“Oil price and Indonesian economic growth”

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OIL PRICE AND INDONESIAN ECONOMIC GROWTH

Abstract

Oil prices and economic growth are important indicators to see the success of Indonesia's development performance. The use of oil as the world's main energy source in general and Indonesia in particular is driven by industrialization. The more industries, the greater the energy resources needed. In the same context, economic growth will also increase oil demand. The purpose of this study is to examine and create empirical evidence of the relationship between world oil prices and economic growth towards domestic oil prices. Furthermore, to test and create empirical evidence on the relationship of domestic oil prices, agriculture, trade, investment, inflation, interest rates, industry, labor, exchange rates and balance of payments to economic growth. The expected output of this research will be to provide information on the policy of the transmission mechanism of oil prices and economic growth in Indonesia. The method used is descriptive and econometric approach to the analysis of simultaneous equation models with two stages of the least squares method. The results of the study indicate that there is a simultaneous relationship between oil prices and economic growth. Economic growth, world oil prices and domestic oil prices a year ago had a positive effect on domestic oil prices. The second result shows that domestic oil, agriculture, investment, interest rates, industry, exchange rates, balance of payments and economic growth in the previous year have a positive effect on economic growth, while trade, inflation and labor have a negative influence on economic growth.

Keywords industrialization, oil prices, economic growth, transmission

JEL Classification Q32, Q43, O13

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INTRODUCTION

Indonesia faced the mid-1997 economic crisis, which eventually developed into a national crisis. The economic crisis has caused the paralysis of economic activities and the rising prices of various community needs. Thus, government intervention is needed in overcoming the impact of the economic crisis. The government restructured monetary policy and fiscal policy. To stabilize the rupiah exchange rate and prevent hyperinflation, strict monetary policy was carried out, including limiting money supply growth.

The condition of the banking system at that time had worsened the state of the national economy. Economic indicators reflect this situation where economic growth in 1997 was only 4.7 percent, far below the average for the past three decades which reached around 7 percent. Even in 1998, economic growth experienced a negative of 13.2 percent. Inflation soared, recorded 11.05 percent in 1997 and reached 77.63 percent in 1998 (Bappenas, 1999).

While one source of state revenue that has been a mainstay is from petroleum, oil is one of the country's main sources of income, both in the form of tax revenues, as well as oil revenue sharing, and other revenues

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obtained by the government. Although state revenues from oil continue to decline over time, dependence on oil revenues is still large. Decrease in revenues from oil is due to fluctuations in oil prices and economic crises, which have positive and negative impact on economic growth. The long-term impact on economic growth from oil prices, exchange rates, and crises contains some information that is useful in predicting the future economy (Yusuf, 2015). The weakening of crude oil prices was mainly due to the declining demand of crude oil in Asian countries due to the ongoing economic crisis (Bappenas, 1999).

The movement of international crude oil prices triggered by the crisis in oil-producing regions, the condition of domestic oil prices greatly affects Indonesia's economic growth, because oil prices are largely determined by demand and supply. Similarly economic growth has an effect on oil prices (Yusuf, 2015).

The decline in oil prices will result in two things. First, the decline in oil lifting targets by oil companies, both foreign companies and national companies. Oil companies will be reluctant to produce, because prices are not or less profitable. Second, the decline in oil prices will have a direct impact on declining government revenues (Daeng, 2017).

From this study, this research needs to be done to understand and respond to the economic conditions nationally and regionally. Development conditions and fluctuations in oil prices and economic growth in the period 1984–2014. While the condition of economic growth also fluctuated during the period 1984–2014, the highest economic growth in 1989 was 9.08 percent. The lowest economic growth in 1998 was minus 13.13 percent. The average economic growth is 5.41 percent. Economic growth experienced a drastic decline in 1998 minus 13.13 percent due to the economic crisis and financial and monetary crisis.

From the description above, the problem in this study is: what is the pattern of the influence of world oil prices and economic growth on domestic oil prices? and what are the effects of domestic oil prices, agriculture, trade, services, inflation, interest rates, industry, labor, exchange rates and balance of payments on economic growth?

1. LITERATURE REVIEW

Factors that influence oil prices fundamentally follow commodity price movements determined by demand and supply of the commodity itself. The factors that influence both of these will affect world oil prices, both in the short and long term. Although these factors cannot be measured easily, because the market is global and there are many uncertainties, estimates can be made by observing the latest developments. In addition, it should also be noted that such markets are vulnerable to speculators and price games (Muttaqiena, 2015).

The most sought-after trading commodity in the world besides gold is oil. Like gold, oil is a very rare commodity. But it turns out that not only is this a factor that supports the continued ups and downs of oil prices. The use of oil in the economy shows that economic growth tends to increase the quantity of resources in the real productive sector. The low level of oil use in the economy shows a low level of productive capacity, which has an impact on decreasing income from the economic sector for the nation. The effort to convert crude oil into textiles can provide added value up to 60 times. The oil exporters state that during the period 1996–2000, oil tax revenues obtained by the G7 industrial countries were $270 billion per year, while the total oil revenues obtained by all oil-exporting countries as a whole were around $170 billion per year during the same period (Ibrahim, 2008).

