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SHOCK OF WORLD OIL PRICE AND ITS IMPLICATION ON INDONESIAN ECONOMY WITH VECTOR AUTOREGRESSIVE (VAR) APPROACH

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Abstract: *World oil price is a variable impacted to the world economic dynamics including Indonesia economics as the small country. The fluctuation of oil price is influence to the macroeconomic indicator of Indonesia economic. This research use Vector Autoregressive (VAR) as the analysis research tools to describe analysis of several variables in this research. Economic variable in this research are world oil pricing, interest rate, consumer price index and exchange rate of Rupiah. Therefore, it is always interesting to be discussed and reviewed in-depth as it serves as important information for making economic decisions and teaching economy. The estimation method used in this research was Vector autoregressive (VAR) method. The data were taken from credible secondary data such as International Financial Statistics (IFS), Bank of Indonesia (BI), and Bureau of Central Statistics (BPS) from the first month of 2008 until the tweenty two months of 2014. The analysis method was done through impulse response analysis and matrix decomposition to find out the effect of one variable to the other variables in a certain period of time. The data were processed using Eviews program to gain estimated parameter model that meets the statistic criteria and economic theories. After a series of econometric tests, estimated statistic findings were obtained to study the modeling aspect, model stability, and autoregressive model. The research findings show that the contribution of inflation variable in the first period is as much as 85.2%, GDP in the first period is 10.71%, world oil prices are 1.68%, currency in circulation (M1) is 2.39%, and the exchange rate is 0%. Then, in the tenth period GDP is 6.82%, world oil prices are 17.4%, currency in circulation (M1) is 9.48%, inflation and the exchange rate are 52.55% and 13.7% respectively. In conclusion, it is necessary to formulate mixed policy to deal with problems that trigger inflation, so that inflation can be effectively controlled.*

Keywords : *inflation, impulse response, debt trap, economic growth, variance decomposition*

1. INTRODUCTION

Oil is the main component in driving the economic engine of the manufacturing and the transportation sector. Strategic play role of oil in the economy, in national and global scale, is impact on the stability of macroeconomic variables such as exchange rates, interest rates, consumer price index and economic growth. The

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dynamics of world oil prices are determined by the movement of the supply and demand side. World oil production is produced by the countries who are members of organizations OPEC and non-OPEC.

OPEC (Organization of Petroleum Exporting Countries) is an organization of the world oil cartel that collects oil producing countries - including Indonesia – to organize the oil production quotas for each country in order to control the world oil price. However, world oil production was also affected by the oil production from countries non-OPEC. At the time of rising world oil production will push world oil prices decline and vice versa. While on the other hand permintsuatu (demand) the world's oil is influenced by the economic growth of industrialized countries to move their industrial machinery as well in addition to transportation and other energy needs. World oil demand is also influenced by climatic factors which world oil prices tend to rise during the winter because the demand for oil to drive increased space heating energy. There is a tendency of world oil demand over the years continued to rise along with economic growth in industrialized countries while on the other side reserves (stock) world oil thinned, so that at some point the community will be faced with the reality that the world's oil reserves will be exhausted.

Fluctuations in world oil prices in addition to economic factors also influenced by non-economic climate, political conflict, policy changes large countries, the change of political regime, market speculation, etc. There are two standards in the pricing of oil, they are Brent Crude and West Texas Intermediate (abbreviated as WTI). Brent oil is the default value which based on the results of ocean exploration; it is opened in 1970 and became the basis for the establishment of world oil prices to around 40% of world oil since 1971. However, due to the tendency of oil production in the North Sea, Brent Europe has decreased, the starting year 2007 began to develop a new standard that WTI oil prices. In contrast to Brent based on oil production in the North Sea of Europe to WTI based on the results of US oil production in Texas, it was applied to the oil production industry make lots of demand in industrialized countries, especially China and the US.

Indonesia, as the small state economies is highly influenced by fluctuations in world oil prices. Indonesia as well as a member of OPEC, is also a net oil importer to meet the needs of oil tends to rise in value. Changes in oil prices affect the amount of foreign exchange reserves as well as its impact on other macro-economic scale, namely the exchange rate, inflation rate, stock index and interest rates. Here are presented data on the development of world oil prices in recent months:

Fluctuations in world oil prices are influenced by many factors, economic factors or non-economic. The political crisis between Saudi Arabia and Iran triggers the increasing of oil price, however the increase of world oil supplies by OPEC and non-OPEC members could potentially decrease the oil prices and will affect to Indonesian economy, afterwards.

Table 1
The development of world oil price

Index	*Unit*	*Price*
Brent Crude (ICE)	USD/bbl	28,94
Crude Oil (Tokyo)	JPY/kl	20,880
Natural Gas (Nymex)	USD/MMBtu	2,10
WTI Crude Oil (Nymex)	USD/bbl	29,42

Source: Hargaminyak.net, 16 January 2016

2. THEORITICAL ANALYSIS

2.1. Leverage of world oil price to economy

World oil prices have a significant impact on the world economy through its influence on the real sector and monetary sector. It bring world oil prices on the real economy impact to the increase production costs from the increasing of transport costs and other production costs such as the costs of purchase for diesel oil and gasoline to fuel the factory. The increasing of world oil prices will ultimately escalate the cost of production and encourage to increase on inflation in the production costs (recognize as cost push inflation theory). The determination of oil prices can be explained by the interaction between demand (demand) and supply side (supply). (Nizar, 2012). World oil demand is driven by the need to transport both oil transportation by land, sea or air. Oil demand for transport continues to increase along with the increasing number and intensity modes of transportation such as motorcycles, cars, trains, aircraft, and ships. The escalate of world oil demand will drive an increasing world oil prices, and vice versa if the decline in world oil demand, it will push down the price of world oil prices.

