

How do Exports and Imports Distress Foreign Exchange Reserves in Indonesia? A Vector Auto-Regression Approach

S. Hariadi, A.Z. Tayibnapis, & N. Irawati

University of Surabaya, Surabaya, Indonesia

ABSTRACT: IMF conveyed that Indonesia's foreign exchange (FX) reserves grasped 123.283 billion US \$ in 2018 and ranked 21st in the world (China was the highest with 3.103 trillion US \$ and Somalia was the lowest with 30 million US \$). FX reserves are imperative indicators in international trade that form the fundamental strength of a country's economy. The advance of FX reserves is influenced by numerous factors, including export and import deeds. Recognizing the effect of exports and imports on the position of Indonesia's FX reserves for the last 25 years (period 1991- 2015), this study customs a quantitative approach with the Vector Auto-Regression. Indonesia's FX reserves were positively influenced by FX reserves one year ago, negatively by exports one year ago, positively by imports one year ago, positively by exports two years ago, and negatively by imports two years ago. According to the theory, exports and imports can affect Indonesia's FX reserves but only perceived in the subsequent two years.

*Keywords:*FX reserves, export, import.

1 INTRODUCTION

In the global era, every country is encouraged to conduct international trade in order to boost economic growth (Tambunan 2004). The foremost deeds in international trade are exports and imports (Goyal 2012). Indonesia is one of the countries that relies on exports and imports as a source of state revenue to generate foreign exchange reserves (Beny 2013).

The IMF conveyed that Indonesia's foreign exchange reserves grasped 123.283 billion US \$ in 2018 and ranked 21st in the world (China was the highest with 3.103 trillion US \$ and Somalia was the lowest with 30 million US \$). Foreign exchange reserves are imperative indicators in international trade that form the fundamental strength of a country's economy. The advance of foreign exchange reserves is influenced by numerous factors, including export and import deeds (Amir 2004, Agustina & Reny 2014).

Foreign exchange reserves are foreign currency deposits in central banks and monetary authorities (Gandhi 2006). These deposits are central bank assets stored in numerous reserve currencies, such as dollars, euros, or yen. Deposits are used to guarantee

liabilities, namely issue local currencies and deposits of various banks in the central bank (Soludo 2005, Nda 2006, Osabuohien & Egwakhe 2008).

Foreign exchange reserves can be defined as liquid foreign financial assets controlled by the monetary authority that is always prepared to be used to finance the balance of payment (Asmanto & Suryandari 2008). The main reason a country holds foreign exchange reserves is to finance international obligations and reduce unpredictable international payments, for example, as a result of the actions of international speculators. The quantity of foreign exchange reserves is influenced by several factors, one of which is export and import activities (Juniantara 2011).

Foreign exchange reserves can be an imperative indicator to perceive the extent to which a country can conduct international trade and show the fundamental strength of a country's economy (Purnamawati & Fatmawati 2013). Indonesia's foreign exchange reserves are still quite small. This resulted in Indonesia being unable to make international payments and stabilizing the exchange rate, which eventually led to a balance of payments deficit and a weakening of the rupiah.

Indonesia's exports in 1991 amounted to 29,142.4 (million US \$) and continued to increase to 53,443.6 (million US \$) until 1997. Indonesia's imports in 1991 amounted to 25,868.8 (million US \$) and continued to increase to 41,679.8 (million US \$) until 1997. The value of Indonesia's foreign exchange reserves continued to increase in 1991-1996 but declined in 1997 by 17,427 (million US \$).

Likewise, Indonesia's balance of payments initially continued to increase in 1991-1996, then declined or deficit in 1997 of -10,021 (million US \$), followed by a weakening of the rupiah in 1997 of 4.65 (Rp / US \$).

Since the devaluation on November 15, 1978, Indonesia has implemented a floating exchange rate system until August 1997. In this system, the rupiah exchange rate is floated against the basket currencies of Indonesia's major trading partners. With this system, Bank Indonesia sets the indicative exchange rate and allows the exchange rate to move in the market with a particular spread.

