IMPACT OF VOLATILITY EXCHANGE RATES ON INDONESIAN ELECTRONIC IMPORTS FROM INTRA AND EXTRA ASEAN

Imam Mukhlis
Fakultas Ekonomi, Universitas Negeri Malang
e-mail: imm_mkl@yahoo.com

Abstract

This study analyzes the effects of exchange rates volatility and Gross Domestic Product (GDP) on electronic commodity import demand in Indonesia from intra and extra ASEAN. It applies an Error Correction Model along with Dickey-Fuller and Augmented Dickey-Fuller tests. It finds that Indonesian import demand for electronic commodity is significantly affected by GDP only in the short run. It also finds that exchange rates volatility in the short run have a negative effect on import demand from intra ASEAN and have a positive effect from extra ASEAN. In the long term, Indonesian import demand from extra ASEAN is positively affected only by exchange rates volatility.

Keywords: Exchange rates volatility, error correction model, gross domestic product, ASEAN
JEL classification numbers: F14, F31

INTRODUCTION

Liberalization and globalization in the world today have been changing the economy in many countries. The countries are becoming more open, accompanied by higher flows of goods, services and capital across these countries. This means that the world economy becomes borderless in the sense that they become internationally interdependent, both in goods and financial markets (Abel and Bernanke, 2004, pp. 468).

Indonesia as one of the developing countries can not avoid the phenomenon. Increased economic growth achieved in the Indonesia during this openness is inseparable from the role of the Indonesia government. Indonesia's participation in various economic agreements/trade in the world can have an impact on the vast area of economic cooperation and trade that can be done by Indonesia. This might reduce the development gap in across countries becomes, which is likely to promote world economic integration (Kimura and Obashi, 2009).

These might have an impact on volatility of the exchange rate of Indonesian currency against foreign currency such as USD. As we know since the failure of the fixed exchange rate system of the Breton Woods in 1971 to support the harmonization of the world economy, many countries began to implement floating exchange rates system. The changes in currency exchange system are resulted in a more volatile Indonesian currency against foreign currencies. The volatility of exchange rates also impacts the trade performance in many countries. Various monetary policies might be adopt to deal with the volatility, depends on the orientation, such as those with the exchange rate anchor, the monetary aggregate target, or inflation targeting framework (IMF, 2006).

The volatility of exchange rates describes a country's currency changes against currencies of other countries. According to Younus and Chowdhury (2006) free floating exchange rate system is implemented to prevent the occurrence of currency overvaluation at the home country because of this policy may result in a lack of competitive exports in world markets and import substitution to grow rapidly to compete with imported goods.

The relationship between the volatility of exchange rate with the flow of international trade might be of negative, positive and ambiguous in nature (Bailey et al., 1992). The negative relationship means that the volatility of the currency has adverse affects on trade flows across countries. According to Hooper and Kohlhagen (1978), higher the volatility of exchange rates lead to higher costs of risk averse/neutral traders, so it can reduce the foreign trade.

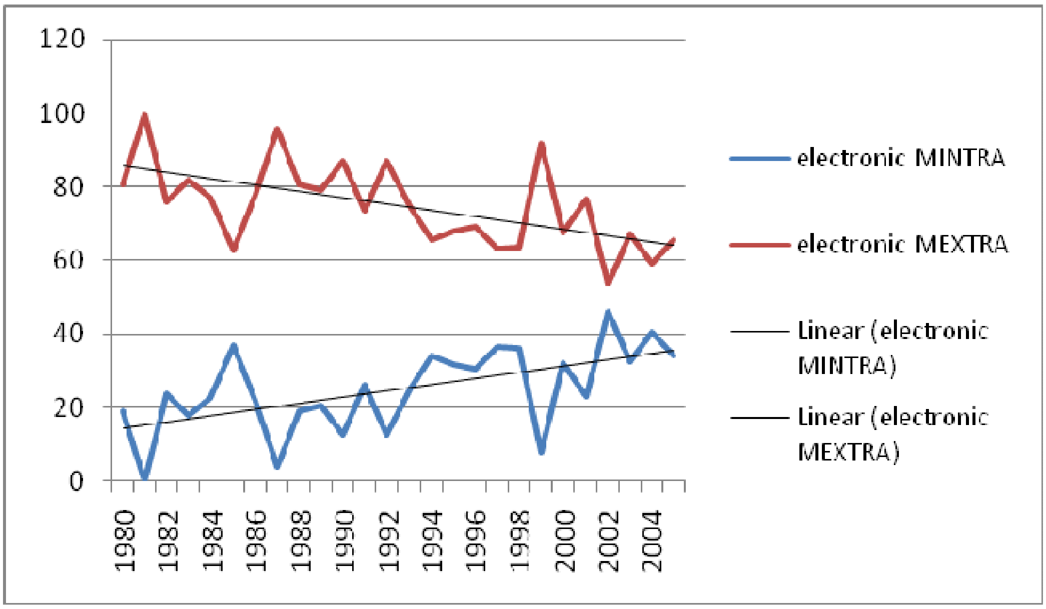
The impact of exchange rate fluctuations on economic behaviour of agents can be explained by the amount of costs and prices that arise from exchange rate volatility. In this case, according to Baldwin and Krugman (1989), the cost required by economic agents to enter these markets is the sunk cost. The existence of exchange rate volatility does not necessarily lead directly to economic agents outside the market. Economic agents will be waiting for the exact time which has not earned a profit margin on the negative condition or loss.

The macroeconomic impact of exchange rate volatility can also affect the trade balance performance. This can theoretically be explained by the theory of J-Curve. This theory explains that the impact of currency devaluation initially resulted in a negative impact on a country's trade balance, before it increases the trade balance (Herosobroto, 2006).

Various studies have been done in analyzing the relationship between the Indonesian Rupiah with its inte national trade performance. The study conducted by Agolli and Mimoza (2008) suggests a significant positive effect of volatility on exchange rates on import demand in European countries during 1993:1-2003:4. A research by Kamoto (2006) proves the validity of the J-Curve theory, namely depreciation of the currency provides a positive influence on the trade balance in South Africa. In line with these findings, the results of research by Suselo et al. (2008) also shows a significant positive effect between the volatility of IDR/USD against Indonesia's import demand from the world during the year 1990(I)-2005(IV). Results of research conducted by Herosobroto (2007) shows the presence of positive and negative effects of volatility in IDR/USD with the performance of exports of processed wood (HS code 4418, HS 4412 and 4409) from Indonesia to trade partner countries. Result of research by Hayakawa and Kimura (2008) gives the conclusion that the volatility of exchange rates may cause the existence of trade barriers in the East Asian intra-trade than trade in other trade areas. While the study by Poon et al. (2005) gives the result of the negative effects of exchange rate volatility on export performance of ASEAN countries.

The development of an economy cannot be separated from the constellation of a growing world economy. The growing integration of national economies with the economies in the region has resulted in changes in international trade activities. In this case there is no doubt that the role of foreign trade in the economic development of Indonesia is very big. This can be seen from the large proportion of Indonesia's trade to GDP of Indonesia. In this case the contribution of exports and imports has more than 50% of Indonesia's GDP (Zainal, 2004). In this case the volatility that occurs in the value of the Rupiah currency with foreign currency will have a major effect on the economy. The volatility of exchange rate in real terms will affect the development of input prices and domestic inflation in the end.