Fluctuation in oil prices is also influenced by speculators to take advantage from social, political, security, environment issues related to the world economy. Sensitive issues regarding the security situation in the Middle East region or border conflicts in the South China Sea might be one of factor in triggering the movement of world oil prices. On commodity markets, oil is one of the commodities included in the list of commodities for transactions in addition to other economic type commodities such as soybeans, rubber, tin, iron, etc. The oil shocks have occurred in 1973 and 1978, driven by rising global oil demand from industrialized countries that are members of the OECD (organization for economic cooperation and development). The price movement of commodities economy is also triggered by the movement of demand and supply. Fluctuation in world oil prices was also triggered by a change of the supply side (supply). (Nizar, 2012). Increasing the amount of oil quota in the OPEC members; and discovery of new wells by countries other oil will boost world oil supply and ultimately bring down world oil prices. (Kesicki, 2010).

2.2. The transmission of oil price mechanism

The influence of oil price fluctuations on the economy can be described by seven (7) lines (Nizar, 212): First, the effects of the supply-side shock effect that increase in oil prices will lead to a decrease in output due to oil as one of the inputs in the production process, so the impact on the decline in production could increase the unemployment and decline in economic growth as the implications of rising production costs (Qianqian, 2011, Brown and Yucel, 2002, Lardic and Mignon, 2006). Second, securities Transfer of Wealth which there is a transfer of wealth or purchasing power from importing countries to oil exporting countries. This condition result importing countries reduced oil demand while the demand for oil in the oil exporting countries will increase. Since its oil-exporting countries boosted by demand or consumption of the products the country was reduced, thereby saving is increases. Increasing the amount of savings will push down the interest rates and increase the investment. So, the increasing on investment could offset the declining on the consumption of goods in the importing country, therefor, the aggregate number of output is fixed. (Nizar, 2012, Berument and Tasci, 2002, Cologni and Manera, 2008). Third, real balance Securities explained the increasing of world oil prices could encourage an increase in demand for cash. If this phenomenon is not offset by the improving number of the money supply (JUB), it could impact on the increase of the interest rate and inhibit investment, it will ultimately reduce economic growth. (Nizar, 2012, Berument and Tasci, 2002, Lardic and Mignon, 2006). Fourth, inflation's effect increase in oil prices will lead increase demand for alternative fuels enhancement; such as gasoline, pertamax, diesel fuel, herewafter will encourage increasing fuel prices. Enhancement of fuel prices could lift up the costs of production through cost production process and transportation costs which ultimately increase the price of goods. The enhancement in prices could encourage the workers' demands to increase wages, here as to encourage an increase in inflation. (Nazir, 2012, Mignon and Lardic, 2006). Higher world oul prices is lift up the other economic commodities through the enhancement of transportation cost (Figure 1).

Fifth, the effect of consumption, investment and stock prices, which rise in world oil prices reduce disposable income. It could reduce consumption expenditure and investment expenditure (Nizar, 2012, Sadorsky, 1999, Kilian, 2008, 2009). Sixth, sectoral adjustment effect could change the composition of production factor and process. The company would made an adjustment to the production process using production methods which use less fuel. Reallocation use of production factors lead to ellufiation of unemployment (Nizar, 2012, Lardic and Mignon, 2006). Oil prices changing was influenced by a number of oil production from OPEC and non-OPEC members. Reduction in the number of oil production from OPEC and non-OPEC members would boost world oil prices, vice versa. Seventh, the effect of the balance of payments will lead to pressure on the current account where the value of fuel imports is becoming increasingly more. It impact