In order to preserve the stability of the rupiah exchange rate, Bank Indonesia can intervene if the exchange rate fluctuates beyond the upper or lower limit of the spread (Triyono 2008). When the controlled floating exchange rate system was implemented in Indonesia, the rupiah exchange rate continued to depreciate against the US Dollar from year to year.

The value of the rupiah has declined since May 1997, making Bank Indonesia conduct four interventions by widening the range of interventions, but the effect is not abundant. The value of the rupiah in the United States dollar continues to be depressed. In August 1997, the monetary authority removed the intervention and put in place a free-floating exchange rate system (Adiningsih et al. 2008).

Since August 14, 1997, until now, Indonesia has implemented a free-floating exchange rate system. Bank Indonesia intervened in the foreign exchange market because it was solely to maintain the stability of the rupiah exchange rate, which was more determined by market forces.

In 1998, economic growth dropped by -13.10%. Indonesia's foreign exchange reserves decreased by the US \$ 14.4 billion due to the state of the Indonesian economy, which was experiencing a monetary crisis accompanied by an increase in inflation of 82.4% and the weakening of the value of Indonesia's exports.

On January 22, 1998, the rupiah experienced the lowest depreciation of 197% to Rp. 16,650.00/US \$. The depreciation of the rupiah against the US dollar was the highest compared to the currencies of other Asian countries, which also experienced a deprecia-

tion against the US dollar during that period (Sultan 2012).

Indonesia's economic growth in 2008 was 4.12%, and the exchange rate of the rupiah against the US dollar was at Rp. 12,650/US \$. The development of foreign exchange reserves once again declined sharply at the US \$ 80.20 billion due to the global crisis that occurred in the United States and impacted countries in the world, including Indonesia. Indonesia's inflation rate increased to 12.14%, which caused foreign exchange reserves to only be able to finance imports and pay off foreign debt for 4.4 months, which was previously able to finance imports for 6.79 months (Afdinizar 2012).

In 2015, Indonesia's economic growth increased by 4.67%, and the inflation rate decreased by 7.18%. The situation resulted in Indonesia's foreign exchange reserves increased by the US \$ 107.6 billion. The exchange rate of the rupiah suddenly plummeted to the level of Rp. 14,098/US \$.

2 RESEARCH METHODS

This type of research used in this research was explanatory by using a quantitative approach (Creswell 1994, Sugiyono 2013). The scope of this research was focused on matters relating to the effect of exports and imports on Indonesia's foreign exchange reserves.

The data used in this study were time series data with a 25-year time period (1991-2015) and sources from the World Bank (The World Bank 2017a, b, c), scientific journals, and various related literature. This study used multiple regression models with the following Vector Auto-Regression (VAR) methods (Gujarati 2007, Juanda & Junaidi 2012).

$$CD_t = \alpha_1 + \sum_{i=1}^k \beta_1 CD_{t-1} + \sum_{i=1}^k \gamma_1 X_{t-1} + \sum_{i=1}^k \delta_1 M_{t-1} + \varepsilon_{1t} \quad (1)$$

$$X_t = \alpha_2 + \sum_{i=1}^k \beta_2 X_{t-1} + \sum_{i=1}^k \gamma_2 CD_{t-1} + \sum_{i=1}^k \delta_2 M_{t-1} + \varepsilon_{2t} \quad (2)$$

$$M_t = \alpha_3 + \sum_{i=1}^k \beta_3 M_{t-1} + \sum_{i=1}^k \gamma_3 X_{t-1} + \sum_{i=1}^k \delta_1 CD_{t-1} + \varepsilon_{3t} \quad (3)$$

where CD_t = Indonesian Foreign Exchange Reserves Year t ; X_t = Indonesia Export Year; M_t = Indonesian Imports of the Year; ε = Error caused by random factors.

The Indonesian data used were sourced from the World Bank for the 1991-2015 period (The World Bank, 2017a, b, c). By using Eviews 9.0, a series of tests were conducted: Data Stationary Test (Augmented Dickey-Fuller), Lag Length Criteria Test, Cointegration Test (Johansen Cointegration), Vector Auto-regression (VAR), Granger Causality Test, Impulse Responsive Function (IRF) Analysis and Variance Analysis Decomposition (VD)

3 RESULTS AND DISCUSSIONS

The first stage was the stationarity test, carried out by the Augmented-Dickey Fuller (ADF) method. Table 1 shows that all variables were stationary in the same degree in the first difference, thus avoiding spurious regression. i

Table 1. First difference ADF test results

Variable	t-statistic	Critical Value 1%	Prob.	Remarks
CD _t	-3.460602	-2.669359	0.0014*	Stationer
X _{t-1}	-3.706646	-2.669359	0.0007*	Stationer
M _{t-1}	-3.706646	-2.669359	0.0007*	Stationer

* significant at level $\alpha = 1\%$.

