The Impact of Oil Price on the Growth, Inflation, Unemployment and Budget Deficit of Vietnam

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ABSTRACT

In oil exporting countries, especially OPEC members, oil price fluctuation has significant impacts on their economies. Herein, just a drop in the oil price causes directly many adverse effects, such as inflation, falls in economic growth, and increases in unemployment. However with a country which not only exports crude oil but also imports petroleum as Vietnam, it is not easy to determine falling or a rising oil prices is beneficial to the economy. Therefore, this paper aims to carry out a numerical analysis on the influences of oil prices on the macroeconomic variables of Vietnam, including inflation, growth rate, budget deficit and unemployment, during a period from 2000 to 2015. By using a vector auto regression model, it is realized that a rise in oil prices would lead to higher inflation and budget deficit in Vietnam while its impacts on the gross domestic product growth and unemployment are unclear.

Keywords: Oil Price, Vietnam, Impulse Response, Variance Decomposition
JEL Classifications: E31, O47, Q4

1. INTRODUCTION

As same as other materials, oil is one of the most important factors for manufacturing processes and good transportations. Hence, production costs and consumer prices trend in the same direction as oil prices. Furthermore, oil price fluctuations can reduce temporarily the total production when companies delay their investment decisions due to uncertain conditions or costs arising from re-allocation processes of resources.

Although being one of countries exporting crude oil, Vietnam only has small domestic production and limited reserves, and consequently, has to import large quantities of oil products to meet the domestic demands. Therefore, Vietnam's economy is more sensitive to oil price fluctuations than other developing countries that have large oil supplies. Moreover, oil prices in Vietnam are largely influenced by the government's price control policies and interventions. Hence, the analysis of the economy response towards oil price shocks is the topic which both academia and policymakers specially pay attention to. Many abroad researches

have been carried out to investigate the relation between oil prices and macroeconomic variables. Herein, the case studies were normally selected as US, OECD countries or a group of countries in Asia while the case with Vietnam has not been considered. There are also a number of studies which were done in Vietnam. However, these works mostly focused on growth variables, inflation while did not appropriately evaluate the influence of oil price shocks on the macroeconomic indicators, such as inflation, growth, government spending and unemployment rate.

In order to deal with the aforementioned problems as well as to satisfy the demand on Vietnam's economy investigation, this paper aims to find out the relationship between oil prices and inflation variables, growth, government spending and unemployment rate. The rest of this paper is therefore organized as: Section 2 is to introduce the theoretical foundation as well as to revise the related works; the procedure to develop the research model and data observation is then presented in Section 3 while the analytical results are clearly discussed in Section 4; finally, conclusion remarks are given in Section 5.

2. THEORETICAL FOUNDATIONS AND LITERATURE REVIEW

2.1. Theoretical Foundation

Based on Keynes theory, the increase of manufacturing material (high oil price) could lead to the high production cost, high consumer price and low real wage. This then decreases the labour power and, generates a negative interaction between oil price and economic effect while generates a positive correlation between product prices and unemployment ratio. In addition, high crude oil price causes alternative fuels or oil products' price to rise immediately. Subsequently, companies need to cut down amounts of oil use or increase production costs. As a result, the growth rate and productivity is reduced.

Hamilton (1983) introduced the first model to show that the rising oil prices could negatively affect the macroeconomic efficiency. Meanwhile, the theoretical study of Bernanke (1983) proved that when companies recognize the increasing uncertainty about future oil prices, they prefer to postpone their investments, leading to the lower total production. Especially, they face with a selection of technologies relating to the fuel efficiency. The more fluctuation of oil prices, the more valuable the choice to delay is. At the same time, Ferderer (1996) pointed out that the instability caused by oil price shocks could lessen investment demands, which explains the negative correlation between oil prices and productivity but positive correlation with inflation.

