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Determinants of external debt, export-import, FDI, exchange rate, to foreign exchange reserves through balance of payments as intervening variables

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Abstract

Foreign exchange reserves are interpreted as part of national savings and are a very important monetary indicator to show the strength or weakness of the country's economic fundamentals. Foreign exchange reserves is influenced by various factors, including; external debt, exports, imports, investment, and balance of payments. The purpose of this study is to analyze the determination (degree of influence) of factors of foreign debt, import exports, FDI, exchange rates, on foreign exchange reserves through and balance of payments (BOP). The research method used is a quantitative research method with secondary data types in the form of data series with a period of 12 years (2011-2022). The data analysis method used is path analysis. With the help of E-views software. The results of the analysis p there is a structure/path I obtained that the exchange rate variable has a real effect on the BOP (balance sheet), In the structure/path I it is obtained that the exchange rate variable has a real effect on the BOP. While simultaneously (together) it is known that the variables X_1 , X_2 , X_3 , X_4 , and X_5 not significant effect on Y_1 (balance of payments). The results of the structure/path II analysis found that the external debt variable had a real effect on the country's foreign exchange reserves, and simultaneously (together) it was known that the variables X_1 , X_2 , X_3 , X_4 , X_5 and X_6/Y_1 had a real effect on Y_2 (foreign exchange reserves). In addition, it was also found that the balance of payments /BOP variable as an intervening variable did not have a real effect on foreign exchange reserves.

Keywords: Foreign debt; Foreign investment; Foreign exchange; Export-import

1 Introduction

Indonesia is a country that adheres to an open economic system. Indonesia is an example of a country that opens itself to cooperation between countries, one of which is by conducting international trade. International trade is a business

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transaction (export, investment, import, and others) carried out by more than one country (Dhipayana, 2018). International trade is carried out to meet domestic needs and improve welfare for its people (Grozdanovska et al., 2017). Therefore, international trade has an important role in the country's economy (Hady, 2001), where all domestic needs cannot be met by the country itself (Sonia & Setiawina, 2016). Through international trade, many benefits can be achieved, both direct and indirect. The direct benefits of international trade include specialization, a country can export the commodities it produces in exchange for what other countries produce at a lower cost (Titievskaia & Harte, 2019). The country will benefit directly through an increase in national income and will ultimately increase the rate of output and economic growth (Terzea, 2016). All international trade transactions that occur in a country are summarized in the balance of payments consisting of export and import components of goods and services.

Export-import activities carried out by a country will be recorded in the trade balance (BOP) (Mankiw, 2000). The more export activity, the greater the foreign exchange that the country will receive. This is as in Classical Theory (David Hume) states that if a country has a balance of payments surplus, there will be an inflow of gold that causes the amount of money to increase. That is, if a country exports more than its imports, then the country will benefit in the form of foreign exchange which then this foreign exchange is stored in the country's foreign exchange reserves. This means that the larger a country trades, the greater its foreign exchange reserves. While the opposite condition will occur from import activities, where the higher the import, the more depleted the country's foreign exchange reserves. Foreign exchange reserves are used as a means of transaction (payment) in import activities.

Foreign exchange reserves are interpreted as part of national savings and are very important monetary indicators to show the strong or weak economic fundamentals of a country (Gandhi, 2006). The size of a country's foreign exchange reserves is a signal (indicator) for *global financial markets* regarding the credibility of monetary policy and creditworthiness of the country. The motive for ownership of high foreign exchange reserves for the state is more or less the same as the motive for someone (individual / private) to own wealth. In the sense that the higher the foreign exchange reserves owned, the better/more stable the country's economy. Foreign exchange reserves are used as a tool to stabilize exchange rate fluctuations to reduce demand and finance imports, so that the domestic currency exchange rate can be maintained (Aulia & Masbar, 2016). On the other hand, foreign exchange reserves can be used as foreign trade transactions (imports), while from export activities will be generated a number of transactions that will increase the country's foreign exchange reserves. This is as stated by Uli (2016) that foreign exchange reserves are influenced by exports, imports, and the rupiah exchange rate (exchange rate). In addition, foreign exchange reserves are also influenced by foreign debt, foreign investment and portfolio investment (Febriyenti et al., 2013).

Based on the functions and benefits of foreign exchange reserves that have an important role in reducing exchange rate fluctuations and encouraging a country's economic progress (Sayoga & Tan, 2017), it is very important to maintain the availability of foreign exchange reserves. Foreign exchange reserves in sufficient quantities are one of the guarantees for achieving monetary and macroeconomic stability of a country (Dewi & Dewi, 2017). The more actively a country trades (exports), the more foreign exchange is needed. In addition, foreign exchange is also used in development financing (Ridho, 2015), such as; financing projects for industrial development and other projects, such as; construction of roads, bridges, docks, airports, terminals and so on. Foreign exchange reserves are an important source of funding for development, which is stored and accounted for by Bank Indonesia. Thus, the purpose of this study is to analyze the determination (level of influence) of factors of foreign debt, import exports, FDI, exchange rates, and balance of payments (BOP) on foreign exchange reserves.

