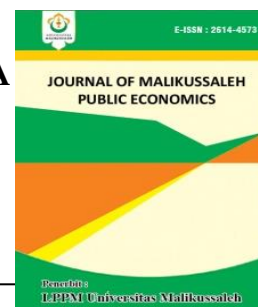# THE EFFECT OF FLUCTUATION WORLD OIL PRICES AND THE RUPIAH EXCHANGE RATE ON ECONOMIC GROWTH IN INDONESIA

Ulfa Ajnura[*a], Hijri Juliansyah[*b]
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A R T I C L E I N F O R M A T I O N   A B S T R A C T

This study examined the effect of fluctuations in world oil prices and the rupiah exchange rate on economic growth in Indonesia in the short and long term. This study used time-series data for 31 years. The analytical model used was the Autoregressive Distributed Lag model. The results show in the short term showed that world oil prices had a positive but insignificant effect on economic growth in Indonesia, while the rupiah exchange rate had a negative and significant effect on economic growth in Indonesia. In the long term, world oil prices had a positive and significant effect on economic growth in Indonesia. The rupiah exchange rate has a negative and significant effect on economic growth in Indonesia. It indicated that in the short term, the rupiah exchange rate had an influence or contribution to economic growth in Indonesia, and in the long term, world oil prices had an effect or contribution to economic growth in Indonesia.

1. INTRODUCTION

Economic growth is one of the measuring tools of the economy that must be considered by each country globally. Understanding of economic growth from Prof. Kuznets in Rahardja & Manurung, (2001) is a periodic increase in the potential of a country in the fulfillment of various types of economic goods for soecity.

Economic growth is assessed as an increase in production and income, which means that there is an increase in national income as indicated by the value of the Gross Domestic Product (GDP). The increasing GDP of a country indicates that the country is more developed than other countries, not only that a country that is able to maintain and even always increase its economic growth is an achievement and success of a country in the long term.

According to Arifin, (2016) Economic growth is often connected with energy, where energy is one of the main inputs in the production process.

In Indonesia, fuel is a subsidy that has consumed a lot of government funds, this subsidy was implemented by the Suharto regime based on article 33 of the 1945 Constitution (Abidin, 2013). At that time the government was still able to finance the production of these subsidies until oil imports came to Indonesia. In 2014 the Jokowi-JK government revoked the oil subsidy budget and shifted the consumptive aspect to the productive aspect, especially for infrastructure, health and education (Hasan, 2018).

According to Etornam, (2015) revealed in the results of his research, in general, previous studies argue that world oil prices have a negative and significant effect on GDP. Then Etornam explained that this relationship played a role especially for oil-importing countries in the advanced economic category and argued that a different phenomenon might occur if the case was a developing country and an oil importer oil, such as Ghana.

Similar to Ghana, Indonesia which is a developing country and an oil importer where high world oil prices will affect the demand for the dollar currency which will affect the depreciation of the rupiah exchange rate due to a negative idea that the government cannot stabilize the exchange rate when foreign exchange reserves are low.

Salvatore in Nulhanuddin & Andriyani, (2019) explained that it is very important to determine the exchange rate system for a country because the exchange rate is a tool used to puss the country's economy from the impact of an open economy. In purpose and duties, Bank Indonesia (BI) explained that Indonesia had implemented three exchange rate systems, first is fixed exchange rate system from 1970 to 1978, second iscontrolled floating exchange rate system since 1978 and third is a free floating exchange rate system since August 14, 1997.

With the implementation of the latest exchange rate system, the rupiah exchange rate is fully determined by the market so that the applying of exchange rate is truly a reflection of the balance between the power of supply and demand. It can be seen indirectly that the increase of world oil prices will make Indonesia suffer a loss so that it cannot increase the economy or GDP. The data last 5 years for each variables are follows :

Table 1
Data of Indonesia's Economic Growth, World Oil Prices, Rupiah Exchange Rate

Year	GDP (%)	US$/Barel	Rupiah/ 1 dolar
2015	4,80	52,39	13.795
2016	5,03	43,73	13.600
2017	5,06	54,19	13.548
2018	5,10	71,31	14.710
2019	5,00	64,21	13.901

In table 1 it can be seen that during the last 5 years economic growth in Indonesia has a positive trend in the year 2018 which was 5.10 percent this was due to growth in expenditure components such as the agricultural, industrial and trade sectors and also in production components such as non-profit institutions that serve households, exports and imports. The negative trend occurred in the year 2015 which was only 4.80 percent due to the low purchasing power of consumers and producers plus inappropriate import policies that made food prices fluctuate.

