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Oil Price, Government Revenue, Export Value, and Economic Growth: Indonesia's Case.

Harga Minyak Bumi, Penerimaan Pemerintah, Nilai Ekspor, dan Pertumbuhan Ekonomi: Kasus Indonesia

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Abstract

Oil has been one of the main sources of Indonesia's revenue, either from government budget or balance of payments point of views. Due to supply and demand of oil in the world market, prices of oil, either ICP, Brent UK, or WTI, had been decline lately. There are three hypotheses in this paper. The first hypothesis, oil prices change has a positive relationship with the government revenue. Using correlation coefficient, it is found that prices of oil are positively correlated with government revenue in terms of income tax and non-tax revenue with relatively small value. The second hypothesis, oil prices have a positive correlation with export value. Correlation coefficient indicates that they are positively correlated with a somewhat higher value relative to the first finding. The third hypothesis is oil prices are positively correlated with economic growth in terms of GDP constant price. Using Johansen cointegration, it is found that oil prices are not cointegrated with economic growth. This implies that oil is correlated with government revenue and export value. However, it seems that for the whole economic growth, oil is not correlated to the economy, or the reduction of oil price would not necessarily translate into a decline in the economic output.

Abstrak

Minyak bumi merupakan salah satu sumber penerimaan, baik dari sisi penerimaan pemerintah maupun neraca pembayaran. Akibat permintaan dan penawaran akan minyak di pasar dunia, harga minyak bumi, terutama ICP, Brent UK, dan WTI, belakangan ini menurun tajam. Terdapat tiga hipotesis dalam tulisan ini. Hipotesis pertama, perubahan harga minyak memiliki hubungan yang positif dengan penerimaan negara.. Menggunakan koefisien korelasi. ditemukan bahwa harga minyak berhubungan positif dengan penerimaan negara dalam hal pajak penghasilan dan penerimaan negara bukan pajak dengan nilai koefisien yang relatif kecil. Hipotesis kedua, harga minyak bumi memiliki hubungan positif dengan nilai ekspor. Hasil pengujian korelasi menunjukkan bahwa kedua variable memiliki hubungan positif dengan nilai koefisien yang sedikit lebih besar dibandingkan dengan hasil korelasi pertama. Hipotesis ketiga adalah harga minyak bumi memiliki hubungan positif dengan pertumbuhan ekonomi dengan menggunakan PDB harga konstan. Menggunakan analisis Johansen *cointegration* menemukan bahwa harga minyak tidak ter-kointegrasi dengan pertumbuhan ekonomi. Hal ini menunjukkan bahwa minyak bumi berkorelasi dengan penerimaan negara dan ekspor. Namun, untuk pertumbuhan ekonomi global, minyak bumi tidak berkorelasi dengan ekonomi, atau penurunan pada harga minyak tidak ditranslasikan dalam penurunan output ekonomi.

1. INTRODUCTION

Oil has been one of the main sources of Indonesia's revenue, either from the government budget revenue point of view in terms of tax or non-tax revenue or from the balance of payments point of view in terms of export revenue. It is also the main source to finance the government subsidy on the domestic consumption of gasoline.

From a historical perspective, Indonesia has been one of the members of the Organization of the Petroleum Exporter Countries (OPEC) since 1962, suspended as of 1st January 2009 then later on reactivated as of 1st of January 2016. Up to now, Indonesia has been producing oil through several wells.

From price points of view, the price of oil has fluctuated for several decades. In 1973, due to the Arab oil embargo, the oil price shoot up. In 1986, however, the oil price began to come down and then fell down quickly due to the excess of supply, among others. From the 1990s onward, the oil price has been stabilized. In 2008, the oil price went down due to the Lehman Brothers crises, where the decline keep continued until after 2014. Due to the movement of supply and demand of oil in the world market, the oil price has been gone down so much that almost all economists said that the economy of developing countries would be stagnated without knowing when the price will recover.

This paper will try to analyze the relationship between the oil price and the Indonesian economy, that is the government revenue particularly those whose revenues would be exposed to the oil price and export revenue.

For a fiscal relationship with the change in oil price, Indonesia depends on royalties and oil related taxes for revenue. The royalty is part of the non-tax revenue from oil and gas or called property tax on oil and gas. The oil-related tax is the income tax on oil and gas. When the price of oil went down, government revenue will fall down, thus reduce the money available for healthcare, and education, among others. The prudent reaction to price volatility is to save during times of high oil price and use this savings to maintain stable levels of government spending during low price of oil. Without savings to buffer the effect of volatile commodity prices, the government can be drawn into procyclical spending, when government expenditure rises during periods of economic growth and falls during periods of economic weakness.

For export revenue, a change in the price of will correlate with the value of export for exporting oil countries i.e. Indonesia. In addition to the analysis of the relationship of oil prices with the government revenue and the export revenue, this paper will also analyze the relationship of oil price with the economic growth. The hypotheses of this paper are, the oil price has a positive correlation with the government revenue in terms of tax on oil, export revenue in terms of oil, and economic growth in terms of Gross Domestic Product or GDP.

Note that the relationship of the decline in oil prices with government expenditure i.e. government subsidy would not be calculated or analyzed in this paper. A separate research could be done by other researchers on in this issue. Also, note that the volume i.e. production and lifting of the oil production is not going to be analyzed as well in this paper. Thereby the microeconomics aspect of the oil production, i.e. production based on the capacity of the oil well and the regulation related to the pre and post production, for example, will not be covered in this paper. This part would probably run by another researcher.

This paper is divided into 5 (five) parts, which are an introduction, theoretical and empirical background, methodology, analysis, and conclusions. All calculations in this paper are using Eviews.