One of the interesting developments in Indonesia's international trade activity is the import demand of electronic products. This demand is high as the result of a vast growing population an increases in percapita income. The growth of the import demand is depicted in Figure 1.



Source: http:/UN.Comtrade.org/database.

Figure 1: Development of Indonesia Electronics Import Value from Intra and Extra ASEAN to Indonesian Total Imports

Based on the figure, it can be inferred that during the years 1980-2004 there has been a narrowing in Indonesian electronics industry imports with intra and extra ASEAN. Indonesian imports development of electronic commodity extra ASEAN is still far greater than that of the intra ASEAN. However, it should be noted that the trend might reflect a convergence between Indonesia's imports from intra ASEAN (MINTRA) with Indonesian imports from extra-ASEAN (MEXTRA).

The economic crisis in 1997/1998 has provided valuable lessons in relation to the stability of exchange rates. The economic crisis marked by the occurrence of shortage in the availability of foreign currency in terms of USD resulted in a depreciation of IDR. This depreciation of the currency has led to the increase in the price domestic goods. This occurs because Indonesian manufactured products use inputs imported from other countries. On the other hand, the depreciation of the rupiah currency has benefited Indonesian exporters. This happens because their products are considered cheap by overseas buyers.

Indonesian foreign exchange system experienced a couple of changing. In the period prior to 1997, Indonesia adopted fixed exchange rate system (managed floating exchange rate system), before it changed in 1997 into floating exchange rate system (Zainal, 2004:71).

Based on the description above, this study aims to analyze the impact of national income and the volatility of exchange rate (IDR/USD) against imports of Indonesian electronics industry intra and extra ASEAN during the period 1994-2005.

METHODS

Types and Sources of Data

The data used in this research is time series data, ranging from 1994 to 2005. The data are the value of Indonesian electronic industrial components import (from Intra and Extra ASEAN), national income and the volatility of IDR/USD, collected from the Asian Development Bank (2006), International Financial Statistics, IMF (2008), UN Comtrade Data Base (2009), and UN statistical data (2008).

Measurement of Exchange Rate Volatility (IDR/USD)

Exchange rates volatility describes the exchange rate fluctuations as a result of factors that influence it. Measurement of volatility can be done by a quantitative approach, Moving Average Standard Deviation (MASD) (Vergil, 2002) and autoregressive conditional heteroscedasticity (ARCH) and Generalized Autoregressive Conditional Heteroscedacity (GARCH) (Arize, 1995, Zainal, 2004). The GARCH models can be formulated as follows (Pozo, 1992):

$$LER_t = a + zLER_{t-1} + e, \quad (1)$$

$$h_t = k + le^2_{t-1} + mh_{t-1}, \quad (2)$$

where
LER = the log of IDR/USD,
h = the variance of the error term,
a, k = constants,
z, l, m = coefficient of each variables,
e = the error term.

Based on the above equation, the approach in the GARCH is divided into two equations, namely the conditional mean equation (1) and conditional variance equation (2). Conditional mean equation is used to obtain error value term and the conditional variance equation is used to obtain the value of the exchange rate volatility of IDR/USDIn the conditional variance equation can know the amount of ARCH (e^2_{t-1}) and the amount of GARCH (h_{t-1}) to obtain the value of ht as values approach the exchange rate volatility. In the conditional variance equation can know the amount of ARCH (e^2_{t-1}) and the amount of GARCH (h_{t-1}) to obtain the value of ht as values approach the exchange rate volatility. Therefore the volatility of exchange rates can be measured by the value of the error term variance (h_t) in equation (2).

Equation (2) predicts the variability of exchange rates at current period. The variation of the exchange rate is a function of three factors, namely, the average variance, the information about exchange rate movements (volatility) from the previous period and the value of error variance prediction earlier period (Zainal, 2004).

According to Pozo (1992) ARCH/GARCH is able to explain the behaviour of exchange rate uncertainty. Model specification ARCH/GARCH can be used to estimate the variance of changes in exchange rates as time dependent. Specification of time dependent can be used to explain the pattern and persistence in the behaviour of exchange rate volatility (Zainal, 2004).

Data Analysis

The model developed in this research has been used by Thorbecke (2008) in analyzing the impact of exchange rate volatility on trade flows of electronic commodities in countries of East Asia. The function of trade flows in the study is $M = f(ER, Vole)$, where M is the flow of trade value, ER is exchange rate and $Vole$ is the volatility of exchange rates. The function is then modified by incorporating elements of national income (GDP) to replace the variable ER and import value to change trade flow, so that the function of import demand becomes $M=f(GDP,Vole)$. The function is then estimated by Ordinary Least Square method (OLS) regression approach to a dynamic version of the Error Correction Model (ECM) by Domowitz and Elbadawi. The empirical model used in this study is as follows:

$$M_t=a_0+a_1GDP_t+a_2Vole_t+e_t. \quad (3)$$

Or in the form of log linear model,

$$LM_t= a_0+a_1LGDP_t+a_2Vole_t+e_t. \quad (4)$$

However, these long-term equilibrium is rarely happened, which creates imbalances and disequilibrium error (DE):

$$DE_t = LM_t - LM_t^*$$

or

$$DE = LM_t - a_0 - a_1 LGDP_t - a_2 Vole_t \qquad (5)$$

Furthermore, by following the approach taken by Domowitz and Elbadawi (1987), the model can be formulated in a single quadratic cost function as follows:

$$C_t = b_1(LM_t - LM_t^*)^2 + b_2[(LM_t - LM_{t-1}) - f(Z_t - Z_{t-1})]^2 , \qquad (6)$$

where the components of these costs include the cost of imbalance ($b_1(LM_t - LM_t^*)^2$) and adjustment costs ($b_2(LM_t - LM_{t-1})$). The notation of f is in the model is a row vector that gives weight to the element $Z_t - Z_{t-1}$, while Z is a vector of variables that affect the linear to the LM. Minimization is then performed to a single period quadratic cost function with the following steps:

$$C_t = b_1 (LM_t - LM_t^*)^2 + b_2 [(LM_t - LM_{t-1}) - f(Z_t - Z_{t-1})]^2.$$

$$\frac{dC_t}{dLM_t} = 2b_1 (LM_t - LM_t^*) + 2b_2 [(LM_t - LM_{t-1}) - f(Z_t - Z_{t-1})] = 0.$$

$$(b_1 + b_2) LM_t = b_1 LM_t^* + b_2 LM_{t-1} + b_2 f(Z_t - Z_{t-1})$$

By entering a long-term model and incorporates the *LGDP* and *Vole* as a function of *Z*, it can be derived that

$$(b_1 + b_2)LM_t = b_1 (a_0 + a_1 LGDP_t + a_2 Vole_t) + b_2 LM_{t-1} + b_2 f_1 LGDP_t + b_2 f_2 Vole_t - b_2 f_1 LGDP_{t-1} - b_2 f_2 Vole_{t-1},$$

$$(b_1 + b_2)LM_t = b_1 a_0 + b_1 a_1 LGDP_t + b_1 a_2 Vole_t + b_2 LM_{t-1} + b_2 f_1 LGDP_t + b_2 f_2 Vole_t - b_2 f_1 LGDP_{t-1} - b_2 f_2 Vole_{t-1},$$

$$LM_t = \frac{b_1}{b_1+b_2} a_0 + \frac{b_1}{b_1+b_2} a_1 LGDP_t + \frac{b_1}{b_1+b_2} a_2 Vole_t + \frac{b_2}{b_1+b_2} LM_{t-1} + \frac{b_2}{b_1+b_2} f_1 LGDP_t + \frac{b_2}{b_1+b_2} f_2 Vole_t - \frac{b_2}{b_1+b_2} f_1 LGDP_{t-1} - \frac{b_2}{b_1+b_2} f_2 Vole_{t-1} \qquad (7)$$

