Exchange Rate, Export, and Import in the Indonesian Economy: VAR Approach

Sri Harnani[1], Bambang Hadi Prabowo[2], Muhammad Birrul Alim[3], Mirta Wahyu Wulandari[4]
[1,2,4]STIE Jaya Negara Tamansiswa Malang,Indonesia.
[3]Economics Department, Faculty of Economics and Business, University of Jember, Indonesia.

Abstract

This study aims to investigate the impact of the exchange rate (rupiah against the United States dollar) on exports of goods and services, as well as imports of goods and services. This study uses data from 2000 to 2019 by modeling "autoregressive vectors" to understand causal relationships between variables. This research is based on secondary data from the world bank. We use the exchange rate of the rupiah against the United States dollar, exports, and imports in Indonesia as variables. It evaluates the causal relationship between exchange rates, exports, and imports in Indonesia. The implication of the findings of this study is that high imports of goods and services will weaken the rupiah exchange rate against the US dollar. This can happen because Indonesia is an import-oriented country, and there is a relationship between export and import variables. Import of goods and services sector in Indonesia. In addition, the results of the study show that the causal relationship only occurs in the imported variable that affects the exchange rate, and the export variable that affects imports, while the causality relationship between other variables is not significant.

Background

The exchange rate is a relative price that is defined as one currency's value in relation to another currency. It establishes the purchase power of at least products sold across currencies. Exchange rate fluctuations have a considerable impact on the pricing of traded items. A country's exchange rate appreciation results in a decrease in the price of its export items and a rise in the price of imported goods for its trading partners (Shambaugh, 2004; Obstfeld, 2003; Bawono, Zainuri ,Wilantari, 2019). Exports are efforts to sell commodities that we have to other countries or foreign nations in accordance with government regulations by expecting payment in foreign currencies, as well as communicating in foreign languages (Ali, Ali, & Dalmar, 2018). Meanwhile, import is the purchase or entry of goods from abroad into a domestic economy (Sukirno, 2006 ; Viphindrartin & Bawono, 2021). International trade (exports and imports) will cause differences in the currencies used between the countries concerned. As a result, currency differences between exporting and importing countries lead to a difference in currency exchange rates or exchange rates (Kartikasari, 2017).

The appreciation of the exchange rate will have an impact on the price of imported products being cheaper than the price before the appreciation occurred. On the other hand, when the

exchange rate depreciates, the demand for exported goods will increase as a result of lower prices for exported goods. Meanwhile, the demand for imported goods decreased because the depreciation of the exchange rate caused the price of imported goods to be higher. Simultaneously, changes in the trade balance will affect the exchange rate of the domestic currency as a result of export and import transactions that cause the entry and exit of currency (Choudhri & Hakura, 2015).

From here, to determine the impact of the currency exchange rate (rupiah against the United States dollar) on exports of goods and services, as well as imports of goods and services, this study was conducted. This study uses 19 years of secondary data, from 2000 to 2019, with research variables namely currency exchange rates, exports, and imports.

Domestic currency's relative worth increases as the number of domestic currency units needed to acquire a unit of foreign currency decreases, but the exchange rate rises when the price of foreign currency rises, making the domestic currency cheaper or depreciating. If, on the other hand, more domestic money is needed to acquire the same amount of foreign currency, this implies a rise in the value of the domestic currency (Landon & Smith, 2007). The nominal and actual exchange rates of a country's currency are two different ways to measure the value of its currency. The nominal exchange rate is the price at which the currencies of two nations are traded against each other (Mundell, 1963; Sasongko, Bawono, & Prabowo, 2021)). Actual exchange rates indicate how much one country's currency is worth in terms of other nations' currencies. Because the exchange rate may affect the relative price of a product, it is frequently used to boost competition by making products more costly or less expensive (Kewal, 2012).

