

Using the ECM Approach between Growth of the Current Account Balance and Foreign Exchange Reserve in Indonesia

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ABSTRACT: *The aim of this research to analyze relationship equilibrium to the long-term and short-term between the current account balance and foreign exchange reserve. As datum from the world bank starts from 1982 until 2018, the used methodology Error Correction Model (ECM). The result of the estimate and analysis were the current account balance and foreign exchange reserve stationary at level with the ADF test. The variables had relationship equilibrium for the long-term and had one-way causality. That was the foreign exchange reserve that causes the current account balance. For the long-term, the current account balance had positively and not significantly to change the development of the foreign exchange reserves. From the short-term disequilibrium relationship to the equilibrium relationship, the current account balance had negatively and not significantly too to change the development of the foreign exchange reserves. The value of the current account balance of Indonesia has a deficit in some periods. It would have a bad impact on domestic foreign exchange reserves. To the Government, the Ministry of Trade to keep the export performance to the stability of the current account balance surplus to increase the Indonesian economic growth.*

KEYWORDS : *Foreign Exchange Reserve, Current Account Balance, ECM*

I. INTRODUCTION

Indonesia as a developing country implementing an open economic system, export and import activities become supporters in improving the economy. High export performance supports domestic production to continuously improve distribution output in meeting the needs of the world. High export performance is increasingly supporting the trade balance surplus so it impacts increasing domestic foreign exchange reserves.

Management of a country's foreign exchange reserves began with the efforts to improve export performance in the country. Foreign exchange reserves strongly affect the economic condition of a country in the future. The value of high foreign exchange reserves able to control the country's economy in international trade activities both in the real market and in the money market. Foreign exchange reserves can be in the form of stocks of other countries and in gold reserves in the country.

Foreign exchange reserves are viewed by economic policymakers as 'money in the bank'—the more, the better. Reserves are a fundamental pillar of the macroeconomic toolkit. In countries that implement fixed or partially fixed foreign exchange rate systems, they are used as a means to keep the exchange rate at or near the official target or parity level. Beyond exchange rate stabilization, foreign exchange reserves are considered a key indicator of the strength of an economy, particularly of its exporting and importing industries. Regarding international trade, foreign exchange reserves are often a necessary requirement to finance imports of goods and services. Finally, foreign reserves reveal the financial strength of a country. 'Foreign exchange reserves are particularly important in international trade because they facilitate international transactions and increase the speed at which trade deals are finalized. Additionally, these reserves could contribute to the efficiency of international supply chains[1].

The International Monetary Fund (IMF) defines foreign exchange reserves as the external stock of assets that a country's monetary authorities hold. They are composed of foreign banknotes, bank deposits in foreign currencies, and foreign bonds, treasury bills, and other government securities[2].

