The Nexus of America's Exchange and Interest Rate toward Indonesia's Economy: An Application of Time-Series Regression

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Abstract

This study examines the nexus of the US interest rate, the Indonesian interest rate, and the Indonesia economy's exchange rate. This study uses time-series data with research time starting from 2010.1 - 2019.4. This study's analysis model uses the Ordinary Least Square (OLS) multiple linear regression model with the unit root test method with the Augment Dickey-Fuller (ADF) approach. The results show that the US interest rate variable significantly affects the Indonesian economy, although its effect cannot identify directly. For the variable of Indonesia's interest rate, the development tends to identify the development of foreign interest rates is also significant. When the domestic interest rate rises, the government must strive to suppress the increase rate by implementing monetary policies to stabilise the domestic interest rate. In contrast, this study's exchange rate variable is significant for the Indonesian economy, even at different levels. So, it is hoped that the government can continue to maintain the stability of the economy at the domestic interest rate by monitoring the exchange rate that affects exports to identify it carefully and how it can affect Indonesia's economic growth.

Keywords
The US interest rate, Indonesia's interest rate, exchange rates, Gross Domestic Product

1. Introduction
The economy in various countries today refers to an open economy, where each country conducts trade between countries, known as international trade. Countries with open economies are countries that carry out export-import activities of goods or services and borrow or provide loans to the world capital market (Mankiw, 2005). According to Widoatmodjo (2009), the capital market condition is strongly influenced by the appearance of the aggregate economy. He explained the relationship between the capital market and the macroeconomy shows a positive correlation (the economic situation substantially affects the capital market). Openness is a means to promote growth through research and development and broader market access (Nowbutsing, 2014). Economic openness from the financial side has influenced economic growth (Zulham et al., 2019; Nuraini, 2019). Like other countries, Indonesia is also one of the countries that conduct economic activities with other countries.

The beginning of 2015 was the right moment to predict the future condition of Indonesia's economy. As one of the countries with just experienced a political overhaul, a series of new policies will undoubtedly affect its economic projections. Even though the economic pace in 2014 experienced a slowdown, many experts and economists predict that in 2015 the Indonesian economy will experience a fairly good improvement given economic recovery conditions.

Bank Indonesia policy carried out a comprehensive evaluation of Indonesia's economic development in 2014 and the economic prospects for 2015 and 2016, indicating that this policy is still consistent with efforts to steer inflation towards the 4.0% target in 2015 and 2016, and supports control of the current account deficit to a level that is healthier (Istiqamah, 2018). The following is a table of Indonesia's GDP growth rate, which continues to increase from 2015 at 4.88% to 2019, reaching 5.20%. It is sufficient to describe the Indonesian economy experiencing significant growth in the last 5 (five) years.

Table 1. Indonesia's GDP. Growth Rate in 2011 – 2019 (Constant Prices in 2010)

Tahun	Gross Domestic Product (Billion IDR)	
	GDP (Milliyar	Growth (%)
2015	8.982.517,10	4,88
2016	9.434.613,40	5,03
2017	9.912.928,10	5,07
2018	10.425.397,30	5,17
2019	10.949.243,70	5,20

Source: Central Bureau of Statistics (2020)

The global economic turmoil impacts economic growth, but it is not a worry, considering that Indonesia's export market share to the United States is only 13%. Even though the US economy is experiencing a recession, it is generally believed to have the potential for revival. The vibrant market evidence this, and the Fed, which has become the foundation for tackling the recession, can still create positive market players' expectations. The weakening of the US dollar against all world currencies will increase inflation, making it difficult for banking interest rates to fall. In the end, it will reduce Indonesia's gross domestic product. Countries whose currencies have appreciated against the United States dollar to remain strong in their level of competitiveness make adjustments, which will impact interest rates and overall economic performance (Muhammad et al., 2019; Zulham et al., 2019; Sirojuzilam et al., 2019). Regarding the threat of a recession in the United States economy, it is estimated that it will not affect Indonesia's investment, considering that the Indonesian economy is dominated by the local economy (Sihono, 2008).