World crude oil variable has a positive trend in 2016 which fell to US$ 43.73 per barrel this was due to the lifting of Iran's economic sanctions. The lifting of sanctions allows Iran to increase oil supplies by up to 500,000 barrels per day. The negative trend in the year 2018 reaching US$ 71.31 per barrel as a result of rising demand for oil prices by countries with development programs such as South Korea and India and still continuing geopolitical tensions between Arab countries or the Arab Spring.

In this study the data presented shows that the increase in world oil prices will increases Indonesia's GDP, the increase in world oil prices should decrease Indonesia's GDP, this theory agaipts the research of Musa et al., (2019) with the result that world oil prices have a positive and significant effect on Nigerian GDP.

The rupiah exchange rate was also still stable until 2017 but in 2018 the rupiah exchange rate was on a negative trend of Rp. 14,710 per dollar.

This value is even the worst in the last 30 years, the cause is the trade war between the United States and China which was started by the United States raising interest rates to 2 percent which caused foreign investors move and transfer their wealth in United States dollars.

In this study, the data shows that the depreciation of the rupiah exchange rate increases economic growth but, the depreciation of the exchange rate should reduce economic growth. This theory agaipts with the research of Musa et al., (2019) with the result that the exchange rate has a significant positive effect on Nigeria's GDP.

This study aims to determine how big the short-term and long-term effects of fluctuations in world oil prices and the rupiah exchange rate on economic growth in Indonesia.

2. LITERATUR REVIEW

Economic Growth

According to Sukirno, (2013) GDP is the value of goods or services in a country produced by production factors belonging to the community and foreign nationals residing in the country or can be defined as a benchmark of economic growth marked by an increase in production and revenue or an increase in national income indicated by total GDP.

Then Mankiw, (2006) explains that GDP is understood as the market value of all final goods and services produced by a country in a certain period.

While the understanding of economic growth is seen from the explanation of Lincolyn Arsyad in Sapthu, (2013) Economic growth is defined as an increase in GDP / Gross National Income without calculate whether the increase is greater or smaller than the population growth rate or whether changes in the economic structure occur or not.

World Oil Prices

Price is a determination of the exchange value set by the seller and the buyer to obtain a product.

According to Gitosudarmo, (2014) Price is a measure of the size of the value of a person's satisfaction with a product he buys. The higher the satisfaction expected on a product, will be more expensive the product price and conversely the lower the satisfaction expected on a product, the cheaper the price of the product. This is related to the theory of consumer behavior in which countries that import oil really need oil to develop the country's production sector.

The world oil price can be said to be the price formed as a result of the supply and demand for world oil commodities. World crude oil is generally measured from prices on the world oil market with the standard West Texas Intermediate (WTI) and Brent oil (Purnomo et al., 2020).

Rupiah exchange rate

According Mishkin, (2008) is the price of one currency in another currency. Understanding the exchange rate according to Sukirno, (2011) is the amount of currency value needed to obtain one unit of another country's currency. Then According Mankiw, (2006) The exchange rate is the price set by two countries in conducting trade transactions.
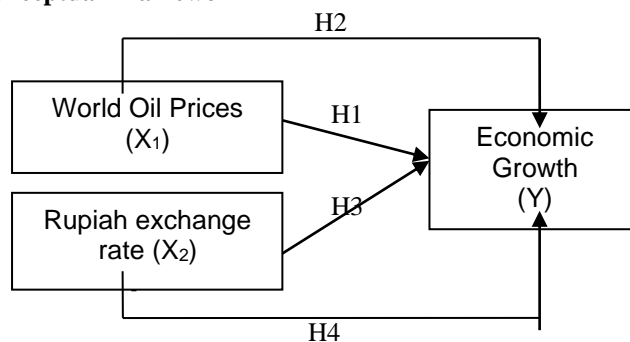
Conceptual Framework

Figure 1 Conceptual Framework

Based on the conceptual framework, it is explained that the effect between the independent variable and the dependent variable that is world oil prices (X_1) and the rupiah exchange rate (X_2) on Economic Growth (Y) will be tested with the Autoregresive Distributed Lag (ARDL) dynamic model.

