# CURRENCY SUBSTITUTION IN INDONESIA

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*Abstract: This article describes the phenomenon of currency exchange when there is high inflation in a country or it's referred to dollarization. The phenomenon of high inflation also occurred in Indonesia in recent years when the economic crisis. This article tries to examine whether there dollarization in 1997 until 2004. The results showed that there has been exchange of currency or dollarization is significant when the economic crisis and its aftermath.*

*Keywords: economic crisis, dollarization, currency substituion, high inflation*

*Abstrak: Artikel ini merupakan penelitian yang menjelaskan fenomena pertukaran mata uang ketika ada inflasi yang tinggi di suatu negara atau yang disebut dolarisasi. Fenomena inflasi yang tinggi juga terjadi di Indonesia dalam beberapa tahun terakhir selama krisis ekonomi. Penelitian ini menguji apakah ada dolarisasi pada tahun 1997 sampai tahun 2004. Hasil penelitian menunjukkan bahwa telah terjadi pertukaran mata uang atau dolarisasi signifikan ketika krisis ekonomi dan akibatnya.*

*Kata kunci: krisis ekonomi, dolarisasi, substitusi mata uang, inflasi tinggi*

## INTRODUCTION

In high inflation countries, the high decrease of the domestic currency value leads agents to substitute it with foreign currency. This phenomenon is usually called currency substitution, or simply dollarization.

Reviewing some literatures, we find some variety of currency substitution definitions, However all of them focus broadly on the three traditional functions of money: unit of account, provider of transaction services, and provider of store of value services. Calvo and Vegh (1992) and Cuddington (1989) limit the currency substitution to the use of currencies as media of exchange. Other authors limit their definition to the store of value function of money. However, the term ''dollarization'' is frequently used to indicate that foreign money as a store of value, and not necessarily as a medium of exchange.

Especially to the speculators who seek the gain from the volatility of money.

Currency substitution is a phenomenon in the whole world but especially in developing countries. The significance of currency substitution plays an important role in financing government deficit, determining an appropriate foreign exchange regime, implementing a stabilization program and conducting the monetary policy. The substitution of money can be modeled, as foreign currencies are perfect substitutes as means of payment.

During the last ten years, Indonesia economy experienced periods of high economic growth as well as severe economic crises. One remarkable characteristic of the Indonesia economy has been high and persistent inflation. Since financial liberalization in 1983, domestic financial markets with the rest of the world capital account restrictions were eliminated.

Moreover, after financial crisis financial transactions were allowed to be conducted in both domestic and foreign currencies.

The experiences from various Latin American countries, including Argentina, Bolivia, and Peru, currency substitution has apparently increased in these countries subsequent to the reduction in inflation. Currency substitution in developing countries is usually one of the ultimate consequences of high and variable inflation. High inflation, in turn, is the result of the fiscal imbalances, leads to currency substitution. Institutional factors play a crucial role in the process of currency substitution. When restriction on holding of foreign currency removed the dollarization process usually begins with the foreign money substituting domestic money as a store of value. As high inflation continues, some prices -particularly of real estates, cars and other imported items – start to be quoted in foreign currency. After this some transactions begin to be performed in foreign currency especially those involving large transfer of funds. However, domestic money seems to retain its functions as a unit of account and medium of exchange in almost all nondurable goods (Calvo and Vegh, 1992).

The slow down of economic growth of Indonesia and followed by a slightly growth of export, a large current account deficit, a rising external debt and an un hedged foreign currency - denominated borrowing by the private sector lead to an initial devaluation of Rupiah. Stanley Fisher (1998) suggested that as currencies continued to slide, the debt service costs of these countries' private sectors increased. Consequently, resident hastened to hedge their external liabilities, intensifying exchange rate pressure.

However, this pressure imposed on domestic currency, which then influences domestic money holding and economy growth. This make domestic tends to hold foreign currencies to increase their wealth and hold less domestic currency. If this force continues then the decline in holding domestic currency will persists and further worsen the economic condition.

This paper will determine the relationship between currency depreciation and domestic money holding in Indonesia. This paper adopts the definition of currency substitution used by Akcay, Alper, and Karasulu (1997) and Calvo and Vegh (1992) focusing on the M2 definition of money as a proxy for currency substitution. These findings have important policy related implications. Developing countries have long tried to achieve long-run sustainable and stable economic growth by artificially fixing their currency to a more stable country's currency.