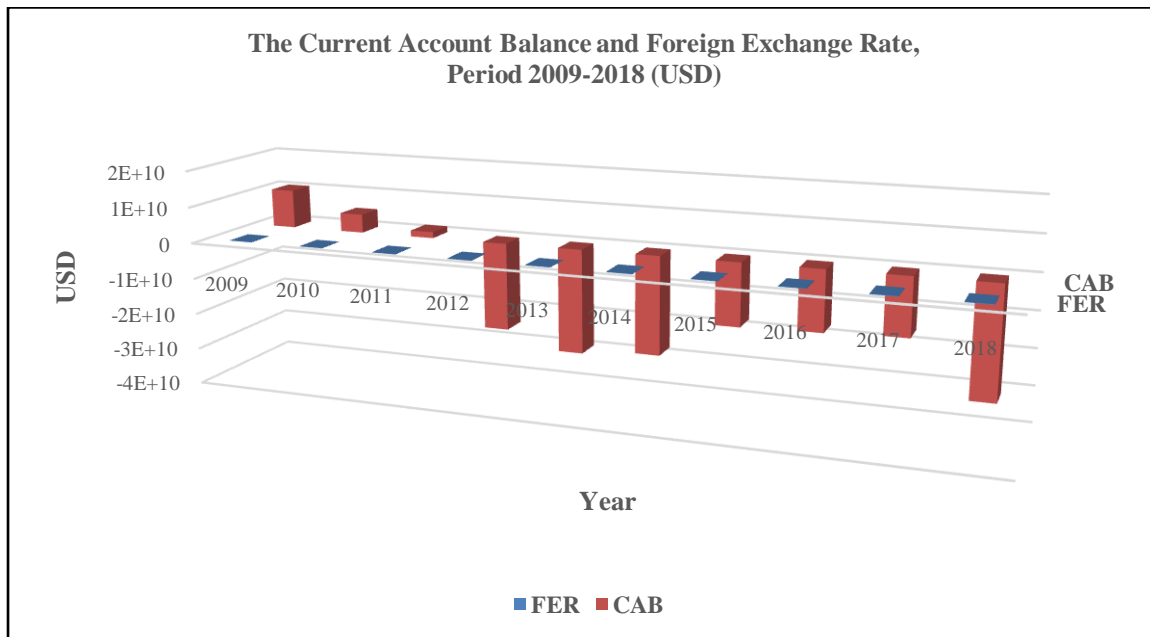


Fig. 1: The Current Account Balance and Foreign Exchange Rate, Period 2009-2018 (USD)

The figure above, about the ten years latest of the current account balance and foreign exchange reserve in Indonesia. For the highest value of the current account balance in 2009 is US\$ 10,628,489,686.08 but the lowest in 2018 is negative US\$ 31,050,512,052.22. And for the highest value of the foreign exchange reserve in 2017 is US\$ 130,215,330.38 but the lowest in 2009 is US\$ 66,118,916.97. The surplus of the current account balance could be helping the foreign exchange reserve improvements. The high value of the current account balance as positively for the stability of the foreign exchange reserve point. But in 2012 until 2018, the value of the current account balance as negative showed. That condition disturbed the stability of the foreign exchange reserve domestic.

For any period, the current account balance of Indonesia is negative and so had fluctuation. That was a problem for the foreign exchange reserve of domestic and so to international relationship Indonesia with other countries in the world trade, like export and or import activities. This research has aimed to know short term relationships and or long term equilibrium between the variables.

II. HEADINGS

In Indonesia, the arrangement of the institutions authorized to manage the foreign exchange reserves shall be stipulated by the Law on Bank Indonesia No. 23 of 1999 as amended by Law No. 3 of 2004. Pursuant to section 13 of the law, to Bank Indonesia in order to implement monetary policy is authorized to manage foreign exchange reserves. In the management of foreign exchange reserves, Bank Indonesia can conduct various foreign exchange transactions and can receive loans[3].

The purpose of the management of foreign exchange reserves is to (1) support monetary policy which is an integral part of the policy of maintaining the exchange rate, (2) assisting the Government to pay the foreign debt in a timely manner, and (3) financing Import activities in order to support economic activities in the country.

The principle that is the basis of Bank Indonesia in managing and maintaining foreign exchange reserves is security and readiness to fulfill obligations immediately without neglecting the principle to obtain an optimal income. In managing the foreign exchange reserves, Bank Indonesia shall seek to keep the reserves of the maintained amount to be sufficient to enforce the monetary policy.

The current account defined as the sum of net exports of goods and services and unrequited transfers balances can be derived via the national income accounts, as well. The latter shows the main relationship between current account balance and capital flows and can be calculated with the help of the difference between private savings minus private investments and government spending minus tax revenues[4].

The current account also offers information about the competitive structure of the balance of a country. For instance, a country importing more than it exports can be considered to be relatively less competitive in international markets. Especially, in those among European Union member countries, which are non-competitive in foreign markets, the balance of payments deficits could not be overcome through increases in exchange rate depending on the use of fixed exchange rates and thus the imbalances that may occur in external

payments are more damaging to the country's economy. Another important point to take into consideration carefully in this regard is how these deficits are financed. In case a country having this deficit is attractive to direct foreign investment, without the need for a change in the exchange rate, these deficits can be funded by the help of direct foreign investment. But, the capital coming to the country in this way buys assets and thus one owner of a larger proportion of the assets in the country passes into the hands of foreigners. If these deficits are funded more short-term capital, in case of any crisis, it causes a deepening of the crisis by outflowing. Therefore, these deficits' being permanent points to the financial fragility of those countries[5].