2. THEORETICAL AND EMPIRICAL BACKGROUND

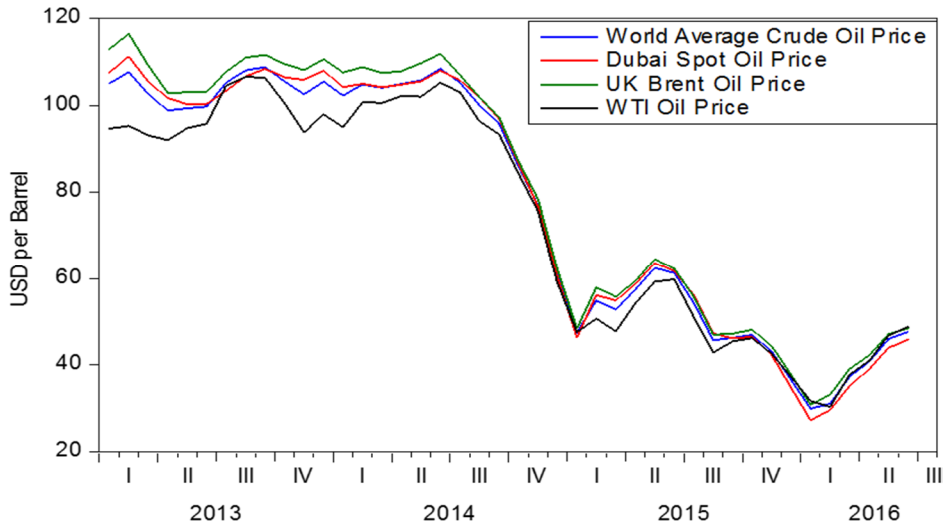
Indonesia joined Organization of the Petroleum Exporter Countries (OPEC) initially in 1962. The membership was suspended as of 1st January 2009. Later, it was reactivated as of 1st January 2016. Indonesia made its first commercial oil discovery in the Northern Sumatera through the drilling

of the Telaga Tunggal Number 1 well. Up to now, Indonesia has been producing oil through several wells. The volume of the product, called lifting, has been gradually declining to several factors, such as aging oil well and no new well so far (OPEC, 2016).

On the price of oil, Indonesia through OPEC has somewhat control over the world price. This has been done through controlling the production of OPEC member thus the world supply of oil, in what economist called oligopoly cartel approach. For example, in 1973, through the Arab oil embargo, oil prices shoot up. Again in 1979 in the middle of the Iranian Revolution, the oil price rose steeply again. In 1986, after reaching a record level, the oil price began to go down, then crashed due to a supply glut, among others. Near the end of the 1980s, a production ceiling shared among members of OPEC and a reference basket for pricing, added with intensive dialogue between OPEC members and Non-OPEC, stabilized the price at the level somewhat higher but still lower than the price at the beginning of the 1980s. From the 1990s until 2000s, price moved less volatile relative to the previous period. The global financial crises in mid-2008, known among others as Lehman Brothers crises, pushed down the oil prices after reaching record level as a result of the increased use of oil as an asset class, among others. This price drop could be considered as demand-driven. Between 2011 and beginning of 2014, prices were stabilized. A combination of speculation and oversupply, thus supply driven, causing prices to fall down after 2014 (OPEC, 2016),

Near the end of 2014, the volatility of the oil price was still continued due to among others the slowdown of the China economy, the shift in the China domestic economy from investment which needed natural resources to domestic consumption which rely on the end-product, and the outward shift of the world supply of oil due to the increase in production of oil from non-OPEC countries (The Economist, various issues). As stated in Husain et al. (2015), supply factors have played a somewhat bigger role compare to demand factors in driving down the price of oil between 2014 and 2015. There was a higher oil production which came out from non-OPEC sources i.e. the United States shale. On the other hand, demand was somewhat weaker than expected in Europe and particularly Asia i.e. China, as mentioned above.

GRAPH-1: Monthly movement of North Brent and WTI (January 2013 until June 2016)



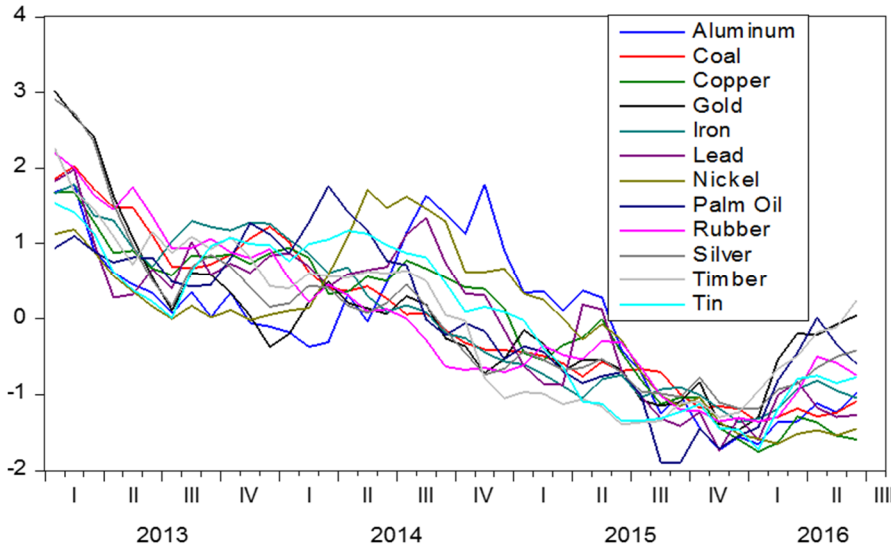
Source: CEIC

Graph 1 shows the movement of oil price during 2012 until August 2016. There was a sharp decline around the middle of 2014 which continued until the beginning of 2015. Thereafter, the price went up somewhat but then fell down much further until it stabilized in the beginning of 2016. Presently, the price of oil has been gone upward somewhat but has not reached the higher position in 2015. It is also much lower relative to the position achieved before 2014.