Hypothesis

Based on the theory in this study, researchers can take the hypotheses as following:

H1 : It is assumed that in the short term oil prices world has a negative and significant effect on economic growth in Indonesia

H2 : It is assumed that in the long term oil prices world has a negative and significant effect on economic growth in Indonesia

H3: It is assumed that in the short term Rupiah exchange rate has a negative and significant effect on economic growth in Indonesia

H4 : It is assumed that in the long term Rupiah exchange rate has a negative and significant effect on economic growth in Indonesia

3. RESEARCH METHODOLOGY

The scope of research

The object of this research is world oil price, rupiah exchange rate and economic growth. The research location is in Indonesia.

Types and Sources of Data

The type of data used in this study is quantitative data, namely data in the form of numbers. While the source data in this study used secondary data. The data of economic growth sourced from the World Bank, data of world oil prices sourced by BP Statistical Review of World Energy and data of the rupiah exchange rate from BPS Indonesia in from 1989 to 2019 totaling 31 years.

Variable Operational Definition

The definitions of variables in this study are as follows:

1. World Oil Price (X_1)

The world oil price is the world's crude oil price which is formed due to the demand and supply of world oil commodities. World oil prices are calculated in US Dollars per Barrel (1 barrel = 159 Liters), using world oil averages (Dubai, U.K., Brent and U.S. West Texas Intermediate).

2. Rupiah Exchange Rate (X_2)

The rupiah exchange rate is the unit price of the domestic currency against foreign currencies. In this study the rupiah was determined against the United States dollar.

3. Economic growth (Y)

Economic growth is the process of changing the economic conditions of a country towards a better condition during a certain period as measured by Gross Domestic Product in percent.

Data analysis method

Autoregressive Distributed Lag **(ARDL)**

This research was conducted using a quantitative descriptive method using Autoregressive Distributed Lag (ARDL) which is one of the dynamic models in econometrics because the ARDL model describes the time flow of the dependent variable in relation to past values (Gujarati & Porter, 2009). Gujarati and Porter also explain that, actually ARDL is combination of *Autoregressive* (AR) and *Distributed Lag* (DL) model. The AR model is a model that uses one or more past data from the dependent variable, while the DL model is a regression model that involves data in the present and past time (Lagged) from the independent variables. Menurut Nkoro & Uko, (2016) Lag is a past value that is used to see the future. The DL model can distinguish long-term and short-term reactions from the variables studied.

Although there are other simpler models such as the Ordinary List Square (OLS), the ARDL model can see the effect of the dependent variable and the independent variable from time to time, including the effect of the dependent variable from the past on the value of the dependent variable in the present. In this study, the author uses the ARDL model which can be interpreted as a model that uses data time in the past and present which consists of the independent variable and the dependent variable. The ARDL equation in general is as follows:

$$\Delta GDP_t = \alpha_{0i} + \sum_{i=1}^{n} \alpha_{1i}\, \Delta GDP_{t-i} +$$

$$\sum_{i=1}^{n} \alpha_{2i}\, \Delta WOP_{t-i} + \sum_{i=1}^{n} \alpha_{3i}\, \Delta EXC_{t-i} +$$

$$\beta_{11} GDP_{t-1} + \beta_{21} WOP_{t-1} + \beta_{31} \Delta EXC_{t-1} + \varepsilon_{1t}$$

Stationary Test

To avoid regression problems, what must be done is to change non-stationary data into stationary data (Widarjono, 2013). Stationary test can be done by unit root test to determine the stationarity of one variable. If it turns out that it is not stationary, then it must be continued through the integration test. ARDL implementation unit root test with Philips-Perron (PP) from research reference Chor & Md. Darit, (2015) which suggests that the stationary test results from Philips-Perron are more compatible with the ARDL model and require the variable to be stationary at the First Difference level.

