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Influence of Exchange Rate, World Income, Interest Rates, and Investments in Indonesian Exports*

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Abstract

This study aims to test the influence of world income, interest rates, and investments on Indonesian exports for the period from 1986 to 2018. We use the Autoregressive Distributed Lag (ARDL) model with Error Correction Mechanism (ECM) version, which can provide long-term impact analysis and short-term dynamic results. The results showed that, in the short run, exchange rate, world income, and investments, respectively, positively affect Indonesian exports, *ceteris paribus*. These results correspond to the proposed hypotheses. Meanwhile, interest rates also show a positive influence on Indonesian exports in the short run, *ceteris paribus*, but this direction does not correspond to the research hypotheses. The research also found that there is cointegration between variables. Indonesian export value adjusts the exchange rate, world income, interest rates, and investments with delay, which is a 30.93% difference in long-term and short-term export values corrected. In the long run, world income and investment have a positive effect on exports. This indicates that multinational companies do not solely invest to dominate the domestic market, but they also promote Indonesian exports. Following the results of this research, the increase in FDI will grow exports. Increased exports will certainly increase GDP and ultimately promote economic growth.

Keywords: Real Exchange Rate, Consumer Income, Lending Interest Rate, FDI, Autoregressive Distributed Lag

JEL Classification Code: F00, F14, F43, P45

1. Introduction

Trade between countries is better known as international trade terms. International trade arose due to a commodity

that could not be produced by any country due to resource limitations, natural and climate conditions. It regards as a result of the interaction between competing demands and supplies (Choi, 2018).

There are two categories in international trade, namely, trade in goods and services. Based on economic theory, trade (export and import) is one of the keys to a country's economic growth, in addition to consumption, investment, and government expenditure. Exports become an essential factor for the growth and industrialization and accumulation of foreign reserves of trade surplus (Wang, Wong, & Yip, 2018). By using the Gross Domestic Product (GDP) as an indicator, the growth of the Indonesian economy is very dynamic. The gap between real GDP per capita relative to developed and weak economies has increased (Wang, Wong, & Yip, 2018). In the New Order era, economic growth stabilizes at a range of 6%–7% per year. At the time of the crisis, especially in the 1998 period, Indonesia's economy contracted with a growth rate of negative 13.12%. After that period, the Indonesian economy began to rise with a growth rate ranging from 5% to 6% per year.

Interest rates are the prices given to investors from the use of investment funds based on the calculation of economic value within a specified period. Bank interest rates

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are used as industrial controllers of a country. Low interest rates lead to reduced risk perceptions and increased risk tolerance (Chaudron, 2018). Governments regulate interest rates aimed at maintaining the economic sustainability of their country. The ups and downs of commodity prices also influence the economy of a nation. The continuous trend of price increases can affect import-export activities. The constant improvement in the number of export commodities in the international market cannot compete, which ultimately resulted in declining export activities. Nominal interest rates can remain substantially below the average half of the last century, as central banks have the aim of controlling inflation below the average rate of inflation (Kiley & Roberts, 2017).

There are several differences in previous research results. Studies are showing the positive influence of real exchange rates on export growth (Chaudhary, Hashmi, & Khan, 2016; Kang & Dagli, 2018; Xu, 2018), but insignificant (Majeed & Ahmad, 2007). Other studies have shown that the nominal exchange rate positively affects the export of luxury commodities, e.g., Bordeaux as Cardebat and Figuet (2019) found that the more expensive the goods, the more quantity is demanded. On the other hand, the influence of consumer income also affects positively and consistently, based on the results of previous research (Arize, Osang, & Slottje, 2008; del Rosal, 2019; Nanang, 2010; Xu, 2018). Credit interest rates can have a negative effect, but there are research results indicating credit interest rates have no effect on exports. Most studies found positive effect of investments on exports (Bhatt, 2013; Majeed & Ahmad, 2007), but Safitriani (2014) found short-term negative effect of investments on Indonesian exports.

From the above description, we attempt to analyze the linkages between investments, US dollar exchange rate, lending interest rates, and world income with Indonesian exports. This research is a case study with a quantitative approach aimed at testing the theory and providing empirical evidence.