From the 1970s to the twentieth century, international oil prices have fluctuated up and down, indicating that the daily price of oil also rises and falls. Fluctuations in crude oil prices from January 1974 to March 2010 showed that prices had risen rapidly since 2002. The nominal price was the highest at $127.77/barrel in July 2008, which was an increase of almost 12 times compared to $9.59 per barrel in in January 1974. Meanwhile, prices rose from $12.27 per barrel in February 1999 to $113.47 in July 2008, increasing almost nine-fold. Fluctuations in the in-

crease in oil prices have implications for the world economy, so many have conducted research on the theme of oil prices and economic growth as has been reported in several literature since the 1970s (Kareem, 2012).

Economic growth is related to the increase in per capita output, the process of increasing per capita output cannot be analyzed by looking at what happens with the total output, on the one hand, and the population, on the other hand. Economic growth is the growth of total GDP and population. In other words, the theory must include theories regarding total GDP growth and the theory of population growth. Because if the two aspects can be explained, the development of the output can also be explained.

The development of Indonesia's petroleum export value also fluctuated, which tends to lead to an increase in the value of its exports. The highest increase occurred in 1998 with a development percentage of 160.31 percent, while the biggest decrease was in 1999 with a value of 33.04 percent. The decline in petroleum exports is a result of the government's lack of attention in the oil sector, but the increase in prices has caused the value of oil exports to increase (Mustika, 2015).

In 1996, there was a fluctuation in oil prices which affected macroeconomics. The asymmetrical effect of rising oil prices and the decline in the aggregate economy gives the subject for researchers about the mechanism of the business cycle, the opportunity to test the theory of the mechanism. Asymmetry of oil price fluctuations against GDP causes simple mechanism effects that were initially planned to be more advanced, such as contractions and expansion in the availability of resources, there is a shift in productive capacity or the effect of inflation shifting aggregate demand. Instability and unclear relationship between oil prices and GDP, the specification of changes in oil prices need to be examined, as well as specifications for changes in GDP, changes in oil prices and other economic variables (Jones, 2004).

Oil prices are influenced by economic factors from the supply side such as production and imports, as well as from the demand side such as consumption and exports. As with the impact of the devalued dollar, currencies and oil prices are traded globally, which have an impact on higher prices so that producers try to maintain the economic value of the oil sold. Oil production trends are against GDP as government revenues from the oil and gas sector to economic growth. Oil production fluctuated between 1970 and 1971 from 41.2 percent, 19.1 percent in 1972 and 21.4 percent in 1979. A negative growth rate of 30.9 percent occurred in 1981 (Ibrahim, 2007).

In 2005, Indonesia officially left the oil exporting countries, where Indonesia has joined OPEC since 1961, which was founded in 1960. Indonesia's oil production continues to decrease every day. In the 1970s, oil reserves were predicted to be around 12 billion barrels. Now that number is only around 5 billion barrels. The increase in world oil prices has caused an increase in the price of subsidized fuel in Indonesia, which is usually followed by rising prices of basic commodities. Indonesia since 2004 has become an oil importer. From the report of the Special Task Force for Upstream Oil and Gas Business Activities, it was stated that Indonesia in 2013 only produced at least 830,000 barrels up to 850,000 barrels per day. Up slightly from 2012, which only produced 826,000 barrels per day (http://www.tempo.co/), even though the need for domestic oil consumption in 2012 reached 1.41 million barrels per day (http://migasreview.com/).

Efforts to cover the growing oil demand, imports of fuel became a choice. Given the reduced oil stock, the burden of the state budget for fuel subsidies has swelled. Economic development is disrupted, production continues to decline every year. Economic growth in the sense of purpose as a condition of a country, which is characterized by the presence of: large consumption capacity in most societies, mostly non-agricultural, and very urban-based (Nuafalfatih, 2017).

The hypothesis in this study is the simultaneous relationship between oil prices and Indonesia's economic growth, namely: allegedly world oil prices and Indonesia's economic growth have been positively affected by Indonesia's domestic oil prices, allegedly Indonesian oil, agriculture, trade, investment, inflation, interest rates, industry, balance of payments, exchange rates and labor have positive impacts on Indonesia's economic growth.

The objectives to be achieved in this study are as follows:

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1) to test and create empirical evidence of the relationship between world oil prices and economic growth to domestic oil prices;

2) to test and create empirical evidence of the relationship of domestic oil prices, agriculture, trade, services, inflation, interest rates, industry, labor, exchange rates and balance of payments for economic growth.

2. RESEARCH METHODOLOGY

The scope of this research carried out in Indonesia with the unit of analysis is the time series data from 1971–2016. Then the data are processed into two parts of the equation and the model separately, namely the model of the oil price equation and the model of equality of economic growth. Both equations become simultaneous relationships, namely the relationship of variables is two-way.