*Literature Review*. More than forty years ago, McKinnon (1963) and Mundell (1961) reminded an optimum currency area (OCA) did not imply identity between national territory and OCA when factor mobility within countries is low. He clarified that the distinction between OCA and national territory by defining OCA as an area where flexible exchange rates can be used to reach full employment and external equilibrium, while keeping domestic price level under control. An obvious implication of this view is that there are countries where full employment, external equilibrium and low inflation cannot be reached simultaneously. Such countries should not be considered optimum currency areas.

Thirty-six years later, McKinnon's (1999) and Mundell's (1999) agreed to propose for fixed or quacsy-fixed exchange rates for small and open economy countries, and this seemed to be in contrast with economics profession's mainstream. Growing popularity of inflation targeting and fears of short-term international capital flows, led many authors to conclude that flexible exchange rates represent the best monetary regime market (Masson, 1999; Mishkin, 1999a, 1999b). Fluctuating exchange rate was seen as a vehicle of macroeconomic adjustment as well as a vehicle of prevention against volatile short-term international capital flows.

There are at least five reasons why this view has to be reconsidered (Sonje, 2002). Firstly, fluctuating exchange rate can serve as an adjustment mechanism only if a country represents an optimum currency area. Secondly, exchange rate fluctuations can stimulate short-term capital flows, which means that stable exchange rate, if credible, can stabilize international capital flows. Thirdly, Stable exchange rate can be a solution to central bank's

problem if there is a close correlation between nominal interest rate and nominal exchange rate. Fourthly, the exchange rate changes may lead to wealth effects and offsetting macroeconomic adjustments when large share of assets and liabilities is denominated or held in foreign currency. Fifthly, fluctuating exchange rates in European countries in the last 15 years did not imply lower macroeconomic adjustment costs for countries that pursued such policies.

Most of the developing countries have implied the currency substitution in order to sustain the economic performance. Sonje (2002) conducted a research about the currency substitutions in the newly members of European Union found that there are three group of countries that implying currency substitution. The first group that has a low substitution currency is Poland and Hungary. The second group comprises Czech Republic, Estonia, Lithuania, Romania, Slovenia, Slovakia and Turkey. The third group comprises Bulgaria, Croatia and Latvia. The division of these groups depends on elasticity of substitution between different denominations of monetary and financial assets. The higher of the elasticity reflects the sensitivity of domestics to change their assets in foreign currency, especially Euro Currency.

The currency substitution also occurred in Thailand during 1977 – 1990. Oskooee and Thecaratanachai (2001) found that when Thailand devaluated its currency, there was a slow down in economic activity, thus a recession. This decline led to a currency substitution among the domestic in order to increase their wealth.

Prock *et. al* (2002) attempt to find the currency substitution among the three big economic countries in Latin America: Argentina, Brazil and Mexico. In their paper, they find that currency substitution occurred more in Argentina and Brazil than Mexico perhaps because of relatively more successful economic policies implemented in Mexico after the December 1994 crisis. The lack of a significant result for currency substitution in Mexico could be a reflection of its credible exchange rate and monetary policy. Mexico has a reasonable record of relative financial stability in the recent past. Furthermore, their foreign reserve to GDP ratio is higher and more stable compared to Argentina and Brazil. Mexico has a relatively more credible Central Bank policy and lesser degree of currency substitution.

*Model.* This paper adopts the definition of currency substitution used by Akcay, Alper, and Karasulu (1997) and Calvo and Vegh (1992) focusing on the M2 definition of money as a proxy for currency substitution. The currency substitution to least occur in countries that have implemented successful stabilization programs and are in a strong position to sterilize foreign shocks.

The demand for money has two features in general. The first is that it can formulate the monetary policy. The second is that money demand can formulate the exchange rate function together with other fundamental variables such as income, interest rate and price. We follow Arango and Nadiri (1981) and Bahmani-Oskooe (1996) by assuming that the M2 money demand function takes the following form:

$$\text{Log} M_{2t} = a + b \log Y_t + c \log E_t + x \log i_t + e_t \quad (1)$$

where $M_2$ is the real money stock, $Y$ the real income, $i$ the interest rate, and $E$ the nominal exchange rate. In Eq. (1), the income elasticity *(b)* is expected to be positive and the interest elasticity *(x)* is expected to be negative. As argued by Arango and Nadiri (1981), a depreciation of the domestic currency increases the value of foreign securities held by domestic individuals. If this increase is perceived as an increase in wealth, demand for domestic cash balances may increase. The link between exchange rates and money demand can also be used to define currency substitution. According to the currency substitution literature, when the exchange rate is expected to depreciate, the expected return from holding foreign money increases, and the demand for domestic currency falls (as individuals substitute foreign money for domestic currency). So if depreciation of the Indonesia Rupiah reflected by an increase in effective exchange rate induces a decline in money holdings by domestic residents, the estimate of *c* should be negative.