If $b = \frac{b_1}{b_1+b_2}$, then

$$\frac{b_2}{b_1+b_2} = \frac{(b_2+b_1)-b_1}{b_1+b_2} = (1-b),$$

so that the equation can be simplified into

$$LM_t = ba_0 + ba_1 LGDP_t + ba_2 Vole_t + (1-b)LM_{t-1} + (1-b)f_1 LGDP_t + (1-b)f_2 Vole_t - (1-b)f_1 LGDP_{t-1} - (1-b)f_2 Vole_{t-1}$$

$$LM_t = ba_0 + [ba_1 + (1-b)f_1]LGDP_t + [ba_2 + (1-b)f_2]Vole_t - (1-b)f_1 LGDP_{t-1} - (1-b)f_2 Vole_{t-1} + (1-b)LM_{t-1}$$

$$LM_t = g_0 + g_1 LGDP_t + g_2 Vole_t + g_3 LGDP_{t-1} + g_4 Vole_{t-1} + g_5 LM_{t-1} \qquad (8)$$

where

$g_0 = ba_0,$
$g_3 = -(1-b)f_1,$
$g_1 = ba_1 + (1-b)f_1,$
$g_4 = -(1-b)f_2,$
$g_2 = ba_2 + (1-b)f_2,$
$g_5 = (1-b).$

To avoid such a phony estimator if the variable is not stationary, we then reparameterize it into

$$LM_t - LM_{t-1} + LM_{t-1} = g_0 + g_1 LGDP_t - g_1 LGDP_{t-1} + g_1 LGDP_{t-1} + g_2 Vole_t - g_2 Vole_{t-1} + g_2 Vole_{t-1} + g_3 LGDP_{t-1} + g_4 Vole_{t-1} + g_5 LM_{t-1}.$$

Because $X_t - X_{t-1} = \Delta X_t$, then the above equation becomes

$$\Delta LM_t + LM_{t-1} = g_0 + g_1 \Delta LGDP_t + g_1 LGDP_{t-1} + g_2 \Delta Vole_t + g_2 Vole_{t-1} + g_3 LGDP_{t-1} + g_4 Vole_{t-1} + g_5 LM_{t-1}$$

$$\Delta LM_t = g_0 + g_1 \Delta LGDP_t + g_2 \Delta Vole_t + (g_1 + g_3) LGDP_{t-1} + (g_2 + g_4) Vole_{t-1} + (g_5 - 1) LM_{t-1}$$

$$\Delta LM_t = g_1 \Delta LGDP_t + g_2 \Delta Vole_t + (g_5 - 1) LM_{t-1} + g_0 + (g_1 + g_3) LGDP_{t-1} + (g_2 + g_4) Vole_{t-1}$$

$$\Delta LM_t = g_1 \Delta LGDP_t + g_2 \Delta Vole_t - (1 - g_5)\left[LM_{t-1} - \frac{g_0}{1 - g_5} - \frac{g_1 + g_3}{1 - g_5} LGDP_{t-1} - \frac{g_2 + g_4}{1 - g_5} Vole_{t-1}\right]$$

$$\Delta LM_{t-1} = \alpha_1 \Delta LGDP_t + \alpha_2 \Delta Vole_t + \alpha_3 [LM_{t-1} - \beta_0 - \beta_1 LGDP_{t-1} - \beta_2 Vole_{t-1}] \ldots \quad (9)$$

where

$\alpha_1 = g_1$

$\alpha_2 = g_2$

$\alpha_3 = -(1 - g_5)$

$\beta_0 = \dfrac{g_0}{1 - g_5}$

$\beta_1 = \dfrac{g_1 + g_3}{1 - g_5}$

$\beta_2 = \dfrac{g_2 + g_4}{1 - g_5}$

Those equations can be written as follows

$$\Delta LM_t = \alpha_1 \Delta LGDP_t + \alpha_2 \Delta Vole_t + \alpha_3 [LM_{t-1} - \beta_0 - \beta_1 LGDP_{t-1} - \beta_2 Vole_{t-1}],$$

$$\Delta LM_t = -\alpha_3 \beta_0 + \alpha_1 \Delta LGDP_t + \alpha_2 \Delta Vole_t + \alpha_3 LM_{t-1} - \alpha_3 \beta_1 LGDP_{t-1} - \alpha_3 \beta_2 Vole_{t-1}$$

$$\Delta LM_t = -\alpha_3 \beta_0 + \alpha_1 \Delta LGDP_t + \alpha_2 \Delta Vole_t + \alpha_3 LM_{t-1} - \alpha_3 \beta_1 LGDP_{t-1} + \alpha_3 LGDP_{t-1} - \alpha_3 LGDP_{t1} - \alpha_3 \beta_2 Vole_{t-1} + \alpha_3 Vole_{t-1} - \alpha_3 Vole_{t-1},$$

$$\Delta LM_t = -\alpha_3 \beta_0 + \alpha_1 \Delta LGDP_t + \alpha_2 \Delta Vole_t - \alpha_3 \beta_1 LGDP_{t-1} + \alpha_3 LGDP_{t-1} - \alpha_3 \beta_2 Vole_{t-1} + \alpha_3 Vole_{t-1} + \alpha_3 LM_{t-1} - \alpha_3 LGDP_{t-1} - \alpha_3 Vole_{t-1},$$

$$\Delta LM_t = -\alpha_3 \beta_0 + \alpha_1 \Delta LGDP_t + \alpha_2 \Delta Vole_t + (-\alpha_3 \beta_1 + \alpha_3) LGDP_{t-1} + (-\alpha_3 \beta_2 + \alpha_3) Vole_{t-1} - \alpha_3 (LGDP_{t-1} + Vole_{t-1} - LM_{t-1}),$$

$$\Delta LM_t = \gamma_0 + \gamma_1 \Delta LGDP_t + \gamma_2 \Delta Vole_t + \gamma_3 LGDP_{t-1} + \gamma_4 Vole_{t-1} + \gamma_5 (LGDP_{t-1} + Vole_{t-1} - LM_{t-1}), \quad (9)$$

where

$\gamma_0 = -\alpha_3 \beta_0,$

$\gamma_1 = \alpha_1,$

$\gamma_2 = \alpha_2,$

$\gamma_3 = -\alpha_3 \beta_1 + \alpha_3,$

$\gamma_4 = -\alpha_3 \beta_2 + \alpha_3,$

$\gamma_5 = -\alpha_3.$

These equations are used to estimate the import demand function component of Indonesian manufacturing industries (electronics) from the intra/extra-ASEAN. By looking at the significance γ_5, we can see whether there is a long-term equilibrium relationship, and at the same time it can be used to see whether the model specification is appropriate or not (Insukindro, 1999). The linear regression models were then estimated by ECM approach Domowitz and Elbadawi version with the following equation

$$DLM_t = a_0 + a_1 DLGDP_t + a_2 DVOLE_t + a_3 BLGDP_t + a_4 BVOLE_t + a_5 ECT, \quad (10)$$

where $ECT = BLGDP_t + BLVOLE_t - BLM_t$.

