	2.507796	-2.79346	-3.07446	-0.11367	20.53121	3.263839
Mean dependent	-0.03308	-0.00493	0.015387	0.016689	1910.225	-0.03923
S.D. dependent	0.466218	0.033961	0.04305	0.119885	3573.643	0.748931
Determinant resid covariance (dof adj.)		0.000169				
Determinant resid covariance		9.75E-08				
Log likelihood		-22.9873				
Akaike information criterion		9.422589				
Schwarz criterion		17.7529				

Appendix 2
VAR Output Table: UK

VECTOR AUTOREGRESSION ESTIMATES
Date: 11/14/07 Time: 11:57
Sample (adjusted): 1994Q1 2006Q4
Included observations: 52 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	DGBONDS5	DLOGREER	DLOGRGDP	DLOGROIL	DM1	TBILLS3
DGBONDS5(-1)	0.043493	-0.03491	-4.77E-03	0.010352	-3020.91	0.027865
	-0.21303	-0.01235	-0.00387	-0.08752	-6138.73	-0.18354
	[0.20416]	[-2.82689]	[-1.23065]	[0.11828]	[-0.49211]	[0.15182]
DGBONDS5(-2)	-0.11144	0.007337	0.004192	-0.06155	-917.551	-0.08099
	-0.20491	-0.01188	-0.00373	-0.08418	-5904.56	-0.17654
	[-0.54387]	[0.61769]	[1.12521]	[-0.73110]	[-0.15540]	[-0.45875]
DGBONDS5(-3)	-0.12879	0.015897	0.003082	0.023158	-4970.84	0.073377
	-0.21853	-0.01267	-0.00397	-0.08978	-6297.12	-0.18827
	[-0.58934]	[1.25500]	[0.77567]	[0.25794]	[-0.78938]	[0.38973]
DGBONDS5(-4)	-0.19078	-0.04394	-0.00273	-0.10695	2050.012	-0.20992
	-0.23028	-0.01335	-0.00419	-0.09461	-6635.72	-0.1984
	[-0.82846]	[-3.29206]	[-0.65207]	[-1.13047]	[0.30894]	[-1.05810]
DGBONDS5(-5)	-0.02941	0.019459	-0.00862	0.103463	8803.312	0.217679
	-0.23528	-0.01364	-0.00428	-0.09666	-6779.88	-0.20271
	[-0.12501]	[1.42677]	[-2.01403]	[1.07035]	[1.29845]	[1.07386]
DGBONDS5(-6)	-0.15785	0.001392	0.009411	-0.07521	-5930.82	-0.29484
	-0.20801	-0.01206	-0.00378	-0.08546	-5993.86	-0.17921
	[-0.75886]	[0.11549]	[2.48857]	[-0.88005]	[-0.98948]	[-1.64522]
DLOGREER(-1)	1.446518	0.344325	-0.05251	-0.02517	274101.1	4.338685
	-3.19106	-0.18497	-0.05802	-1.31099	-91952.9	-2.74925
	[0.45330]	[1.86152]	[-0.90499]	[-0.01920]	[2.98089]	[1.57813]
DLOGREER(-2)	-4.01004	0.447388	0.179644	-1.28713	113613.1	2.317899
	-3.88856	-0.2254	-0.0707	-1.59755	-112052	-3.35018
	[-1.03124]	[1.98485]	[2.54095]	[-0.80569]	[1.01393]	[0.69187]
DLOGREER(-3)	-5.16562	0.28495	0.017754	0.195037	52591.15	8.842071
	-3.58832	-0.208	-0.06524	-1.4742	-103400	-3.09151
	[-1.43956]	[1.36997]	[0.27213]	[0.13230]	[0.50862]	[2.86011]
DLOGREER(-4)	-3.67257	-0.20965	-0.04436	-1.29713	110251.5	-4.01672
	-3.38267	-0.19608	-0.0615	-1.38971	-97474.2	-2.91433
	[-1.08570]	[-1.06923]	[-0.72124]	[-0.93338]	[1.13108]	[-1.37826]