Another transmission channel of the oil price shocks to economic activities is rising oil prices would shift wealth from oil importing countries to exporting countries (Fried and Schultze, 1975). A rise in oil prices can be considered as a tax from oil exporting countries which is applied to oil consuming countries and subsequently, lessens their domestic demands. Thus, this fall in demand will lead to higher unemployment and lower gross domestic product (GDP) growth.

In other studies (Tatom, 1988; Bernanke et al., 1997), it was stated that behavior of executive bodies of a monetary policy committee is as a channel that explains economic effects of oil price shocks. For the goal of price stability over high oil prices, central banks could raise the interest rates, but this would cause a fall in demand and a high unemployment rate. On the other hand, to stabilize productivity, central banks could to lower the interest rates to compensate for losses in real GDP and therefore, inflation might continue to rise. As a result, a rise in oil prices would affect complexly to production potential.

Hence, most of the macroeconomic theories and related studies implied that increases in oil prices will cause directly or indirectly negative impacts on the economy. Many empirical studies have been then performed to find more evidence to reinforce this conclusion.

2.2. Literature Review

One of the first authors to estimate the influence of high oil prices on real incomes of the US and other developed countries is known as Hamilton (1983; 2011). He found statistically the negative correlation between oil price changes and real GNP growth in the US and the positive correlation with the unemployment rate, and especially, the reasons for most of the US economic recessions which were due to sharp rises in oil prices. Therefore, the high fluctuation and unpredictable of oil prices have attracted much research in an effort to find out the relationship between oil prices and macroeconomic variables, such as real GDP, prices, unemployment and real investment in different countries. However, most of the previous studies were carried out with the US or other developed countries. Only a few studies were done with Asian countries, but excluding Vietnam. Generally, these studies showed the adverse impacts of rising oil prices on the macroeconomic variables although these impacts might vary from time to time and be different for each specific country. However, another question arises whether a fall in oil prices affect completely in the opposite direction as a positive impact on the economy or not. Hence, another research trend is to analyze the nonlinear influence of oil price shocks on the economy.

Rising oil prices usually come with low productivity, but lower oil prices do not result in the higher productivity. The reasons are known as the reallocation effects and adjustment costs (Hamilton, 1996; Cunado and Gracia, 2003; Huang et al., 2005). Firstly, higher oil prices cause a decrease in total supply because companies cut production to cope with higher input costs, and also a lower demand because customers feel insecure when making investment decisions or try to buy goods with long durability. Secondly, these lead to the reallocation of the energy resources, from sensitive energy sectors into efficient sectors. All these factors therefore slow down the economic growth. Meanwhile, lower oil prices stimulate production processes of companies and household spending. Nevertheless, the reallocation by areas in the opposite direction may lessen the economic growth. Furthermore, due to the rigidity of nominal wages (which are adjusted after oil prices rise), it requires adjustment costs on the labor market. It means nominal wages do not decrease and production costs still remain high. The overall effect of these factors points out that lower oil prices do not improve productivity.

Some studies suggested that monetary policy is also a reason for the asymmetric influence (Bernanke et al., 1997). It means that monetary policy can be tightened or loosed by central banks to deal with influences of rising oil prices, while normally be unchanged when oil prices fall. In other studies about this asymmetric influence (Hooker, 1996; Mork et al., 1994; Ferderer, 1996; Cunado and Gracia, 2005), it was stated that productivity does not react symmetrically to the oil price shocks because new technologies for saving fuels or utilizing alternative resources will be introduced to overcome oil price shocks.

In case of Vietnam, there is a number of studies have been conducted to quantity impacts of oil prices on macroeconomic variables (Nguyen et al., 2009; Narayan and Narayan, 2010; Trung and Vinh, 2011; Hoa and Giang, 2012; Anh and Và Cộng, 2015). These works mainly concerned with the inflation rate and GDP growth while the unemployment and budget spending have not been considered. Therefore to overcome this drawback, this paper aims to evaluate the influence of oil prices on macroeconomic

variables, including the inflation, economic growth, budget deficit and unemployment rate.