Actually, if the price of oil was compared to the price of another commodity, they are all moving in a similar direction that is downward. Graph 2 below showed the movement of various prices of world commodity, such as aluminum, coal, copper, gold, iron, lead, nickel, palm oil,

rubber, silver, timber, and tin. The graph showed that there is a general tendency that almost every important prices of the commodity have been gone down. There was a somewhat upward movement sometimes in the beginning of 2016, just like the price of oil. However, these prices have not reached the highest position achieved in 2014, similar to the price of oil.

GRAPH-2: Monthly movement of various prices of world commodity (January 2013 until June 2016)



Source: CEIC

On theoretical basis regarding the price decline, there are underlying factors. Lower oil prices could be a cause that driving global economic growth. Lower oil prices could be also a response due to a shock which affecting global economic growth. In the first case, the lower price could be driven by some factors which are not related at all to the current global economic trend, for example, due to the new finding of technology know how on oil processing which pushes supply upward. In the second case, the lower oil price could be the result of unexpected changes in global economic condition, for example, a decline in the economic condition of certain large countries which resulted in a lower demand shock for oil with significant spillovers to many other countries. Research showed that both supply and demand factors contributed to the sharp decline in oil prices, but a larger share comes from the supply factors (Husain et al, 2015). Slower demand comes mainly from Europe and Asia i.e. China, while higher supply resulted from non-OPEC countries and better output from Iraq, Libya, and Saudi Arabia.

Another theoretical feature of the oil price decline is whether the lower oil price will be temporary or permanent. If temporary, then gain in the real income of those in advanced oil importing countries will mostly be saved, or in the case of real income losses in oil exporting countries, borrowing will go up. If permanent, spending patterns will need to adjust. The persistence of the lower oil price depends on the underlying factors affecting the price decline and the speed of adjustment in oil markets when the price goes down. Research showed that a substantial part of the oil price decline from this point of view is expected to persist into the medium term, thus not fully permanent (Husain, 2015)

As stated above, the first analysis would be the relationship of oil prices on the government revenue. From this point of view, countries with significant commodity exports such as Indonesia, governments often depend heavily on royalties and oil related taxes for revenue. In the case of Indonesia, the royalty is part of the non-tax revenue from oil and gas or called property tax on oil and gas. The oil-related tax is the income tax on oil and gas. Falling commodity prices can reduce the fiscal condition, depriving the revenues available for healthcare, infrastructure, and education for example.

The prudent reaction to price volatility is to save during times of high oil price and use this savings to maintain stable levels of government spending during low price of oil. Without savings to buffer the effect of volatile commodity prices, the government can be drawn into procyclical spending, when government expenditure rises during periods of economic growth and falls during periods of economic weakness. Commodity booms can stimulate procyclical spending by enhancing the creditworthiness of commodity exporters, pushing down the spread in interest rate and increasing access to both government and private sectors to international capital markets. Frankel et al (2013) found out that there is a sizeable reduction in the pro-cyclicality of government deficits during the 2000s, thus implying more conservative fiscal policy by commodity exporters and higher levels of macroeconomic stability. This was driven mostly by improvements in the quality of domestic institutions and the incentive to increase savings levels during commodity booms.

Falling commodity prices can also give a fiscal opportunity to the government that regulates domestic prices i.e. subsidize domestic fuel consumption i.e. Indonesia. Regardless of Indonesia's exporter status, when oil price declined, the government of Indonesia has an opportunity to cut subsidy rates on a permanent basis, a policy that is justifiable on sustainability, efficiency, and equity points of view. The government took the opportunity and thus open a fiscal space for increased national saving to financed more long term and important expenditure i.e. infrastructure financing (Gangelhoff, 2015; Foo, 2015; The Economist, various issues).

Despite the sustainable fiscal policy action in the face of lower oil price, declining oil price definitely will affect the government revenue related to oil revenue, as stated above. Ehrhart and Guireniau (2009) found the robust evidence that tax revenue in developing countries increase with the rise of commodity prices but goes down due to the volatility of the prices. In other words, the volatility of commodity prices, both imported and exported commodities, is negatively affecting tax revenues. Reduced price of a commodity leads to smaller income taxes (see also Medina, 2010).

On the second analysis which is the relationship of oil price with export, a change in the price will definitely has a positive relationship with the value of export, considering that the concerning country i.e. Indonesia is exporting oil. In general, the market value of energy export i.e. oil usually exceeds the cost of exploration and exploitation by a large margin. These activities, therefore, generate large economic rents that are payments in excess of what is required to draw the observed supply into the market. In contrast to most agricultural, manufacturing, and service activities, primary commodity rents can be highly persistent, since the investment required to develop new sources of supply is subject to sharply increasing cost. These primary commodity rents translate into large foreign capital inflows, easily obtained government revenues, and increased demand for goods and services produced in the local economy.

However, despite these advantages, primary commodity exporters failed to reach rapid growth and transformation. There is an explanation for this in the presence of commodity rents diverts the economy resources into activities characterized by low productivity growth. One classic example is *Dutch disease.* There have been so many papers on this particular issues i.e. Bruno & Sachs (1982), Corden (1984), Ebrahimzadeh (2012), and Ismael (2012). In this condition, there is a tendency for any non-primary commodity activity that faces global competition i.e. tradable services and much of manufacturing, to become unprofitable when there is a primary commodity boom. In a country with abundant primary commodity, commodity price boom can, therefore, produce deindustrialization. Sectors that produce non-traded goods and services i.e. transport, construction, retail, expand in response to higher demand. Meanwhile non-primary-commodity export cannot compete since their prices are kept down by a strong exchange rate which has been appreciated due to the incoming flow of revenues from primary commodity export revenue. Manufacturing firms also do not want to invest, since labor costs are not competitive when measured in local currency. This syndrome constitutes a disease, thus the term *Dutch disease,* since the sectors that are considered as very important to high-quality jobs and long-run productivity gains are shrinking (Gangelhoff, 2015). All of the above explain the phenomena of the higher price of primary commodity i.e. oil. In the case where the price of the commodity goes down, as stated above, definitely export related to the oil would go down as well.