Exports are purchases of domestically produced items by foreign buyers. It is the country's capacity to produce items that can be sold in international markets that is the most significant determinant of exports (Choudhri & Hakura, 2015). Imports and exports have a direct impact on national revenue. Even so, an increase in national income does not always lead to an increase in exported goods, as national income can rise as a result of rising consumer spending, corporate investment, government expenditures, and the substitution of imported goods with products made in the country instead of those made abroad (Sukirno, 2006). When the value of exports increases, it can be interpreted that the demand for goods from other countries has increased. If exports decline, on the other hand, it can mean that the demand for other countries for export goods has weakened. Exports are an injection of income streams as well as investments. In contrast to exports which will contribute to the state's income, imports are state expenditures. The acquisition of products and services from outside the nation into the country with a cooperation agreement between two or more countries may be termed as import. The importation of items from outside the country may be seen as a kind of commerce if the relevant procedures are followed (Adewuyi, Ogebe, & Oshota, 2001).

Research Method

This study uses data from 2000 to 2019 by modeling "autoregressive vectors" to understand causal relationships between variables. This research is based on secondary data from the world bank. We use the exchange rate of the rupiah against the United States dollar, exports, and imports in Indonesia as variables. To evaluate the causal relationship between exchange rates, exports, and imports in Indonesia, the following multivariate regression model was used:

$$ER_t = \beta_0 + \beta_1 EX_t + \beta_2 IM_t + e_t \qquad \text{eql 1}$$
$$EX_t = \beta_0 + \beta_1 ER_t + \beta_2 IM_t + e_t \qquad \text{egl 2}$$
$$IM_t = \beta_0 + \beta_1 ER_t + \beta_2 EX_t + e_t \qquad \text{eql 3}$$

Description :
ER : Exchange rate
EX : Export
IM : Import
e : error term
t : time series
β : the magnitude of the effect of causality
eql: equation
This study uses vector calculations where each regression relationship will be brought together so that each variable will alternately become the dependent variable and the independent variable. The zero theory of Dickey-Fuller, taken from the PP test, and p=1 is the formula in Δyt = (ρ − 1)yt-1 + ut, in which Δ − for the first time different operators. This research used the following equation for the "unit root test":

$$\Delta Y_1 = \alpha_0 + \beta_0 T + \beta_1 Y_{t\text{-}1} + \sum_{i=1}^{q} \alpha_1 \Delta Y_{t\text{-}1} + e_t$$

Description:
Y as the variable is being examined for unit root
T as the variable which indicates the "linear trend," the "lag difference" means is ΔY_{t-1},
$\alpha 0$ are shown as "constant term," with the
"t" as a "time trend" indicator.
The following are the "unit root test's" null and alternate hypotheses:
H0: α=0
H1: α≠0

Result and Discussion

Before a causality or vector assumption can be satisfied, a stationarity test must be performed. The Augmented Dickey-Fuller test (ADF) may determine if a series is non-stationary by examining the error term, which includes the possibility of autocorrelation if the series is non-stationary. The unit root test yielded the following results:

Table 1. ADF's Unit Root Test on ER, EX, IM data in Indonesia

Variable	Unit Root	Include in the examination Equation	Statistics for the ADF Test	5% Critical Value	Description
Exchange Rate, (ER)	Level	Intercept	-0.387198	0.8930	
	First Diff	Intercept	-4.592271	0.0023	Stationer
Export (EX)	Level	Intercept	-2.103508	0.2454	
	First Diff	Intercept	-5.688860	0.0003	Stationer
Import (IM)	Level	Intercept	-1.385825	0.5670	
	First Diff	Intercept	-3.139429	0.0414	Stationer

ER, EX, and IM data are stationary at the first difference. This is indicated by the Augmented Dickey-Fuller Test, with a probability of 0.0023, a probability of less than 5%, in this case, the ER data shows stationary at the first difference compared to the original data. The same thing happened to data I and IN which were stationary at the first difference from the original data. From here, we can take the next step in defining vector analysis. For causality and vector testing, an accurate idea of the lag time is required. Prior to conducting a VAR analysis or a causality test, the optimal pause time must be determined. In this experiment, the shortest or lowest Akaike Information Criteria (AIC) is used to determine the optimum time lag. Due to the fact that the data utilized in this test are annual data covering a 19-year period, the gap length ranges from 0 to 4. This lag is believed to be long enough to account for ER, EX, and IM for more than a year.