2. Literature Review

A country that has a real exchange rate that has been depreciated indicates that the price of goods in the country is lower relative to the cost of assets abroad. These changes encourage consumers, both at home and overseas, to buy more products from the domestic market and fewer items from other countries. As a result, exports of the country will rise, and imports fall. In developing countries, the exchange rate is an industrial policy instrument that diversifies the economy toward long-term growth (Guzman, Okampo, & Stiglitz, 2018). In developed countries like European countries, the inflow of capital that appreciates real exchange rates erode international competitiveness

and causes dislocation and requires regulatory policies (Thorbecke & Kato, 2018). Empirical studies show that there is a positive and significant impact of real exchange rates on export volumes (Chaudhary, Hashmi, & Khan, 2016; Kang & Dagli, 2018; Xu, 2018).

In addition to prices, other factors that may affect the number of goods requested are consumer income. In standard products, increased consumer income – when the cost of goods and other factors are considered constant – will increase the quantity of goods demanded. GDP is the market value of all final products and services manufactured in a country within a specific time. The expenditure (or market value) of all goods and services can also be interpreted as an income for the region's economy. As such, GDP can also be construed as a country's income. Previous studies, such as Bayramoglu and Sukruoglu, 2016, Çakmak, Gökçe, and Çakmak, 2016, Durmaz and Lee, 2015, and Oktay and Gözgör, 2013, per capita GDP is used as a proxy for consumer income. The difference is that we use world GDP, except for Indonesian GDP.

The interest rate is the percentage of interest on borrowed funds. Investors or lenders require high-interest rates because they give higher returns. However, the higher the interest rate, the higher the cost to pay by the borrower funds. The high-interest rate would impede producers from acquiring capital. Capital limitations can then reduce production capacity. Reduced production capacity will undoubtedly decrease the number of products that can export. As such, the interest rate of loans is suspected of having a direct influence on exports.

Investment is an activity conducted by investors in the hopes of generating profit. Investments in Indonesia are divided into two groups, namely, domestic investment and foreign investment. Most countries, especially developing countries, seek to attract FDI into their economies as they expect long-term economic growth from additional stable resources in host countries. Some more fundamental reasons support the attractiveness of FDI (Iamsiraroj, 2016). FDI is very beneficial for host countries, being a means of transferring technology, stimulating domestic investments, and facilitating the increase of human capital and institutional reform (Goh, Sam, & McNown, 2017). The high amount of local investment will increase domestic production. The rise in output is expected to increase exports abroad. Unemployment can be influenced by investment and innovation of firms' decisions, which can then affect the distribution of revenues (Paramati & Nguyen, 2019). One prominent explanation is that FDI and export-promoting activities are essential contributors to economic growth. Export activities will drive more efficient production by exploiting differences in comparative excellence across the country, achieving economies of scale, and lowering costs (Goh, Sam, & McNown, 2017).

2.1. Hypotheses

The depreciation of the real exchange rate shows that the price of goods in the country becomes cheaper relative to the products abroad. This research uses the shortest term, i.e., the rupiah exchange rate per 1US dollar. Thus, there is a suspected positive influence between the exchange rate and Indonesian exports. Exports of a country will depend on consumer income (Mankiw, 2012). As consumer income increases, the ability to buy goods will also increase, increasing the volume of exports. The high interest rate will limit the supply of funds for business actors to impede the development of its business. The obstructed effort will lower the production rate and will ultimately reduce the export volume. The high amount of domestic investment will increase domestic production. The increase in output is expected to increase exports.

This study examines the effects of exchange rates, world income, interest rates, and investment on Indonesian exports. The investigation is based on the following hypotheses:

H1: *The exchange rates have a positive effect on exports.*

H2: *Consumer or world income has a positive effect on exports.*

H3: *Interest rates have a negative effect on exports.*

H4: *Investments have a positive effect on exports.*

3. Methodology

The research used a quantitative approach. The data used in this research are secondary data sourced from the World Bank. The exchange rate is measured using the IDR/USD term. We use the real exchange rate by adjusting the nominal exchange rate at relative prices in Indonesia and abroad using the following formula (Cardebat & Figuet, 2019).

$$RER = IDR/USD \times CPI_{USA}/CPI_{INA} \quad (1)$$

Where the RER is the real exchange rate, IDR/USD is the nominal exchange rate of the Rupiah to one US dollar, and the CPI ratio shows the relative price in Indonesia and the US. We chose the US as the world's consumer price proxy because the currency of the country has become commonly used in international trade in Indonesia. Besides, this determination is also based on the nature of this study, researching Indonesian exports in aggregate. The use of the US is expected to reflect conditions in international markets.