On the relationship between oil price shocks and the economic activity, since the 1980s there are many studies which investigated the relationship between oil price changes and macroeconomic variables (Hamilton, 1983; Du et al, 2010; and Naccache, 2010). Gangelhoff (2015) shows that the effects of commodity price movements (using Purchasing Power Parity or PPP-adjusted dollar) on real GDP is large and significant. Even though there are available literatures on the negative relationship between oil price shocks and gross national product, for example, for developed countries, the impact on macroeconomic variables in developing countries is not conclusive (Rahma, 2016). This might be the result to differences in economic characteristics and the way the fiscal and monetary authorities respond to oil price shocks (Tang, 2010). As stated in Gangelhoff (2015), for oil importing countries, lower oil prices would act like a boost in the productivity of capital and labor, driving up real GDP from the supply side. This positive impact is reinforced from the demand side as the income effect of lower commodity prices expands the demand for domestic goods and services. For oil exporter countries, the favorable impact of lower material cost is offset by a direct hit on profitability that affects both output and investment in the oil-producing sectors, while the demand-side impact of a large and negative income effect drives down spending and real GDP in the non-oil sectors of the economy.

3. METHODOLOGY

3.1. Model

The oil price would be related to two sources of revenue and economic activity. Those two source of revenue are government revenue i.e. tax on oil, and export revenue. Oil price would also be related to the economic activity through the GDP. Thus, three analyses would be run in this paper. The first part is the analysis of the relationship between oil prices and government revenue, where in this part, a coefficient correlation would be run between oil prices and the government income tax and non-tax revenue both contain revenue from oil. The second part is the relationship between oil prices and the export revenue, where a coefficient correlation would be run between oil prices and export value. And the third part is the relationship of oil price with the GDP, where a formal model would be run.

3.2. Data

All data are taken from CEIC. To linearize those data, they are all multiplied by natural logarithm. Data coverage would be from a time series data from a first quarter of 2000 until the second quarter of 2016 or 66 observations.

3.3. Unit Root Tests

Before running the analysis, the time series properties of all variables should be tested to find out the time series properties of the variables. In other words, to find out whether the series is stationary or not, which there are several tests that had existed. Lately, a robust Phillips-Perron test had been developed. This test is a generalization of the Dickey-Fuller and Augmented Dickey-Fuller test where under Phillips-Perron test, the disturbance is weakly dependent and heterogeneously distributed (instead of the independence and homogeneity under Dicky-Fuller). Besides, under Phillips-Perron, major changes in the data, such as oil shock, financial deregulation, and major intervention in the monetary policy by the Central Bank are accommodated (Enders, 2015; Holden & Perman, 1994; Chu & White, 1992).

4. ANALYSIS

4.1. Unit Root Test of All Variables

Since all data are using time series data, they have to follow the procedure of testing the properties of time series data, or unit root test. A Phillips-Perron unit root test will be done on all variables under the null hypotheses that the variable is not stationary.

TABLE-1: Unit Root Test of Phillips-Perron

Phillips-Perron unit root test
(2000 - 2016)
(Observation = 66)

Variables	t-statistics			Order
	Intercept	Trend and intercept	None	
Log (price of ICP)	-1.702369	-1.352363	0.144167	I(1)
Log (price of Brent)	-1.780109	-1.674155	-0.527009	I(1)
Log (price of WTI)	-1.770213	-1.606639	0.206075	I(1)
Log (export value)	-0.961692	-5.661366***	-1.761563*	I(0)
Log (income tax)	-7.573236***	-22.86604***	0.077890	I(0)
Log (non-tax revenue)	-7.709841***	-7.706871***	-0.681682	I(0)
Log (GDP Constant Price)	0.699759	-6.598609***	12.65365	I(1)

Notes:
(*) indicates rejection of the null hypotheses at 10% MacKinnon critical values.
(**) indicates rejection of the null hypotheses at the 5% MacKinnon critical values.
(***) indicates rejection of the null hypotheses at the 1% MacKinnon critical values.

The result, as shown in Table 1 above, is that, all prices variables which are ICP, Brent, Western Texas Intermediate (WTI) are not stationary on the level, or integrated of order one, or has to be differenced one time to be stationary. Furthermore, the value of export variable is stationary using trend and intercept under 1% MacKinnon critical value, and using no trend nor intercept under 10% MacKinnon critical value, but not stationary otherwise. Thus this variable could be considered weakly stationary (Greene, 2011).

Income tax is stationary using intercept, and trend and intercept, both under 1% MacKinnon critical values, but not stationary otherwise, So, this variable could be considered as weakly stationary (Greene, 2011).

Moreover, non-tax revenue variable is similar to income tax where this variable could be considered as weakly stationary. GDP Constant Price, however, only stationary using trend and intercept, under 1% MacKinnon critical value, so this variable could not be considered as stationary. This series is not stationary.

Since the result is rather mixed for some variables, all statistics procedure for analysis number one and number two would be done in the first difference. So, for analysis number one, that is the relationship between oil price and government revenue, a correlation coefficient analysis would be done. While for analysis number two, that is the relationship between oil price and value of export, a similar correlation coefficient analysis also would be done. A correlation coefficient measures the strength and the direction of a relationship between two series. If the value of the coefficient is close to plus 1, then this indicates that there exist a positive correlation and negative otherwise. A correlation greater than 0.5 is generally described as strong, whereas correlation less than 0.5 are generally described as weak.

However, for analysis number three, that is the relationship between oil price and output, since those variables are not stationary, a Johansen cointegration analysis would be done. On the cointegration, some important points are among others: cointegration refers to a linear combination of non-stationary variables, all variables must be cointegrated of the same order, and if those variables are cointegrated then there is a long-run equilibrium among the variables so that they will not wander arbitrarily far from each other (Enders 2015; Green, 2011).