Optimum Lag Test

This test is carried out to determine the lag that will be used in the implementation of the next test. Determination of the optimum lag is very important because the length of the lag is expected to be appropriate so as to get the dynamics of the system to be modeled. If the lag is too long, it will result in more parameters that must be estimated so that it can reduce the ability to reject H0, because adding too many parameters will reduce the degrees of freedom. Determination of the optimal lag length can be done in few ways, such as looking at the information on AIC (Akaike Information Criterion) and SC (Schwarz Criterion). The criterion that has the smallest AIC and SC values is the lag used. The Eviews program has provided an star sign for the lag that is set as the optimum lag.

Granger Causality Test

In the regression estimation there is a dependent variable Y and an independent variable X. If time series data is used, the concept of causality can be explained in a different way by the fact that time cannot go backwards. If an event A occurs before event B, then event A may cause event B, but it is impossible for event B to cause event A. Such a trait can be explained by using Granger Causality. X called granger causes Y if past values of variable X can help to explain variable Y. Keep in mind that if X granger causes Y, there is no certainty that X caused Y, but it can be explained as X might cause Y (Rosadi, 2016).

Cointegration Test

Cointegration is a long-term relationship between variables. This test was developed on the basis of the perception that although the data are not individually stationary, but when a linear combination of two or more time series data is performed, it will become stationary like the stationarity test, cointegration test also has several types. The implementation of the cointegration test used is the Bound Test. According to Nkoro & Uko, (2016) The cointegration test of the ARDL model is determined by the Bound Test, if the F-statistics value is greater than the Upper Bound I(1) value then reject H0 which means that in the model there is a long-term or cointegrated relationship, if the F-statistical value is below the lower Bound I value. (0) then accept H0, meaning that there is no long-term relationship and is not cointegrated in the model, and if the F-statistical

value is between the Upper and Lower bound values, the results cannot be concluded.

Model Stability Test

To test the stability of economic growth, CUSUM (cumulative sum of recursive residuals) is used. If the CUSUM plot is at a critical value of 5 percent or does not fall outside the upper and lower limits, then the estimate is considered stable, and vice versa. In addition to the CUSUM test, the CUSUMQ or cumulative sum of squares of recursive residuals is also used which applies the same as the CUSUM test (Longe, 2018).

4. RESEARCH RESULTS AND DISCUSSION

Results of data analysis
ARDL Test Results

The test results using the ARDL method there are several tests or steps including the following :

Stationary Test Results

The first step of ARDL model is the stationary test is to require the variable to be stationary at first different using the Philip-Perron method. Stationary test results can be seen in the table below :

Table 2
Stationary Test Results

Variable	Criteria	Prob.	Information
Economic growth	Level	0.0365	Stationary
	1diff	0.0000	Stationary
	2diff	0.0000	Stationary
World Oil Prices	Level	0.5952	Not
	1diff	0.0037	Stationary
	2diff	0.0000	Stationary
Rupiah exchange rate	Level	0.4446	Not
	1diff	0.0010	Stationary
	2diff	0.0000	Stationary

Source : Processed data(2021)

Based on the results of the Unit Root test with the help of E-views 10 in the table above, it shows that all variables in this study, that is economic growth, world oil prices and the rupiah exchange rate, are stationary at the first difference level at a significance level α=5%, which means that one of the conditions in the use of the ARDL model has been met.