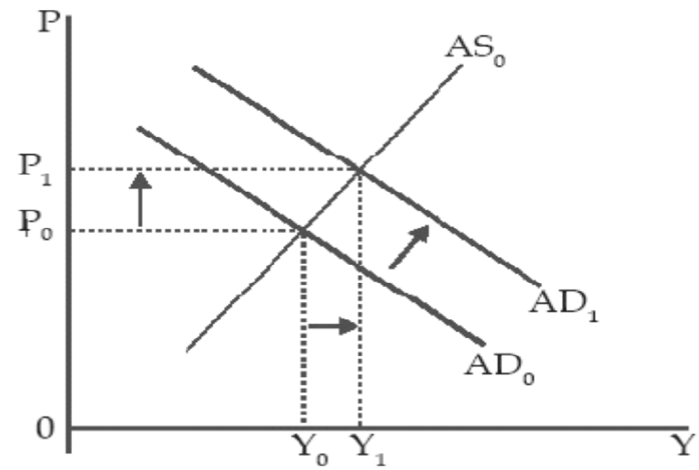

Figure 1: Demand pull inflation

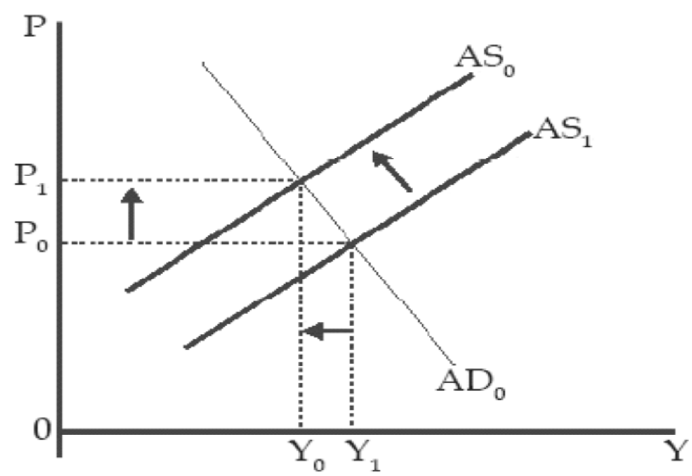

Figure 2: Cost push inflation

to the tension on the balance of payments which should be offset by inflows on the balance sheet capital either through foreign debt and capital through the stock market. Increasing in the price of oil (in Indonesia known as BBM) is eventually lead to the depletion of foreign exchange reserves and depreciation.

3. EXPERIMENTAL/ RESEARCH METHODOLOGY

3.1. Unit Root Test

To get the adequate analysis, it must be able to answer the question of stationary data unit root test. Analysis by Vector Autoregressive (VAR) approach requires a stationary time series data. Unit root test is the concept used for stationary time series data by the method of Augmented Dickey-Fuller test (ADF). When a time series of data is not stationary, it can be said that the root of the problems facing the unit root problem which would get the spurious data and invalid of analytical results. To detect the presence of unit root problem can be seen by comparing the value of t-statistics regression results with test scores ADF. The model equation is as follows:

$$\Delta M_t = a_1 + a_2 T + \Delta M_{t-1} + ?_i \Delta M_{t-1} + e_t$$

Where: ΔMt-1 = (ΔMt-1 - ΔMt-2) and so on,

m = long time-lag by i = 1,2 .... m.

The null hypothesis is ä = 0 or ñ = 1. The value of t-statistics ADF is equal to the value of t-statistic DF. Testing unit roots could also be done by using the model of the Phillips-Perron test. Data have to be stationary if the value of the ADF statistic is greater than the value of the table to the critical value of 5% or 10%.

3.2. Causality Granger test

Granger causality test is to find out the causality between the variables studied. There are several possibilities of Granger causality test, which are one direction causality, two-way causality and the causality between the variables studied.

3.3. Uji Kointegrasi Johansen's

Co-integration test to give an early indication of whether the analytical model applied has a long-term relationship Co-integration relations, namely whether there are similarities shift and stability of the relationship between the variables in the study. Co-integration tests in this study using Johansen's Co-integration Test.

3.4. Vector Auto Regressive (VAR) analysis

VAR analysis is a dynamic economic analysis model which incorporates elements of change over time (lag) in the variables studied. Dynamic behavior between the observed variables and each is linked to the model analysis of VAR will be described further through the property function is the function Impulse Response and Variance Decomposition.

VAR model analysis can also be applied to expectations or projections of a variable amount. VAR is also able to incorporate aspects of their shock in the model are analyzed and can see the long-term response based on historical data. Studies of changes in world oil prices are highly sensitive to the economic shock (shock) both from domestic and foreign markets. VAR is one of the analysis tools that are not only useful to look at the causal relationship between the variables, but also can be used to see how far the effects of the economic shock on other macroeconomic parameters. Dynamic values between variables were observed to see the impact of the shock on the model analysis of VAR would be further described by the completeness of the analysis is the function Impulse Response and Variance Decomposition.

Data

This study analyzed using secondary data. The data is the fluctuations in world oil prices and its implications on the Indonesian economy in 2008 half of 1 to 2014 half of 12 to enter the study variables that include oil prices the world (BBM), the interest rate (r), the exchange rate (exchange rate), Wages (W) and the consumer price index (CPI).

Stationarity test

The initial stage of the study is to look at the character of the data examined whether stationary or not. This study was using Eviews program to analyse the stationary, while the data is done by testing the unit root through ADF test and the Phillips-Perron (PP) test (Table 2).

Table 2
Stationary test

	Level		*First difference*	
	ADF	*PP*	*ADF*	*PP*
BBM	0,085564	0,085564	-8,695356	-8,695356
R	-2,142694	-1,016444	-3,602395	-3,632516
CPI	-2,691353	-2,702303	-9,378042	-9,378311
Exchange rate	-1,080105	-0,681049	-3,760105	-6,195902
Wages	0,534282	0,729817	-9,774176	-9,784118

Based on the test results of the ADF and PP above note that all study variables did not qualify at the current level at a significance level of 1% and 5%. Then, proceed with the test stationary at first difference level with ADF and PP test, could results stationary in all variables in first difference data (Table 2). Requirementsof VAR analysis is all the study variables must be stationary and if it is not stationary, then continued in the first difference as in this stationary test results.