3. RESEARCH METHODOLOGY AND RESEARCH DATA

3.1. Selection of Research Model

For time-series data analysis, the most popular autoregressive model is known as vector auto regression (VAR), firstly introduced by Sims (1980). By using this model, many studies were done to investigate reaction of macroeconomic variables to oil price shocks (Rafiq et al., 2009; Farzanegan and Gunther, 2009; Du et al., 2010; Farzanegan, 2011). In this paper, the VAR model is employed to analyse effects of oil prices on the growth, inflation, unemployment and budget deficit in Vietnam. The analysis procedure therefore can be summarized as the followings:

A generic VAR model is firstly expressed as:

$$A_0Y_t = A_1Y_{t-1}+A_1Y_{t-2}+...+A_pY_{t-p}+\varepsilon_t \qquad (1)$$

Here, Y_t is the Nx1 vector of the N endogenous variables at time t; A_i is the NxN matrix (i = 0, 1,…, p); ε is the Nx1 matrix of the error with following attributes:

$$E(\varepsilon_t) = 0 \qquad (2)$$

$$E(\varepsilon_t\varepsilon_\tau') = \begin{cases} \sum \text{ if } t= \tau \\ 0 \text{ if } t^1\ \tau \end{cases} \qquad (3)$$

Thus, the general form of VAR model can be re-written in a shortened form as:

$$Y_t =A_0^{-1}A_1Y_{t-1}+ A_0^{-1}A_1Y_{t-2} +…+ A_0^{-1}A_pY_{t-p} + A_0^{-1}\varepsilon_t \qquad (4)$$

The transmission channels analysed above show that a rise of oil prices increase the inflation, thereby affect the growth and unemployment. Moreover, based on the characteristics of the mechanism for crude oil export and petroleum product import of Vietnam, it is suggested that the oil prices affect the budget deficit. Thus, the vector of endogenous variables in the VAR model is chosen in a sequence as:

$$Y_t = (oil_t, inf_t, gdp_t, deficit_t, unemployment_t)' \qquad (5)$$

The sort order of these variables in the VAR model plays the vital role. In order to inspect the sensitivity of the model with respect to the variable sequence, a stability test with different variable arrangements has been done based on economic theories to ensure the analysis results using this model can be properly derived.

To determine the shocks, the Cholesky decomposition method for covariance matrix of the residuals from the variables of the shortened VAR model is used. Two important analytical tools of the VAR estimation model are the uses of impulse response functions (IRFs) and variance decomposition analyses. By using

IRFs, the magnitude and statistical significance of the response to an increase of standard deviation of oil prices can be observed. Meanwhile variance decomposition analyses enable inspection of not only the self-influence of the model variables' shocks but also oil price shocks' importance to variations of these variables.

3.2. Research Data

In this study, a data set of oil price (oil), inflation (inf), growth (gdp), budget deficit (deficit) and unemployment rate (unemployment) for a period from 2000 to 2015 was obtained quarterly from several sources, including ABD, Reuters and Vietnam General Statistics Office (GSO). Herein, oil is measured by the natural logarithm of the crude oil price on the market of Dubai; inf (%) is calculated by the increasing level of the consumer price index (CPI); gdp is computed in accordance with the growth rate of GDP at fixed prices issued by the GSO; unemployment (%) is represented by the unemployment rate in the urban areas; and deficit (%) is derived according to the ratio of budget deficit to GDP at fixed price. Oil prices and CPI data was monthly observed and then, used to compute the mean values for each quarter. Because the lack of quarterly statistic data about budget deficit, this quarterly data set was derived by an interpolation method, called quadratic - match average, using Eviews statistical package. To perform the analysis, 64 observations were used. The analysis then used the original data sequences to estimate the parameters in the VAR model as the method proposed by Pirovano (2012)[1]. As a result, the statistical data can be described as in Table 1.