In this study, the world income is measured by real income per capita worldwide except Indonesia. We measure the world's incomes by collecting real GDP data of 2010 in US dollar units and also populations, both for the whole world and Indonesia. We further subtract Indonesia's GDP

from World GDP and divide it by the world population that differs from the Indonesian population. Thus, the world income is obtained per capita, representing consumer income in export destinations or international markets.

The interest rates used in this research are the short- and medium-term loan interest rates charged by banks to debtors in the private sector. This data has a percent unit and is to illustrate the public view of investors and business actors in the perspective of the cost of lending. Furthermore, the investment used is FDI that entered into Indonesia. Investment in question is a net investment, i.e., the subtraction of divestment from investment conducted by foreigners. This variable is measured using the FDI ratio of Indonesian GDP.

Indonesian export data used in this research are from the World Bank. Exports value is defined as the value of goods and services exported all around the world. This includes the value of merchandise, cargo, insurance, transportation, travel, control, licensing, and other services, such as communications, construction, finance, information, business, personal, and government services. We transformed the data into a natural logarithm form because of smoothing reasons.

In order to answer the research questions, we used a regression method. The ARDL model will be conducted in this research. The decision of using ARDL models is based on the nature of time-series data that are mostly non-stationary. If the data are non-stationary, the use of a simple linear regression will result in spurious regression (Gujarati, 2015). We used the ARDL model to avoid spurious regression results. The ARDL model used is as following.

$$\begin{aligned} \text{LN_EXPORTS}_t = & \alpha_0 + \sum_{t=1}^p \alpha_{1t} \text{LN_EXPORTS}_{t-1} \\ & + \sum_{t=0}^{q_1} \alpha_{2t} \text{LN_RER}_{t-1} \\ & + \sum_{t=0}^{q_2} \alpha_{3t} \text{LN_WI}_{t-1} \\ & + \sum_{t=0}^{q_3} \alpha_{4t} \text{IR}_{t-1} + \sum_{t=0}^{q_4} \alpha_{5t} \text{FDI}_{t-1} + u_t \end{aligned} \quad (2)$$

Equation (2) generates the ARDL model of (p, q_1, q_2, q_3, q_4) . The letters p and q_1, \dots, q_4 indicate the lag applied in the model. The maximum lag length is determined by using the Akaike (AIC) criterion in the VAR estimation of each model. Furthermore, statistical software will provide the optimal lag combination of the ARDL model. The optimal ARDL model is indicated by the lowest AIC value.

Next is to test the cointegration between variables. Cointegration is the integration of the variables. This integration is tested using the Bounds test (Pesaran, Shin, & Smith, 2001). The Bounds test produces a statistical value of F , which is then compared with a critical value based on the table of Pesaran, Shin, and Smith (2001). If the

statistical value of F is more than the upper critical value or $I(1)$, then the variable has a long-run relationship. Thus, it is necessary to further estimate using ARDL with error correction adjustments (Error Correction Mechanism, ECM). If the value is less than the lower critical value or $I(0)$, then the variable has no long-run relationship or is not cointegrated. Thus, the only estimation of the ARDL model is required without error correction. By entering the error correction mechanism, the adjusted ARDL model is as follows.