OPTIMAL LAG LENGTH

The next step is to determine the optimal lag length to determine the length of the period of the response of a variable against his past and to other endogenous variables. There are several methods of determining the optimal lag length likelihood (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Criterion (SC) and Hannan Quinn (HQ).

Table 3
Determination of lag optimal

Lag	*LogL*	*LR*	*FPE*	*AIC*	*SC*	*HQ*
0	-1876.244	NA	1.03e+14	46.45047	46.59828*	46.50977
1	-1826.989	91.21345*	5.64e+13*	45.85158*	46.73841	46.20738*
2	-1811.939	26.01137	7.26e+13	46.09727	47.72313	46.74959

Note: * indicates lag order selected by the criterion

Table 3 shows that the optimal lag length of lag 1 according to the criteria of LR, FPE, AIC and HQ are visible from the mark (*). The next step in the estimation methods used lag VAR 1.

GRANGER CAUSALITY TEST

The following stage in the analysis of VAR is the Granger causality test where VAR analysis explain the influence between independent variables in the study as well as a dynamic influence in some previous time period. Through Granger causality testing, can be seen on the variables studied. Granger causality test was also to determine the direction of the relationship of one variable to another variable.

Granger causality test results in Table 4 describe the oil price (BBM) affect the interest rate (BIRATE) but not vice versa. Effect of fluctuations in world oil prices to the amount of interest rate (BIRATE) can be explained by a phenomenon in financial markets and commodity markets where the increase in world oil prices could push the financial market. This situation was in line with the oil price transmission mechanism version of real balance effect that increasing of oil prices would push up the demand for money and if the monetary authority did not keep pace with the increase of the money supply, hereafter, it cause lift up interest rates and impact to decrease of investment levels and economic growth. Granger causality test also revealed the rise in oil prices result enhancement in inflation (CPI). This situation is in line with the transmission mechanism versions effects of rising inflation where the increase in world oil prices would be followed by a rise in commodity prices alternative other alternative fuels such as premium, pertamax, diesel, etc. This in turn will raise the price of commodities such alternative fuels as a result of the increase in demand for the commodity. The increase in oil prices will increase the cost of production and the resulting rise in the price of the finished product. World oil prices (BBM) has also resulted in the increase in the exchange rate (RATE), this phenomenon can be explained through the transmission mechanism versions effect the balance of payments (balance of payments effect)

Table 4
Granger causality test

Null Hypothesis	*Obs*	*F-Statistic*	*Prob.*
BIRATE does not Granger Cause BBM	83	0.82139	0.3675
BBM does not Granger Cause BIRATE		16.2109	0.0001
IHK_SER does not Granger Cause BBM	83	2.71431	0.1034
BBM does not Granger Cause IHK_SER		5.38839	0.0228
KURS does not Granger Cause BBM	83	0.38373	0.5374
BBM does not Granger Cause KURS		20.3078	2.E-05
UPAH does not Granger Cause BBM	83	5.01423	0.0279
BBM does not Granger Cause UPAH		0.03208	0.8583
IHK_SER does not Granger Cause BIRATE	83	5.14154	0.0261
BIRATE does not Granger Cause IHK_SER		8.29436	0.0051
KURS does not Granger Cause BIRATE	83	1.47727	0.2278
BIRATE does not Granger Cause KURS		3.76411	0.0559
UPAH does not Granger Cause BIRATE	83	4.88505	0.0299
BIRATE does not Granger Cause UPAH		0.60479	0.4390
KURS does not Granger Cause IHK_SER	83	3.38861	0.0694
IHK_SER does not Granger Cause KURS		1.47141	0.2287
UPAH does not Granger Cause IHK_SER	83	0.28038	0.5979
IHK_SER does not Granger Cause UPAH		0.02692	0.8701
UPAH does not Granger Cause KURS	83	3.75548	0.0562
KURS does not Granger Cause UPAH		0.03011	0.8627

where the increase in world oil prices (fuel) caused to value of the rupiah to depreciate due to the decreasing the amount of foreign exchange. It also reserves due to increase fuel imports resulting pressure on the current account. Inflation (CPI) affect the interest rate (BIRATE) and reverse rate (BIRATE) affects the rate of inflation (CPI). This phenomenon is aligned to the descriptions in monetary theory; which explain the rising interest rates cause the cost of capital costs have become increasingly expensive, So the cost of production increased and transformed by the manufacturer in the form of price increases. Likewise, on the contrary that the inflation rate causes capital outflow phenomenon as to restore equilibrium in the money market led to a rise in interest rates. Rising wages (WAGE) leading to higher interest rates (BIRATE) where it can be explained wage increases could cause increasing production costs and therefore demand for cash would increase. If it is not offset by increases in money supply would lead to rising of interest rate. Likewise, the ascension level of wages have an impact on the rupiah was getting depreciated due to the rising cost of commodity production in the country so more depressed exports and imports increased. This condition causes pressure on the current account balance and the decreasing number of foreign parts so that the rupiah will depreciate.

JOHANSEN'S CO-INTEGRATION TEST

Co-integration test to give an early indication of whether the analytical model applied has a long-term relationship (Co-integration relations), namely whether there are similarities shift and stability of the relationship between the variables in the study. Co-integration tests in this study using Johansen's Co-integration Test.