Any increase in interest rates set by The Federal Reserve or the Fed will have a major impact on money markets and capital markets worldwide. Investors will withdraw their funds and make capital outflows to return their funds to be invested in the form of or deposits. This situation caused shocks in the money and capital markets, especially in developing countries such as Indonesia. The currency exchange rate against the US Dollar has decreased significantly, impacting stock prices' collapse (Murtadho, 2016). The development of US interest rates in 2010 was still fluctuating. Throughout 2012, there were significant changes in US interest rates. January 2013, the cut in US interest rates reached the level of 0.14%. Despite this, US interest rates again increased by 1% in February 2013. The decline in US interest rates also occurred in June 2013, which reached the level of 0.09% (Siahaan, 2014).

The BI rate one that is frequently mentioned and appears in the news. The critical role of interest rates in determining Indonesia's monetary policy is also observed by Erawati and Richard (2002). On the one hand, this benchmark interest rate is a response to an economic situation (Noviar et al., 2020; Zulham et al., 2019). On the other hand, it is also like a signal that signals the national economy's ins and outs amidst the global economy (Gerai Info Bank Indonesia, 2013). This research is in line with that conducted by Muchlas and Agus (2015), the interest rate variable has a positive effect on the IDR exchange rate against the US dollar. It means that any increase in bank interest rates in Indonesia will increase the movement of the IDR exchange rate against the US dollar.

The US dollar is accepted as the currency often used in international trade because the US dollar is a strong currency and a reference for most other developing countries. The United States is Indonesia's dominant trading partner, so when the IDR's value against the US Dollar is unstable, it will disrupt trade, resulting in losses. The recent changes and weakening of the IDR against the US Dollar have been influenced by two factors, namely internal and external. The emergence of these external factors was influenced by the growing strength of the US economy itself, which gave rise to a stronger dollar value that impacted the international economy and world currencies. According to Bjornland and Havard (2006) research, interest rates are important in predicting exchange rates. When viewed from the impact of the American economic crisis that occurred, this study's objective is to examine the nexus of the US interest rate, the Indonesian interest rate, and the exchange rate on the Indonesia economy.

2. Literature Review
2.1 Indonesia economy
The economy is considered to experience growth if the people's real income in a certain year is greater than the community's real income in the previous year (Riyad, 2012). Economic growth can be defined as developing increased goods and services produced in society (Sukono et al., 2019). The increase in production is due to production, investment, technology, and labour (Muhammad et al., 2018; Sukirno, 2013). The indicator usually used is the Gross Domestic Product (GDP) (Mankiw, 2007). Measuring an economy's progress requires a precise measuring tool for economic growth, including the Gross Domestic Product (Sukono et al., 2019). At the regional level, it is called the Gross Regional Domestic Product (GRDP), namely the number of goods or services produced by an economy in the long term of market prices. The productivity of sectors strongly influences economic growth in using the production factors. According to the traditional neoclassical growth theory, output growth always comes from one or more of three factors, namely an increase in the quality and quantity of labour, additional capital (savings and investment) and technological improvements (Todaro and Smith, 2008).

2.2 American's Interest Rates (The Fed)
The United States has a major influence on the world economy's stability through its Federal Central bank. The power of the Fed's Central Bank is very large, especially in the world capital markets. The Fed, which is the bank responsible for monitoring and responding to developments in the economy. Currently, The Federal Reserve is the captain of monetary policy in the United States. The world economy currently depends on the conditions of the world bank and the United States economy. The policies carried out by The Federal Reserve often have positive or negative impacts on some countries around the world, including Indonesia. The monetary policy undertaken by the United States Government is facing its economic problems in 2017 - 2018 is to raise the Fed interest rate (FFR) periodically and indirectly. It affects the value of Indonesian exports (Ichwani, 2018). In his research, Sandra (2006) states the difference between the Fed interest rate and B.I rate, and the money supply has a significant effect on the IDR exchange rate.

2.3 Indonesia's Interest Rate
Fadly Hasan (2008) said the Fed increased its interest rates. The SBI also rose, resulting in substitution between the demand on the money market and the capital market; when bank or savings interest rates rise, investment shifts from the stock market to the money market. In terms of investors. If the Fed's interest rate rises, there will be a capital outflow so that more investors will sell their shares and switch to savings abroad (America). An increase in interest rates causes the demand for domestic money to increase so that the domestic currency appreciates. Conversely, if the Fed interest rate falls, there will be capital in the flow so that more foreign investors will buy shares in Indonesia. (Misgiyanti, 2009). Likewise, research from Stenly (2010) states that the SBI (Bank Indonesia Certificate) interest rate has a significant effect on the IDR exchange rate against the US dollar in a positive direction.