$$\begin{aligned} \Delta \text{LN_EXPORTS}_t = & \alpha_0 + \sum_{i=1}^p \beta_i \Delta \text{LN_EXPORTS}_{t-i} \\ & + \sum_{i=0}^{q_1} \gamma_i \Delta \text{LN_RER}_{t-i} \\ & + \sum_{i=0}^{q_2} \delta_i \Delta \text{LN_WI}_{t-i} \\ & + \sum_{i=0}^{q_3} \vartheta_i \Delta \text{RI}_{t-i} + \sum_{i=0}^{q_4} \rho_i \Delta \text{FDI}_{t-i} \quad (3) \\ & + \varphi_1 \text{LN_EXPORTS}_{t-1} \\ & + \varphi_2 \text{LN_RER}_{t-1} \\ & + \varphi_3 \text{LN_WI}_{t-1} + \varphi_4 \text{RI}_{t-1} \\ & + \varphi_5 \text{FDI}_{t-1} + u_t \end{aligned}$$

Where $\Delta X_t = X_t - X_{t-1}$, the coefficients β , γ , δ , ϑ , and ρ indicate a short-term relationship, while the coefficient φ indicates a long-run relationship.

Cointegration is tested using the Bounds test. This test is based on a combined hypothesis test on all coefficients φ . The null hypothesis in this test is that all coefficients φ are equal to zero or there is no long-term relationship. The decision-making criteria are based on the critical value of F in Pesaran, Shin, and Smith (2001).

4. Results and Discussion

Table 1 shows that the natural logarithm of Indonesian export value (LN_EXPORTS) has a normal distribution, as well as the natural logarithm of world income (LN_WI) and interest rates (IR). This can be seen from the Jarque-Bera statistical value, each of which is less than the critical value χ^2 with a degree of freedom of 2. On the other side, the natural logarithm of the real exchange rates (LN_RER) and FDI do not have a normal distribution. Thus, two of the four independent variables do not have a normal distribution; while the dependent variable has a normal distribution.

The first step is to ensure that the data on each variable is not integrated into the second order. From the Augmented Dickey-Fuller (ADF) test, each of the variables is incorporated into the first order. In other words, the whole variable is stationary on the first difference and not up to the second difference. The second step is to determine the optimal lag amount on the ARDL model. Using the help of EViews 10 software, the optimal model is ARDL (1, 3, 3, 3, 3). The third step is to test for cointegration on the ARDL model. If a cointegration were found, the ARDL model would be adjusting to the Error Correction Mechanism (ECM). An integrated model indicates that there is an equilibrium in the short term that will then move toward long-run equilibrium. The cointegration test result using the Bounds test (Pesaran, Shin, & Smith, 2001) indicates there is a long-run relationship (see Table 2). As such, we use the ARDL model with the ECM version (see Table 3).

When we know there is cointegration in the model, we estimate the long-run equation (see Table 4). The model in Table 4 shows a good model because (1) the residuals are normally distributed; (2) there is no autocorrelation;

Table 1: Descriptive Statistics

Statistics	LN_EXPORTS	LN_RER	LN_WI	IR	FDI
Mean	25.4423	9.2457	9.0653	17.6455	1.1215
Median	25.3518	9.2453	9.0485	17.7600	1.2700
Maximum	26.2506	9.9639	9.3179	32.1500	2.9200
Minimum	24.3922	8.8397	8.8287	10.5400	-2.7600
Std. Dev.	0.5573	0.2427	0.1502	5.2661	1.3332
Skewness	-0.2139	1.0022	0.0891	0.7058	-1.0718
Kurtosis	1.9178	3.8643	1.6396	3.0483	3.9856
Jarque-Bera	1.8621	6.5511	2.5883	2.7431	7.6537
Probability	0.3941	0.0378	0.2741	0.2537	0.0218
Sum	839.5972	305.1073	299.1561	582.3000	37.0100
Sum Sq. Dev.	9.9401	1.8851	0.7215	887.4100	56.8806
Observations	33	33	33	33	33

(3) it is homoscedastic; and (4) the coefficients are stable based on CUSUM and CUSUMSQ test.

The use of an ECM version of ARDL models can provide long-run impact analysis and short-run dynamics (Wooldridge, 2016). In the short run, the real exchange rates,

world income, interest rates, and investments influence the value of Indonesian exports.

