Evaluating the Mechanism of Oil Price Shocks and Fiscal Policy Responses in the Malaysian Economy

Hussain A Bekhet1 and Nora Yusma Mohamed Yusoff2
1 College of Graduate Studies
2 College of Business Management and Accounting
University Tenaga Nasional (UNITEN)
Muadzam Shah Campus, Pahang, Malaysia
E-mail: profhussain@uniten.edu.my; nora@uniten.edu.my

Abstract: The paper aims to explore the symmetric impact of oil price shock on economy, to understand its mechanism channel and how fiscal policy response towards it. The Generalized Impulse Response Function and Variance Decomposition under the VAR methodology were employed. The empirical findings suggest that symmetric oil price shock has a positive and direct impact on oil revenue and government expenditure. However, the real GDP is vulnerable in a short-term but not in the long term period. These results would confirm that fiscal policy is the main mechanism channel that mitigates the adverse effects oil price shocks to the economy.

1. Introduction
The oil price shock is expected to have significant effects on the government budget, supply and demand in domestic markets as well as energy and emissions trends on a global scale [7]. However, the impact of high oil prices on Malaysian economic performance would depend on the exposure of the Malaysian economy to oil, and also to energy elasticity of demand, particularly in terms of domestic consumption even on energy consumption and the extent of the spillover effect of the increase in costs on other products and services.

Thus, the current paper attempts to explore the impact of the symmetric oil price shock on the Malaysian economy and to simulate the effects of oil price shock on government expenditure and revenue in the Malaysian economy. The empirical finding of this study is significant especially to help government and policy planner in giving policy guidelines especially in designing a proper fiscal policy instrument in the macroeconomic level planning. In order to analyze the oil price shocks impacts the GIRF and VDC under VAR model were employed. The VAR model is still the most widely applied empirical approach used to determine the relationship between oil prices and macroeconomic variables [4].

From the previous researches, many researchers have concluded that there is a negative relationship between increases in oil prices and the subsequent economic downturns in the United States [5], [3], [9], [2], [6]. Also, other countries found that co-integration relationship between world oil prices and macroeconomic variables exist in the long run [8], [10]. Earlier, [1] concluded that net-oil exporting countries do not exempt from the negative impacts of high oil prices on their economies. The positive effects of high oil prices would dampen trade and hinder growth through a contractionary effect of trading partners. On the contrary, the response of terms-of-trade to oil price shocks is statistically insignificant. On the other hand, [9] found an asymmetry between the responses of the
GDP and oil-price increases and decreases, concluding that the decreases were not statistically significant. Thus, his results confirmed that the negative correlation between GDP and increases in oil-price was persistent.

2. Data Sources and Methodology
2.1 Data and Variables
The annual data for the (1980-2010) period for oil prices (OILP), real GDP (RGDP), oil revenue (OR), non-oil revenue (NOR), government total expenditure (GOE) and total subsidy (SUB) for Malaysian economy was used. GDP data were collected from the Department of Statistics. GOE, OR, NOR, SUB and OILP data collected from the Economic Planning Unit (www.epu.gov.my). Furthermore, all these variables were measured in constant price (2000 as a base year) and transformed (logarithm base). The logarithm transform procedure is used to ensure that all variables are in stationary [11].

2.2 Model Specification:
The study employed the VAR model to simulate a standard error unit shock on oil price. In order to explain how a VAR is estimated we assume that each equation contains k lags values of Y and X variables. In this case, it can estimate each variable by using the OLS method:

\[ Y_t = \alpha + \sum_{j=1}^{k} \beta_j Y_{t-j} + \sum_{j=1}^{k} \gamma_j X_{t-j} + U_{1t} \]  

\[ X_t = \alpha' + \sum_{j=1}^{k} \delta_j Y_{t-j} + \sum_{j=1}^{k} \psi_j X_{t-j} + U_{2t} \]

Where, the \( U_1 = (U_{11}, U_{2t}) \) is the stochastic error terms for \( t = 1, 2, \ldots, T \). In addition, \( U_{1t} \) and \( U_{2t} \) are assumed independent and with zero mean, i.e. \( E(U_{1t}) = 0 \), \( k \) is the lag length criteria, \( \alpha \) and \( \alpha' \) are constant terms, \( \beta, \gamma, \delta, \psi \) are the coefficients estimate for independent variables. The above VAR models will be extending to comprise 6 major endogenous economic variables. These are OILP, RGDP, OR, NOR, SUB and GOE.