Table 5
Co-integration test (Trace)

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	*Eigenvalue*	*Trace Statistic*	*0.05 Critical Value*	*Prob.***
None *	0.517617	180.4456	69.81889	0.0000
At most 1 *	0.431075	121.3953	47.85613	0.0000
At most 2 *	0.337869	75.71074	29.79707	0.0000
At most 3 *	0.299542	42.31512	15.49471	0.0000
At most 4 *	0.153282	13.47737	3.841466	0.0002

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Probability value of 0.0000 is smaller than $\alpha = 5\%$ where the value of statistics at 180.4456> t-table value = 69.81889 at $\alpha = 5\%$. This means that the hypothesis H0 is therefore concluded that there is a co-integration equation (Table 5, with $\alpha = 5\%$). Thus from Trace co-integration test statistics were known to exist co-integration equation 5 could be formed.

Table 6
Co-integration test (Maximum Eigen value) Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	*Eigenvalue*	*-Eigen Statistic*	*0.05 Critical Value*	*Prob.***
None *	0.517617	59.05033	33.87687	0.0000
At most 1 *	0.431075	45.68452	27.58434	0.0001
At most 2 *	0.337869	33.39562	21.13162	0.0006
At most 3 *	0.299542	28.83775	14.26460	0.0001
At most 4 *	0.153282	13.47737	3.841466	0.0002

Max-eigenvalue test indicates 5 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

In table 6 described co-integration test using the maximum Eigen value and can be seen in sequence each probability value smaller than á = 5%. This means that each hypothesis H0 can thus be concluded that there are five forms of co-integration equation which can be formed by a maximum Eigen value. The results is : Trace and maximum Eigen value can be concluded that there is a co-integration equation 5 can be formed.

ESTIMATION AND MODEL VALIDATION

Based on the results of the determination of the optimal lag length is known on lag 1. Afterwards, i had done test using error correction method. This model estimates specification of a dynamic model using VAR or VECM in this research. After this data passed all test for stationary, co-integration test, the data need to test whether it could be analyse using VAR or VECM. The result could be seen on table 7.

Table 7
VECM model

Cointegrating Eq:	*CointEq1*				
D(BBM(-1))	1.000000				
D(BIRATE(-1))	2444.567 (725.536) [3.36933]				
D(IHK_SER(-1))	32.42687 (13.6841) [2.36967]				
D(KURS(-1))	-3.702814 (0.53978) [-6.85990]				
D(UPAH(-1))	15.39266 (3.78938) [4.06205]				
C	-89.13104				
Error Correction:	*D(BBM,2)*	*D(BIRATE,2)*	*D(IHK_SER,2)*	*D(KURS,2)*	*D(UPAH,2)*
CointEq1	-0.059601 (0.04794) [-1.24321]	1.03E-05 (1.5E-05) [0.67735]	0.000373 (0.00177) [0.21114]	0.189922 (0.02819) [6.73769]	-0.020806 (0.00592) [-3.51719]

contd. table 7

D(BBM(-1),2)	-0.599978	2.94E-05	-0.010758	-0.097148	0.009687
	(0.11305)	(3.6E-05)	(0.00417)	(0.06647)	(0.01395)
	[-5.30740]	[0.82343]	[-2.58174]	[-1.46157]	[0.69449]
D(BIRATE(-1),2)	704.2325	-0.088835	0.978287	-373.6785	165.0259
	(380.171)	(0.12017)	(14.0137)	(223.530)	(46.9094)
	[1.85241]	[-0.73926]	[0.06981]	[-1.67171]	[3.51797]
D(IHK_SER(-1),2)	4.652415	-0.000312	-0.474553	-2.413216	0.336844
	(2.77253)	(0.00088)	(0.10220)	(1.63018)	(0.34210)
	[1.67804]	[-0.35547]	[-4.64337]	[-1.48034]	[0.98463]
D(KURS(-1),2)	-0.130112	-3.62E-05	-0.004558	0.075160	-0.054720
	(0.16751)	(5.3E-05)	(0.00617)	(0.09849)	(0.02067)
	[-0.77672]	[-0.68373]	[-0.73817]	[0.76309]	[-2.64734]
D(UPAH(-1),2)	0.695789	-0.000520	-0.004683	-1.600553	-0.363426
	(0.82919)	(0.00026)	(0.03057)	(0.48754)	(0.10231)
	[0.83912]	[-1.98503]	[-0.15323]	[-3.28289]	[-3.55205]
C	15.09455	-0.000609	0.402307	5.551018	-0.081325
	(47.9244)	(0.01515)	(1.76657)	(28.1783)	(5.91341)
	[0.31497]	[-0.04019]	[0.22773]	[0.19700]	[-0.01375]
R-squared	0.346676	0.086152	0.330285	0.411095	0.407426
Adj. R-squared	0.293704	0.012056	0.275983	0.363346	0.359380
Sum sq. resids	13719800	1.370772	18642.19	4743115.	208886.2
S.E. equation	430.5841	0.136103	15.87204	253.1722	53.12990
F-statistic	6.544493	1.162711	6.082453	8.609489	8.479835
Log likelihood	-602.5500	50.26852	-335.2027	-559.5331	-433.0654
Akaike AIC	15.05062	-1.068358	8.449450	13.98847	10.86581

VECM models estimates for co-integration coefficient could not be applied to this study because the coefficient value is less than t-table (-1.24321). The results of the model estimation using Vector Autoregressive (VAR) can be seen that the price of oil (BBM) affect the interest rate (BIRATE) and the exchange rate (RATE).