In the LN_RER variable, the direct effect of the depreciation of the IDR/USD exchange rate of 10% increased the Indonesian export value of 0.34%, *ceteris paribus*. Referring to Purwono, Mucha, and Mubin (2018), there is a positive effect of IDR/USD on Indonesia's current account, meaning that the depreciation on IDR would increase Indonesian exports. On the other side, this result contradicts Oktora and Firdani's (2019) study regarding natural rubber in China. The higher real effective exchange rate of the export destination country against the exporting countries will cause the commodity prices in the export destination country to be lower than the exporting countries (Oktora & Firdani, 2019). Thus, exported goods will decline as consumers choose to consume domestic goods rather than imported goods. Furthermore, an increase of 10% of the world's consumer income will lead to the rise in Indonesian export value by 31.3% at that moment, *ceteris paribus*. This result is supported by Arize, Osang, and Slottje (2008) in Latin America.

In the variable interest rate, the direct effect of changes in the lending interest rate of 1 unit (percent) will lead to an increase in the Indonesian export value of 0.02%, *ceteris paribus*. The direct influence of interest rates on the export

Table 2: Bounds Test Result

F-Bounds Test		Null Hypothesis: No Levels Relationship		
Test Statistic	Value	Sig.	I(0)	I(1)
Asymptotic: $n = 1000$				
F-statistic	6.22	10%	2.45	3.52
k	4	5%	2.86	4.01
		2.50%	3.25	4.49
		1%	3.74	5.06
Actual Sample Size	30	Finite Sample: $n = 30$		
		10%	2.752	3.994
		5%	3.354	4.774
		1%	4.768	6.67

Table 3: ARDL Model Results with ECM

Dependent Variable: D(LN_EXPORTS)					
ARDL(1, 3, 3, 3, 3)					
Variables	Coefficient	Std. Error	t-statistic	Prob.	F-statistics
C	-7.096029	1.111233	-6.385728	0.0000	
D(LN_RER)	0.033519	0.057262	0.585358	0.5692	16.11383
D(LN_RER(-1))	-0.587235	0.067330	-8.721755	0.0000	(0.0002)
D(LN_RER(-2))	-0.123001	0.058196	-2.113554	0.0562	
D(LN_WI)	3.130210	0.529519	5.911420	0.0001	10.88448
D(LN_WI(-1))	-2.095010	0.504671	-4.151240	0.0013	(0.0010)
D(LN_WI(-2))	-0.788423	0.497686	-1.584179	0.1391	
D(IR)	0.018503	0.003713	4.983326	0.0003	3.700941
D(IR(-1))	-0.014462	0.003756	-3.849887	0.0023	(0.0428)
D(IR(-2))	-0.006705	0.004112	-1.630627	0.1289	
D(FDI)	0.043609	0.008498	5.131788	0.0002	6.856342
D(FDI(-1))	-0.021121	0.008358	-2.526871	0.0266	(0.0061)
D(FDI(-2))	-0.022182	0.008167	-2.715973	0.0187	
ECT(-1)	-0.309356	0.048033	-6.440529	0.0000	
R^2	0.962182	F-statistic			31.3141
Adjusted R^2	0.931455	Prob. F-statistic			0.0000

Note: ^aThe number in parentheses indicates probability value.

Table 4: The Long-Run Coefficient Estimation Result

Variables	Coefficient	Std. Error	t-statistic	Prob.
LN_RER	0.477891	0.322048	1.483913	0.1636
LN_WI	4.659370	1.218576	3.823618	0.0024
IR	0.090788	0.042739	2.124239	0.0551
FDI	0.274764	0.063587	4.321070	0.0010
C	-22.938055	10.126375	-2.265179	0.0428

Note: ^aThe dependent variable is LN_EXPORTS, i.e. natural logarithm of Indonesian exports value.

value of Indonesia is alleging because the distribution of credit that proscribes with the average loan interest rate is not specific to the export-commodity producers, so it is not able to explain the movement of exports in this research.

While in the FDI variable, the direct effect of an increase of 1 unit (percent) of FDI ratio to Indonesian GDP will lead to a rise in export value by 0.04%. When foreigners invest in the country, more capital can use to increase production capacity. Investment theory, which states that increased investment in production capacity will increase exports proved through empirical evidence in this research.