Optimum lag length test results

The results of the Optimum Lag Length test against the ARDL equation with the independent variables of world oil prices and the rupiah exchange rate show the optimum lag is lag 2. The choice of lag 2 is based on the Sequential Modified LR test statistic criteria Final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC), and Hannan-Quinn information criterion (HQ), at the level of significance =5% can be seen in the table below:

Table 3
Uji Lag Optimum

Lag	0	1	2
LogL	-425.7510	-367.8022	-356.4459
LR	NA	99.91182	17.23024*
FPE	1.39e+09	47914668	41710921*
AIC	29.56904	26.19325	26.03075*
SC	29.71048	26.75903*	27.02086
HQ	29.61334	26.37045	26.34084*

Source : Processed data (2021)

The selection of the optimum lag used is seen based on where the start sign (*) is most located, which means that the asterisk indicates the selected lag order according to the criteria used. The choice of lag 2 is caused by the smallest value of each criterion being in lag 2 so that the ability to reject H0 is higher and can avoid autocorrelation indications.

Graph result of selected lag

The graph results are seen to test the suitability of the ARDL model so that the research model that is formed does not violate econometric rules. Graph results obtained from graph testing using the Akaike Information Criteria (AIC) method obtained the following results:
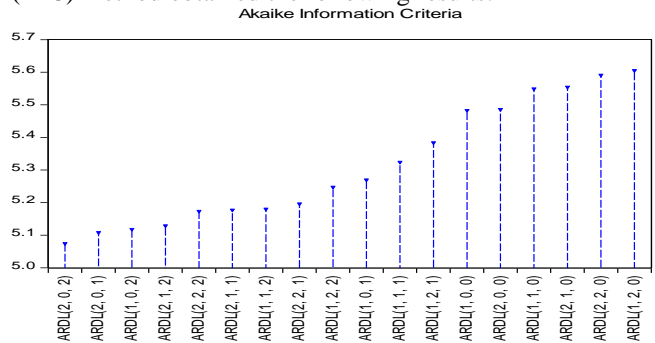
Source : Processed data (2021)
Figure 2 Graph of selected lag

Based on the results of the graph testing of the selected lags, the selected criteria is at lag 2 (2,0,2) which means that each independent and dependent variable has a lag of 2 lags.

Cointegration test results : *Boundtest*
ARDL cointegration testing using Bounds Test as a condition of the ARDL model.

Table 4
Cointegration test results

Variabel	F-Statistik	Taraf Kepercayaan 5%		Kesimpulan
PDB, WOP, EXC	8.061892	I0 Bound	I1 Bound	Terima Ha
		3.1	3.87	

Source: Processed data (2021)

Based on the results of the cointegration test in table 4 with the Bounds Test model, it is found that the f-statistic value is greater than Upper Bounds and Lower Bounds (8.061892 > 3.87). This indicates that there is cointegration between the variables of world oil prices, the rupiah exchange rate and economic growth.

Granger Causality Test Results

Granger causality test is intended to determine whether or not there is a two-way relationship between variables. Granger causality test results can be seen from the table below:

Table 5
Granger Causality Test Results

Null Hypothesis:	F-Statistic	Prob.
WOP does not Granger Cause PDB	0.16369	0.8499
PDB does not Granger Cause WOP	0.20264	0.8180

EXC does not Granger Cause PDB	2.21464	0.1310
PDB does not Granger Cause EXC	1.91283	0.1695
EXC does not Granger Cause WOP	2.41885	0.1104
WOP does not Granger Cause EXC	0.42193	0.6606

Source :Processed data (2021)

It can be seen from the results of table 4 that each variable does not have a causal relationship or a two-way relationship that proved a probability value > 0.05.

ARDL model estimation results

After performing the cointegration test, the next step is the ARDL estimation test. The results of testing the ARDL estimation in the short term can be seen from the table below :

Table 6
Short-term ARDL Estimation Test Results

Variable	Coef.	Std. Error	t-Statistic	Prob.
GDP(-1)	0.252778	0.178723	1.414351	0.1713
GDP(-2)	-0.280685	0.173394	-1.618769	0.1197
WOP	0.044009	0.021973	2.002888	0.0577
EXC	-0.001961	0.000504	-3.888804	0.0008
EXC(-1)	0.000797	0.000777	1.025322	0.3164
EXC(-2)	0.000870	0.000564	1.543199	0.1370
CointEq (-1)*	-1.027907	0.169804	-6.053508	0.0000
C	6.373298	1.704269	3.739607	0.0011

Source : Processed data (2021).