The data used in this study are time series data. This research uses data sources obtained from several publications and literature studies such as: Central Jakarta Statistics Indonesia of various years of issuance, British Petroleum, and Economic Indicators Monthly Statistics Bulletin at the Jakarta Indonesia Statistics Agency of various years of publishing and other data sources.

Endogenous variables are variables that are the center of attention of researchers to make models or variables specified in the model and want to observe the variation. This research focuses on oil prices and economic growth as endogenous variables.

Exogenous variables are variables that are considered determined outside the system model and are expected to be able to explain variations in endogenous variables. This study focuses on the variables of each financial sector and the real sector as exogenous variables, namely: world oil prices, industry, trade, investment, agriculture, labor, exchange rates, inflation, and interest rates.

Inaction variables, which are variables with lag elements, are generally used for time series data. This study focuses on the lag variable, namely domestic oil prices, and economic growth. The mathematical analysis model and econometric estimation model of this study are as follows.

Mathematical models

1) $P_domoil_t = f\left(P_foroil_t, Ecgrowth_t\right);$

2) $Ecgrowth_t = f\left(P_domoil_t, Agr_t, Trade_t, Cin_t, \pi_t, r_t, Industry_t, L_t, S_t, BOP_t\right),$

where P_domoil – domestic oil prices, P_foroil_t – world oil prices, $Ecgrowth_t$ – economic growth, Agr_t – agriculture, $Trade_t$ – trading, Cin_t – investment, π_t – inflation, r_t – interest rate, $Industry_t$ – industry, L_t – labor, S_t – exchange rate, BOP_t – balance of payments;

Econometric models

1) $$P_domoil_t = A_0 + A_1 \cdot P_foroil_t + A_2 \cdot Ecgrowth_t + A_3 \cdot P_domoil_{t-1} + ex_t;$$

2) $$Ecgrowth_t = B_0 + B_1 \cdot P_domoil_t + B_2 \cdot Agr_t + B_3 \cdot Trade_t + B_4 \cdot Cin_t + B_5 \cdot \pi_t + B_6 \cdot r_t + B_7 \cdot Industry_t + B_8 \cdot L_t + B_9 \cdot S_t + B_{10} \cdot BOP_t + B_{11} \cdot Ecgrowth_{t-1} + ey_t.$$

In this study, the data used are time series data for 46 years of observation from 1971 to 2016 in Indonesia. We test the Hausman specification to see if there is a simultaneous relationship between domestic oil prices (PDO) and Indonesian economic growth (ECG). Following is the simultaneous equation between oil prices and Indonesia's economic growth for the period 1971–2016:

$$P_domoil_t = A_0 + A_1 \cdot P_foroil_t + A_2 \cdot Ecgrowth_t + A_3 \cdot P_domoil_{t-1} + ex_t, \quad (1)$$

$$Ecgrowth_t = B_0 + B_1 \cdot P_domoil_t + B_2 \cdot Agr_t + B_3 \cdot Trade_t + B_4 \cdot Cin_t + B_5 \cdot \pi_t + B_6 \cdot r_t + B_7 \cdot Industry_t + B_8 \cdot L_t + B_9 \cdot S_t + B_{10} \cdot BOP_t + B_{11} \cdot Ecgrowth_{t-1} + ey_t. \quad (2)$$

Simultaneous equation notation

$$PDO_t = \alpha_{10} + \alpha_{11} PFO_t + \\ + \alpha_{12} ECG_t + \alpha_{13} PDO_{t-1} + \mu_{11t}, \quad (3)$$

$$ECG_t = \alpha_{20} + \alpha_{21} PDO_t + \alpha_{22} AGR_t + \\ + \alpha_{23} TRA_t + \alpha_{24} CIN_t + \alpha_{25} INF_t + \\ + \alpha_{26} SUB_t + \alpha_{27} IND_t + \alpha_{28} LBR_t + \\ + \alpha_{29} KUR_t + \alpha_{30} BOP_t + \mu_{31t}. \quad (4)$$

Transformation of simultaneous equation notation

$$\log PDO_t = \alpha_{10} + \alpha_{11} \log PFO_t + \\ + \alpha_{12} ECG_t + \alpha_{13} \log PDO_{t-1} + \mu_{11t}, \quad (5)$$

$$ECG_t = \alpha_{20} + \alpha_{21} \log PDO_t + \\ + \alpha_{22} \log AGR_t + \alpha_{23} \log TRA_t + \\ + \alpha_{24} \log CIN_t + \alpha_{25} INF_t + \alpha_{26} SUB_t + \\ + \alpha_{27} \log IND_t + \alpha_{28} \log LBR_t + \\ + \alpha_{29} \log KUR_t + \alpha_{30} \log BOP_t + \\ + \alpha_{31} ECG_{t-1} + \mu_{21t}. \quad (6)$$

We test the Hausman specification to see if there is a simultaneous relationship between domestic oil prices $(\log PDO_t)$ and economic growth (ECG_t). There are two types of identification testing propositions, namely order condition and rank condition. The notations used are:

M – number of endogenous variables in the model;
m – number of endogenous variables in the equation;
K – number of variables predetermined in the model;
k –number of variables predetermined in the equation.