3. Empirical Results and Findings
First, based on the unit root test results, we fail to reject the null hypothesis of unit roots even at the 10\% significance level. However, when we performed the unit root test at first difference, \( I(1) \), the results indicate that all variables are \( I(1) \) since the \( P \)-value is significant at 1\% and 5\% level. Second, the result of the LM test for VAR model (at lag order 1) suggests that there is no obvious residual autocorrelation problems exist in the model because all \( p \)-values are larger than the 0.05 level of significance. Furthermore, the AR Polynomial test confirms that there is no root lies outside the unit circle; hence the VAR models will satisfy the stability condition.

The impact of symmetric OILP shocks that is a standard deviation (S.D) innovation on oil revenue, fiscal tools and real GDP, are presented in the following steps:

Third, Figures 3(a) -3(f) show the IRFs for one standard deviation (SD) symmetric OILP shocks to current and future values of endogenous variables over the 10-th period ahead. Figure 3(a) suggests
that the OILP shock has an immediate effect, which leads to a decrease in RGDP in the short run, as predicted by theory. The larger negative impact occurs in the 3-rd period which is decreased to negative 0.15%. This is followed by a gradual increase over next periods until the 5-th period which are around 2 years.

![Figure 3(c). Response of NOR to OILP Shocks](image)

![Figure 3(d). Response of SUB to OILP Shocks.](image)

However, the impact on RGDP growth becomes stable or asymptotes to 0 after the 6-th period. This suggests that the impact of OILP shock on the growth rate of GDP is relatively short-lived. It is seen that an OILP shock has instantaneous positive and significant impact on OR until in the 2-nth period and there is substantial volatility in the OR over the 2-nd period (Figure 3(b)). The time path of the impulse response indicates an initial appreciation in the OR, before it decreases after the 2-nd to the 4-th period, finally asymptotes to 0 after the 6-th period.

![Figure (e): Response of GOE to OILP Shocks](image)

The OR has increased sharply to 26% over the next 2-th period before it falls in the next period. As far as OILP shock is concerned, we confirm that OILP shocks leads to a decrease in NOR until the forth periods (see Figure 3 (c)). This situation may be partly explained by the indirect effects of OILP shocks that effects through cost channel. However, SUB and GOE variables show a decreasing effect of OILP shock on a short term trend, with the magnitude effect of SUB larger than GOE (Figure 3 (d) and 3 (e)) respectively. This simply implies that OILP shocks have a strong impact on SUB and GOE variables. A shock of OILP causes government operating expenditure levels to decrease rapidly until the 4-th period. This suggests that the impact of OILP shock on government expenditure is relatively short-lived. Fourth, the accumulated effects of one S.D. of OILP shocks on the endogenous variables for up to the 10-th period found that 1 percent increase in OILP shocks contribute a sharp increase in the OR by 22% over the next 10-th period. At the same time, the accumulated response over 10-th period for NOR is 1.4%, which is far smaller than the impact on the OR. While the accumulated response for up to the 10-th period is estimated to be positive 5.3% which indicated that 1 percent increase in OILP shocks contributes an increase in the GOE by 5.3% over the next 10-th period. On the other hand, the accumulated response for a SUB up to the 10-th period is estimated to be positive 26% which indicated that 1 percent increase in OILP shocks contributes a sharp increase in the total subsidy by 26% over the next 10-th period.