The results of the lag length criteria test as the second stage are shown in Table 2. The values of the static LR, Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC) and Hannan-Quinn Information (HQ) are in lag 2. The lowest Akaike Information Criterion (AIC) value is also in lag 2, where the lowest AIC value obtained from the estimated VAR with various lags shows that the lag length is the best to use (Gujarati 2007). Thus, the optimum lag used in the next stage of testing is using the optimum lag 2.

Table 2. Lag length criteria test results

Lag	LogL	LR	FPE	AIC	SQ	HQ
0	-1720.9	NA	2.5e+61	149.90	149.90	149.9
1	-1664.4	93.2	4.1e+59	145.78	146.30	145.9
0	-1646.7	24.6*	2.0e+59*	145.02*	146.00*	145.2*

* indicates lag order selected by the criterion. LR: sequential modified LR test statistic (each test at 5% level)

Furthermore, the Johansen Cointegration test using optimum lag 2 found a long-term balance relationship in the time series data. Based on the Trace Statistics value, the Maximum Eigenvalue value, as well as the MacKinnon Probability value, shows that the model used in this study does not have cointegration. Thus, the null hypothesis that there is no cointegration is acceptable.

Because there is no cointegration, the VAR method can be performed. VAR test results using lag

2 and the first difference data are shown in Table 3. Estimation results show that the variables that have a significant relationship with CD are as follows (t-table = 2.07387).

The current year's foreign exchange reserve variable is influenced by last year's foreign exchange reserves (3.04633 > t-table value). Foreign exchange reserves one year ago had a positive influence on current foreign exchange reserves of 0.0783346. This means that every increase of one million US \$ of foreign exchange reserves one year ago could increase the current year's foreign exchange reserves by 0.783346 million US \$.

The current year's foreign exchange reserve variable is affected by exports two years ago (2.68954 > 2.07387). Exports two years ago affected positively on the current year's foreign exchange reserves, which amounted to 0.980414. That is, every increase of one million US \$ exports two years ago could increase the current year's foreign exchange reserves by 0.980414 million US \$.

Table 3. VAR test results

Variable	D(CD)	D(XT1)	D(MT1)
D(CD(-1))	0.783346 (0.25714) [3.04633]	0.280553 (0.31961) [0.87779]	-0.399801 (0.37365) [-1.07000]
D(CD(-2))	-0.356051 (0.28166) [-1.26412]	1.729198 (0.35009) [4.93936]	2.237960 (0.40927) [5.46819]
D(XT1(-1))	-0.792973 (0.31141) [-2.54641]	-0.505347 (0.38706) [-1.30560]	-0.006033 (0.45250) [-0.01333]
D(XT1(-2))	0.980414 (0.36453) [2.68954]	-0.429057 (0.45309) [-0.94696]	-0.719762 (0.52968) [-1.35886]
D(MT1(-1))	0.649043 (0.26259) [2.47174]	0.160578 (0.32638) [0.49200]	-0.204607 (0.38155) [-0.53625]
D(MT1(-2))	-0.885400 (0.31932) [-2.77276]	0.174972 (0.39690) [0.44085]	0.685987 (0.46399) [1.47844]
C	2.3E+09 (2.2E+09) [1.05831]	3.97E+09 (2.8E+09) [1.42799]	2.4E+09 (3.2E+09) [0.73960]

The current year's foreign exchange reserve variable was affected by imports two years ago (-2.77276 > 2.07387). Imports two years ago negatively affected the current year's foreign exchange reserves, amounting to -0.885400. That is, every increase of one million US \$ imports two years ago could reduce current foreign exchange reserves by 0.885400 million US \$.