2 Material and methods

The research method used is quantitative research method. Quantitative research methods are considered appropriate and appropriate for analyzing secondary data in the form of numerical data and analyzing the influence between variables. According to Adedoyin (2020) quantitative research is considered as an organized investigation of phenomena through the collection of numerical data and the implementation of statistical, mathematical or computational techniques. It further states that the source of quantitative research is the positivism paradigm that advocates an approach embedded in statistical details involving other strategies such as inferential statistics, hypothesis testing, mathematical exposition, randomization of experimental and quasi-experimental designs, blinding, structured protocols, and/or questionnaires with various prearranged answers. Quantitative research objectives are measurable and cannot be separated from variables and hypotheses.

The data used in the study are secondary data in the form of data series within a period of 12 years (2011-2022) sourced from Bank Indonesia 2010-2022 (BI, 2023), consisting of data on foreign exchange reserves, foreign debt, import exports, foreign direct investment (FDI), exchange rates, and Indonesia's balance of payments (BOP). The data unit is in the form of US dollars (US\$).

The data analysis method used is path analysis. The path analysis approach was first developed by Sewall Wright in 1918, which is to develop path analysis to make a hypothesis study of causal relationships using correlation (Wooldredge, 2021). This technique is also known as causal modeling (Lleras, 2011). Data analysis technique with path analysis is an analysis technique based on regression and correlation methods (Yusuf et al., 2020; Syahrir et al., 2020). This naming is based on the reason that path analysis allows users to test theoretical propositions regarding cause and effect relationships without manipulating variables. Manipulating variables means giving treatment to certain variables in the measurement. The basic assumption of this model is that some variables actually have a very close relationship with each other (Sarwono, 2010). Path analysis allows researchers to analyze more complex models that multiple linear regression cannot do. Path analysis can also be used to determine direct and indirect relationships, one of which is through intervening variables. Path analysis presents causal relationships between variables in the form of images to make them easier to read. This depiction is done to explain the relationship that occurs both dependent and independent variables or other relationships to moderation variables. Path analysis as an extension model of regression is used to test the alignment of the correlation matrix with two or more causal relationship models that are compared (Denis & Legerski, 2006). The model is depicted in the form of a circle/square and arrow where a single arrow shows as the cause (Streiner, 2005). In detail, the structure/pathway model in this study is as follows:

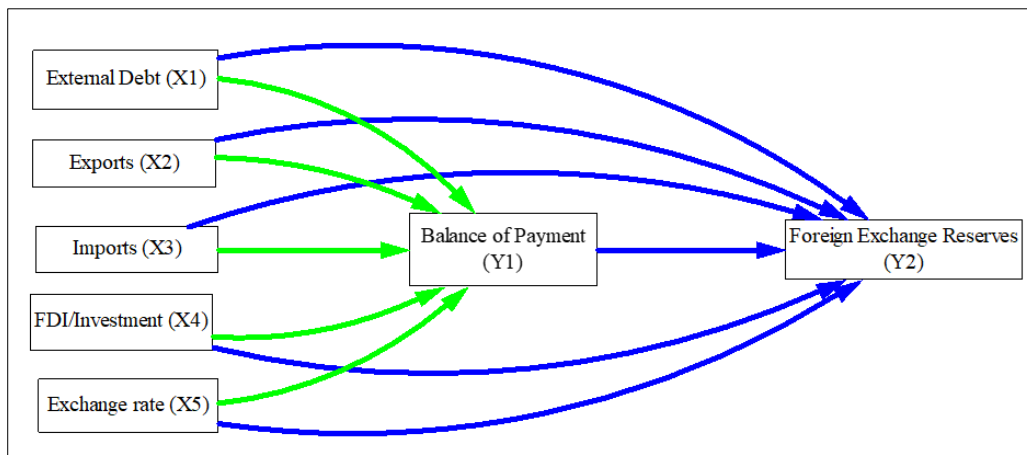


Figure 1 Research structure/path model

The model built consists of two structures/paths, namely structure/path I consisting of; external debt (X_1), exports (X_2), imports (X_3), FDI/investment (X_4), exchange rate (X_5) against balance of payment/BOP (Y_1), and structure/path II, consisting of; external debt (X_1), exports (X_2), imports (X_3), FDI/investment (X_4), exchange rate (X_5), balance of payment/NPI (Y_1) against foreign exchange reserves (Y_2). Based on the structure/path model, hypotheses are then built to be tested statistically (T-test, F-test and R-Square). Data analysis is done with the help of EViews software. The advantage of EViews lies in its ability to process data based on time-series dimensions, although it can still process cross-section and panel data. In addition, EViews does not require long steps/stages like similar programs in processing data. In this study, EViews software was used considering the type of data used was a data series.