Order condition

In simultaneous equations, a number of M equations (which do not have predetermined variables) is as follows:

$$M - 1 \geq 1,$$

if $M - 1 = 1$, then the equation is identified;

if $M - 1 > 1$, then the equation is overidentified;

if $M - 1 < 1$, then the equation is unidentified.

Rank condition

In the equation that has a predetermined variable, the following rule applies:

$$K - k \geq m - 1,$$

if $K - k = m - 1$, identified,

if $K - k > m - 1$, overidentified,

if $K - k < m - 1$, unidentified.

Based on equations (5) and (6), then endogenous variables include $\log PLO_t$ (domestic oil prices) and ECG_t (Indonesian economic growth).

Exogenous variables include $\log PFO_t$ (world oil prices), $\log AGR_t$ (agriculture), $\log TRA_t$ (Trade), $\log CIN_t$ (investment), INF_t (inflation), SUB_t (interest rate), $\log IND_t$ (industry), $\log LBR_t$ (labor), $\log KUR_t$ (exchange rate) and $\log BOP_t$ (balance of payments).

M is 2 $\log PDO_t$ and ECG_t,

$M - 1 = 1$, then 2 – 1 = 1, the equation is identified,

K is 11 $\log PFO_t$, $\log AGR_t$, $\log TRA_t$, $\log CIN_t$, SUB_t, $\log IND_t$, $\log LBR_t$, $\log KUR_t$, $\log BOP_t$, α_{10} and α_{20}.

Equation (5)

$(K - k) > (m - 1) = (11 - 2) > (2 - 1)$
is overindentified.

Equation (6)

$(K - k) = (m - 1) = (11 - 10) = (2 - 1)$

is identified.

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3. RESULTS

Then, it is regressed by including predicted from the estimation results in Table 1.

The output results in Table 2 show that the coefficient of the residual variable (res) is significant with a *p*-value of 0.1796 and significant at alpha 10%, which means the null hypothesis (no simultaneous relationship) is rejected. Therefore, it can be concluded that the Hausman test shows that there is a simultaneous relationship between the variables of domestic oil prices (PDO) and Indonesia's economic growth (ECG) for the period 1971–2016 (Yusuf, 2015).

Table 1. Hausman test for domestic oil prices

Source: Processed.

Variable	Coefficient	Std. error	t-statistic	Prob.
C	–0.129863	0.186498	–0.696324	0.4901
LOGPFO	0.946949	0.108781	8.705094	0.0000
LOGPDO1	0.193752	0.152177	1.273205	0.2099
R-squared	0.658065	Mean dependent var		1.484281
Adjusted R-squared	0.641782	S.D. dependent var		0.287114
S.E. of regression	0.171842	Akaike info criterion		–0.620147
Sum squared resid	1.240241	Schwarz criterion		–0.499703
Log likelihood	16.95330	Hannan-Quinn criter		–0.575246
F-statistic	40.41519	Durbin-Watson stat		0.286805
Prob (*F*-statistic)	0.000000	–	–	–

Table 2. Hausman economic growth test

Source: Processed.

Variable	Coefficient	Std. error	*t*-statistic	Prob.
C	7.602431	11.76199	0.646356	0.5227
LOGAGR	0.233478	0.445907	0.523603	0.6042
LOGTRA	–1.755126	2.114526	–0.830033	0.4127
LOGCIN	–0.281596	0.518159	–0.543455	0.5906
INF	–0.190404	0.047901	–3.974960	0.0004
SUB	0.072419	0.246041	0.294337	0.7704
LOGIND	0.619324	1.444894	0.428629	0.6711
LOGLBR	–1.159536	1.140624	–1.016580	0.3170
LOGKUR	2.437512	1.187603	2.052463	0.0484
LOGBOP	0.308837	0.900898	0.342810	0.7340
ECG1	0.137663	0.136718	1.006912	0.3215
RES	6.140513	4.475946	1.371892*	0.1796
R-squared	0.619255	Mean dependent var		4.753636
Adjusted *R*-squared	0.488374	S.D. dependent var		3.483176
S.E. of regression	2.491448	Akaike info criterion		4.890606
Sum squared resid	198.6340	Schwarz criterion		5.377203
Log likelihood	–95.59333	Hannan-Quinn criter.		5.071060
F-statistic	4.731432	Durbin-Watson stat		1.432543
Prob (*F*-statistic)	0.000270	–	–	–

4. DISCUSSION

4.1. Economic growth equation model

$$ECG_t = \alpha_{20} + \alpha_{21} \log PDO_t + \alpha_{22} \log AGR_t + \\ + \alpha_{23} \log TRA_t + \alpha_{24} \log CIN_t + \alpha_{25} INF_t + \\ + \alpha_{26} SUB_t + \alpha_{27} \log IND_t + \alpha_{28} \log LBR_t + \\ + \alpha_{29} \log KUR_t + \alpha_{30} \log BOP_t + \alpha_{31} ECG_{t-1} + \mu_{21t}.$$

The output results in Table 3 show that the oil price coefficient has a positive and significant effect on Indonesia's economic growth in the period 1971–

Table 3. Simultaneous equations of economic growth

Source: Processed.