VAR model estimation showed the rate of bank interest (BIRATE) positively and significantly influenced by world oil price variable (BBM), the previous period of interest rate (BIRATE) and significant negatively affected by the KURS in the previous period. Rate of inflation (CPI) is significantly negatively affected by the prior periods of oil price variable (fuel) and is not influenced by other variables in other research. Fluctuations in the exchange rate (RATE) positive and significantly influenced by previous period of interest rate variable (BIRATE) and the magnitude of the exchange rate previous period (RATE). Meanwhile, wages (WAGE) was not significantly affected by the amount of any study variable in this study.

Table 8
Estimation of VAR Model

	D(BBM)	*D(BIRATE)*	*D(IHK_SER)*	*D(KURS)*	*D(UPAH)*
D(BBM(-1))	-0.054956	6.82E-05	-0.008840	0.033555	-0.008617
	(0.11919)	(4.0E-05)	(0.00412)	(0.08151)	(0.01486)
	[-0.46109]	[1.71212]	[-2.14348]	[0.41164]	[-0.57982]
D(BIRATE(-1))	482.2118	0.707194	-0.107949	472.9202	9.968631
	(248.129)	(0.08297)	(8.58540)	(169.699)	(30.9403)
	[1.94339]	[8.52320]	[-0.01257]	[2.78682]	[0.32219]
D(IHK_SER(-1))	2.474276	-0.000499	-0.036624	3.535523	0.125395
	(3.24286)	(0.00108)	(0.11220)	(2.21784)	(0.40437)
	[0.76299]	[-0.45985]	[-0.32640]	[1.59413]	[0.31010]
D(KURS(-1))	-0.137255	-9.08E-05	-0.004927	0.282343	-0.012351
	(0.15160)	(5.1E-05)	(0.00525)	(0.10368)	(0.01890)
	[-0.90538]	[-1.79099]	[-0.93925]	[2.72317]	[-0.65334]
D(UPAH(-1))	-0.042137	-0.000521	0.007816	0.129210	-0.090997
	(0.91906)	(0.00031)	(0.03180)	(0.62856)	(0.11460)
	[-0.04585]	[-1.69486]	[0.24578]	[0.20556]	[-0.79403]
C	59.75108	0.005401	-0.079039	30.56515	15.37269
	(43.3114)	(0.01448)	(1.49860)	(29.6212)	(5.40069)
	[1.37957]	[0.37291]	[-0.05274]	[1.03187]	[2.84643]
R-squared	0.052997	0.574144	0.078550	0.247857	0.017446
Adj. R-squared	-0.009306	0.546127	0.017929	0.198374	-0.047195
Sum sq. resids	10232253	1.144164	12250.03	4786004.	159098.5
S.E. equation	366.9263	0.122698	12.69585	250.9457	45.75370
F-statistic	0.850634	20.49280	1.295747	5.008935	0.269893
Log likelihood	-597.4607	58.80089	-321.6221	-566.3069	-426.7459
Akaike AIC	14.71855	-1.287827	7.990783	13.95871	10.55478
Schwarz SC	14.89466	-1.111725	8.166885	14.13481	10.73088
Mean dependent	48.78049	-0.003049	-0.548780	39.67073	13.21951
S.D. dependent	365.2308	0.182125	12.81121	280.2812	44.71079

STABILITY TEST MODEL

The next important stage is to test the stability of the model to obtain valid information in the application analysis of the VAR model, hereafter i have a valid analysis for Impulse Response Function (IRF) and the Forecast Error Variance Decomposition (FEVD). Model conditions would be stable when the VAR model has a characteristic root or modulus values less than 1 or pointed on the unit circle.

Table 9
Stability test model

Root	*Modulus*
0.638981	0.638981
0.345746	0.345746
-0.039506 - 0.182851i	0.187070
-0.039506 + 0.182851i	0.187070
-0.098756	0.098756

No root lies outside the unit circle.
VAR satisfies the stability condition.

Table 9 reveals their characteristics or modulus values all indicate value of less than 1 which means analysis of the VAR model is valid and the information from the analysis of Impulse Response Function (IRF) and the Forecast Error Variance Decomposition (FEVD) provide a valid meaning.