The export variable one year ago was affected by foreign exchange reserves two years earlier (4.93936 > 2.07387). Foreign exchange reserves two

years ago affected positively on exports one year ago, amounting to 1.729198. It means foreign exchange reserves two years ago could increase exports one year ago by 1.729198 million US \$.

The import variable one year ago was affected by foreign exchange reserves two years ago (5.46819 > 2.07387). Foreign exchange reserves two years ago affected positively on imports one year ago, amounting to 2.237960. This means that foreign exchange reserves two years ago could increase imports one year ago by 2.237960 million US \$.

Meanwhile, the Granger Causality test results show that there is a one-way causality (causation) relationship between the CD variable and the $X(t-1)$ variable. Also, there is a one-way causality relationship between the CD variables, statistically, causing the variable $M(t-1)$. Finally, there is a bidirectional causality relationship between the two variables $X(t-1)$ and $M(t-1)$.

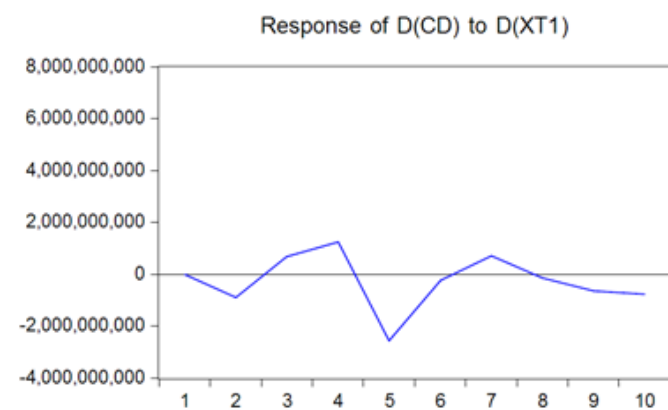


Figure 1. Impulse response function CD against $X(t-1)$.

Based on Figure 1, the response was given by the variable CD due to shock on the variable $X(t-1)$ fluctuates. The first to second period showed a negative response, but in the third to fourth period responded positively and continued to fluctuate until the ninth period until the last showed a negative response. This means that an increase in exports causes a decrease in foreign exchange reserves and vice versa, a decrease in exports causes an increase in foreign exchange reserves.

This is not in accordance with the theory put forward earlier, due to the condition of the Indonesian economy in this period that has not been stable and Indonesia's economic activity declined due to several factors, one of the factors is the monetary crisis that hit Indonesia in 1998 and 2008, so that an increase in exports will increase Indonesia's foreign exchange reserves in the next two years.

Meanwhile, the response given by the variable CD due to the shock on the variable $M(t-1)$ shows a positive response. In the first period, $M(t-1)$ showed a positive response, but in the third period began to give a negative and fluctuating response until the fifth period responded positively but in the sixth period returned negative while in the ninth period until the last period showed a positive response. This means that an increase in imports causes an increase in foreign exchange reserves and vice versa, a decrease in imports causes a decrease in foreign exchange reserves.

This is due to the increase in other foreign exchange sources such as increased exports resulting in increased foreign exchange reserves and being able to finance imports for more than three months so that rising imports do not cause foreign exchange reserves to decline.

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Variance Decomposition of the CD variable shows that in the initial period, the variables $X(t-1)$ and $M(t-1)$ did not influence the CD variable. However, in ten periods the contribution of $M(t-1)$ which continued to increase caused CD to decrease, the increase in $M(t-1)$ reached 20.04% and partly by $X(t-1)$ was only 8.94% in ten periods due to imports constitutes state expenditure so that if imports rise it tends to decrease foreign exchange reserves, in the tenth period CDs decrease to reach 71%.

4 CONCLUSION

Foreign exchange reserves in the current year are significantly affected positively by foreign exchange reserves one year ago. The current year's foreign exchange reserves were also significantly negatively

affected by exports one year ago and significantly affected positively by imports one year ago. Foreign exchange reserves in the current year were significantly positively affected by exports two years ago and significantly negative by imports two years ago.

In other words, exports and imports can affect Indonesia's foreign exchange reserves; namely, exports have a positive effect, and imports negatively affect foreign exchange reserves, but it will only be seen two years later.

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