Because of the current account balance has a major contribution to foreign exchange reserves in Indonesia, it is important to know how the current account balance relationship in the short term or long term between those variables for the period.

III. INDENTATIONS AND EQUATIONS

This research has time series datum from the website of worldbank and the period was 1982 until 2018, and analyze for the relation of equilibrium for long term then correction for the short term disequilibrium with Error Correction Model (ECM), then to know causality between the variables. The step of a method for this research as follows:

1. Unit Root Test

In this step, the Unit Root test uses the Augmented Dickey-Fuller (ADF) method, to know stationarity or not for every variable of estimates. The Formula of the ADF test as follows:

$$DY_t = \alpha_0 + \gamma Y_{t-1} + \sum_{i=1}^{\rho} \beta_i DY_{t-1+i} + \varepsilon_t \dots\dots\dots (1)$$

Hypothesis null in this test was $H_0: \gamma=0$. Datum has said stationary with comparison statistics of MacKinnon. The criteria were if the number of $|ADF_{stat}| >$ critical number of MacKinnon or Prob.*t-statistics < 0.05 then the datum was stationary and the other way then the datum was not stationary.

2. Cointegration Test

In this step, the cointegration test for analyzing cointegration or relation of equilibrium for long term between the variables. The method is the Johansen test. This method had required to do with two statistic tests. That is, the trace (λ_{trace}) test for Hypothesis Null test had required an amount of cointegration direction is $\leq \rho$. The formula as follows:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{\rho} \ln(1 - \lambda_i) \dots\dots\dots (2)$$

The amount $\lambda_{r+1}, \dots, \lambda_n$ is the least of *eigenvectors* ($\rho - r$). Hypothesis null has used that is the sum of the same cointegration direction with r . And the result of cointegration vector $\leq r$, where $r = 0, 1, 2$ and beyond.

The next for the second statistics test, with the formula as follows to know the number of *eigenvalues* (λ_{max}) maximum:

$$\lambda_{max}(r, r + 1) = -T \ln(1 - \lambda_{r+1}) \dots\dots\dots (3)$$

To know there or not cointegration relation between the variables, that is seen from the ratio of Trace Statistics and Max-Eigen Statistics value with the critical value of $\alpha=0.05$.

3. Causality Test

In this step, to know there or no relation of one way, two way between the variables used the formula as follows:

$$X_t = \sum_{i=1}^m a_i X_{t-i} + \sum_{j=1}^n b_j Y_{t-j} - \mu_t \dots\dots\dots (4)$$

$$Y_t = \sum_{i=1}^r c_i X_{t-i} + \sum_{j=1}^s d_j Y_{t-j} - v_t \dots\dots\dots (5)$$

Where μ_t and V_t showed error terms assume there is no serial correlation, and $m = n = r = s$. By the result of estimation from the equation model (4), (5) shows 4 related possibilities of coefficient regression value from that equations as follows:

$$[1] \text{ if } \sum_{j=1}^n b_j \neq 0 \text{ and } \sum_{j=1}^s d_j = 0,$$

There the causality one way between the variables Y to X.

$$[2] \text{ if } \sum_{j=1}^n b_j = 0 \text{ and } \sum_{j=1}^s d_j \neq 0,$$

There the causality one way between the variables X to Y.

$$[3] \text{ if } \sum_{j=1}^n b_j = 0 \text{ and } \sum_{j=1}^s d_j = 0,$$

There does not the causality between the variable X and Y (variable X and Y has exogen each other).

$$[4] \text{ if } \sum_{j=1}^n b_j \neq 0 \text{ and } \sum_{j=1}^s d_j \neq 0,$$

There the causality two way between the variables Y and X.