The actual data indicates that the oil price had significant changes during the observed period. It reached the lowest 18,24USD/barrel in the fourth quarter/2001 and the highest 116,67USD/barrel in the second quarter/2008. While the inflation rate and budget deficit of Vietnam tended to fluctuate in the same direction with the oil price, the other two economic variables had the negative correlation with the oil price. This can be seen through the statistical correlation analysis of these variables as summarized in Table 2.

4. EMPIRICAL RESULTS

4.1. Initial Inspection

There are many criteria to select the optimal lag length for the model as presented in Table 3. The result implies that the optimal latency is 2 or 5. However, by evaluating the Log likelihood and Schwarz values of the VAR model when using these two latency values, it was found that the optimal lag length as 2 was more suitable and, therefore, selected for this application. The results of autocorrelation test in Table 4 show that the model did not contain the autocorrelation phenomena when using this latency.

Moreover, AR roots graph in Figure 1 proves that the estimated model captures the stability conditions and the reliability of our empirical results.

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1   Pirovano, 2012. Monetary policy and stock prices in small open economies: Empirical evidence for the new EU member states. Economic Systems 36, 372-390 (page 378).

Table 1: Analysis of characteristics described the statistical data

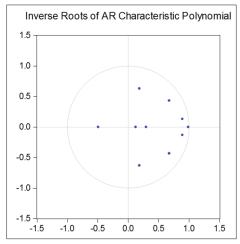| Statistics	OIL	INF	GDP	Deficit	Unemployment
Mean	4.001	7.228	6.718	0.664	4.713
Median	4.067	6.658	6.855	0.595	4.651
Maximum	4.759	27.753	9.261	1.336	6.511
Minimum	2.903	-2.266	3.140	0.032	2.880
SD	0.572	6.593	1.262	0.445	1.090
Skewness	−0.290	1.184	−0.113	0.103	-0.007
Kurtosis	1.705	4.321	2.984	1.484	1.802
Jarque-Bera	5.367	19.618	0.138	6.233	3.821
P	0.068	0.000	0.933	0.044	0.148
Sum	256.092	462.652	429.982	42.523	301.680
Sum of squared deviations	20.655	2738.828	100.356	12.480	74.915
Observations	64	64	64	64	64

Source: Calculation using the statistical analysis package, SD: Standard deviation

Table 2: Statistical correlation analysis of the economic variables

Correlation probability	OIL	INF	GDP	Deficit	Unemployment
OIL	1.000				
	-				
INF	0.586	1.000			
	(0.000)	-			
GDP	−0.428	−0.155	1.000		
	(0.000)	(0.219)	-		
Deficit	0.110	−0.574	−0.520	1.000	
	(0.384)	(0.000)	(0.000)	-	
Unemployment	−0.825	−0.340	0.422	−0.306	1.000
	(0.000)	(0.005)	(0.000)	(0.013)	-

Source: Calculation using the statistical analysis package. Values in parentheses represent the probability

Figure 1: AR roots graph

Inverse Roots of AR Characteristic Polynomial

4.2.IRFs

Figure 2 demonstrates the responses of the variables, inf, gdp, deficit and unemployment, with respect to the oil price shock, oil. It can be realized that when the oil price rose a standard deviation unit, the inf value tended to increase from 0.84% immediately after the first quarter, to 2.54% after four quarters, and then reduce gradually to a −0.8% of the accumulative level after 10 quarters. This indicates the immediate and remarkable impacts of the oil price on production factors, production costs, and consumer prices. In addition, the trend of rising inf in the first

several quarters and then, continuously descending for the next quarters implements that the high oil price was the driving force for companies to update modern manufacturing technologies, consumers cut consumption of energy-intensive products. Consequently, it helped to prevent the economy index from the adverse effects of oil price shocks. The impact of oil price shocks to the inflation is consistent with most of the theoretical researches and numerical analyses done previously (Hamilton, 1983; Gisser and Goodwin, 1986; Ferderer, 1996; Tang et al., 2010; Cunado and Gracia, 2005; Cologni and Manera, 2008; Ran and Voon, 2012).