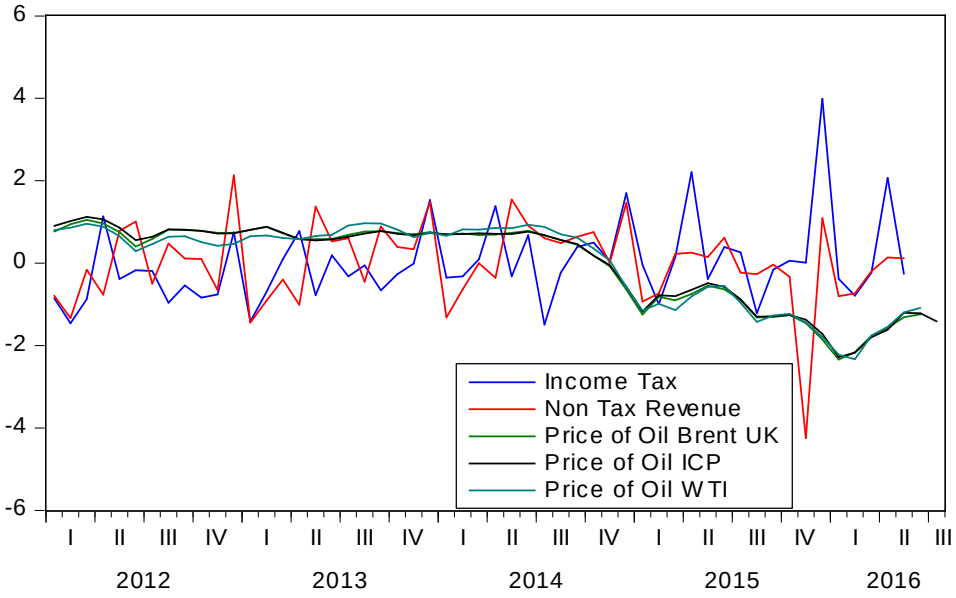
Note that the possibility of running a regression and therefore getting the elasticity for analysis number one and number two is not possible since those concerned variables are integrated of different orders. As stated in Greene (2011), in this case, both must be drifting apart.

A regression of one variable which is I(1) against the other which is I(0) means a regression of one variable that is growing at an increasing rate on one variable that is growing at a constant rate. The result would be the distance between them would have to be increasing with time, not varying randomly.

Also, note that the possibility of running a regression and again getting the elasticity for analysis number three is also not possible since those concerned variables are not stationary or I(1). A regression on this type of variables is spurious since all errors are permanent (Green, 2011).

4.2. Correlation between Oil Price and Government Revenue

GRAPH-3: Comparison between prices of oil and the income tax and non-tax revenue (January 2012 until June 2016)



Source: Ministry of Finance

As stated above, the result of the unit root test showed that all variables are not stationary on the level. Therefore, in this part, the analysis would be done on the difference.

Before running the correlation coefficient, visual inspection is done using graphical approach. Graph 3 above shows that prices of oil Brent UK, ICP, and WTI have a somewhat similar direction with the revenue from income tax and non-tax revenue. There was some sharp fluctuation of those revenues through which created some gaps between revenue and oil prices.

The result of the correlation between prices of Crude Oil Indonesia (ICP), West Texas Intermediate (WTI), and United Kingdom Brent, against the Indonesia's Government Revenue in terms of Income Tax and Non-Tax Revenue, could be seen in the attachment below[†]. Attachment 1 below shows that there are positive relationships between all variables. The degree of the relationship between each of those prices and the government revenue, however, is varied. The price of Crude Oil Indonesia is more correlated to government revenue, followed by West Texas Intermediate, and Brent.

[†] Income tax and non-tax revenue data is used here since they are the closest number and the more general number that can be used in the statistics approach. Using a more detailed data such as income tax on oil and non-tax revenue on oil will give zero values in some periods, for example in the beginning of the year i.e. January. This zero numbers exist since in a certain year, there was no revenue collected yet in January. The implication for zero number in statistics is somewhat significant (Greene, 2011). Natural logarithm of zero number will give no number at all. Thus to avoid this, this paper uses a more general data such as income tax instead of income tax on oil, and non-tax revenue instead of non-tax revenue on oil. Note that this data generalization will not reduce the substance of this paper.

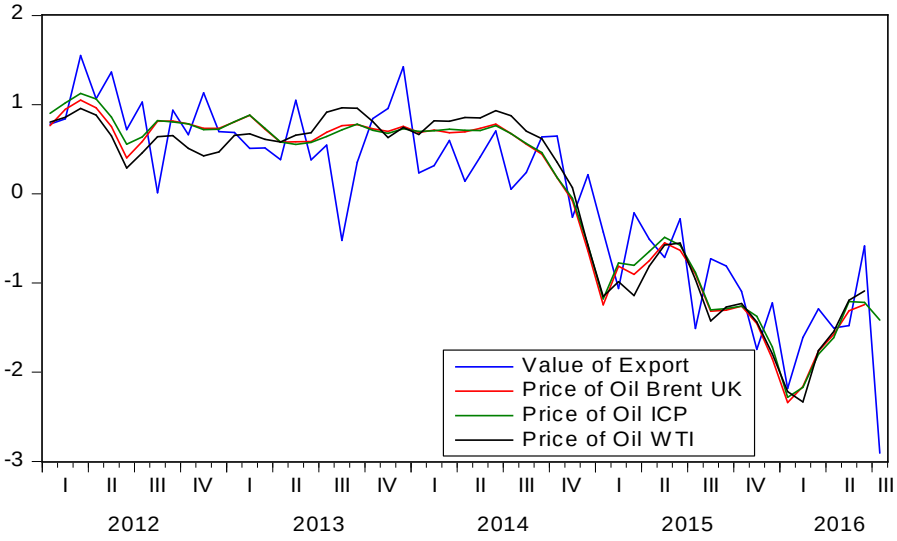
Attachment 1 shows that on the coefficient, on average, the coefficient number between the prices and the government revenues are around 5 percent. The coefficient is rather small, i.e. less than 10%. However, the absolute number of the impact of the change in oil price would be quite significant. Five percent taken from the total revenue would bring significant impact on the government budget. The impact would create a gap between the revenue target and revenue realization (note that the high need for development financing pushes the revenue target upward). This gap in the revenue portion would be transmitted into a cut for government expenditure. It would not be an easy decision for the government to cut expenditure since some part of the money is already earmarked to finance education, health, and regional government development program.