In this case the model specification is said to be valid when the coefficient of *ECT* (a_5) is statistically significant (Martinez-Espineira, 2007). ECM estimation by the above model provides two results, namely, in the short run and long term. Coefficients a_1 and a_2 in the above equation is the ECM coefficient in the short run. Then a_3 and a_4 coefficients in the above equation can be used to calculate the coefficient of ECM in the long term. Meanwhile the regression coefficient of long-term ECM model can be calculated from the size and the deviation coefficient of the long term.

Both scalars can be used to determine from the raw variance and covariance matrix of the estimated ECM model (Martínez-Espineira, 2007). The variables observed in the ECM model can be assumed as the following:

$$DY_t = e_0 + e_1\,DX_t + e_2\,BX_t + e_3\,B\,(X_t\text{-}Y_t), \quad (11)$$

where

$$DY_t = (1\text{-}B)\,Y_t = Y_t\text{-}Y(_{t\text{-}1}) \text{ and } DX_t = (1\text{-}B)\,X_t = X_t\text{-}X(_{t\text{-}1})\; r_0 = e_0/e_3 \text{ and } r_1 = (e_2+e_3)/e_3. \quad (13)$$

Furthermore, the standard deviation of the long-term regression coefficients for r_0 and r_1 can be calculated by the following equation

$$\text{Var}(r_0) = R_0^T\,V\,(e_3,e_0)\,R_0, \quad (14)$$

$$R_0^T = [dr_0/de_0\;\; dr_0/de_3] = [1/e_3\;\; \text{-}r_0/e_3],$$

where Var (r_0) is the variance estimator of the variance r_o, R_0 is the matrix of partial derivatives (14), $V(e_3, e_0)$ is the variance-covariance matrix parameters were observed and T is the transpose matrix R_0.

$$Var(\,r_1) = R_1^T\,V(e_3,e_2)\,R_1, \quad (15)$$
$$R_1^T = [dr_1\,/de_2\;\; dr_1/de_3\,] = [1/e_3\; \text{-}(r_1\; \text{-}1/e_3)],$$

where Var (r_1) is the variance estimator of the variance R_1, R_1 is the partial derivative matrix (15), $V(e_3, e_2)$ is the variance-covariance matrix parameters were observed and T is the transpose matrix R_1.

This study also tests stationarity to determine whether the variables used in the model are stationary. In addition, it also tests whether there is cointegration in the variables used in the model. This latter test is important to see whether the variables used in the model shows long-term equilibrium relationship (Azis, 2010).

Stasionarity Test

Statistically, there are several ways to test the null hypothesis of the existence of unit roots (said to be non-stationary when the variables have unit roots), such as the Dickey Fuller test (DF) and Augmented Dickey Fuller developed into (ADF), Cointegration Regression Durbin Watson test (CRDW) Z test by Phillips. Nevertheless DF and ADF test are popular tests in the analysis of time series data stationarity (Harris, 1995, pp. 28).

This study uses the ADF test because the regression equation adds regressor in differenced terms so as to minimize the risk of autocorrelation in the residuals of his time estimates in determining the stationary (Thomas, 1997, pp. 409). Therefore, this study focuses more on the ADF test because this test is the development of the DF test. The ADF was established in order to obtain autoregressive equation model as follows:

$$DX_t = a_0 + a_1T + a_2\,X_{t\text{-}1} + b_1DX_{t\text{-}1} + b_2DX_{t\text{-}2}\; br_{\text{-}1}DX_{t\text{-}i.} + U_t, \quad (16)$$

or

$$DX_t = a_0 + a_1T + a_2\,X_{t\text{-}1} + b_i \sum_{i=1}^{m} DX_{t-i} \,.+U_{t.}\,, \quad (17)$$

where $DX_t = X_t\text{-}X_{t\text{-}1}$, i = order difference equation, T = time trend, X_t is the variable that was observed in period t. In this case the value of the ADF to test the hypothesis $a_2 = 0$ is indicated by the ratio of regression coefficient t on $X_{t\text{-}1}$ equation (16) and (17).

The test criterion is that if the t value of the parameter a_1 equation (16) is greater than the ADF table at a certain degree of confidence, then H_0 is that states are not stationary data (containing the unit root) is rejected and instead accept the alternative hypothesis that states the data stationary (does not contain unit root). Meanwhile, when the value of t statistic values on regression coefficients $X_{t\text{-}1}$ (t-test) in smaller than the ADF table, then the hypothesis Ho is that states are not stationary data is received and otherwise reject the alternative hypothesis that states the data stationary.

If the observed data are not all stationary, then the next step is to test the degree of integration. This test is to determine at what degree the observed data are not stationary line will become stationary. A variable is said to integrate the degree d or $I(d)$, namely if the data is necessary differentiation of d times to become stationary.

This test is basically the same as the unit root test in the previous section. Only X_t to be replaced with DX_t, so that:

$$D(DX_t) = a_0 + a_1 T + a_2 DX_{t\text{-}1} + b_i \sum_{i=1}^{m} D(DX_{t-i}) + U_t, \qquad (18)$$

where $D(DX_t) = DX_t - DX_{t\text{-}1}$.

The most important thing in this test is to find in what degree these non stationary variables become stationary after differencing process. If after the first difference, X_t becomes stationary (DX_t) than X_t is $I(1)$. If DX_t is not stationary, than we can further find the next difference, $D(DX_t)$ to make it stationary. If it is staionary, than X_t is $I(2)$.

Cointegration Test

Cointegration is the existence of long-term equilibrium relationship between economic variables which are referred to the economic system which will experience convergence any time (Harris, 1995). Individual variables used in the model might be non-stationary, but together they can be cointegrated. To know the presence of long-term relationships between economic variables, there are some conditions that must be met, namely (Thomas, 1997). a) the existing time series data on the degree of a stationary, $I(1)$. b) The existence of a linear combination between time series data, namely the degree of 0 or I (0).

This means that if two variables met in the model, it can be said to have cointegration between both of them. The occurrence of cointegration in a model can be done by testing the stationarity residuals obtained from OLS estimation of static regression models. Stationarity test against static regression residuals can be done by using the approach of Dickey-Fuller (DF test) and Augmented Dickey-Fuller (ADF test). Residuals are stationary gives the sense that among the variables that have estimated the long-term relationships (Thomas, 1997, pp. 426, Harris, 1995, pp. 53).

Normality Test

The assumption of normality in the classical linear model means that the confounding variable is normally distributed. If this assumption is not fulfilled in the model, the F and t tests can not be done, because the t and F tests are derived from a normal distribution. The main hypothesis in this test is a confounding variable (error term or residual) of a normal distribution model.