Meanwhile, contrary to the expectations of the positive impact of rising oil prices to economic growth of a crude oil exporting country as Vietnam, the impulse response analysis shows that this effect is very small. For example, the shock with a unit increase in the standard deviation of oil prices caused the GDP to only rise slightly by 0.14% after 2 quarters and then, to be continuous downward and reach the accumulative level at −0.33% after 5 quarters. Compared with the previous studies, some authors also found no significant effect of oil prices on GDP growth or production in oil exporting countries (Olomola and Adejumo, 2006), or concluded that the impact of oil prices on productivity and investment was a long-term factor compared to that of either price or monetary variable (Tang et al., 2010). Findings of Hamilton (1983) and, Burbidge and Harrison (1984) showed that changes of oil prices affect remarkably and negatively to the growth. However, these studies did not have enough evidence for all of their observation periods. Thus, the results in our study are different from the outcomes of previous studies about Vietnam (Trung and Vinh, 2011; Hoa and Giang, 2012).

Similarly, the response of the unemployment rate to the oil price shocks was very small. For a unit increase in the standard deviation of oil prices, the unemployment rose only 0.003% after the first quarter and then continuously decreased to reach the accumulative level −0.22% after 6 quarters. The reason for the rise of unemployment was that the rising oil prices led to higher production costs in many industries, lower productivity and therefore, higher unemployment rate. However, the reallocation of specialized labour and capital from one sector to another could take place after a period of time. Subsequently, the total workforce could be employed again over a long term (Bernanke, 1983;
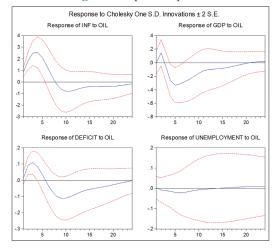
Table 3: Lag length criteria test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	−361.5357	NA	0.171284	12.42494	12.60100	12.49367
1	−124.6181	425.6486	0.000130	5.241290	6.297665	5.653656
2	−68.32977	91.58772	4.60e-05	4.180670	6.117358*	4.936675*
3	−41.18304	39.56982	4.49e-05	4.107900	6.924900	5.207542
4	−4.368272	47.42241	3.30e-05	3.707399	7.404711	5.150680
5	29.74973	38.16591*	2.85e-05*	3.398314*	7.975939	5.185233

*Indicates lag order selected by the criterion

Table 4: Autocorrelation LM test

Lags	LM-Stat	P
1	36.28892	0.0673
2	22.54761	0.6040
3	15.10131	0.9390
4	76.37075	0.0000
5	33.99423	0.1080
6	27.94043	0.3106
7	26.22363	0.3957
8	55.75258	0.0004
9	29.70047	0.2357
10	35.66122	0.0769
11	26.22709	0.3956
12	51.58832	0.0014

Figure 2: Impulse responses

Ferderer, 1996; Brown and Yucel, 2002). Or from the perspective of monetary policy, tightening or loosening the monetary policy after the rising energy prices could affect the unemployment and therefore, any increase in the unemployment rate could be only temporary.

Regarding the impact of oil prices on the budget deficit, a unit increase in the standard deviation of oil prices could cause the budget deficit to tend to increase and reach the accumulative level 0.11% after three quarters. This result is similar to the study by Rafiq et al. (2009) for the case of Thailand, according to which the impact of oil price fluctuation was slowly transmitted to the budget deficit during the period of financial crisis in Asia. Although there was limited empirical evidence in the previous studies to evaluate the influence of oil prices on the budget deficit, it was consistent with the characteristics of Vietnam's economy in the researched period. This can be explained through following reasons.

4.3. An Increase in Oil Prices Rises Production Costs, Reduces Profits of Enterprises, Lessens Tax Revenues, and Contributes to Higher Budget Deficit

Although rising oil prices is beneficial for oil and gas companies, it inevitably adversely affects most of other industries, especially transportation, production of fertilizers, plastics, exploitation of natural resources, fishing fisheries and metallurgy. Along with the exchange rate variations, price of crude oil will influence strongly on production costs and profits of enterprises in the economy. Next, profits from these businesses are a source of revenue for the budget. Therefore, rising oil prices will reduce profits of enterprises using products from crude oil and indirectly, contribute to the budget deficit as indicated through the empirical analysis in this study.