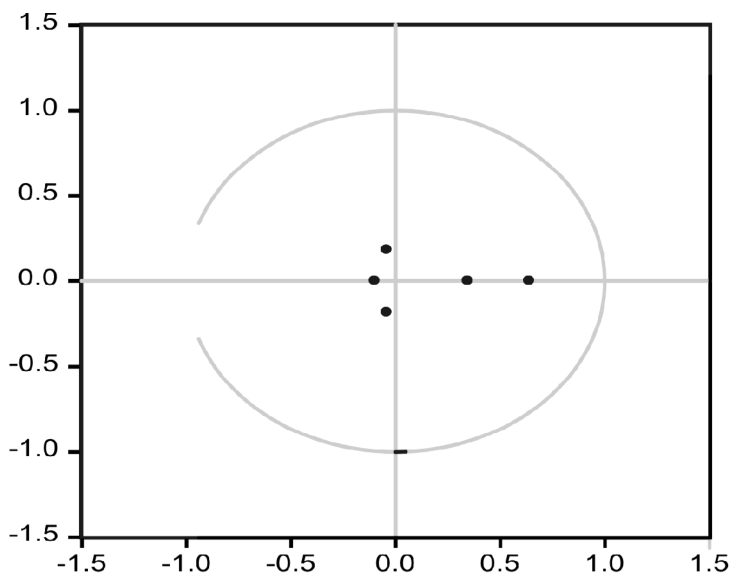

Figure 3: Result of stability test

Autoregressive Inverse Characteristic polynomial roots are in the loop (figure 3). It reinforces previous model stability test results that the application of the VAR model in this study is said to be stable.

IMPULSE RESPONSE FUNCTIONS

Completing the VAR analysis by performing the impulse response function analysis to determine the effect of the shock to the economy is complementary in overcoming difficulties in the interpretation of the results of VAR analysis. Impulse response function described the pace of shock one variable to another variable within a certain time. From the analysis of the impulse response function can be detected length of the shock effect of one variable to another variable to influence disappear and return to the equilibrium position. On the other side of the impulse response function could also track the response of the dependent variable when there is a shock in u1 and u2.

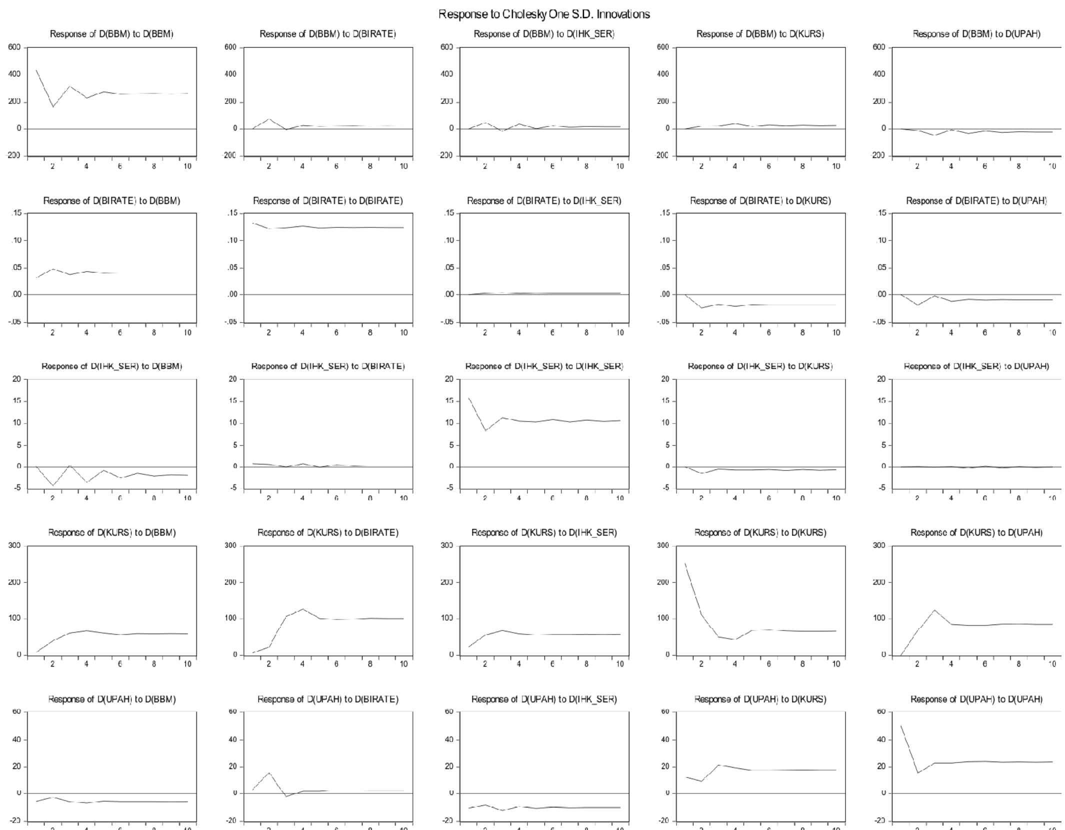

Figure 4: Impulse-Response Function (IRF)

Analysis function impulse responses the effect of oil prices (fuel) to variable other research, namely the interest rate (BIRATE), inflation (CPI), the exchange rate (EXCHANGE) and labor costs (WAGES) in the left sides of Figure 4. Generally, shock fluctuations in world oil prices begin to be felt after the 2nd period (month) and the dependent variable would be stable again through long-term balance. This phenomenon confirms the world oil price shock influence to other macro-economic variables in the Indonesian economy.

a) Shock of world oil prices in the first period (month) positively effect on the interest rate and tendency running stable in the fourth period (month); the influence of world oil prices fluctuation in the long term has narrowed but not leading to the long-term equilibrium level.

b) One standard deviation shock in world oil prices in the first period and the second eventually caused decrease in the rate of inflation (CPI). However, later in the third period (months) start showing symptoms to increase. The pattern of increasing then keep going fall from shock world oil prices (fuel) against inflation (CPI) is influence the movement to shrink and stable in the sixth period even though not leading to long-term equilibrium level.

c) One standard deviation shock in world oil prices (fuel) in the first period and the second actually cause an increase in the exchange rate (depreciation) and away from long-term equilibrium level. Then show the symptoms of the smaller impact of fluctuations in world oil prices against the rupiah, but does not lead to long-term equilibrium level.

d) Shock of one standard deviation for the oil price (BBM) for the first period (month) showed symptoms on the level of wages (WAGE) found balance in the long-term balance, but then decreased and shrink the effect of fluctuations in world oil prices to the level of wages, but does not lead to long-term equilibrium level.