In this case the test of Jarque-Bera Lagrange multiplier can be used to test the normality of confounding variables in the model. This test uses the results of the estimated disturbance variables and Chi Square probability distribution. When the value of Chi Square test is bigger than Chi Square table, then the main hypothesis which states confounding variables from a normal distribution model is rejected. Conversely, if the value of Chi square count is less than the Chi Square table, then the main hypothesis which states confounding variables from a normal distribution model is acceptable. Based on the results using EViews software package, the acceptance or rejection of this hypothesis can also be seen from the *p*-value resulted from the calculation Jarque-Berra. If the resulted *p*-value is less than the significance level of confidence (α), the main hypothesis can be rejected. Conversely, if the resulting *p*-value is greater than the significance level of confidence (α), the main hypothesis is accepted.

Nonautocorrelation Test

Autoorrelation test in OLS assumptions is used to find out whether there is a relationship between the residuals for a certain period with the residual period of time before or was there a serial correlation among residuals. The main hypothesis proposed in this test is the absence of serial correlation between residuals in the observations. Autocorrelation can occur when a disturbance variable in a certain period variable correlated with other disturbances in the period. When this happens, then the resulting estimator will be inefficient, although it is still unbiased. In a regression equation containing autocorrelation means, disturbance variables can be written as follows:

$$E(u_i\ u_j) \neq 0,\ i \neq j. \qquad (19)$$

This means that the expected value of two different interference values (u_i and u_j) is not equal to zero. Non autocorrelation test was developed by Breusch and Godfrey (BG). BG test assumes that the disturbance factors (u_t) is derived from the following P^{th}-order autoregressive scheme. To apply the BG test, there are several steps that need to be done, namely: (1) Perform regression or estimated using empirical models which we estimate, then get the residual value. (2) Do test the zero hypothesis $(H_0): \rho_1 = \rho_2 = ... = \rho_p = 0$ by performing regression residues with residues lag explanatory variables added in accordance with the desired order.

If $(n\text{-}p)^* R^2 = \chi^2_{test}$ exceeds the value, the zero hypothesis is rejected, and vice versa. Based on the calculations of EViews software package, it can be seen that the resulting *p*-value. If the *p*-value is greater than the confidence level (α), the main hypothesis cannot be rejected.

Homoscedasticity Test

Homoscedaticity is one of the classical assumptions that must be met by the OLS estimators. Heteroscedasticity test in the classical OLS assumptions used to determine whether the error term is the same for all the observations. The main hypothesis in this test is the absence of heteroscedasticity against error term (residual) estimation results. Deviation on homoscedasticity assumption is referred to as heteroscedasticity. Homoscedasticity can occur when a probability distribution stays the same in all observations of *X*, and variance of each residual is the same for all values of explanatory variables, namely

$$\text{Var}(u) = E[u_t - E(u_t)]^2 = E(u_t)^2 = \sigma^2 u. \qquad (20)$$

To test the presence of heteroscedasticity, we can use the White test. This test has several steps as follows: (1) Estimate the empirical model being observed, then get the estimated residual value and find the squares (u_i^2). (2) Estimate the following regression:

$$\begin{aligned} u_i{}^2 &= \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_1^2 \\ &\quad + \alpha_4 X_2^2 + \alpha_5 X_1 . X_2 + u_i \end{aligned} \qquad (21)$$

Reject the hypothesis that there is heteroscedasticity problems in the empirical models are estimated, if the value R^2 of the second step of the regression multiplied by the amount of data (n) with a degree of freedom (df) equals [$nR^2 = \chi^2_{test}$] is smaller than χ^2_{table}, and otherwise reject the hypothesis that there is a problem homoscedasticity in empirical models are estimated, χ^2_{test} greater than χ^2_{table}. The amount depends on the number of df. Using Eviews software package, the acceptance or rejection of the main hypotheses can be seen also from the value of Obs*R^2. White Heteroscedasticity test can also be seen from the corresponding p-value. If the p-value is greater than the amount of confidence level (α), the null hypothesis cannot be rejected.

Linearity Test

This test is used to view the specification model to be used in the estimation is correct or not. Linearity test is done because of the model specification errors can result in inefficiency of the estimator. The main hypothesis in this test is the existence of linearity in order to know the specification of the model linearity model, and then used the general test of specification of Ramsey RESET Test. The main hypothesis in this linearity test is used in the linear model.

Ramsey RESET test can be done by getting the fitted value of the dependent variable. Fitted values have been obtained and then performed regression together with the original model as independent variables. The coefficient of determination (R^2) is required in order to calculate the value of the F-test. If the calculated F-test is smaller than the value of F-table, we can accept the hypothesis. Conversely, if F-test is greater than the value of F-table, then reject the hypothesis that the model used was linear. Based on the Eviews results, the acceptance or rejection of the hypothesis can be seen from the resulting p-value. If the p-value is greater than the amount of confidence level, the main hypothesis can not be rejected (α).

Non-multicolinierity Test

Multicollinearity itself was first introduced by Ragnar Frisch in 1934. According to Frisch, a regression model, multicollinearity is said to hit when there is perfect linear relationship or exact in between some or all independent variables from a regression model. As a result there will be difficulties to be able to see the independent variables affect the dependent variable. The main hypothesis in this test is not a linear relationship between the independent variables. In order to detect the existence of multicollinearity in a regression equation can be calculated from the partial correlation coefficient (r_{ij}) are counted. If the value of the partial correlation coefficient is smaller then allegedly did not happen multicollinearity.

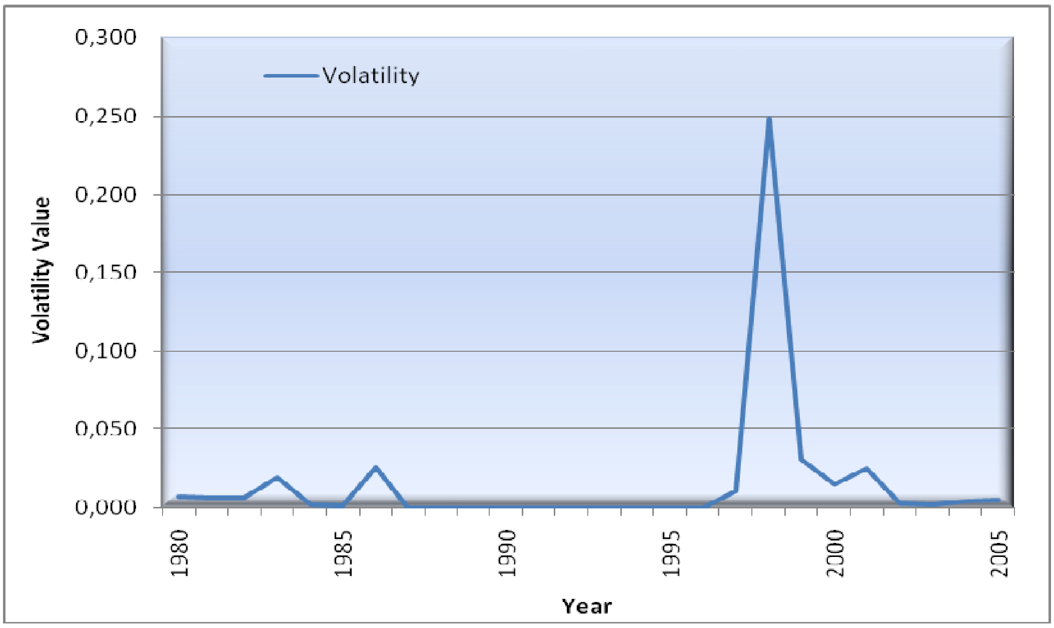
RESULTS DISCUSSION

Volatility in IDR/USD

The results of the volatility in this study use data of real IDR/USD monthly during the years 1980-2005 using based year 2000. The estimated equation with the approach of ARCH/GARCH as the following

$$\underset{}{LER_t} = \underset{(19,26)}{0,602} + \underset{(250,9)}{0,929}LER_t(-1) + e_t, \quad (22)$$

$$h_t = \underset{(2,99)}{0,00003} + \underset{(6,36)}{2,319}\, e^2_{t-1} + \underset{(6,96)}{0,188}h_{t-1} + e_t \quad (23)$$



Source: Data estimation.