4.4. Revenue of Crude Oil for the Budget Tends to Decrease Over the Years

Figure 3 shows the actual value of crude oil revenues, especially the structure of crude oil revenues in the total budget revenue of Vietnam which tends to decrease over the years. It means that the oil price increase may do not bring any significant contribution to the budget revenue as the previous years. Even though the oil prices rose to the highest in the observation period (2008) and contributed to the total revenue from crude oil to reach 89.6 trillion (an increase of 16.4% compared to 76.98 trillion in 2007), the share of crude oil revenues in the total budget revenue was down from 24.37% by 2007 to 20.81% by 2008, and continuously declined thereafter. By 2005, the share of crude oil revenues in the total budget revenue was 7.1% (although most of this decline was due to the falling crude oil prices). And this is estimated to be only 5.37% by 2016 if assuming the average crude oil price is 60USD/barrel[2].

Meanwhile, the demand for importing petroleum products was constantly increasing (except the period of crisis) to supply to the manufacturing industries, services and consumers (Figure 4).

The result was that the rising oil price led to higher production costs, lower enterprises' profits and consequently, lower tax revenues for the budget or higher budget deficit. In addition, there could be indirect impacts of the higher oil price such as an increase in inflation and tightened monetary policy by increasing the interest rates. As a result, the enterprises' costs were increased or their investments were reduced. This caused adversely effects on the budget revenues[3]. Furthermore from the perspective of consumers,

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2   Based on the Vietnam's official budget estimates 2016 (http://www.mof.gov.vn).
3   This transmission channel was analyzed in Bohi (1991), Bernanke et al.

as the oil prices rose, households had to spend more for travel every day, consequently, forcing them to cut consumption of other goods or reduce saving. The increased freight rates also caused the prices of consumer goods to be high. Therefore, consumers would have to face with double disadvantages from the energy expenditure. This would contribute to limit consuming and curtail production, which made the economy became stagnant and the government budget was difficult to increase the tax revenues of the consumer goods.

4.5. The Reaction of the Budget Deficit and Unemployment to the Internal Shocks

Figure 5 depicts the responses of deficit and unemployment to inf and gdp. As seen in this figure, the impulse response of deficit indicates that the shock with a unit increment in the standard deviation of inf made deficit to rise 0.034% after 2 quarters and decrease continuously afterward, reaching the accumulative level −0.094% after 7 quarters. Meanwhile the shock with a unit increment in the standard deviation of gdp caused deficit to increase 0.084% after 5 quarters and slowly reduce thereafter. Regarding unemployment variable, its impulse response shows that the shock with a unit increment in the standard deviation of inf made it firstly to reduce 0.022% in the first quarter and then gradually increase. And the shock with a unit increment in the standard deviation of gdp made it to reduce more at 0.065% after the first quarter and maintain at -0.03% from the 6th quarter. The changes of deficit and unemployment caused by inf and gdp can be clearly described though a variance decomposition analysis as shown in the following section.
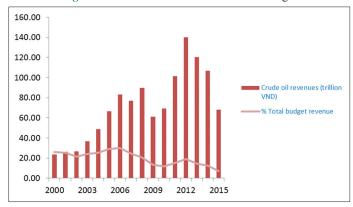
4.6. Variance Decomposition

In this section, the variance decomposition analysis was used to assess the relative importance over time of the shocks to the uncertainties of the macroeconomic variables.