Note that as stated above, in the case of Indonesia, the revenue from oil showed up in the government revenue as income tax on oil and gas, and non-tax revenue from oil and gas. In absolute value, for example in the government budget of 2015, income tax on oil and gas only contribute about 7% from total income tax. Meanwhile, non-tax revenue on oil and gas only contribute about 30% from total non-tax revenue

There is a possibility that part of the somewhat small coefficient was also probably due to the fluctuation of the exchange rate. Government revenue from oil is calculated as the volumes of oil sold multiply by its price then converted to domestic currency by the nominal exchange rate agreed between the government and the oil producer.

4.3. Correlation between Oil Price and Value of Export

GRAPH-4: **Comparison between prices of oil and the value of export (January 2012 until June 2016)**



Source: CEIC

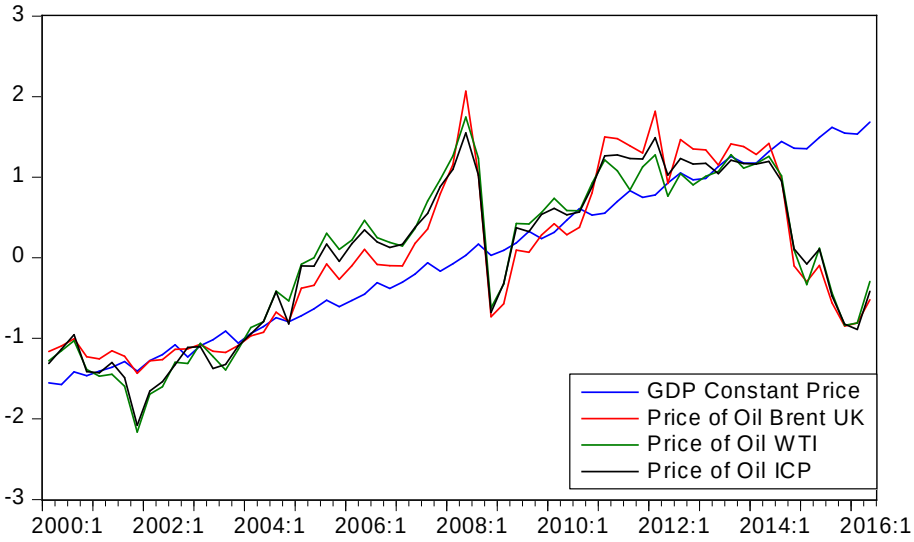
In this part, all variables, which are prices of oil and export value, are differenced ones. Again, before running a correlation coefficient between the prices of oil and the value of export, a visual inspection using graphical approach is done. Graph 5 above shows that all prices are related to the export value in a similar direction.

Attachment 1 below shows that from coefficient correlation points of view, the similar positive relationship exists between those prices and value of Indonesia's export, as in between those prices and the government revenue. There exists a positive relationship between the prices of oil and the export value of Indonesia. The degree of the relationship between each of the prices and the value of export is similar as in the relationship between the prices and the government revenue. The price of Crude Oil Indonesia is more correlated to export value, followed by West

Texas Intermediate, and Brent. The coefficient is around 8 percent, which is somewhat higher than the coefficient between the prices and government revenue.

4.4. Johansen Cointegration between Oil Price and Output

GRAPH-5: **Comparison between prices of oil and Gross Domestic Product Constant Price (quarterly between 2000 q1 until 2016 q2)**



Source: CEIC

Visual inspection between output, proxied by GDP Constant Price and price of oil ICP, the price of oil Brent UK, and price of oil WTI, shows that there were some similarity and difference between them. In several periods, the movement of prices of oil is similar to the movement of GDP Constant Price. In other periods, there was a sharp difference between them. Generally, GDP Constant Price keeps moving upward while prices of oil fluctuate around the GDP line. This implies that GDP Constant Price or output of Indonesia has no correlation with prices of oil.

A more formal analysis could be done using econometric approach. Since all data are not stationary, a Johansen Cointegration test will be done for these variables. The model, a bivariate model generalized from Gangelhoff (2015), in order to simplify the theoretical approach, is:

$$Y_t = f(P_t) \quad (1)$$

Where: Y is GDP constant price in year t and P is oil price in year t.

A linearized equation of the model is as follows. Note that this model is chosen due to the simplicity of the relationship where there are no other variables in the model, thereby the relationship between both variables could be pinpointed without any intervention from some other series:

$$\text{Log (GDP Constant Price}_t) = \alpha + \beta \text{ Log (Price of Oil}_t) \quad (2)$$

The Johansen Cointegration would be run based on the above-linearized equation under several assumptions. Based on the assumption that the series have linear deterministic trends but the cointegrating equations have only intercepts, it is found that there are no linearly independent cointegrating vectors. Therefore those variables are not cointegrated. The result of the test could be seen from Table 2, 3, and 4 below, where Table 2 represents the cointegrating

result between GDP Constant Price and price of oil ICP, while Table 3 represents the cointegrating result between GDP Constant Price and the price of oil WTI, and Table 4 represent the cointegrating result between GDP Constant Price and the price of oil Brent UK. Note that *Eviews* calculated the eigenvalues of the Johansen cointegration test and gives the 5% critical values for λ_{trace} only, while the critical values for λ_{max} are not given. Therefore the test using λ_{max} will not be done here. From those tables, the first column reports the eigenvalues obtained from the estimated π matrix. The second column reports the various λ_{max} statistics calculated using the eigenvalues. The last column reports the λ_{trace} statistics, which is the summation of the λ_{max} statistics. The λ_{trace} will be used here to test the null hypothesis r = 0 against the general alternative. Its value is then compared to the critical values given by *Eviews* using the 5% critical value. Since the value is smaller than the 5% critical value, therefore the null hypothesis cannot be rejected or the variables are not cointegrated.