2.4 Exchange Rate
Another country's currency measures the price of a country's currency called the exchange rate. Exchange rates are volatile (fluctuating), it also affects the economy and daily life because when the United States dollar is higher in value against other countries' currencies. The products of other countries are cheaper for Americans, United States goods are increasingly expensive for a resident of another country. Conversely, if the US dollar falls, goods from other countries are more expensive for residents of the United States and products from the United States become cheaper for other countries' residents (Federic, 2008). The development of the IDR exchange rate against the US dollar since the implementation of the floating system by the Indonesian government has often fluctuated, and the IDR tends to depreciate. The demand and supply of dollar currency are fully submitted to the international market (Utomo, 2018).

3. Methods
This study analyses the nexus between the US interest rate and the Indonesian economy's IDR exchange rate. This study's data type is secondary data in the form of time series, which is descriptive quantitative, namely data with a research period starting from 2010.1 - 2019.4. The required data is collected by conducting non-participant observation, namely by downloading the Central Bureau of Statistics www.bps.go.id, the official website of the United States Bank www.federalreserveonline.org, and conducting a literature study related to research. In estimating, the multiple linear regression analysis equations using the Ordinary Least Square (OLS) method estimate the population regression function and sample regression (Ajija et al., 2011 and Primanti, 2011). So that the model equation can be written as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \mu$$

Whereas,

Y	= Indonesia's economic growth
β_0	= constant
$\beta_1 \ \beta_2 \beta_3$	= regression coefficient
X_1	= The Fed
X_2	= B.I. Rate
X_3	= Exchange rate
μ	= standard error

Also, test the stationary data unit (Unit Root Test) to see whether the correlation between variables is stationary or not. By using the following equation:

$$\Delta Y_t = \delta Y_{t-1} + \mu_t$$

Where $\delta = (\rho - 1)$ and Δ is the first difference. Furthermore, to determine whether there is a unit root or not, the equation is regressed and looks for the value of with the following hypothesis:

$H_o : \delta = 0$ (there is a unit root, meaning that the time series data is not stationary)
$H_1 : \delta < 0$ (there is no unit root, meaning that the time series data is stationary)

Definition of Operational variables

1. The Fed (X1) is the most common interest rate in America. The Fed is measured in units (%).
2. BI. rate is the interest rate that applies to Indonesia. BI. rate is measured in units (%).
3. Exchange rate (exchange rate) (Y) is the IDR exchange rate against the US Dollar (Rp / US $). The exchange rate is measured in IDR units.
4. GDP is the value of Indonesia's economic growth based on prevailing prices (Nominal GDP). GDP is measured in IDR units.

5. Results and Discussion

5.1 Results

This study uses the unit root test to see whether the data used is stationary or not before regression of each variable's time-series data. If there is a unit root, it will be tested again at the first difference level to obtain stationary data. This test was conducted with the Augmented Dickey-Fuller (ADF) approach.

Table 2. Unit Root Test Results Using the Augmented Dickey-Fuller Approach (ADF).

Var	Level		1st difference		
	ADF.	Critical Value	Var	A.D.F.	Critical Value
The Fed (NS)	-0.540957 k = 1	-2.941145**	DThe Fed (S)	-3.888052 k = 0	-3.615588***
BI. Rate (S)	-3.317846 k = 0	-2.938987**	DBI Rate (S)	-7.903161 k = 0	-3.615588***
ER (NS)	-1.003225 k = 0	-2.938987	DER (S)	-5.499100 k = 0	-3.615588***
GDP (NS)	1.958745 k = 3	-3.588509	DGDP (S)	-7.302680 k = 2	-3.588509***

Note: ***, **, * is significant level 1%, 5% and 10%., k is lag length

Table 2 shows the result of the unit root test using the Augmented Dickey-Fuller approach. The BI rate data has an absolute statistical value of 3.317846, which is greater than the critical value in the MacKinnon table of 2.938987 at a 1 per cent confidence level. Whereas for The Fed, ER and GDP, the data are not stationary (non-stationary), the differences are made at the first or first levels. The results show that the Fed rate is stationary at the 1 per cent

confidence level because it has an absolute statistical value of 3.888052, which is greater than the critical value in the MacKinnon table of 3.615588 with a probability of 0.0049 per cent. The exchange rate (Exchange Rate) is stationary at a confidence level of 1 per cent. It has an absolute statistical value of 5.499100, which is greater than the critical value in the MacKinnon table 3.615588 with a probability value of 0.0000 per cent. The test results at the first difference level are stationary, indicated by the ADF value being greater than the critical value. To identify the independent variable's effect on the dependent variable, the analysis in this study used the econometric method with the least-squares approach (Ordinary Least Square / OLS). The results of the research analysis, as seen as follows:

Table 3. OLS. Estimation Results American Interest Rates, Indonesian Interest Rates and Exchange Rates on the Indonesia Economy

Variable	Coefficient	t – stat	p-value
The Fed	0.040301	4.926548	0.0000
BI Rate	-0.012067	-0.713935	0.4799
Exchange Rate	0.564971	11.24094	0.0000
Constant	9.501936	18.29809	0.0000
R^2	0.926163		
DW	0.653631		
F - Statistic	150.5195		p – value = 0.000000

Note: ***, **, * is significant level 1%, 5% and 10%., k is lag length

Table 3 illustrates the Fed, BI. rate, and Exchange Rate are zero; the GDP value is 9.501936 IDR. Where if the Fed increases by 1%, the GDP on average will increase by 0.040301 IDR. If the BI. Rate increases by 1% on average, the GDP will decrease by 0.012067 IDR. If it increases by 1% for the exchange rate, the GDP on average will increase by 0.564971 IDR. The F statistical test used in this study is to test the effect of the independent variables, namely The Fed (X1), BI rate (X2) and the Exchange Rate (X3), together on the dependent variable, namely Economic Growth (GDP) (Y). From the ANOVA test using F test, the F value is calculated at 150.5195 with a probability value (sig.) is 0.000 or the probability is smaller than 0.05. The regression model can be used to determine the level of economic growth. It can be said that The Fed, BI Rate and the exchange rate simultaneously (together) have a positive effect on economic growth.

5.2 Discussions
American's Interest Rate (The Fed)
The Federal Funds Rate is an important reference rate for financial market players, both in America and across the country. The US government has planned to raise this interest rate to attract US investors who have already invested in developing countries to invest in the United States again, thereby opening up great opportunities to stabilise the economy in America. So that with this increase in interest rates, there is also an increase in labour absorption, household spending and investment in the business world, and the unemployment rate remains low.

Indonesia's Interest Rate (BI Rate)
Indonesia's interest rate, which continues to fluctuate every year, illustrates that our economy can experience shocks at any time, both from outside and from within the country itself, so the government must watch quickly when there are small or large shocks. The shock that occurs in the interest rate can greatly affect economic growth (GDP).

Exchange Rate
The development of the exchange rate of each country is different and tends to be unstable. External and internal factors clearly influenced the continued weakening of the IDR. The strengthening of the US economy has encouraged the strengthening of the US dollar against most world currencies, including the IDR. The internal factor for the weakening of the IDR was triggered by the continuing deterioration in the current account that reached a deficit. This transaction deficit was triggered by weakening international commodity prices. The decline more influenced the decline in commodity prices in crude oil prices. The effect of exchange rate fluctuations has a major impact on Indonesia's development performance and the business climate.

Gross Domestic Product

Gross Domestic Product is the total value of goods and services produced by various production units in a country's territory within a certain period (usually in one year). This GDP measures all final goods and services income, namely all goods and services products in the economic system during a year in a country. During the research period, Indonesia's GDP experienced an increasing trend every year. The increase in GDP shows that people's purchasing power has increased. This increase in purchasing power will increase prices on the domestic market to become expensive so that there is a tendency to import.

6. Conclusion

The world economy easily influences the Indonesian economy because it is still very dependent on developed countries, so to maintain the economy's stability, the interest rate in the country must receive close treatment and supervision from the government to see carefully how the conditions of interest rates are in place. In an up and down position, so that this can affect Indonesia's economic growth. The results show that the US interest rate variable significantly affects the Indonesian economy, although its effect cannot identify directly. For the variable of Indonesia's interest rate, the development tends to see the development of foreign interest rates is also significant. When the domestic interest rate rises, the government must strive to suppress the increase rate by implementing monetary policies to stabilise the domestic interest rate. In contrast, this study's exchange rate variable is significant for the Indonesian economy, even at different levels. So, it is hoped that the government can continue to maintain the economy's stability at the domestic interest rate by monitoring the exchange rate that affects exports to identify it carefully and how it can affect Indonesia's economic growth.

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