From table 6 above, the ARDL equation:

GDP = 6.373298 + 0.044009WOP – 0.001961 EXC

From the short-term estimation results above, it can be seen that the value of Constanta is (6.373298), which means that if the world oil price and the rupiah exchange rate are constant, then economic growth is constant at 6.373298 percent. The coefficient value is (0.044009), which means that if in the short term the world oil price increases by 1 dollar per barrel, economic growth will increase by 4 percent. Then, the variable of world oil prices in the short term has a positive but not significant effect on economic growth in Indonesia. The coefficient value is (-0.001961) which means that if in the short term the rupiah exchange rate appreciation by 1 rupiah, then economic growth will decrease to 0.1 percent. Next, the rupiah exchange rate in the short term has a negative and significant effect on economic growth in Indonesia.

Long-Term Estimation Test Results

The test results, as follows :

Table 7
Long-Term ARDL Estimation Test Results

Long Run Equation			
Varia	Coef.	Std. Er	t-Stat.	Prob.
WOP	0.042814	0.020101	2.129923	0.0446
EXC	-0.000286	0.000169	-1.690429	0.1051
C	6.200266	1.217405	5.093017	0.0000

Source :Processed data (2021)
The ARDL equation in the long term is as follows:

**GDP = 6.200266+0.042814WOP - 0.0000286EXC**

From the results of the long-term estimation above, it can be seen that the value of Constanta is (6.200266) which means that if the world oil price and the rupiah exchange rate are constant, the economic growth is constant at 6.200266 percent. The coefficient value is (0.042814), which means that if in the long term the world oil price increases by 1 dollar per barrel, economic growth will increase by 4.28 percent. Next, the variable of world oil prices in the long term has a significant positive effect on economic growth in Indonesia. The coefficient value is (-0.0000286), which means that if in the long term the rupiah exchange rate strengthens by 1 rupiah, economic growth will decrease to 0.2 percent. Then, the rupiah exchange rate in the long term has a negative and insignificant effect on economic growth in Indonesia.

ARDL Model Stability Test Results
The results of the ARDL model stability test as follows :
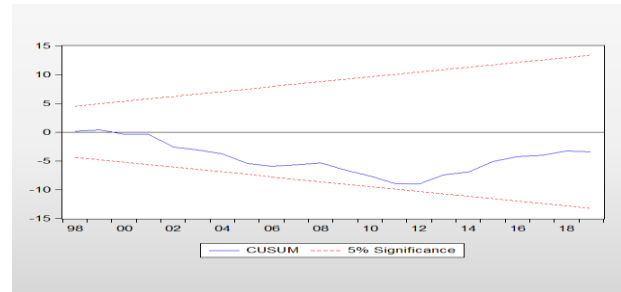
Figure 3 CUSUM Test Results
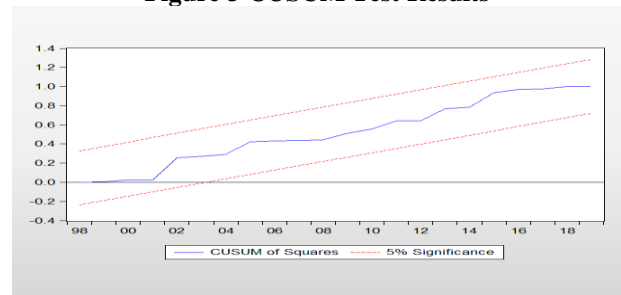
Figure 4 CUSUM-Square . Test Results

The CUSUM test results from Figure 3 and Figure 4 above show that the model is in a stable state to make long-term decisions, because the CUSUM line is between the 5% significance line. Meanwhile, the results of the CUSUM-Square test are also stable because the QUSUM-Square line is still between the 5% significant line.

Discussion

The Effect of World Oil Prices on Economic Growth in the Short Term

There are differences in the test results in this study which has been carried out, it can be concluded that world oil prices have a positive but not significant effect on economic growth in the short term. This is because in addition to being an oil importing country, Indonesia is a producer of crude oil and refined oil that is exported abroad, so Indonesia will also benefit from the increase in world oil prices which of course will be followed by an increase in the selling price of ICP (Indonesian Crude Price). However, fluctuations in world oil prices which are the benchmark for ICP prices will also affect ICP prices, this means that if world oil prices decline, they will lower ICP prices, which in turn will contribute to smaller ICP contributions to GDP.