TABLE-2: Cointegrating result between GDP Constant Price and price of oil ICP

Sample 2000Q4 – 2016Q2
Usable observation = 63
Variables: GDP Constant Price and Price of Oil ICP

Eigenvalue	λ_{max}	λ_{trace}
λ_1 = 0.053478	3.462580	3.467076
λ_2 = 7.14E-05	0.004496	0.004496

TABLE-3: Cointegrating result between GDP Constant Price and the price of oil WTI

Sample 2000Q4 – 2016Q2
Usable observation = 63
Variables: GDP Constant Price and Price of Oil WTI

Eigenvalue	λ_{max}	λ_{trace}
λ_1 = 0.056879	3.689347	3.693890
λ_2 = 7.21E-05	0.004543	0.004543

TABLE-4: Cointegrating result between GDP Constant Price and the price of oil Brent UK

Sample 2000Q4 – 2016Q2
Usable observation = 63
Variables: GDP Constant Price and Price of Oil Brent

Eigenvalue	λ_{max}	λ_{trace}
λ_1 = 0.051979	3.362832	3.470334
λ_2 = 0.001705	0.107502	0.107502

The finding that oil prices are not cointegrated with the GDP Constant Price is probably could be explained when the component of GDP Constant Price from an expenditure point of view is broken down. For the past several years, household consumption is the most important component of the GDP. Consumption is the number one contributor to the growth of the Indonesia's economy, followed by domestic investment, government consumption, and export minus import. Export-import which contains oil contributed little to the growth of the economy. Even latest figures such as the 2016's second quarter show that the growth of export import is negative. Thus oil, which according to the above analysis, is only somewhat correlated with export, differ in its direction with the economic activity.

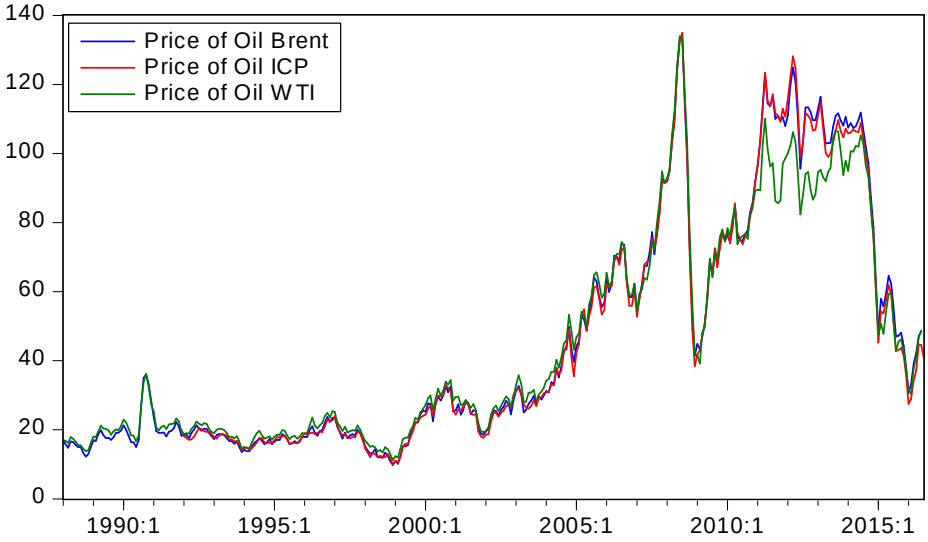
Note that there is another channel where oil price would affect domestic economy. It is through what is called the price pass-through. This is where the reduction in the world price of oil would affect the price of petroleum at the retail level. In many emerging markets and

developing economies, including Indonesia, administrative controls on energy prices, often in the context of fuel price subsidies, provide for more sustained limited pass-through. As stated above, this part is outside the context of this paper and will not be analyzed here.

The result of this part is in line with Ftiti et al. (2016), Rogoff (2005), Barsky & Kilian (2001, 2004) and Berbanke et al. (1997) even though with a different reason. Ftiti et al. (2016) using pooled data of selected OPEC countries shown that in the short term, there is a much lower correlation, and even negative relationship for some countries, between prices of oil and economic growth. According to Rogoff (2005), the impact of oil prices is weak due to deeper financial markets where a high percentage of a domestic investor in the domestic financial market would absorb or mitigate the external shock which might come from the international oil market, and better anchored monetary policy among others. This monetary policy reaction which somehow offset the impact of oil prices is similar to the finding of Bernanke et al. (1997), while Barsky & Kilian (2004) shown that the disturbance in the oil market matter less for US macroeconomic performance.

This, however, is not in line with the result done by some other researcher, for example, Boheman et al. (2015). Boheman, using unrestricted bivariate VAR-model using data from OPEC and non-OPEC countries, found out that economic growth is affected by the oil price shocks. An upward movement of the prices of oil will push economic growth to go up. The notable difference between this paper and the paper done by Boheman et al. (2015) is the period under observation. Boheman et al were using data between 1980 until 2008, while in this paper the data is emphasized on the oil price shocks within 2014 and 2015.

GRAPH-6: **Monthly movement of prices of oil of Brent, ICP, and WTI (January 1988 until June 2016)**



Source: CEIC

Graph 6 above shows the movement of prices of oil of Brent UK, ICP, and WTI. When the data was pull back as far as 1980 and then the period was cut within 1980 until 2008 as in Boheman et al. (2015), it could be seen that the prices of oil have the tendency to go up. A regression line using the period between 1980 until 2008 as in Boheman et al. (2015) would be pulled upward. However, when the period of observation was around 2013 until 2016, as in this paper, the tendency of the prices was downward. This implies that different period observation will give a different result. This could probably explain the difference of the result between this paper and other such as Boheman et al.