## METHOD RESEARCH

This paper uses a three variable vector autoregressive (VAR) in order to get such potential interactions. The VAR model is a fine approach to estimate the unrestricted reduced-form equations with uniform sets of lagged dependent variables as regressors. Since no restrictions are imposed on the structure of the system, VARs can be viewed as a flexible approximation to the reduced form of the correctly specified but unknown model of the true economic structure.

In order to detect whether a stable long-run relationship among the currency substitution variables, this paper uses the co-integration technique. Co-integration methodology allows researchers to test for the presence of equilibrium relationships between economic variables.

Prior to testing for co-integration, we need to examine the time series properties of the variables. They should be integrated of the same order to be co-integrated. In other words, variables should be stationary after differencing each time series the same number of times. Therefore, at the first step we develop unit root test to find non-stationary level.

### Unit Root Test

Ganger and Newbold (1974) suggested that in the presence of non stationary variables, there might be a spurious regression. A spurious regression has a high $R^2$ and t-statistics that appear to be significant, but the results are without any economic meaning.

The time series of $m$, $y$, $r$, and $\pi$ are in fact non stationary time series, that is generated by random process and can be written as follow:

$$Z_t = Z_{t-1} + \varepsilon_t \qquad (2)$$

where $\varepsilon_t$ is the stochastic error term that follows the classical assumptions, which means, it has zero mean, constant variance and is non autocorrelation (such an error term is also known as white noise error term) and $Z$ is the time series. Since we need to use the stationary time series for the next co-integration test and we also need to solve this unit root problem,

therefore, we will run the regression of unit root test based on the following equation:

$$\Delta Z_t = a + b Z_{t-1} + c \Delta Z_{t-1} + \varepsilon_t \qquad (3)$$

where we add the lagged difference terms of dependent variable $Z$ to the right-hand side of equation (2). This augmented specification is then used to test:

$$H_o: b = 0 \qquad H_1: b < 0$$

Therefore, both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) statistics are used to test the unit root as the null hypothesis.

### Co-integration Test

Engle and Granger suggested that co-integration refers to variables that are integrated of the same order. If two variables are integrated of different orders, they cannot be co-integrated.

Under the unit root test, the results show that the variables of money demand, income, exchange rate and interest rate are stationary at the first difference [I(1)]. Continuously, all the variables will be tested in co-integration test, by using the Johansen test statistics, imply that if money demand function variables are co-integrated, so there is a long term equilibrium relationship between these variables.

## RESULTS AND DISCUSSION

Data used in this paper is taken from International Financial Statistics and run from first quarter 1997 until first quarter 2004. The chosen exchange rate is quarterly market exchange rate in terms of Rupiah per US dollar. The income (output) measure is quarterly Gross Domestic Product. The chosen money supply is quarterly M2. Moreover, the interest rate chosen variables is three months deposit rate.

*Table 1* presents the results of both unit root tests for all variables in levels and first difference. The ADF test fails to reject the null hypothesis at the 5% level for some variables such as output ($y$) and interest rate ($r$). Similarly, the PP

**Table 1. Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) Statistics for Currency Substitution**

| | Level | | 1st difference | |
|---|---|---|---|---|
| **Var.** | **ADF** | **PP** | **ADF** | **PP** |
| | k=1 | k=4 | k=1 | k=2 |
| m | -3,4757* | -3,4216* | -6,0283* | -6,832* |
| | k=1 | k=1 | k=1 | K=2 |
| y | -1,2986 | -1,3545 | -4.,114* | -4,3341* |
| | K=1 | K=3 | K=1 | k=1 |
| e | -4,4635* | -3.,808* | -3.,980* | -3,7980* |
| | K=1 | K=2 | K=1 | k=1 |
| i | -2,1939 | -1,472 | -2,7946** | -2,7946** |

Note: The ADF and PP statistics were generated by model with constant and trend.
k is the lag length and was determined by Akaike info criterion and Schwarz criterion for the ADF test. The PP test use the automatic lag length that suggested by Newey-West. All variables were tested in log form.
* denote rejection of the null at 5% level
** denote rejection of the null at 10%level

test also fails to reject the null hypothesis for the same variables.

However, the ADF and PP test reject the null hypothesis for all variables in the first difference at 5% level, except variable interest rate (*r*) which is at 10% level. Since all variable are stationary at first difference, therefore, it is an I(1) stochastic process. The finding imply that it is reasonable to proceed with test for co-integrating relationship among combination of these series under the premise of non-stationary.