Data analysis results indicate long-run relationships or cointegration between exchange rate, world income, interest rates, and investments in the value of Indonesian exports. The coefficient of ECT(-1) is -0.309356 and statistically significantly different from zero. This coefficient indicates that the volume of Indonesian exports adjusts the exchange rate, world income, interest rates, and investments with inaction, which is about 30.93% the difference in long-run and short-run export value is corrected in 1 year. Consequently, it will take about three years to return to the full long-run balance.

In the long run, all of the variables examined have positive coefficients, but only the LN_WI and FDI variables are statistically significantly different from zero. An increase of 1% of the world's consumer real income will increase by 4.66% of Indonesian export value, *ceteris paribus*. This shows that in aggregate, Indonesian export commodities apply to normal goods – increasing consumer income will increase demand for goods. Our finding supports previous studies (Cardebat & Figuet, 2019; Choudhry, 2005; Nanang, 2010; Xu, 2018). Mohammadi, Taghavi, and Bandidarian (2012) showed a positive influence of Iran's national income on import demand. These findings strengthen our conclusion that Indonesian export is positively affected by the consumer's income abroad.

While 1 unit (percent) increase in the ratio of FDI-to-GDP will increase export value by 0.27%. The coefficient sign is positive as expected and also supports previous studies (Andraz & Rodrigues, 2010; Bhatt, 2013; Majeed & Ahmad, 2007), also contradict the findings of Nguyen and Do (2020). This positive effect of investment on export indicates that multinational companies do not

solely invest to dominate the domestic market, but they also promote Indonesian export value (Majeed & Ahmad, 2007). Furthermore, the elasticity of Indonesian export value changes as a result of investment change (FDI/GDP) is 0.308149. This indicates that the elasticity in Indonesian export value changes as a result of the FDI/GDP change is inelastic.

The influence of exchange rates on the value of Indonesian exports is statistically insignificant despite the positive coefficient. The positive insignificant coefficient shows a weak impact of the exchange rate on the export value. A depreciation of Rupiah relative to US dollar does not necessarily promote Indonesian exports (Majeed & Ahmad, 2007). Other studies also found an insignificant effect of the exchange rate on the trade balance, such as Rose (1991), Siddiqui and Akhtar (1999), Wilson and Tat (2001).

The empirical results in this study showed a positive coefficient between the interest rate of the loan to Indonesian export value. This means that the more expensive debt costs will increase the number of exports. The direct influence of the interest rate of the loan to Indonesian export value is alleging because the credit distribution that is proscribing with the average loan interest rate is not specific to the export, so it is not able to explain the movement of exports in this research.

5. Conclusion

The exchange rate used in this study is Rupiah against the US dollar. World income is intended to measure the consumer income of Indonesian exports. This variable is measured using the constant value of the world and Indonesian GDP per capita. The interest rate used is the interest rate of the loan charged to the debtor by various banks for short- and medium-term loans. Investments are measured using the net FDI ratio of Indonesian GDP based on constant price.

The results showed that in the short term, exchange rate, world income, and investments respectively positively affect the value of Indonesian exports, *ceteris paribus*. These results correspond to the proposed hypothesis. Meanwhile, interest rates also show a positive influence on Indonesian export value in the short-run, *ceteris paribus*, but this direction does not correspond with the research hypothesis.

The research also found that there is cointegration or long-run relationship. Indonesian export value adjusts the exchange rate, world income, interest rates, and investments with inaction, which is a 30.93% difference in long-run and short-run export values corrected in 1 year. In the long run, only world income and investments influence the number of Indonesian exports, each of which has a short-run effect.

Under normal conditions, not in a crisis such as the COVID-19 pandemic, the Government can establish better bilateral or multilateral relationships so that export barriers can be minimized. This is because, based on the results of the research, real income consumers significantly affect the value of Indonesian exports. If not utilized properly, then Indonesia cannot gain the potential for increased exports through the increase of world consumer income.

Besides, we also argue that some steps need to be taken to attract more FDI. FDI can be improved by easing the foreign investment regulations. Following the results of this research, the increase in FDI will increase export. Increased exports will certainly increase GDP and ultimately promote economic growth.

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