Table 2. AIC value at Lag 0 to 4 ER, EX, and IM data in Indonesia

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1243.234	NA	9.05e+63	155.7793	155.9242	155.7867
1	-1212.325	46.36383*	6.04e+62*	153.0407*	153.6201*	153.0703*
2	-1203.351	10.09550	7.10e+62	153.0439	154.0580	153.0959
3	-1194.390	6.721306	1.13e+63	153.0487	154.4973	153.1229
4	-1186.961	2.785629	4.95e+63	153.2452	155.1284	153.3416

Table 2 shows the findings of the Optimum Lag test. The AIC value at Lag 0 to 4 indicates that the length of the Lag ER, EX, and IM variables are at LR, FPE, AIC, SC, and HQ at Lag 1. Because the results of the three criteria are both in lag 1, then lag one will be selected. The interactions between ER, EX, and IM are shown in the table during this period. Based on these data, there is no preliminary effect for the three variables, so according to FPE requirements, the best lag is at lag 1.

Table 4. VAR Analisys

	ER	EX	IM
ER	0.059114	3.48E+15	8.27E+14
	(0.25705)	(1.8E+15)	(7.5E+14)
	[0.22997]	[1.94188]	[1.10741]
EX	9.49E-17	-0.371272	-0.120759
	(5.9E-17)	(0.41534)	(0.17291)
	[1.59445]	[-0.89391]	[-0.69840]
IM	2.96E-17	0.016031	-0.193484
	(8.2E-17)	(0.56919)	(0.23696)
	[0.36251]	[0.02816]	[-0.81653]
C	1.794248	1.21E+15	3.93E+15
	(1.55903)	(1.1E+16)	(4.5E+15)
	[1.15088]	[0.11103]	[0.86792]
R-squared	0.880928	0.633254	0.933226
Adj. R-squared	0.815979	0.433211	0.896804

Sum sq. resids	10.03568	4.89E+32	8.48E+31
S.E. equation	0.955162	6.67E+15	2.78E+15
F-statistic	13.56350	3.165587	25.62263
Log likelihood	-20.28287	-676.9595	-661.1855
Akaike AIC	3.031430	75.99550	74.24283
Schwarz SC	3.377685	76.34176	74.58909
Mean dependent	11.24067	1.36E+16	1.43E+16
S.D. dependent	2.226608	8.86E+15	8.64E+15

The relationship between ER and ER itself is significantly positive with a coefficient of 0.059114 and a t-statistic of 0.25705, the relationship between EX and IM is significantly negative with a coefficient of -0.120759 and a t-statistic of 0.17291, which means the lower the EX, the higher the IM. The relationship between IM and ER is significantly positive with a coefficient of 2.96E-17 and t-statistic 8.2E-17, meaning that the higher the IM, the higher the ER. This shows that high imports of goods and services will weaken the rupiah exchange rate against the US dollar, as well as exports and imports, the lower exports of goods and services will encourage an increase in the import sector of goods and services in Indonesia. The causality test is used to examine if endogenous factors may function as exogenous variables as well. In other words, if two variables have an effect on one another.

Table 5. The Granger Causality Analysis

Null Hypothesis:	Obs	F-Statistic	Prob.
EX does not Granger Cause ER	19	3.98075	0.0633
ER does not Granger Cause EX		0.54333	0.4717
IM does not Granger Cause ER	19	5.22898	0.0362
ER does not Granger Cause IM		1.74152	0.2055
IM does not Granger Cause EX	19	3.07285	0.0987
EX does not Granger Cause IM		14.2223	0.0017

The results of the Granger causality test analysis can be seen in Table 5. The results show that the causal relationship only occurs in imported variables that affect the exchange rate, with a probability value of 0.0362. Likewise, export variables affect imports with a probability of 0.0017. While the causality relationship between other variables is not significant.

Conclusion
The implication of the findings of this study is that high imports of goods and services will weaken the rupiah exchange rate against the US dollar. This can happen because Indonesia is an import-oriented country, as well as the relationship between export and import variables, low exports of goods and services will encourage increased imports of goods and services sector in Indonesia. In addition, the results of the study show that the causal relationship only occurs in the imported variable that affects the exchange rate and the export variable that affects the import, while the causality relationship between other variables is not significant. This study has limitations, such as the use of secondary data, meaning that data outside of the secondary data that we used were not examined. Studies conducted outside our study period were not examined.

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