The next with strengthening indications causality form, have to do F_{test} for every regression model.

4. Error Correction Model (ECM)

Techniques for correcting short-term disequilibrium to long-term relationship equilibrium called Error Correction Model (ECM), were first used by Sargan and popularized by Engle and Granger (Pratomo dan Hidayat, 2010). ECM model to know the influence of the current account balance to foreign exchange reserve as follows:

$$\Delta FER = \beta_0 + \beta_1 \Delta CAB + \beta_2 \mu_{t-1} + \mathcal{E}_t \dots \dots \dots (6)$$

where:

- Δ : first difference
- FER : the foreign exchange reserve
- $\beta_0, \beta_1, \beta_2$: coefficient
- CAB : the current account balance
- μ_{t-1} : residual previous period
- \mathcal{E} : random error term
- t : time

In the ECM model above shows ΔFER influenced by ΔCAB and equilibrium error term. If the equilibrium error term had zero value, so that model would not be in a state of equilibrium. In the ECM model, the absolute value of β_2 shows how fast the balance can be achieved again.

IV. FIGURES AND TABLES

A deficit of the current account balance as special attention to the Government of Indonesia, especially in the Ministry of Trade to save and increase the current account balance surplus for each period for domestic of the foreign exchange reserve. Following the datum of the growth of Indonesia the current account balance and foreign exchange reserve from 1982 until 2018.

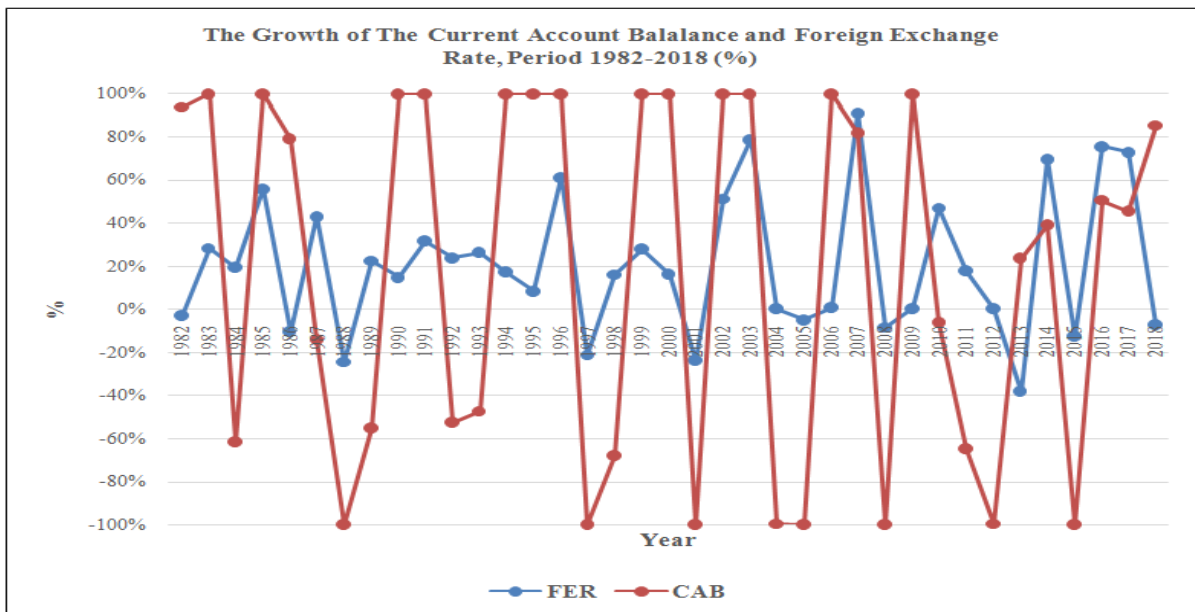


Fig. 2: The Growth of The Current Account Balance and Foreign Exchange Rate, Period 1982-2018 (%)

Over the last thirty-seven years from 1982 to 2018 the growth of the current account balance and foreign exchange reserve have fluctuated. For the highest value of the growth, the current account balance in 2009 is 8335.82 percent and the lowest in 2012 is negative 1549.07 percent. For the highest value of the growth, the foreign exchange reserve in 2010 is 45.51 percent and the lowest in 1982 is negative 26.97 percent. The current account balance value phenomenon that tends to negatively provide an insufficient good impact on the development of Indonesia's foreign exchange reserves.