Variable	Coefficient	Std. error	*t*-statistic	Prob.
C	–2.273385	10.84597	–0.209606	0.8353
LOGPDO	3.876999	2.360934	1.642146	0.1101
LOGAGR	0.255993	0.427015	0.599495	0.5529
LOGTRA	–2.337535	1.680395	–1.391063	0.1735
LOGCIN	0.201856	0.549326	0.367461	0.7156
INF	–0.186556	0.046907	–3.977139	0.0004
SUB	0.180559	0.253229	0.713024	0.4808
LOGIND	0.904003	1.415616	0.638594	0.5275
LOGLBR	–1.026862	1.074541	–0.955628	0.3462
LOGKUR	2.656683	1.158135	2.293932	0.0283
LOGBOP	0.311954	0.861452	0.362126	0.7196
ECG1	0.118063	0.131967	0.894639	0.3775
R-squared	0.629183	Mean dependent var		4.702000
Adjusted *R*-squared	0.505577	S.D. dependent var		3.460746
S.E. of regression	2.433430	Sum squared resid		195.4122
F-statistic	5.090246	Durbin-Watson stat		1.257079
Prob (*F*-statistic)	0.000129	Second-Stage SSR		195.4122
J-statistic	0.000000	Instrument rank		12

2016 indicated by a *p*-value of 0.1101 significant at alpha 10%. Mathematically, the output above can be written in the form of an equation:

$$ECG_t = -2,273385 + 3,876999 \log PDO_t + \\ +0,255993 \log AGR_t - 2,337535 \log TRA_t + \\ +0,201856 \log CIN_t - 0,186556 INF_t + \\ +0,180559 SUB_t + 0,904003 \log IND_t - \\ -1,026862 \log LBTR_t + 2,656683 \log KUR_t + \\ +0,3119554 \log BOP_t + 0,118063 ECG_{t-1} + \mu_{32t}.$$

4.2. Oil price equation model

$$\log PDO_t = \alpha_{10} + \alpha_{11} \log PFO_t + \alpha_{12} ECG_t + \mu_{11t}.$$

The output results in Table 4 show that the coefficient of economic growth has a positive effect on Indonesian oil prices in the period 1971–2016 indicated by a *p*-value of 0.3695. So it can be concluded that the results of the 2SLS test show that there is a relationship between oil prices and economic growth and conversely there is a relationship between economic growth and Indonesian oil prices during the study period (Kareem, 2012). Mathematically, the above output can be written in the form of an equation:

$$\log PDO_t = -0.140911 + 0.934340 \log PFO_t + \\ +0.007020 ECG_t + 0.165730 \log PDO_{t-1} + \mu_{11t}.$$

Table 4. Simultaneous equations of domestic oil prices

Source: Processed.

Variable	Coefficient	Std. error	*t*-statistic	Prob.
C	–0.140911	0.187288	–0.752378	0.4561
ECG	0.007020	0.007737	0.907333	0.3695
LOGPFO	0.934340	0.109893	8.502281	0.0000
LOGPDO1	0.165730	0.155594	1.065142	0.2930
R-squared	0.664796	Mean dependent var		1.484281
Adjusted *R*-squared	0.640269	S.D. dependent var		0.287114
S.E. of regression	0.172204	Sum squared resid		1.215828
F-statistic	27.10449	Durbin-Watson stat		0.342844
Prob (*F*-statistic)	0.000000	Second-Stage SSR		1.215828
J-statistic	0.000000	Instrument rank		4

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4.3. Estimation of economic growth equations

After the data of each research variable were obtained, then with the help of the EViews program, the printout analysis of economic growth equations was obtained using the Two Stage Least Square method approach with the endogenous ECG variable ($Ecgrowth_t$) and 11 predetermined variables namely $\log PDO_t$ (P_domoil_t – domestic oil price), $\log AGR_t$ (Agr_t – agriculture), $\log TRA_t$ ($Trade_t$ – trade), $\log CIN_t$ (Cin_t – investment), INF_t (π_t – inflation), SUB_t (r_t – interest rate), $\log IND_t$ ($Industry_t$ – industry), $\log LBR_t$ (L_t – labor), $\log KUR_t$ (S_t – exchange), $\log BOP_t$ (BOP_t – balance of payments), and ECG_{t-1} ($Ecgrowth_t$ – economic growth one year before), as shown in the following mathematical equation. Mathematically, the results of Table 3 can be written in the form of equations:

$$ECG_t = -2,273385 + 3,876999 \log PDO_t + \\ +0,255993 \log AGR_t - 2,337535 \log TRA_t + \\ +0,201856 \log CIN_t - 0,186556 INF_t + \\ +0,180559 SUB_t + 0,904003 \log IND_t - \\ -1,026862 \log LBR_t + 2,656683 \log KUR_t + \\ +0,3119554 \log BOP_t + 0,118063\ ECG_{t-1} + \mu_{32t}.$$