ANALYSIS OF VARIANCE DECOMPOSITION

Analysis of variance decomposition is often called the analysis of forecast error variance decomposition (FEDV) provides information on the proportion of the movement of the shock effect of a variable to another variable shock of the current period and future periods.

Table 10
Varian decomposition of world oil prices (fuel)

Period	*S.E.*	*D(BBM)*	*D(BIRATE)*	*D(IHK_SER)*	*D(KURS)*	*D(UPAH)*
1	430.5841	100.0000	0.000000	0.000000	0.000000	0.000000
2	470.8845	96.14286	2.602754	1.016929	0.181734	0.055722
3	569.7174	96.47181	1.783430	0.778037	0.271301	0.695421
4	617.2047	96.05507	1.696844	1.005846	0.635589	0.606647
5	676.2884	96.33949	1.487670	0.838231	0.601884	0.732722
6	724.9405	96.41236	1.383325	0.828663	0.693316	0.682336
7	771.4919	96.52171	1.307442	0.751686	0.702032	0.717130
8	815.9524	96.61305	1.226626	0.712728	0.741294	0.706299
9	857.0907	96.67599	1.177757	0.674315	0.760106	0.711836
10	897.2508	96.74160	1.126437	0.642490	0.778205	0.711263

Table 10 describes the summary of the analysis FEDV to fluctuations in world oil prices (fuel) to the other aspects of the Indonesian economy.

1. In the short-term, second period (months) of world oil price shocks (BBM) to itself lead to 96.14286% of world oil price fluctuations. In the second period (month) could also be known to the implications of changes in the world oil price shock (BBM) to changes in interest rates (BIRATE) amounted to 2.602754%. Afterwards, the effect on inflation (CPI) had 1.016929%, its effect on the rupiah (IDR) exchange rate fluctuations, continously its effect on the wages of workers amounted to 0.055722%.
2. In the third period (month) world oil price shock (BBM) influence to change himself at 96.47181%, its influence on changes in interest rates (BIRATE) amounted to 1.783430%. Effect on inflation (CPI) amounted to 0.778037%, influence to rupiah exchange rate fluctuations amounted to 0.271301%, its effect on the wages of workers amounted to 0.695421%.
3. In the short-term fourth period (months) global oil prices (fuel) shock against itself lead to 96.05507% of world oil price fluctuations. It could also be known implications shock price changes world oil (BBM) to changes in interest rates (BIRATE) amounted to 1.696844%, then the effect on inflation (CPI) amounted to 1.005846%, its effect on the rupiah exchange rate fluctuations amounted to 0.635589%, its effect on the wages of workers amounted to 0.606647%. It is important from an economic phenomenon of world oil prices (BBM) shock is that in the 4th period effect on the rate of inflation (CPI) also trended upwards, while the other macroeconomic indicators declined in line with the size of the effect of changes in world oil prices against him own. This phenomenon confirms that in the fourth period (month) changes in world oil prices (fuel) results increase inflation in the magnitude higher than in the previous period.
4. The changes in world oil prices (fuel) until the tenth period (months), relatively stable at the range of 96% and influenced by fluctuations in the world oil price itself. This indicates in the context of small countries, such as Indonesia fluctuations in world oil prices, is mainly due to the influence of external factors such as the condition of the world's security, stability of international politics, international money market sentiment, and other non-economic factors. Likewise, it can be seen that the influence of world oil prices shock on macroeconomic indicators Indonesia runs in the same direction in the sense that the declining influence of changes in world oil prices (fuel) against itself. Moreover, it resulted in decreased effects on indicators of macroeconomic more that the interest rate, inflation, exchange rate of the rupiah against the US dollar and wages of workers.

CONCLUSION

Based on the analysis of results and discussion of this research, some conclusions can be obtained as follows. Fluctuations in world oil prices on economic variables Indonesia transformed through several economic variables, namely the interest rate, the rupiah against the US dollar, inflation, and wages of workers. Fluctuations in world oil prices are affected by changes in oil price itself in some period of time. Shock changes in world oil prices (fuel) results in an increase in the interest rate and up to the 10th observation period lasted in constantly. Shock world oil prices has an impact on increasing the rate of inflation, both directly and indirectly, in example the increasing effect on production costs and transportation costs. Fluctuations in world oil prices (BBM) also has implications for the declining value of the rupiah against the US dollar (depreciation) as a result of increasingly depressed position of the current account due to increased government spending of foreign exchange for oil imports. The world oil price shock (BBM) impact on increasing the wages of workers in response to the rising prices of basic goods result of increased inflation.

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