DLOGREER(-5)	-0.52296	0.393996	-0.01287	1.270323	-11448.6	3.872609
	-3.12685	-0.18125	-0.05685	-1.28462	-90102.7	-2.69393
	[-0.16725]	[2.17379]	[-0.22633]	[0.98887]	[-0.12706]	[1.43753]
DLOGREER(-6)	-4.83275	-0.33642	-0.001	-0.66815	28856.1	-3.12386
	-2.3824	-0.1381	-0.04332	-0.97877	-68650.7	-2.05255
	[-2.02852]	[-2.43612]	[-0.02306]	[-0.68265]	[0.42033]	[-1.52194]
DLOGRGDP(-1)	5.177295	0.310335	-0.67728	3.869635	-135704	-10.7675
	-11.9919	-0.69511	-0.21803	-4.92668	-345557	-10.3316
	[0.43173]	[0.44645]	[-3.10637]	[0.78544]	[-0.39271]	[-1.04218]
DLOGRGDP(-2)	-0.66116	0.70993	-0.30145	9.856458	-499885	-16.3334
	-14.094	-0.81696	-0.25625	-5.79027	-406129	-12.1426
	[-0.04691]	[0.86899]	[-1.17638]	[1.70224]	[-1.23085]	[-1.34513]
DLOGRGDP(-3)	5.563017	-0.20864	-0.26712	-1.38323	-1163723	-18.9813
	-17.7855	-1.03094	-0.32337	-7.30687	-512502	-15.323
	[0.31278]	[-0.20238]	[-0.82605]	[-0.18931]	[-2.27067]	[-1.23874]
DLOGRGDP(-4)	-2.74862	-1.11809	-0.23768	0.212498	-828638	-21.6885
	-17.0087	-0.98591	-0.30924	-6.98773	-490118	-14.6538
	[-0.16160]	[-1.13407]	[-0.76859]	[0.03041]	[-1.69069]	[-1.48006]
DLOGRGDP(-5)	12.33894	-2.15237	-0.40925	8.257371	-660755	-23.8749
	-15.0193	-0.8706	-0.27307	-6.17042	-432792	-12.9398
	[0.82154]	[-2.47229]	[-1.49867]	[1.33822]	[-1.52672]	[-1.84507]
DLOGRGDP(-6)	13.6068	-2.18931	-0.0026	0.311092	-179924	-13.9877
	-14.7076	-0.85253	-0.26741	-6.04236	-423810	-12.6713
	[0.92516]	[-2.56803]	[-0.00971]	[0.05149]	[-0.42454]	[-1.10389]
DLOGROIL(-1)	-0.10185	0.07136	-0.00937	0.226339	45651.04	0.772393
	-0.59856	-0.0347	-0.01088	-0.24591	-17248	-0.51569
	[-0.17016]	[2.05675]	[-0.86132]	[0.92042]	[2.64674]	[1.49779]
DLOGROIL(-2)	-0.13782	-0.02792	-0.00117	0.358964	31768.12	-0.27094
	-0.57291	-0.03321	-0.01042	-0.23537	-16508.7	-0.49359
	[-0.24055]	[-0.84065]	[-0.11231]	[1.52511]	[1.92432]	[-0.54893]
DLOGROIL(-3)	0.283771	0.029031	-0.00603	0.17773	6679.093	1.044405
	-0.54254	-0.03145	-0.00986	-0.22289	-15633.7	-0.46742
	[0.52304]	[0.92313]	[-0.61153]	[0.79738]	[0.42722]	[2.23439]
DLOGROIL(-4)	-0.67728	0.055015	0.001593	-0.20894	3224.964	-0.61729
	-0.58267	-0.03377	-0.01059	-0.23938	-16790.1	-0.502
	[-1.16238]	[1.62888]	[0.15035]	[-0.87282]	[0.19208]	[-1.22966]