3 Results and discussion

3.1 Classical Assumption Test

Structure/path analysis is carried out on path I by analyzing the effect of independent variables of foreign debt (X_1), exports (X_2), imports (X_3), FDI/investment (X_4), exchange rate (X_5) on the balance of payment/NPI (Y_1) on the dependent variable balance of payment / NPI (Y_1), and path II foreign debt (X_1), exports (X_2), imports (X_3), FDI/investment (X_4), exchange rate (X_5), balance of payment/ NPI (Y_1) against foreign exchange reserves (Y_2). To obtain an acceptable model output, a classical assumption test is needed as a prerequisite. Classical assumption tests are intended to provide assurance that the equations of the model obtained have accuracy in estimates, are unbiased and consistent. The results of the classical assumption test of the model are obtained as follows;

3.1.1 Normality Test

The normality test is intended to determine whether a particular sample of data or variables comes from a population that has a normal distribution or not. Data is said to be normally distributed if it does not have a significant or standard difference compared to the standard normal.

The results of the normality test analysis obtained that the variable data is normally distributed where the Sign value. = 0.613065 which means that the value is greater (>) than 0.05. The same result is also obtained from the results of normality analysis for structure/path II, namely obtained the Sign value. = 0.708374. Thus, the data can be carried out statistical tests to see the influence between variables. In addition to the normality test, a multicollinearity test is also needed as a prerequisite test (classical assumption).

3.1.2 Multicollinearity Test

The multicollinearity test is intended to test whether there is a high or perfect correlation between independent variables or not in the developed model. If there is a high correlation between independent variables, the data is not strong enough to be used as estimating data from the model. The following are the results of the multicollinearity analysis of structures /path I and II.

Table 1 Multicollinearity test results

	Centered	Centered
Variable	VIF (Path I)	VIF (Path II)
C	NA	NA
X1	6.150880	10.46079
X2	8.613651	12.81985
X3	5.863467	7.015156
X4	8.980276	15.57191
X5	14.80709	35.21251
X6/Y1	-	3.100558

Based on the results of the multicollinearity test for path I, it is obtained that there is one variable that has a VIF value of more than 10, namely X₅ (exchange rate). Thus, exchange rate variables are considered to have a high correlation relationship with other variables, so that these variables should be excluded from the model so that the developed model becomes good enough as an estimating model. While the results of the multicollinearity test path II obtained that there are three variables that have values above 10, namely X₂ (export), X₄ (FDI / investment) and X₅ (exchange rate). These three variables are indicated to have a high correlation with other independent variables.

3.1.3 Heteroscedasticity Test

The heteroscedasticity test is performed to determine whether in a model there is variance discomfort from residuals in one observation against another. Heteroscedasticity is a residual variance that is not the same across all observations in the regression model. The results of the heteroscedasticity test analysis for path I obtained a probability chi-square value = 0.3142 which value is greater than the sign value. 0.05. Thus, it can be stated that there are no symptoms of heteroscedasticity, in other words the data meet for statistical tests. The same thing is also obtained from the results of the heteroscedasticity test analysis for path II, namely obtained the probability value of chi-square = 0.3182.

3.1.4 Autocorrelation Test

The autocorrelation test aims to show the correlation of observation members sorted by time or space. Autocorrelation is a correlation that occurs between errors / residuals in certain periods (t) with errors / residuals in other periods (t+1). The existence of autocorrelation problems causes the variance formed in the model to be not minimum. In addition, the existence of autocorrelation causes the estimation of model variants to be biased, software tends to suspect model variants underestimate. Autocorrelation generally occurs because data in one period is influenced by data in another period. For example, the rupiah exchange rate on this day is influenced by the rupiah exchange rate on the previous day.

The results of the autocorrelation test analysis for path I obtained the value of Prob. Chi-Square = 0.0207 which indicates that the value is smaller (<) than the sign value. = 0.05 which means that autocorrelation symptoms occur. While different results occur in path II where the value of Prob. Chi-Square = 0.5163 which indicates that no autocorrelation symptoms occur.