Intercept value α_{20} (constant) means the estimation model of economic growth when exogenous variables $\log PDO_t$ (P_domoil_t – domestic oil price), $\log AGR_t$ (Agr_t – agriculture), $\log TRA_t$ ($Trade_t$ – trade), $\log CIN_t$ (Cin_t – investment), INF_t (π_t – inflation), SUB_t (r_t – interest rate), $\log IND_t$ ($Industry_t$ – industry), $\log LBR_t$ (L_t – labor), $\log KUR_t$ (S_t – exchange), $\log BOP_t$ (BOP_t – balance of payments), and ECG_{t-1} ($Ecgrowth_t$ – economic growth one previous year equals 0 (zero). The estimation shows that Intersep $\alpha_{20} = -2.273385$ has a mean negative economic growth of 2.27 percent during the study period (Yusuf, 2015).

As for the effect of domestic oil prices / $\log PDO_t$ (P_domoil_t – domestic oil prices) on economic growth, estimates show that domestic oil prices have a positive correlation to economic growth in Indonesia during the study period. This means that the more domestic oil prices increase, economic growth also increases, the domestic oil price coefficient of 3.876999 percent, which means that every 1 percent increase in domestic oil prices will increase economic growth by 3.87 percent with probability 0.1101 (Yusuf, 2015).

Effect of agriculture / $\log AGR_t$ (Agr_t – agriculture) on economic growth. The estimation shows that Agriculture has a positive correlation to economic growth in Indonesia during the study period. This means that the more agriculture increases, economic growth also increases, the coefficient of agriculture is 0.255993 percent, which means that every 1 percent increase in agriculture will increase economic growth by 0.25 percent with a probability of 0.5529 (Jones, 2004).

Effects of trade / $\log TRA_t$ ($Trade_t$ – trade) on economic growth. Estimates show that trade has a negative correlation with economic growth in Indonesia during the study period. This means that the higher the trade, the lower economic growth, the trade coefficient of 2.337535 percent, which means that every 1 percent increase in trade will reduce economic growth by 2.33 percent with a probability of 0.1735 (Jones, 2004).

Effect of investment / $\log CIN_t$ (Cin_t – investment) on economic growth. Estimates show that investment has a positive correlation with economic growth in Indonesia during the study period. This means that the more investment increases, economic growth increases, the investment coefficient is 0.201856 percent, which means that every 1 percent increase in investment will increase economic growth by 0.20 percent with a probability of 0.7156 (Jones, 2004).

Influence of inflation / INF_t (π_t – inflation) towards economic growth. Estimates show that inflation is negatively correlated with economic growth in Indonesia during the study period. This means that the more inflation increases economic growth decreases, the inflation coefficient is 0.186556 percent, which means that every 1 percent increase in inflation will reduce economic growth by 0.18 percent with a probability of 0.0004 (Bappenas, 1999).

Effect of interest rates / SUB_t (r_t – interest rate) on economic growth. Estimates show that interest

rates are positively correlated with economic growth in Indonesia during the study period. This means that the higher the interest rate, the economic growth increases, the interest rate coefficient is 0.180559 percent, which means that every 1 percent increase in interest rates will increase economic growth by 0.18 percent with a probability of 0.4808 (Jones, 2004).

Effect of industry / $\log IND_t$ ($Industry_t$ – industry) on economic growth. Estimates show that the industry has a positive correlation with economic growth in Indonesia during the study period. This means that the more the industry increases, economic growth increases, the industry coefficient of 0.904003 percent, which means that every 1 percent increase in industry will increase economic growth by 0.90 percent with a probability of 0.5275 (Jones, 2004).

Effect of labor / $\log LBR_t$ (L_t – labor) on economic growth. Estimates show that labor has a negative correlation with economic growth in Indonesia during the study period. This means that the more labor increases the economic growth decreases, the labor coefficient of 1.026862 percent, which means that every 1 percent increase in labor will reduce economic growth by 1.02 percent with a probability of 0.3462, (Jones, 2004).

Exchange rates \$ / $\log KUR_t$ (S_t – exchange rate) towards economic growth. Estimates show that exchange rates \$ positively correlated with economic growth in Indonesia during the study period. This means that the exchange rate is increasing \$ then economic growth increases, the exchange rate coefficient \$ amounting to 2.656683 percent, which means any increase in the exchange rate \$ 1 percent will increase economic growth by 2.65 percent with a probability of 0.0283 (Yusuf, 2015).

Effect of balance of payments / $\log BOP_t$ (BOP_t – balance of payments) on economic growth. The estimation shows that the balance of payments has a positive correlation with economic growth in Indonesia during the study period. This means that the higher the balance of payments, the economic growth increases, the balance of payments coefficient of 0.311954 percent, which means that every increase in the balance of payments of 1 percent will increase economic growth by 0.31 percent with a probability of 0.7196 (Jones, 2004).