To know relationship disequilibrium for the short term to long term relationship equilibrium between the variables, then the result by step in this research are as follows:

1. Unit Root Test

For the Unit Root Test used the Augmented Dickey-Fuller (ADF) test type for the stationary data. The result of unit root test as follows:

Table1: Unit Root Test with ADF Test Type

Variables	ADF test statistic	Level	
		t-Statistic	Prob.*
FER	-7.129784	-2.945842	0.0000
CAB	-6.177929	-2.945842	0.0000

Source: Unit Root test; Eviews v. 10; 2019

The result of the unit root test known the FER and CAB were stationary at Level. The Prob.* value of the both variable is $0.0000 < \alpha = 0.05$.

2. Cointegration Test

For the cointegration test used the Johansen method. This test to know relation equilibrium for long term between the variables. The result of the cointegration test as follows:

Table2: Cointegration test Johansen Method

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.580561	43.43316	15.49471	0.0000
At most 1 *	0.310722	13.02389	3.841466	0.0003
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level *denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.580561	30.40928	14.26460	0.0001
At most 1 *	0.310722	13.02389	3.841466	0.0003
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level *denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values				

Source: Cointegration test Johansen Method; Eviews v. 10; 2019

Had known for cointegration test had a relation equilibrium for the long term in the period, trace statistic > 0.05 critical value and max-eigen statistic > 0.05 critical value.

3. Causality Test

For the causality test used the Granger Causality test. This test to know the causality one and or two way between the variables for FER and CAB. The result of the causality test as follows:

Table3: Granger Causality Test FER and CAB on Lags 2, 4

Pairwise Granger Causality Tests			
Sample: 1982 2018			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
CAB does not Granger Cause FER	35	8.48722	0.0012
FER does not Granger Cause CAB		1.64180	0.2106

Source: Granger Causality test; Eviews v. 10; 2019

Pairwise Granger Causality Tests			
Sample: 1982 2018			
Lags: 4			
Null Hypothesis:	Obs	F-Statistic	Prob.
CAB does not Granger Cause FER	33	5.04864	0.0043
FER does not Granger Cause CAB		0.72841	0.5813

Source: Granger Causality test; Eviews v. 10; 2019

The results are the current account balance and foreign exchange reserve on lags 2 and 4 had the causality one way. It means the current account balance not cause a foreign exchange reserve but the foreign exchange reserve causes current account balance.

4. Error Correction Model (ECM)

To know the long term equation of this research, the result of the estimate as follows:

Table4: Estimate for The Long Term

Dependent Variable: FER				
Method: Least Squares				
Sample: 1982 2018				
Included observations: 37				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
SER01	0.043520	0.249664	0.174313	0.8627
CAB	0.002148	0.001771	1.212838	0.2336
C	8.006937	5.412896	1.479234	0.1483
R-squared				
	0.043900	Mean dependent var		9.488010
Adjusted R-squared				
	-0.012342	S.D. dependent var		16.03067
S.E. of regression				
	16.12929	Akaike info criterion		8.476756
Sum squared resid				
	8845.236	Schwarz criterion		8.607371
Log likelihood				
	-153.8200	Hannan-Quinn criter.		8.522803
F-statistic				
	0.780558	Durbin-Watson stat		2.179448
Prob(F-statistic)				
	0.466187			

Source: Estimate for the long term; Eviews v. 10; 2019

And so the equation for the long term as follows:

$$FER_t = 8.007 + 0.0435_t + 0.0021CAB_t, \dots\dots\dots (7)$$

Next, for a result the unit root test of residual as follows:

Table5: Unit Root Test Residual with ADF Test Type

Variables	ADF test statistic	t-Statistic	Prob.*
RESID01	-7.654208	-2.945842	0.0000