First, Table 5 presents the variance decomposition results of the inflation over a 24-month forecasting period. Inflation persistence is an inherent property and therefore, in a short term, inflation is mostly influenced by the shock itself. However, according to the analysis results, the self-influence of the inflation shock was only about 76% and, the oil prices contributed to a nearly 24% of the inflation change. The rising oil prices continued to go into the manufacturing process and consumption through price factors of production and consumer goods. Subsequently, the change of inflation due to the oil prices was increased in the following periods, and at 63% in the 6th quarter.
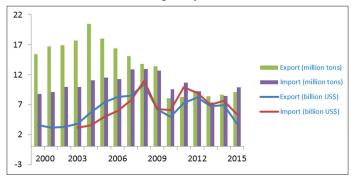
Next, Table 6 displays the variance decomposition results of the GDP. The results imply that the oil prices contributed insignificantly to the change in GDP in the short term, but this contribution increased gradually in the next periods, reaching 23% and 34% after 6 and 24 quarters, respectively. Combined with the impulse response graph, it can be realized that the oil prices affected adversely the GDP in the long term. A possible reason was due to the delays in investments and spending cuts while the monetary policy was tightened to deal with the increase in inflation

(1997).

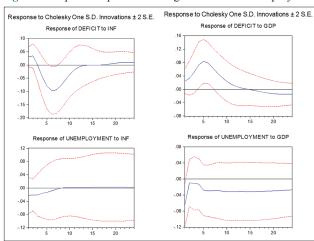**Figure 3:** Contribution of crude oil to the budget

Source: Data from the General Statistics Office and Ministry of Finance

Figure 4: Crude oil exports and other petroleum products' import through the years

Source: Data from the General Statistics Office and Vietnam Petroleum

Figure 5: Impulse responses of budget deficit and unemployment

(Bernanke, 1983; Ferderer, 1996; Bernanke et al., 1997; Cologni and Manera, 2008).

The variance decomposition analysis with the deficit variable is summarized in Table 7. It can be seen that the oil prices only had a very limited influence on the change in the ratio of budget deficit in the first quarter (0.9%). However, this was increased to 24% and 38% after 3 months and 16 months, respectively. In other words for a short term, the changes in oil prices did not affect the budget deficit of Vietnam, or the direct contribution from crude oil to the budget was negligible.

Table 5: Variance decomposition of INF

Period	OIL	INF	GDP	DEFICIT	UNEMPLOYMENT
1	23.62299	76.37701	0	0	0
3	52.15050	41.28849	0.122457	6.326810	0.111741
6	63.11461	25.26960	3.675044	7.341288	0.599453
9	55.61678	29.16949	6.449197	7.623330	1.141207
12	55.17355	28.05559	6.551130	8.741980	1.477755
16	55.10845	27.17671	6.541416	9.476576	1.696846
24	55.77244	26.65902	6.455075	9.365149	1.748320

Source: Author's calculation using the statistical software

Table 6: Variance decomposition of GDP

Period	OIL	INF	GDP	DEFICIT	UNEMPLOYMENT
1	5.78E-05	2.883452	97.11649	0	0
3	3.288577	17.18681	71.06649	7.659317	0.798809
6	23.18723	22.85853	43.15948	10.12474	0.670012
9	31.83035	19.98616	37.47350	10.11752	0.592475
12	33.81171	19.35022	36.19247	9.903500	0.742104
16	34.76858	18.85031	35.34405	9.820710	1.216350
24	34.08487	18.47627	34.69313	10.24342	2.502312

Table 7: Variance decomposition of deficit

Period	OIL	INF	GDP	DEFICIT	UNEMPLOYMENT
1	0.906087	4.206988	2.674611	92.21231	0
3	24.93256	2.514847	5.213521	67.10194	0.237129
6	19.83240	13.24213	15.41506	51.02565	0.484764
9	26.58576	18.26156	14.55828	40.16653	0.427863
12	34.70229	16.24355	12.74936	35.91722	0.387579
16	38.26382	15.21896	11.95726	33.88887	0.671081
24	38.58715	14.59575	11.79131	32.80749	2.218306

The variance decomposition analysis with the last variable, unemployment, was carried out. The analysis results in Table 8 point out that the unemployment rate was very slowly adjusted under the impact of oil prices as well as the other macroeconomic factors. Although the impact of oil prices to the unemployment increased in the long term, it was still negligible (<1%).