3.2 Statistical Test Results

Statistical test analysis was carried out to see the influence between variables, by performing a T test, F test and R-Square (R²) value. In detail the results of statistical test analysis for path I are presented as follows:

Table 2 Results of statistical test analysis of path I

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	384.2143	170.2338	2.256981	0.0648
X1	1.049458	0.511828	2.050412	0.0862
X2	-1.761350	1.029007	-1.711698	0.1378
X3	1.297447	1.195154	1.085590	0.3193
X4	14.76947	7.037813	2.098588	0.0806
X5	-80.15570	27.87539	-2.875500	0.0282
R-squared	0.677477	Mean dependent var		22.91333
Adjusted R-squared	0.408709	S.D. dependent var		60.98417
S.E. of regression	46.89407	Akaike info criterion		10.84051
Sum squared resid	13194.32	Schwarz criterion		11.08297
Log likelihood	-59.04307	Hannan-Quinn criter.		10.75075
F-statistic	2.520670	Durbin-Watson stat		2.730731
Prob(F-statistic)	0.145693			

Table 3 Results of statistical test analysis of path II

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	94.12001	20.45916	4.600384	0.0058
X1	0.291338	0.058995	4.938392	0.0043
X2	0.200631	0.110953	1.808241	0.1304
X3	-0.230534	0.115542	-1.995241	0.1026
X4	0.699632	0.819103	0.854144	0.4320
X5	-6.769568	3.799348	-1.781771	0.1349
Y1	0.000564	0.036083	0.015635	0.9881
R-squared	0.960835	Mean dependent var		121.2095
Adjusted R-squared	0.913836	S.D. dependent var		14.11985
S.E. of regression	4.144694	Akaike info criterion		5.972733
Sum squared resid	85.89242	Schwarz criterion		6.255595
Log likelihood	-28.83640	Hannan-Quinn criter.		5.868007
F-statistic	20.44399	Durbin-Watson stat		2.358575
Prob(F-statistic)	0.002259			

The results of the t test analysis (partial) obtained only the variable X5 (exchange rate) which had a real effect on the NPI (balance sheet), with the value of P (probability) = 0.0282 smaller (<) than 0.05 and also seen from the value of t

count = 2.875500 greater > table value = 2.364624. While the results of simultaneous analysis (together) X_1, X_2, X_3, X_4, X_5 have no real effect on Y_1 (NPI / balance of payment), with the value of Prob (F-statistic) = 0.145693 greater than 0.05. In addition, the results of path I analysis obtained a relatively small R^2 value = 0.408709, which means that the variables X_1, X_2, X_3, X_4, X_5 are only able to explain the NPI variable (balance of payment) of 40.87% and the rest is explained by other variables that are not included in the model. Based on the results of the analysis, the equation $Y_1 = 384.214289021 - 80.1557023662 * X_5$ was obtained. While the results of the statistical test analysis of path II, presented as follows:

The results of statistical analysis on path II obtained the same thing as path I where there is only 1 variable that affects foreign exchange reserves (Y_2), namely only variable X_1 (foreign debt). This is obtained from the probability value = 0.0043 smaller than the sign value = 0.05. Results are also obtained from the value of t statistic = 4.938392 greater than the value of t-table = 2.364624. While the results of simultaneous analysis (together) obtained that variables X_1, X_2, X_3, X_4, X_5 and X_6/Y_1 have significant effect on Y_2 (foreign exchange reserves), with the value of Prob (F-statistic) = 0.002259 smaller than 0.05 which means simultaneously (together) has a real influence on the variable Dependent. In addition, the results of path II analysis obtained a relatively large R^2 value = 0.913836, which means that the variables X_1, X_2, X_3, X_4, X_5 and X_6 / Y_1 are only able to explain the variable of foreign exchange reserves by 91.38% and the rest is explained by other variables that are not included in the model of 8.62%. Coefficient Determination (R^2) is also called the association index. Is a value that shows how much variance in one variable is determined or described by one or more other variables and how much variance in one variable is related to variance in another variable. In bivariate statistics it is abbreviated as r^2 while in multivariate it is abbreviated as R^2 . This value is used as a magnitude to express the magnitude of the influence of all exogenous variables on endogenous variables in combination or referred to as combined influences.

4 Conclusion

- In the structure/path I it is obtained that the exchange rate variable has a real effect on the BOP (balance sheet). While simultaneously (together) it is known that the variables X_1, X_2, X_3, X_4 , and X_5 have no real effect on Y_1 (balance of payments).
- In the structure/path II it is obtained that the variable foreign debt has a real effect on the foreign exchange reserves. While simultaneously (together) it is known that the variables X_1, X_2, X_3, X_4, X_5 and X_6/Y_1 have a real effect on Y_2 (foreign exchange reserves).
- The balance of payments/BOP variable as an intervening variable has no real effect on foreign exchange reserves.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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