Source: Unit Root test; Eviews v. 10; 2019

Next, for a result the estimate of ECM as follows:

Table5: Estimate of ECM

Dependent Variable: D(FER)				
Method: Least Squares				
Sample: 1983 2018				
Included observations: 36 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CAB)	-0.000422	0.001022	-0.412866	0.6824
RESID01(-1)	-1.256327	0.146750	-8.561010	0.0000
C	1.107659	2.232978	0.496045	0.6232
R-squared				
	0.692808	Mean dependent var		0.545459
Adjusted R-squared				
	0.674191	S.D. dependent var		23.46181
S.E. of regression				
	13.39194	Akaike info criterion		8.106838
Sum squared resid				
	5918.350	Schwarz criterion		8.238798
Log likelihood				
	-142.9231	Hannan-Quinn criter.		8.152895
F-statistic				
	37.21239	Durbin-Watson stat		2.100149
Prob(F-statistic)				
	0.000000			

Source: Estimate of ECM; Eviews v. 10; 2019

And the equation for the short term as follows:

$$\Delta FER = 1.1077 - 0.0004 \Delta CAB_t - 1.2563u_{t-1} \dots\dots\dots (8)$$

As a statistic, the ECM value is significant. It shows FER adjust CAB with one lag, and or with other words approximately 125.63 percent from incompatibility between for long and short term for corrected as long as one year. As known, the elasticity of the short term for the CAB variable is 0.0004. Whereas the elasticity of long term for CAB variable is 0.0021 as the equation (7).In the short term, the current account balance had not

significant but negatively influenced the Indonesia exchange reserve with Prob. value $0.6824 > \alpha = 0.05$. And in the long term, the current account balance had not significant too but positively influenced the Indonesia exchange reserve with Prob. value $0.2336 > \alpha = 0.05$. On the basis of the theory, the higher the current account balance would be increasing the number of Indonesian foreign exchange reserves.

Indonesia's foreign exchange reserves are sourced from net exports be said to be the current account balance, gold reserves, and foreign debt. High net export value, high enough country gold reserves and minimal foreign debt will support the country's economy in a better direction towards a significant economic growth rate towards development Indonesia as a measure of community welfare. However, in fact, the net export condition of Indonesia for 37 years indicates the rate of growth fluctuates with a negative value in some period. This is what affects Indonesia's foreign exchange reserves because foreign debt as a long-term component of its development is not good enough would be increasing the rate of economic growth. Therefore, the results of the study showed that in the short-term net export is negatively influential but not significant to the change in the development of foreign exchange reserves to equilibrium. While in the long term net exports have a positive effect but not significant changes in the development of foreign exchange reserves. The condition is not significant to change the development of the foreign exchange reserves due to the value of the Indonesian net exports itself is a dominant deficit in a few years in the period of this research.

V. CONCLUSION

The current account balance and foreign exchange reserve had one-way causality, it was the foreign exchange reserve cause current account balance but the current account balance did not cause foreign exchange reserve. Between the variables had relationship equilibrium for the long term and for short-term as error equation model estimation known to relationship equilibrium, the current account balance had negatively and not significantly influenced to change the development of foreign exchange reserve for the periods. So, in the long-term, the current account balance had positively and not significantly influenced to change the development of Indonesia's foreign exchange reserve.

This situation describes that Indonesia's foreign exchange reserves affect the current account balance, not the current account balance that affects to change the development of the number of foreign exchange reserves. A small contribution from the current account balance to the foreign exchange reserves caused the current account balance to be unable to support an increase in the number of Indonesian foreign exchange reserves to a much higher value. So it can be concluded that Indonesia's foreign exchange reserves are not largely sourced from the current account balance, but from the number of gold reserves even the addition of foreign debt. This is a special concern for governments especially the Ministry of Trade to continue attending to the trend of our net export performance in international markets in an effort to increase the current account balance surplus and keep the stability of the rupiah exchange rate go into high economic growth.

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