4.7. Stability Test

In order to test the reliability of the experimental model developed in this paper, a comparison of the impulse responses of the variables, inf, gdp, deficit and unemployment, to the oil shock using the model in (5) and three other models (6) to (8), generated by changing the Cholesky order, has been performed.

$$Y_t = (oil_t, gdp_t, inf_t, deficit_t, unemployment_t)' \qquad (6)$$

$$Y_t = (oil_t, deficit_t, inf_t, gdp_t, unemployment_t)' \qquad (7)$$

$$Y_t = (oil_t, inf_t, deficit_t, unemployment_t, gdp_t)' \qquad (8)$$

The comparison results showed that there was no change in the responses of the macro variables when using the different experimental models. In addition, a Johansen cointegration test was carried out and consequently, the results as in Table 9 indicate that there was no cointegrated relation between the time series in the model. This confirms the results obtained from the designed experimental model are reliable.

Table 8: Variance decomposition of unemployment

Period	OIL	INF	GDP	DEFICIT	UNEMPLOYMENT
1	0.017931	1.052618	9.041957	0.005135	89.88236
3	0.232501	1.636079	5.224124	3.171267	89.73603
6	0.893504	1.292315	4.270647	5.383969	88.15957
9	0.980767	0.91916	4.243905	6.531266	87.32490
12	0.794565	0.719154	4.407259	7.523820	86.55520
16	0.623147	0.565979	4.571766	8.607460	85.63165
24	0.563004	0.420823	4.741530	9.716469	84.55817

Table 9: Johansen cointegration test

Hypothesized number of CE (s)	Eigenvalue	Trace statistic	0.05 critical value*	P**
None	0.438844	68.94104	69.81889	0.0586
At most 1	0.311774	33.69789	47.85613	0.5184
At most 2	0.098889	10.90596	29.79707	0.9634
At most 3	0.071273	4.554252	15.49471	0.8542
At most 4	0.000720	0.043908	3.841466	0.8340

Trace test indicates no cointegration at the 0.05 level, Max-eigenvalue test indicates no cointegration at the 0.05 level. *denotes rejection of the hypothesis at the 0.05 level, **MacKinnon-Haug-Michelis (1999),

5. CONCLUSIONS

In this paper, the analysis on the effect of oil prices on the economy of Vietnam in the period 2000-2015 indicates that the positive shock in oil prices could cause a rise in the inflation and budget deficit. Meanwhile, the reaction of either the GDP growth or the unemployment was positive in the short term but, insignificant. Therefore in general, the impact of high crude oil prices on the economy was unfavorable. However, for the long term, the adverse effects of high oil prices on the economy could be a driving force for managers to generate policies which encourage enterprises to invest in advanced technologies for saving and using energy efficiently. Consequently, the oil demands can be reduced. Moreover from the perspective of subjectivity, this impact is the motive to make the government and businesses to strengthen the development of alternative fuels as well as their utilization for the production and common life.

The experimental results also point out the risks to the Vietnam's economy as oil prices at high levels, and the essential requirement to prevent risks from oil prices, especially for oil importing firms or enterprises using inputs relating to oil. On the side of authorities, this requirement is the motive to continue to develop the market of derivatives for risk prevention.

With the continuous reduction in the contribution of oil revenues to the Vietnam's budget, the uninterrupted fall of oil prices from the end of 2014, and especially since the experimental results in this study, it is realized that the rise in oil prices could not improve the budget deficit. This leads to a problem for the managers that the state budget of Vietnam needs to focus more on incomes from domestic productive activities and services to achieve the stability and sustainability. Furthermore, this oriented budget is a driving force to issue policies related to regulate oil-and-gas prices, or policies related to investment, trade, production of enterprises

in order to strengthen their competitiveness as well as increase profitability and, conversely, this is the way to foster the revenues.

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