To check currency substitution occurred in Indonesia, then the regression is built using OLS method. The result using the data 1997.1 until 2004.1 is as follows:

$$m_t = -0.005 - 0.047y_t + 0.197e_t * -$$
$$(-1.136) \quad (-0.680) \quad (8.936)$$

$$0.003i_t * + 0.201y_{t-1} * -0.013e_{t-1} -$$
$$(-2.142) \quad (2.223) \quad (-0.370)$$

$$0.004i_{t-1} * -0.564m_{t-1} *$$
$$(-3.676) \quad (-4.356)$$

$R^2 = 0.896 \quad F = 23.425 \quad DW = 2.038$

* denote rejection of the null at 5% level
** denote rejection of the null at 10%level

This regression is made in lag model in order to find out the previous phenomenon. The result shows some variables do not have the same sign as hypothesis. The current income has negative sign while its lag show positive sign. It means that when there is an increase in previous income, it will lead to an increase in holding money in the current time. The same fact is occurred to exchange rate. It seems that people hold less money now to anticipate the depreciation of rupiah currency in the previous period. In addition, people act rationally in responding the increase of interest rate. When crises hit Indonesia, the interest rate reached almost 70.0 percent, therefore people prefer to hold less money. The trend of holding cash in Indonesia also decreases. It can be seen in the negative sign in income variable. The higher of the income, the lower of the people hold money. People prefer to choose alternative payment instrument such as credit card or cheque instead of money.

The parameter estimates of the co-integrating model are reported in *Table 2*. The Johansen test reject the null hypothesis at 5% which proves the existence of co-integrating relationship between money demand, income, exchange rate and interest rate in the long term. Therefore, this result indicates five co-integrating equations at 5% significant level using Trace Statistic. However, based on Max Eigen

**Table 2. Co-integration Results (with a Linear trend)**

| Null r | Alternative r | Trace Statistic | 95 % Critical Value | Max Eigen Statistic | 95% Critical Value |
|--------|---------------|-----------------|---------------------|---------------------|--------------------|
| 0 | 1 | 59.55* | 39.89 | 32.96* | 23.8 |
| ≤1 | 2 | 26.59* | 24.31 | 11.58 | 17.89 |
| ≤2 | 3 | 15.01* | 12.53 | 7.80 | 11.44 |
| ≤3 | 4 | 7.20* | 3.84 | 7.20* | 3.84 |

where r is the number of co-integration vectors
* denote rejection of the null at the 5% level with critical values from Oswald-Lenum (1992).

Statistic at least one co-integrating equation.

Finally, *Table 3* presents the result of VECMs test for each variable. From the table, there is no existence of bilateral causality from each variable. However some variables are significant correlated. The result shows that exchange rate significantly correlated with money demand. In general, the findings of VECMs test suggest that there is co-integrating relationship in short term between exchange rate and macroeconomic fundamentals

## CONCLUSION

This paper examines the money demand function and currency substitution motive in Indonesia. We use two econometric approaches. First, we test the stationary of each time series in order to estimates the co-integrating relation-ship in the long run and short run. The findings have identified that all time series are stationary at the first difference in the Augmented Dickey-Fuller and Phillip-Perron test. Consequently, the Johansen co-integrating test shows there is a co-integration in money demand function in Indonesia. Secondly, we used the VECMs test to prove the relationship among the variables.

Overall, the paper's finding suggests that there is a currency substitution during 1997 to 2004 in Indonesia. People react rationally when there is a fluctuation in exchange rate. In ad-

**Table 3. VECM Granger Causality Test**

| Null Hypothesis: | F-Statistic | Probability |
|------------------|-------------|-------------|
| y does not Granger Cause m | 1.4823 | 0.2499 |
| m does not Granger Cause y | 1.1394 | 0.3390 |
| | | |
| i does not Granger Cause m | 0.8085 | 0.4589 |
| m does not Granger Cause i* | 5.3525 | 0.0132 |
| | | |
| e does not Granger Cause m* | 8.5963 | 0.0019 |
| m does not Granger Cause e | 2.1619 | 0.1400 |
| | | |
| i does not Granger Cause y | 0.5422 | 0.5894 |
| y does not Granger Cause I | 0.9887 | 0.3887 |
| | | |
| e does not Granger Cause y | 1.2971 | 0.2943 |
| y does not Granger Cause e | 1.7444 | 0.1991 |
| | | |
| e does not Granger Cause i* | 15.0436 | 0.0001 |
| i does not Granger Cause e | 0.3158 | 0.7326 |

* denotes reject at 5% level of significant
** denotes reject at 10% level of significant

dition, The trend of holding cash in Indonesia also decreases. People prefer to choose alternative payment instrument such as credit card or cheque instead of money.

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