Figure 2: Volatility in IDR/USD

The value of the monthly volatility of IDR/USD may be obtained from equation (23), by entering the value of the error term or residual equation (22) and the value of error term variance prior periods. The volatility of the annual value data is obtained by calculating the average of each month every year. The volatility of IDR/USD is shown in Figure 2.

The volatility growth of IDR/USD during the years 1980-2005 shows that the value fluctuates. During the period 1980-1987, the volatility is relatively low. The highest value of the volatility is 0.248375 in 1998. The increase on this volatility has led to the economic crisis of 1997-1998. Economic crisis has caused IDR/USD to depreciate very sharply, causing fluctuations in IDR/USD After the economic crisis, a series of monetary policies by the government (Indonesian Bank) reduces the fluctuations in the exchange rates in the period 1994-2005.

Test of Data Stationarity

The summary of the unit root tests using the ADF test can be seen in Table 1. The table shows that the only variable stationary at the degree level is *LGDP* while the others are stationary at first difference.

Error Correction Model Results

The estimation results using the ECM model can be seen in equations (24) and (25). The estimation of Intra ASEAN for Electronic Product is

$$\begin{aligned} DLMINTRA = {} & \underset{(0.007)}{-17.98} + \underset{(0.03)}{3.79DLGDP} \\ & - \underset{(0.07)}{0.20DVOLE} + \underset{(0.93)}{0.03BLGDP} \\ & - \underset{(0.0001)}{2.65BVOLE} + \underset{(0.0001)}{1.73ECTIN}. \end{aligned} \tag{24}$$

The estimation Model of Extra ASEAN for Electronic Product is

$$\begin{aligned} DLMEXTRA = {} & \underset{(0.0)}{15.89} + \underset{(0.017)}{1.26DLGDP} \\ & + \underset{(0.07)}{0.06DVOLE} + \underset{(0.00)}{2.40BLGDP} \\ & - \underset{(0.00)}{1.55BVOLE} + \underset{(0.00)}{1.79ECTEX}. \end{aligned} \tag{25}$$

Table 1: Unit Root Test

Variable	Level of Integration
LMINTRA ELECTRONIC	I(1)*
LMEXTRA ELECTRONIC	I(1)**
LGDP	I(0)*
VOLE	I(1)*

Notes: Entries in * and ** are significant at 5% and 10% levels, respectively.

Table 2: Results of Import Demand Estimation Model ECM Electronics Manufacturing Indonesia Intra/Extra ASEAN In Long Term

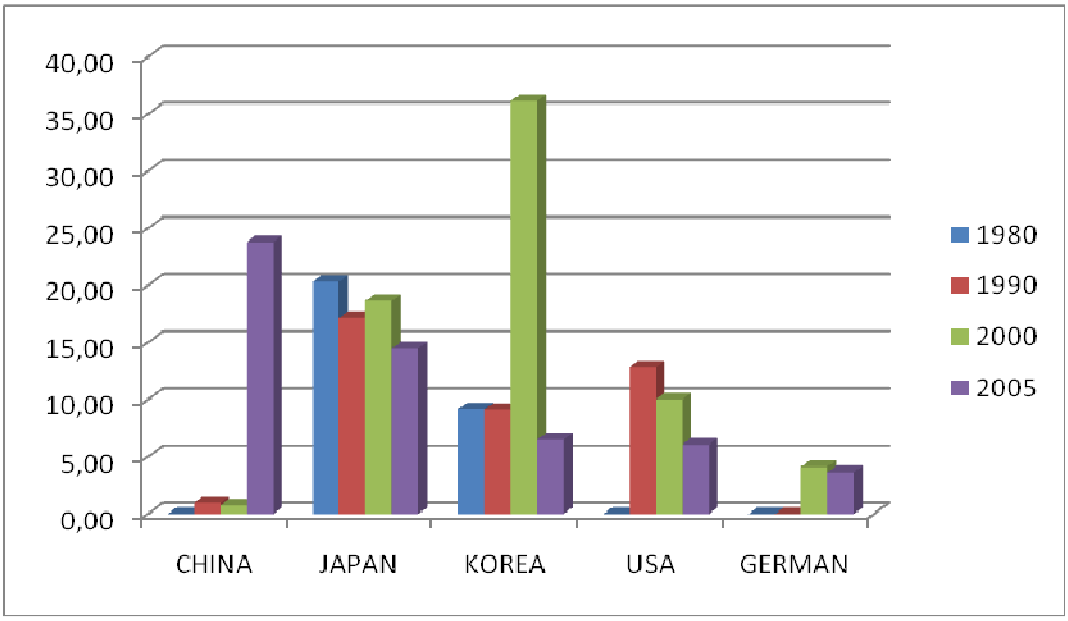
Product	ASEAN	Coefficient of *GDP* (*t* test)	Coefficient of *Vole* (*t* test)
ELECTRONIC	Intra	1.01	-0.52
		(0.71)	(-0.144)
	Extra	2.340	0.136
		(1.48)	(0.08)

In the short run, there is a significant effect from national income (GDP) and the volatility of IDR/USD (*Vole*) to the demand for Indonesian electronic products from intra-ASEAN countries (Malaysia, Singapore, Thailand and the Philippines). The coefficient of GDP is 3.79 and has a positive direction as desired by the theory. The *Vole* coefficient is -0.20. The negative direction meets the theory expectation, namely the J-Curve theory. The *ECTIN* coefficient is positive and significant with a value of 1.73 which indicates the speed of adjustment of each variable in the achievement of equilibrium.

The estimation also shows that import of Indonesian electronic from extra ASEAN countries is also positively and significantly influenced by *GDP* and the volatility of Rp/USD. The coefficient of *GDP* is 1.26 and has a positive direction as expected from the theory. *Vole* coefficient is 0.06 and has a positive direction as desired by the J-Curve theory. The *ECTEX* coefficient is significant and positive with a value of 1.79, indicates the speed of adjustment of the variable to achieve the equilibrium.

To obtain the classical assumptions, the paper conducts various diagnostic tests, namely tests on normality, no-autocorrelation, homoscedasticity, linearity and no-multicolinearity. The results suggest that the model meets the assumptions, as can be seen from Table 2. The table explains that in the long run only the volatility of IDR/USD affects the import of Indonesian electronic commodity with countries outside ASEAN (ASEAN extra). The coefficient is 0.136 and has a positive direction. This means that higher volatility in IDR/USD would increase the imports of some Indonesian electronic from countries outside ASEAN.