Fifth, the VDC for the 6 endogenous variables with symmetric OILP shocks are estimated over the10-period horizon for each endogenous variable based on the VAR model, where the decomposition value converging to stable states. In estimating the impact of OILP shocks on other endogenous variables, it can be seen that an OILP shock is a considerable source of variation, i.e. contribute substantially to around 74.9% and 32.2% of the volatility in OR growth and GOE, respectively. Also, RGDP and SUB contribute around 27.4% and 22.3%, respectively. Besides the OILP, NOR is also a considerable source of variation for RGDP growth which is contributed around
26%. In terms of per OR, fuel subsidies accounted for 26.45% of oil revenues for the year 2005 and decrease to 16% and 17.22% for the year 2006 and 2007, respectively.

It also shows that fuel subsidy accounted for 0.21%, 0.11% and 0.12% of RGDP for the year 2005, 2006 and 2007, respectively. As Malaysia is an oil exporting country, it is expected that high oil prices in the short term would benefit the Malaysian economy. This is also being supported earlier findings [12] which focused on the 31 OPCs. The studied found that oil revenue is a critical source of fiscal revenue where fiscal oil revenue accounted for more than 25 percent of total fiscal revenue over the (2005-2008) period. In the case of Malaysia, oil revenue has contributed 29.2% up to 36.5% of total revenue for the (2005-2007) period.

4. Conclusion
The results suggest that the impact of symmetric OILP shocks has a direct and positive impact on oil revenue, even if a short-term phenomenon. Also, the macroeconomic impacts of oil price shocks are found to be greater in magnitude for real GDP and total subsidy in the Malaysian economy. Besides, in the long time path the changes of world oil price would have significant impact to GOE through the subsidies channel in the country. Besides that, the findings of the study will help to give clear policy directions especially in designing a better policy instrument system in the macroeconomic level planning, especially for establishing and reviewing existing policies (i.e. fuel subsidy policy, energy and environmental policy). Finally, it is worth pointing out that the results of this paper do no more than suggest that the adoption of expansionary fiscal policy during the oil price shocks can facilitate rapid economic growth. In the sense that, as long as there is a stability and persistence of economic policies within the framework of an appropriate macroeconomic discipline, a higher oil price in a small oil-exporting economy like Malaysia will not necessarily be dissolute simply in terms of higher inflation but will contribute positively to assist in achieving an impressive rate of economic growth in a near term.

References
[1] Abeyesinghe T 2001 Estimation of Direct And Indirect Impact Of Oil Prices On Growth Economic Letters 73 147-153
[2] Bernanke B S, Mark G and Mark W 1997 Systematic Monetary Policy and the Effects of Oil Price Shocks Brookings Papers on Economic Activity 1 91-124
[3] Burbidge J and Alan H 1984 Testing for the Effects of Oil-Price Rises Using Vector Auto regressions International Economic Review 25 459-84
[4] Gronwald M 2012 Oil and U.S. Economy The Energy Journal 4 143-160
[5] Hamilton J D 2003 What is an Oil Shock? Journal of Econometrics 113(2) 363-98
[6] Hamilton J D and Herrera A M 2001 Oil Shocks and Aggregate Macroeconomic Behaviour: The Role of Monetary Policy Discussion Paper 2001-10. University of California, San Diego.
[7] World Energy Outlook 1999: Looking at Energy Subsidies 1999 International Energy Agency: Paris, IEA.
[8] Jones D W, Leiby P N and Paik I K 2002 Oil Price Shocks and the Macroeconomy: What Has Been Learned since 1996? In: Proceedings of the 25th Annual IAEE International Conference, Aberdeen, Scotland
[9] Mork K A 1989 Oil and the Macroeconomy When Prices Go Up and Down: An Extension of Hamilton’s Results Journal of Political Economy 91 740-44
[10] Rodriguez R and Sanchez M 2004 Oil Price Shocks and Real GDP Growth: Empirical Evidence for some OECD Countries European Central Bank Working Paper 362
[11] Sari R and Soytas U 2006 The Relationship between Stock Returns, Crude Oil Prices, Interest Rates, and Output: Evidence from a Developing Economy Empirical Economics Letters 5(4) 205-20
[12] Villafuerte M and Murphy P L 2009 Fiscal Policy in Oil Producing Countries During the Recent Oil Price Cycle IMF Working Paper 6.