The results of this study are in line with research Aprilta, (2011) with the results of the study explaining that world oil prices have a positive but not significant effect on economic growth in Indonesia in the short term.

The Effect of World Oil Prices on Economic Growth in the Long Run

The results of the study against the theory that world oil prices have a positive and significant effect on economic growth in the long term. This is because oil is a fundamental need for all countries including Indonesia so that the increase in oil prices will be responded quickly by the government, companies and the public. For this reason, the government has implemented a world oil import tax policy with the meaning that an increase in world oil prices will increase state revenues. The increase in world oil prices will increase the Value Added Tax, Oil and Gas Income Tax and Non-Tax State Revenue of Oil and Gas so that the revenue from the increase in world oil will contribute directly to Indonesia's economic growth.

The results of this study are in line with the research of with Musa et al., (2019) the results that world oil prices have a positive and significant effect on economic growth in Nigeria in the long term.

The Effect of the Rupiah Exchange Rate on Economic Growth in the Short Term

Based on the results that have been carried out, it can be concluded that the research results are in accordance with the hypothesis that the rupiah exchange rate has a negative and significant effect on economic growth in Indonesia in the short term, which means that if the rupiah exchange rate strengthens, it will reduce economic growth in Indonesia.

The results of this study are in line with research by Lastri & Anis, (2020) which explains that the rupiah exchange rate has a negative and significant effect on economic growth in Indonesia in the short term.

The Effect of the Rupiah Exchange Rate on Economic Growth in the Long Term

Based on the results of the study, it can be concluded that the rupiah exchange rate has a negative and insignificant effect on economic growth in Indonesia in the long term. This is due to the Indonesian government's exchange rate policy in response to these macro problems, in this case the government sets a policy to depreciate the rupiah exchange rate which will certainly not disrupt state finances, moreover the policy of depreciating the exchange rate was applied to improve export performance and attract foreign investors so that the depreciated of the rupiah exchange rate indirectly contributed to state revenues.

The results of this study are in line with research conducted by Nulhanuddin & Andriyani, (2019) with the results that the rupiah exchange rate has a negative but not significant effect on economic growth in Indonesia in the long term.

5. CONCLUSIONS AND RECOMMENDATIONS
Conclusions

Based on the results of research that has been done, the conclusion as follows :

1. In the short term, world oil prices contribute positively but not significantly to economic growth in Indonesia.
2. In the long term, world oil prices contribute positively and significantly to economic growth in Indonesia.
3. In the long term, the rupiah exchange rate contributes negatively and significantly to economic growth in Indonesia.
4. In the long term, the rupiah exchange rate contributes negatively but not significantly to economic growth in Indonesia.

Recommendation

The recommendation that can be given by this research are as follows:

1. In the short term, there must be savings in the use of petroleum or replacing oil energy with alternative energy that can be adapted for use, plus applying methods that can increase oil production.
2. In the long term, the government must be able to determine the right policies in order to reduce imports of world oil commodities. One of the efforts that can be taken is to make improvements or developments in the oil and gas sector, for example the use of the latest technology in existing oil refineries, so as to increase their productivity, or to explore new locations.
3. For future research, it is hoped that it will increase the oil and gas import tax variable so that more accurate results are obtained and can explain the effect of world oil prices on increasing economic growth in Indonesia.
4. In the short term, stabilizing the rupiah exchange rate can be attempted by reducing the demand for the dollar. This can be implemented by loving domestic products, in this way the demand for the dollar will decrease.
5. In the long term, it is necessary to have a policy regarding the rupiah exchange rate in an effort to strengthen the rupiah exchange rate, but it must be done carefully because the strengthening of the exchange rate will reduce exports, for this reason it is necessary to stabilize inflation and the amount of money in circulation so that GDP remains stable and continues to grow.

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