The estimation results provide a theoretical justification for what happened in the economy over the years. The significantly influence of national income (*GDP*) for the behaviour of Indonesian imports will further strengthen the level of consumer society. At the same period (1980-2005) there was a decrease in the influence of *GDP* on import demand for electronic Indonesia from intra ASEAN and extra ASEAN in the short run. It might due to the implementation of AFTA in 1992's, thus simplifying the ASEAN countries in international trade activities. In addition, there is also a possible relocation of the electronics industry to ASEAN countries from the countries of the world electronics producers such as Japan, Korea and China. This can result in increased capacity of electronic production in ASEAN. In the long term, the behaviour of Indonesian imports of electronics industry cannot be explained by variations in *GDP*. This might happen because in the long term, possible occurrence of various phenomena of liberalization of the economy increasingly requires cross-border economic cooperation.



Source : http:/UN.Comtrade.org/database.

Figure 3: Percentage Growth of Electronic Import Indonesia from ASEAN Extra

Indonesian imports of electronic products are marked by extra-ASEAN fierce competition among China, Korea and Japan. These countries are competing in product innovation within the framework of competitive advantage. However, the AFTA agreement brings consequence on Indonesia's trade pattern changes of intra and extra ASEAN. The development may be seen in Figure 3.

Among the three countries, Korean imports rather increases sharply in 2000, where the percentage reaches 35% of total extra-ASEAN imports for electronic products. Japan has a market that is relatively stable at around 15% -20% of imports into Indonesia electronically. While China's role beyond the Japanese, Koreans and even the USA and Germany in the contribution of imports to Indonesia with the percentage of approximately 23% in 2005. This contribution in the year 1980-2000 is relatively small compared with the three Asian countries, namely the range of 2%. Developed countries such as USA and Germany experienced decreases during 1980 – 2005.

The results of these empirical estimates can also provide the impact of exchange rate volatility with Indonesian international trade performance. It is well known that the movement in exchange rates occurs because of some external factors such as inflation, interest rates, stock prices, public expectations and behaviour of speculators in the money market. Theoretically, exchange rate movements can affect the behaviour of economic actors in conducting international trade activities. In this case appreciation of the IDR/USD will have implications on the increasing purchasing power for imported goods. Conversely the depreciating IDR against USD will have implications on the decrease of purchasing power for imported goods. In this context, the volatility of IDR/USD has an important role in the development of a country's trade. Higher the volatility of the exchange rate of IDR/USD reflects the increasing gap between demand and availability of USD denominated in the domestic money market. This imbalance can lead to greater costs by importer in the activities of its imports. Based on J-Curve theory, at the inception of the volatility of exchange rates, trade deficits might cause imports to exceed exports. However, over time, the devaluation may have an impact on improvement of a better trade balance, namely exports exceeds imports.

Empirical findings in this study suggest that the J-curve pattern can be explained by import growth of electronic industry of the intra and extra ASEAN in the short run. This means that at the same period (1994-2005) exchange rate volatility provide negative and positive effects on the behaviour of Indonesian imports of electronic industry. Negative coefficient on the volatility of intra-ASEAN imports provides a proof that the volatility of IDR/USD does not give a positive effect on the performance of Indonesia's trade balance. This can be understood because the demand electronic industry in Indonesia is very big and not yet able to be fulfilled by the domestic industry. At the same time it shows that more volatile IDR/USD has an impact on increasing imports of extra-ASEAN electronic industry. This indicates that the strength of electronic commodity production outside ASEAN (extra ASEAN) remains a significant attraction in the fulfilment of domestic consumption of electronics products. The big difference between electronic Indonesian imports from extra-ASEAN and intra-ASEAN provides proof that the widening gap between supply and demand for foreign currency IDR/USD will further enlarge the electronic imports Indonesia from countries outside ASEAN.

The negative influence of exchange rate volatility on Indonesia's import demand from the intra-ASEAN indicates that the higher the level of volatility, the higher the uncertainty faced by importers. Uncertainty means unexpected additional costs to the movements in IDR/USD. This condition will affect the intensity of trade (imports) in an effort to avoid the uncertainty. ASEAN countries continue to use the benchmark of USD as currency exchange ratio in its economic activities. For economic agents in Indonesia, although the period before economic integration carried out fixed exchange rate system, but exchange rate volatility that is especially vulnerable to influence the performance of intra-ASEAN imports of Indonesia.

It can also be shown that exchange rate volatility has a positive influence on Indonesian import demand from ASEAN extra. This means that the higher volatility of IDR/USD, the greater the demand for imports of manufactured products and automotive engines. This might be caused by the importance of such products, which reduce the impact of IDR/USD volatility.

The results of this study prove the existence of ambiguous nature of the effect of exchange rate against a country's international trade performance. According to Byrne et al. (2006), it might happen because there are possible differences in the effect of exchange rate volatility across sectors and therefore the research with regard to exchange rate volatility can use sectoral trade data and a cross-justification of different industries. Furthermore, according to Bodenstein (2006), volatility exchange rates are puzzle that it is hard to tell for sure, so that its impact on macroeconomy is very sensitive and dynamic in its development. The results are consistent with the findings of Asseery and Peel (1991) and Bailey et al. (1986) which suggest that the effect of exchange rate volatility on international trade flows is inconclusive and ambiguous.

The results are consistent with Baldwin and Krugman hypothesis which stated that the movements in exchange rates have a different impact on the sectors of economic activity, depends on the specific characteristics of each industry. These characteristics are level of initial investment, the rate of substitution of goods, and product durability. Sector of economic activities with little initial investment tends to be more sensitive to exchange rate volatility, while economic sectors with the level of need for substantial initial investment is not sensitive to the volatility of exchange rate (Larson et al., 2005). Based on empirical results where the volatility of IDR/USD is very sensitive effect to Indonesia's import demand, the manufacturing sector in Indonesia is an industry with little initial investment levels.

This can be observed further that the activities of Indonesian imports of electronics industry in aggregate are still very large. Domestic industrial capabilities to be able to supply goods manufacturing industry is still faced with capital constraints and limitations of existing technology innovation. As a result of the need for these items must be met from foreign imports. In the case of the electronics industry for example, Japan's role in supplying the needs of this is very dominant. Although the domestic assembly industry has grown so quickly, but the main tool of the availability of these items are still imported goods from country of origin. On the other side can be explained that the monetary authorities (Bank Indonesia) post-1997 economic crisis, the volatility of IDR/USD movement is strongly influenced by the system of market mechanisms. Whenever the exchange rate IDR/USD has been considered to overvalue/undervalue by Bank Indonesia, intervention within the framework of stabilizing the exchange rate can be done by the monetary authorities. However, these efforts have not proved empirically to give effect to the flow of trade (imports) of goods Indonesian manufacturing industry from intra and ASEAN extra.

CONCLUSION

Behaviour of Indonesian import demand for electronics in the short run, both intra and extra ASEAN can be explained by variations in national income. While in the long term did not indicate any influence of the level of national income on import demand for electronic Indonesia either from intra and ASEAN extra.

Import demand of electronic products in the short run can be explained by variations in the development of exchange rate volatility of IDR/USD either from ASEAN intra (negative correlation) and ASEAN extra (positive correlation). While in the long term behaviour of Indonesian electronics industry imports could only be explained by the interaction of trade (imports) of Indonesia from the ASEAN extra countries.