Influence of economic growth one year earlier / ECG_{t-1} ($Ecgrowth_t$ – economic growth one year earlier) on economic growth. The estimation shows that the previous year's economic growth has a positive correlation with economic growth in Indonesia during the study period. This means that increasing economic growth one year earlier then economic growth increases, the coefficient of economic growth one year earlier amounted to 0.118063 percent, which means that every increase in economic growth one year earlier 1 percent will increase economic growth by 0.11 percent with a probability of 0.3775 (Yusuf, 2015).

4.4. Estimated oil price equation

After the data of each research variable were obtained, then with the help of the EViews program, the printout analysis of the oil price equation was obtained using the Two Stage Least Square method approach with the endogenous variable $\log PDO_t$ (P_domoil_t – domestic oil price) and 3 predetermined variables (ECG – economic growth), $\log PFO$ (P_foroil_t – world oil price) and $\log PDO_{t-1}$ (P_domoil_{t-1} – domestic oil price one year before), as shown in the following mathematical equation. Mathematically, the results of Table 4 can be written in the form of equation:

$$\log PDO_t = -0.149911 + 0.934340 \log PFO_t + \\ +0.007020 ECG_t + 0.165730 \log PDO_{t-1} + \mu_{11t}.$$

Intercept value α_{10} (constant) means the estimated model of domestic oil prices at the time of exogenous variables (ECG ($Ecgrowth_t$ – economic growth), $\log PFO$ (P_foroil_t – world oil price) and $\log PDO_{t-1}$ (P_domoil_{t-1} – domestic oil price one year before) equal to 0 (zero)). The estimation shows that Intersep $\alpha_{10} = -0.149911$ has an average mean domestic oil price negative 0.14 percent during the study period.

Effects of world oil prices / $\log PFO$ (P_foroil_t – world oil prices) on domestic oil

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prices. Estimates show that world oil prices have a positive correlation to domestic oil prices during the study period. This means that the increasing world oil prices, the domestic oil prices also increase, the world oil price coefficient of 0.934340 percent, which means that every 1 percent increase in world oil prices will increase domestic oil prices by 0.93 percent with a 0.0000 probability (Yusuf, 2015).

Effect of economic growth / ECG $\left(Ecgrowth_t\right)$ on domestic oil prices. Estimates show that economic growth is positively correlated with domestic oil prices during the study period. This means that the more economic growth the domestic oil price also increases, the coefficient of economic growth is 0.007020 percent which means that every 1 percent increase in economic growth will increase domestic oil prices by 0.007 percent with a probability of 0.3695 (Yusuf, 2015).

Influence of domestic oil prices one year before / $\log PDO_{t-1}$ (P_domoil_{t-1} – domestic oil price one year before) against domestic oil prices. The estimation shows that the domestic oil price in the previous year has a positive correlation to domestic oil prices during the study period. This means that the increasing domestic oil prices a year earlier, the domestic oil price also increases, the coefficient of domestic oil prices one year before is 0.165730 percent, which means that every increase in domestic oil prices one year earlier 1 percent will increase domestic oil prices by 0.16 percent with a probability of 0.2930 (Yusuf, 2015).

CONCLUSION

Novelty This research uses time series data from 1971 to 2016, analysis of simultaneous equation models with two stages of the least squares method. Based on the results of the Hausman specification test shows the simultaneous relationship between domestic oil prices $\left(\log PDO_t\right)$ and economic growth $\left(ECG_t\right)$. Two types of Hausman specification testing propositions are identified: order condition and rank condition. The results of the study indicate that there is a two-way relationship between oil prices and economic growth. Economic growth, world oil prices and domestic oil prices a year ago had a positive effect on domestic oil prices. The second result shows that domestic oil, agriculture, investment, interest rates, industry, exchange rates, balance of payments and economic growth in the previous year have a positive effect on economic growth, while trade, inflation and labor have a negative influence on economic growth.

It is recommended that the Indonesian government be involved in the management of oil and oil reserves are increasingly decreasing, while oil use is increasing. Related to economic growth in order to remain and always be improved in the future, for further researchers to consider microeconomic variables.