DLOGROIL(-5)	0.843396	0.020681	0.007998	-0.30409	1682.757	-0.34669
	-0.51812	-0.03003	-0.00942	-0.21286	-14930.1	-0.44639
	[1.62780]	[0.68860]	[0.84898]	[-1.42859]	[0.11271]	[-0.77667]
DLOGROIL(-6)	-0.25526	0.062573	-0.00421	0.241931	27067.95	1.218894
	-0.58321	-0.03381	-0.0106	-0.2396	-16805.7	-0.50246
	[-0.43768]	[1.85096]	[-0.39673]	[1.00972]	[1.61065]	[2.42584]
DM1(-1)	-5.13E-06	-7.19E-07	-2.27E-07	2.57E-06	-0.56613	-8.01E-06
	-7.70E-06	-4.50E-07	-1.40E-07	-3.20E-06	-0.22203	-6.60E-06
	[-0.66629]	[-1.60910]	[-1.62119]	[0.81068]	[-2.54979]	[-1.20658]
DM1(-2)	7.75E-06	-1.21E-06	-1.46E-07	1.93E-06	-0.67529	-1.21E-05
	-9.50E-06	-5.50E-07	-1.70E-07	-3.90E-06	-0.27509	-8.20E-06
	[0.81234]	[-2.19040]	[-0.84166]	[0.49264]	[-2.45482]	[-1.47502]
DM1(-3)	-4.02E-07	-7.60E-07	-1.07E-07	-1.68E-06	-0.33696	-1.22E-05
	-8.40E-06	-4.90E-07	-1.50E-07	-3.40E-06	-0.2417	-7.20E-06
	[-0.04798]	[-1.56250]	[-0.69920]	[-0.48878]	[-1.39412]	[-1.69492]
DM1(-4)	2.57E-06	-9.97E-08	-6.38E-08	-2.50E-06	0.115169	-9.34E-06
	-6.90E-06	-4.00E-07	-1.20E-07	-2.80E-06	-0.19744	-5.90E-06
	[0.37508]	[-0.25107]	[-0.51221]	[-0.88959]	[0.58333]	[-1.58271]
DM1(-5)	8.72E-06	-2.63E-07	-1.73E-07	1.40E-07	0.135311	-1.45E-06
	-7.00E-06	-4.00E-07	-1.30E-07	-2.90E-06	-0.20118	-6.00E-06
	[1.24835]	[-0.65036]	[-1.35902]	[0.04894]	[0.67258]	[-0.24153]
DM1(-6)	-4.25E-06	-5.66E-09	-1.26E-07	3.21E-06	0.131625	-9.65E-06
	-7.00E-06	-4.10E-07	-1.30E-07	-2.90E-06	-0.2016	-6.00E-06
	[-0.60736]	[-0.01395]	[-0.98864]	[1.11534]	[0.65289]	[-1.60019]
TBILLS3(-1)	0.044776	0.009925	0.000335	0.010657	-9929.46	1.647748
	-0.24654	-0.01429	-0.00448	-0.10129	-7104.2	-0.2124
	[0.18162]	[0.69454]	[0.07482]	[0.10522]	[-1.39769]	[7.75758]
TBILLS3(-2)	-0.30438	-0.04024	-0.01214	-0.12898	10816.47	-0.98677
	-0.44158	-0.0256	-0.00803	-0.18141	-12724.3	-0.38044
	[-0.68930]	[-1.57209]	[-1.51178]	[-0.71097]	[0.85006]	[-2.59378]
TBILLS3(-3)	0.654996	0.039323	0.007804	0.142334	-597.811	0.036591
	-0.46037	-0.02669	-0.00837	-0.18914	-13266	-0.39663
	[1.42275]	[1.47358]	[0.93232]	[0.75255]	[-0.04506]	[0.09225]
TBILLS3(-4)	-0.52972	-0.0163	0.0089	0.083642	-1759.09	0.307982
	-0.4446	-0.02577	-0.00808	-0.18266	-12811.4	-0.38304
	[-1.19146]	[-0.63240]	[1.10106]	[0.45792]	[-0.13731]	[0.80404]
TBILLS3(-5)	0.053409	0.003392	-0.00818	-0.14763	-9240.65	-0.21599

	-0.40857	-0.02368	-0.00743	-0.16785	-11773.3	-0.352
	[0.13072]	[0.14321]	[-1.10065]	[-0.87953]	[-0.78488]	[-0.61359]
TBILLS3(-6)	0.053016	-0.00348	0.001575	0.027031	4227.468	0.021946
	-0.21287	-0.01234	-0.00387	-0.08745	-6133.92	-0.18339
	[0.24906]	[-0.28173]	[0.40706]	[0.30910]	[0.68919]	[0.11967]
C	-0.23409	0.101517	0.037954	-0.10683	78747.95	2.196404
	-1.07553	-0.06234	-0.01955	-0.44186	-30992.2	-0.92662
	[-0.21765]	[1.62836]	[1.94090]	[-0.24177]	[2.54090]	[2.37034]
R-squared	0.777562	0.828153	0.844789	0.761589	0.850388	0.985407
Adj. R-squared	0.243712	0.415722	0.472283	0.189403	0.491319	0.950384
Sum sq. resids	1.04489	0.003511	0.000345	0.176361	8.68E+08	0.775585
S.E. equation	0.26393	0.015299	0.004799	0.108431	7605.364	0.227389
F-statistic	1.456518	2.007977	2.267852	1.331017	2.368315	28.13592
Log likelihood	27.80584	175.8973	236.1882	74.06336	-506.165	35.55511
Akaike AIC	0.353621	-5.3422	-7.66108	-1.42551	20.89098	0.055573
Schwarz SC	1.742006	-3.95382	-6.2727	-0.03713	22.27936	1.443958
Mean dependent	-0.04904	0.005259	0.006761	0.022587	12030.6	5.170192
S.D. dependent	0.303491	0.020015	0.006606	0.120435	10663.44	1.020841
Determinant resid covariance (dof adj.)		6.03E-06				
Determinant resid covariance		3.48E-09				
Log likelihood		63.70346				
Akaike information criterion		6.088328				
Schwarz criterion		14.41864				