5. CONCLUSIONS AND RECOMMENDATIONS

The hypotheses of these paper are oil price, which are price of oil ICP, price of oil Brent UK, and price of oil WTI, has a positive correlation with the government revenue in terms of income tax and non-tax revenue (both contain revenue from oil), export revenue (which also contain oil revenue), and economic growth in terms of GDP Constant Price.

To prove the above hypotheses, three analyses have been done. The first is correlation coefficient between prices of ICP, Brent UK, and WTI, against the government revenue in terms of income tax and non-tax revenue. The result shows that the coefficient number or value between prices of oil and government revenue is around 5 percent. Therefore the first hypothesis is proven. On the number, even though the value is somewhat small, the absolute number of the impact of the change in oil price would be quite significant. Five percent taken from the total revenue would bring significant impact on the government budget. The impact would create a gap between the revenue target and revenue realization (note that the high need for development financing pushes the revenue target upward). This gap in the revenue portion would be transmitted into a cut for government expenditure. It would not be an easy decision for the government to cut expenditure since some part of the money is already earmarked to finance education, health, and regional government development program. There is a possibility that part of the somewhat small coefficient was probably due to the fluctuation of the exchange rate. Government revenue from oil is calculated as the volume of oil sold multiply by its price then converted to domestic currency by the nominal exchange rate agreed between the government and the oil producer.

The second analysis is correlation coefficient between prices of oil against the value of export. A positive relationship exists between those prices and value of Indonesia's export, as in between those prices and the government revenue. There exists a positive relationship between the prices of oil and the export value of Indonesia. Thus the second hypothesis is proven. The degree of the relationship between each of the prices and the value of export is rather similar as in the relationship between the prices and the government revenue, in this case around 8 percent on average. The price of Crude Oil Indonesia is more correlated to export value, followed by West Texas Intermediate, and Brent.

The third analysis is the Johansen Cointegration between prices of oil against the economic growth or GDP Constant Price. The result is that they are not cointegrated. This finding is probably could be explained when the component of GDP Constant Price is broken down. For the past several years, household consumption is the most important component of the GDP which is the number one contributor to the growth of the Indonesia's economy, followed by domestic investment, government consumption, and export minus import. Export-import, which contains oil, contributed little to the growth of the economy. Even latest figures such as 2016 second quarter show that the growth of export import is negative. Thus oil which is part of export, do not contribute as much as in the past, particularly the 1980s and 1990s, to the economic activity. There is another channel, though, where oil price would affect the domestic economy that is through what is called price pass-through. This is where the reduction in the world price of oil would affect the price of petroleum at the retail level. In many, emerging market and developing economies, including Indonesia, administrative controls on energy prices, often in the context of fuel price subsidies, provide for more sustained limited pass-through. As stated above, this part is outside the context of this paper and is not analyzed here.

A regression analysis could not be done in this paper due to the constraint faced by the time series properties' of the variables. In general, through a correlation analysis, a decrease in the oil price is translated into a decrease in the government revenue and export value. However, since oil does not contribute as much as in the past, the reduction of oil price would not necessarily translate into a decline in the economic output.

For further analysis, several things are recommended to be done by other researchers. For example, analyzing the oil prices pass-through effect at the retail effect. Another example is separating the temporary and permanent decline in the prices and then run the impact analysis of the change in oil prices on the macroeconomic variables. One other example is testing whether the *Dutch disease* still exists.

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ATTACHMENT 1.

Correlation Coefficient

	D(LEXPORTVALUE)	D(LINCOMETAX)	D(LNONTAXREV)
D(LPRICEBRENT)	0.082130	0.020035	0.036725
D(LPRICEICP)	0.088343	0.058419	0.048787
D(LPRICE WTI)	0.086136	0.050238	0.039312

ATTACHMEBT 2.a.

Cointegration test

Date: 09/11/16 Time: 21:05

Sample (adjusted): 2000Q4 2016Q2

Included observations: 63 after adjustments

Trend assumption: Linear deterministic trend

Series: LGDPCONSTANT LPRICEOILICP

Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.053478	3.467076	15.49471	0.9417
At most 1	7.14E-05	0.004496	3.841466	0.9456

Trace test indicates no cointegration at the 0.05 level

*** denotes rejection of the hypothesis at the 0.05 level**

**** MacKinnon-Haug-Michelis (1999) p-values**

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.053478	3.462580	14.26460	0.9112
At most 1	7.14E-05	0.004496	3.841466	0.9456

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) p-values**

ATTACHMENT 2.b.

Date: 09/11/16 Time: 21:10

Sample (adjusted): 2000Q4 2016Q2

Included observations: 63 after adjustments

Trend assumption: Linear deterministic trend

Series: LGDPCONSTANT LPRICEOIL WTI

Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.056879	3.693890	15.49471	0.9267
At most 1	7.21E-05	0.004543	3.841466	0.9454

Trace test indicates no cointegration at the 0.05 level

*** denotes rejection of the hypothesis at the 0.05 level**

****MacKinnon-Haug-Michelis (1999) p-values**

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.056879	3.689347	14.26460	0.8906
At most 1	7.21E-05	0.004543	3.841466	0.9454

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) p-values**

ATTACHMENT 2.c.

Date: 09/11/16 Time: 21:11

Sample (adjusted): 2000Q4 2016Q2

Included observations: 63 after adjustments

Trend assumption: Linear deterministic trend

Series: LGDPCONSTANT PRICEOILBRENT

Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.051979	3.470334	15.49471	0.9415
At most 1	0.001705	0.107502	3.841466	0.7430

Trace test indicates no cointegration at the 0.05 level

*** denotes rejection of the hypothesis at the 0.05 level**

**** MacKinnon-Haug-Michelis (1999) p-values**

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.051979	3.362832	14.26460	0.9197
At most 1	0.001705	0.107502	3.841466	0.7430

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) p-values**