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REFERENCES

1. Abdullah, N., & Young, T. (2017). Profitability of Commercial Banks Revisited: New Evidence From Oil And Non-Oil Exporting Countries in the Mena Region. *Investment Management and Financial Innovations, 14*(3), 62-73.
2. Alley, I., Asekomeh, A., & Mobolaji, H. (2014). Oil Price Shocks and Nigerian Economic Growth. *European Scientific Journal, 10*(19), 375-391.
3. Al-Sahlawi, M. A., & Fahd, K. (2013). Data Mining Application in Forecasting the Demand for Oil in Saudi Arabia. *The Journal of American Business Review, 2*(1), 308-314.
4. Badan Pusat Statistik (BPS) (n.d.). Official Web Site. Available at http://www.bps.go.id (accessed on January 17, 2018).
5. Badan Pusat Statistik (n.d.). Official Web Site. Available at http://www.bps.go.id (accessed on January 17, 2018).
6. Bank Indonesia (BI) (n.d.). Official Web Site. Available at https://www.bi.go.id (accessed on January 17, 2018).
7. Bappenas (1999). *Bab II. Pokok-Pokok Reformasi Pembangunan dalam Rangka Penyelematan dan Normalisasi Kehidupan Nasional*. Jakarta.
8. British Petroleum (BP) (2017). *Statistical Review of World Energy*. Retrieved from http://www.bp.com/statisticalreview (accessed on January 17, 2018).
9. Conrad, J. M. (2003). *Resources Economics*. New York: Cambridge University Press.
10. Daeng, S. (2016). *Seperti Ini Dampak Serius Penurunan Harga Minyak Dunia*. Retrieved from http://bisnis.liputan6.com/read/2431727/ (accessed on June 23, 2018).
11. Garba, S. A. (2013). Regression Test of Independence of the Impact of Pertoleum Industry on the Agricultural Sector in Nigeria (1972-2009). *Kuwait Chapter of Arabian Journal of Business and Management Review, 2*(6), 31-38.
12. Greene, William H. (2012). *Econometric Analysis* (7th ed.). Prentice Hill.
13. Gujarati, Damodar N. (2003). *Basic Econometrics* (4th ed.). McGraw-Hill.
14. Ibrahim, M. J. (2008). Growth Prospects of Oil and Gas Abundant Economies: the Nigerian experience (1970-2000). *Journal of Economic Studies, 35*(2), 170-190.
15. Islam, R., Ahmad, B. A. G., Irwanshah, Z. A., & Jeya, M. R. (2017). Impact on Poverty and Income Inequality in Malaysia's Economic Growth. *Problems and Perspectives in Management, 15*(1), 55-62.
16. Jones, D. W., Leiby, P. N., & Paik, I. K. (2004). Oil Price Shocks and the Macroeconomy: What Has Been Learned Since 1996. *The Energy Journal, 25*(2), 1-32.
17. Judge, Hill (1985). *The Theory and Practice of Econometrics*. New York, United States: John Wiley and Sons Ltd.
18. Kareem, S. D., Kari, F., Alam, G. M., Makua, C. G. O., & David, M. O. (2012). Foreign Direct Investment into Oil Sector and Economic Growth in Nigeria. *The International Journal of Applied Economics and Finance, 6*(4), 127-135.
19. Kareem, S. D., Kari, F., Alam, G. M., Makua, C. G. O., David, M. O., & Oke, O. K. (2012). Foreign Direct Investment and Environmental Degradation of Oil Exploitation: The Experience of Niger Delta. *The International Journal of Applied Economics and Finance, 6*(4), 117-126.
20. Karikari, J. A., Agbara, G., Dezhbakhsh, H., & El-Osta, B. (2007). The Impact of Mergers in U.S. Petroleum Industry on Wholesale Gasoline Prices. *Contemporary Economic Policy, 25*(1), 46-56.
21. McCafferty, Stephen (1990). *Macroeconomic Theory*. New York: Harper & Row Publishers.
22. MigasReview (n.d.). Official Web Site. Available at http://migasreview.com/ (accessed on May 10, 2018).
23. Mustika dkk (2015). Pengaruh Ekspor dan Impor Minyak Bumi terhadap pertumbuhan Ekonomi Indonesia. *Jurnal Perspektif Pembiayaan dan Pembangunan Daerah, 2*(3), 107-118.
24. Nuafalfatih (2017). *Teori Pertumbuhan*. Retrieved from https://file.wordpress.com/ (accessed on May 17, 2018).
25. Peach, J., & Starbuck, C. M. (2011). Oil and Gas Production and Economic Growth in New Mexico. *Journal of Economic Issues, XLV*(2), 511-526.
26. Sabir, M., & Malik, Q. A. (2012). Determinants of Capital Structure – A Study of Oil and Gas Sector of Pakistan. *Interdisciplinary Journal of Contemporary Research in Business, 3*(10), 395-400.
27. Tjahjaprijadi, C. (2014). *Analisis Dampak Perubahan Harga Minyak Internasional Terhadap Pertumbuhan Ekonomi Indonesia*. Retrieved from http://www.kemenkeu.go.id/en/Kajian/analisis-dampak-perubahan-harga-minyak-internasional-terhadap-pertumbuhan-ekonomi-indonesia (accessed on October 21, 2017).
28. UU Nomor 22 Tahun 2001, about Oil and Gas.
29. Ying, Q., & Yan, H. (2007). DIY or 3PL: Study on the Third Party Logistics of Petroleum Producing Industry of China. *The Business Review, 7*(3), 291-296.
30. Yusuf, M. (2015). An analysis of the impact of oil price shocks on the growth of the Nigerian economy: 1970-2011. *African Journal of Business Management, 9*(3), 103-115.

http://dx.doi.org/10.21511/ppm.17(1).2019.14