The results of this study support the theory of Baldwin and Krugman Hysteresis which revealed that movements in exchange rates have a different impact on the sectors of economic activity, ASEAN intra imports for commodity components depending on the specific characteristics of each industry, such as the level of initial investment, the level of substitution of goods and security products (Larson et al., 2005).

Between the two variables used as determinants of behaviour Indonesia's import demand from other countries who have influence that is relatively sensitive to exchange rate volatility. Based on the exposure theory suggests that exchange rate volatility can affect the behaviour of economic actors in trading activities. In certain situations the intervention of the monetary authority will not be able to reduce currency volatility that exists, when interventions are not able to provide positive expectations (rational) for economic actors in the market. It is therefore important for monetary authorities to conduct monetary measures which not only focuses on stabilizing exchange rates alone, but must also be followed by the creation of economic conditions that can give certainty and positive expectations in the market.

On the other hand can also be an effort to provide many options for people to not only speculate on the hunt for foreign currency in USD only, but can be switched on in the investment banking sector. This can be done by providing positive incentives to the owners of bank funds with attractive interest rates and tax bases of competitive interest.

Finally, the high volatility of IDR/USD in 1997 reflects the inability of monetary authorities in controlling the external dynamics in the bargaining power of demander and supplier of foreign currency in the money market. In this case the availability of a forward market in foreign exchange market was very helpful for exporters/importers to hedge against the risk of international markets in order to avoid any adverse effects of exchange rate volatility. In addition, by keeping the domestic price level relatively low will reduce the uncertainty in exchange rate movements. Therefore, it required financial instruments in the country who can encourage economic agents to conduct transactions using hedging against foreign currency, so that the risk in trading foreign exchange can be anticipated by the indemnity provided by third parties.

REFERENCES

Abel, A.B. and B.S. Bernanke (2004), *Macroeconomics*, 5th Edition, Addison-Wesley, New York.

Agolli, M.S. and C. Mimoza (2008), "Exchange Rate Volatility Effect on Trade Variations, Working Paper," Albanian Center For International Trade, http://www.acit-al.org, accessed on 13 April 2008, West Indonesian Time.

Arize, A. (1995), "The Effects of Exchange Rate Volatility on US Exports: An Empirical Investigation," *Southern Economic Journal*, 62, 34-43.

Asian Development Bank (2006), Asian Development Outlook 2006.

Azis, N. (2010), "The Role of Exchange Rate on Trade Balance: Empirics from Bangladesh," Working Paper, www.soegw.org, accessed on 26 Mei 2010 West Indonesian Time.

Bailey, M.J., G.S. Tavlas and M. Ulan (1986), "Exchange Rate Variability and Trade Performance: Evidence for the Big Seven Industrial Countries," Weltwirtscaftliches Archiv, 122, 466-477.

Baldwin, R.E. and P. Krugman (1989), "Persistent Trade Effects of Large Exchange Rate Shocks," *Quartely Journal of Economics*, 104, 635-655.

Bodenstein, M. (2006), *On Real Exchange Rate Volatility and Financial Market*, Dissertation, Nothwestern University.

Byrne, J.P., J. Darby and R. MacDonald (2006), "Exchange Rate Volatility: A Real Sectoral Bilateral Analysis," *Economic Journal*, 2, 2-9.

Domowitz, I. and I. Elbadawi (1987), "An Error-Correction Approach to Money Demand: The Case of Sudan," *Journal of Development Economics*, 26(2), 257-272.

Hayakawa, K. and F. Kimura (2008), "The Effect of Exchange Rate Volatility on International Trade in East Asia," ERIA Discussion Paper Series, December, 1-21.

Herosobroto, M.E. (2007), "Analisis Dampak Depresiasi dan Volatilitas Nilai Tukar Terhadap Kinerja Ekspor Kayu Olahan Indonesia," Paper presented at National Seminar, 12 Desember, UI Depok, Jakarta.

Hooper, P. and S.W. Kohlhagen (1978), "The Effect of Exchange Rate Uncertainty on the Prices and Volume of International Trade," *Journal of International Economics*, 8, 483-511.

Harris, R. (1995), *Using Cointegration Analysis in Econometric Modelling*, Prentice Hall, New York.

IMF (2006), *Financial Operations and Transactions*, Annual Report, The International Monetary Fund, Appendix II, 144-146.

IMF (2008), *Financial Operations and Transactions*, The International Monetary Fund Annual Report, The International Monetary Fund, Appendix II, 144-146.

Insukindro (1999), "Pemilihan Model Ekonomi Empirik dengan Pendekatan Koreksi Kesalahan," *Jurnal Ekonomi dan Bisnis Indonesia*, 14(1),1-8.

Kamoto, E. B. (2006), *The J-Curve Effect On The Trade Balance In Malawi and South Africa*, Thesis, Unpublished, The University of Texas at Arlington.

Kimura, F. and A. Obashi (2009), "International Production Networks: Comparison between China and ASEAN," ERIA Discussion Paper Series, Januari, pp. 1-30.

Larson, D.W., M.V.L. Bittencourt, and S.R. Thompson (2005), "An Examination of the Impacts of Exchange Rate Volatility on Sectoral Trade in the Mercosur," Paper Prepared for Presentation at the American Agricultural Economics Association Annual Meeting, Providence, Rhode Island, July 24-27,1-31.

Martinez, R. and Espeniera (2007), "An Estimation of Residential Water Demand Using Cointegration Error Correction Techniques," *Journal of Applied Economics*, IX(1), 161-184.

Poon, W., C. Choong and M. Habibullah (2005), "Exchange Rate Volatility and Export for Selected East Asian Countries: Evidence from Error Correction Model," *ASEAN Economic Bulletin*, 22, 144-159.

Pozo, S. (1992), "Conditional Exchange Rate Volatility and the Volume of International Trade ; Evidence from the Early 1900s," *Review of Economics and Statistics*, 74(2), 325-329.

Suselo, S.L., H.D. Sihaloloho and Tarsidin (2008), "Pengaruh Volatilitas Nilai Tukar Terhadap Pertumbuhan Ekonomi Indonesia," *Buletin Ekonomi Moneter dan Perbankan*, 10(3), 181-221.

Thomas, R.L. (1997), *Modern Econometrics: An Introduction*, Addison Wesley, New York.

Thorbecke, W. (2008), "The Effect of Exchange Rate Volatility on Fragmentation in East Asia: Evidence from the Electronics Industry," RIETI Discussion Paper Series 08-E-016, May, 1-25.

UN Comtrade Data Base (2010), *Commodity Trade*, available at www.uncomtrade.org, accessed 15 Mei 2010 West Indonesian Time.

UN Statistical Data, *Commodity Trade*, available at www.uncomtrade.org, accessed 10 February 2010, West Indonesian Time.

Vergil, H. (2002), “Exchange Rate Volatility in Turkey and Its Effect on Trade Flow,” *Journal of Economics and Social Research,* 4(1), 83-99.

Younus, S. and Chowdhury, M.I. (2006), “An Analysis of Bangladesh’s Transition to Flexible Exchange Rate Regime,” Working Paper Series No: WP 0706, Policy Analysis Unit (PAU), The Bangladesh Bank, December.

Zainal, A.A. (2004), *Exchange Rate Pass-Through, Exchange Rate Volatility, and Their Impacts on Export: Evidence from Indonesian Data,* Dissertation, Kansas University.