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Impact of Exchange Rate Volatility on Malaysian Natural Rubber Price

Aye Aye Khin*, Wong Hong Chau, Ung Leng Yean

Faculty of Accountancy & Management, Universiti Tunku Abdul Rahman, Malaysia

Abstract

Currency exchange rate volatility can affect the natural rubber price because most agricultural commodities are traded in USD. The objectives of the study is to determine the impact of exchange rate volatility on both natural rubber (NR) prices of (SMR20 and RSS4); and forecast a short-term exchange rate price (ERP) of Malaysian Ringgit (RM per USD) and both NR prices strongly represented in the Asian region, Malaysian NR market. The granger causal relationship is first analyzed along the VECM model with more efficient Engle-Granger causality procedure. Both a short-term ERP and NR prices ex-ante forecasts are tested by using Pindyck and Rubinfeld's procedures. The result shows the RSS4 price Granger-cause changes the SMR20 and ERP with unidirectional causality relationship. Both a short-term ERP and NR prices ex-ante forecasts would be on a slightly increasing trend from January to June 2016. It may be due to the government and traders in changing their behaviour by increasing domestic consumptions for the stabilization of the NR supply-demand balance.

Keywords: Exchange rate volatility, forecasting, Malaysian natural rubber price

1. INTRODUCTION

Commodity markets are generally subjected by shocks to demand and supply, the vagaries of environmental factors which influencing the macroeconomic variables such as exchange rates, inflation, export and import or other strongly underlying growth factors based on the changes in government policies (Evenett & Jenny, 2012). These factors may disrupt production from key supplying countries. And yet, commodity prices do exhibit common characteristics: they may portray co-movement or co-integration due to high substitution elasticities, they intend display more variance than other markets prices markets, and commodity prices can be characterized by long periods of stagnancy as interrupted by occasional price spikes (Evenett & Jenny, 2012). Budiman and Fortucci (2003) also explained the long term for rubber production needed to consider the technological innovation, economic development, etc. For medium-term, rubber economy was mainly related on the returning movement of the global economy. However, short-term factors were primarily weather, exchange rate volatility, futures markets interventions and unstable demand.

Goldberg and Charles (2005) explained that exchange rate (ERP) of a country's currency was considered as the value of one country's currency in terms of another currency. Exchange rate included two components, namely; the domestic currency and a foreign currency by quoted each other either directly or indirectly. In Malaysia, 1 USD is how much Malaysia Ringgit (RM), because most agricultural commodities are traded in USD. Osigwe and Uzonwanne (2015) found out a wide range of different types of buyers and sellers in the foreign exchange market. If the values of either of the two component currencies had changed, a market-based exchange rate

*Corresponding author. Tel.: +6-03-90860288; Fax: +6-03-90197062
E-mail: ayeaye5@yahoo.com

would be changed. A currency would be tended to become more valuable if the demand of the currency was greater than the available the supply of the currency and became less valuable each time demand was less than available supply.

The objectives of the study is to determine the impact of exchange rate volatility on both natural rubber (NR) prices of (SMR20 and RSS4); and forecast a short-term exchange rate price (ERP) of Malaysian Ringgit (RM per USD) and both NR prices strongly represented in the Asian region, Malaysian NR market. The short term ex-ante forecast will be explored from January to June 2016 based on the estimation period of the monthly data from January 1990 to December 2015. Therefore, exchange rates volatility could affect natural rubber prices directly or indirectly explained by (Burger *et al*., 2002) and (Budiman & Fortucci, 2003). The direct effect came from the exchange rates would affect the export price in the rubber trading countries. The indirect effect came from provisional demand, which could be either commodity tentative or foreign exchange tentative. However, in the short term, rubber prices could be changed based on movements of the foreign currencies of the exchange rate. This type of changes in prices only had a nominal effect which was no immediate effect on the demand and supply of the natural rubber. Moreover, in the longer term, the changes in currencies may consequence in an increase in demand and/or supply of the natural rubber.

According to Budiman and Fortucci (2003), other impacts of exchange rate volatility were as follow:
1. Increasing in domestic prices, rising consumer prices and falling real wages, it will cause real household income,
2. Increasing of proportionate value of external debt exposure,
3. Low business confidence and credit crunch because of exchange rate uncertainties, and
4. Continuing the economic growth rate worsen if the exchange rates continue to remain unstable.

In terms of primary commodities, NR prices had risen from USD2,000/tonne in September 2009 to USD5,500/tonne in February 2011 in Malaysia (Figure 1). Export volume was increased from 690 thousand tonnes to 960 thousand tonnes from 2009 to 2011. However, the NR prices were started to decrease severely from USD2,100 per tonne in January 2014 to USD1,100 per tonne in December 2015; the exchange rate was RM4.29 per USD during the period in Figure 1.

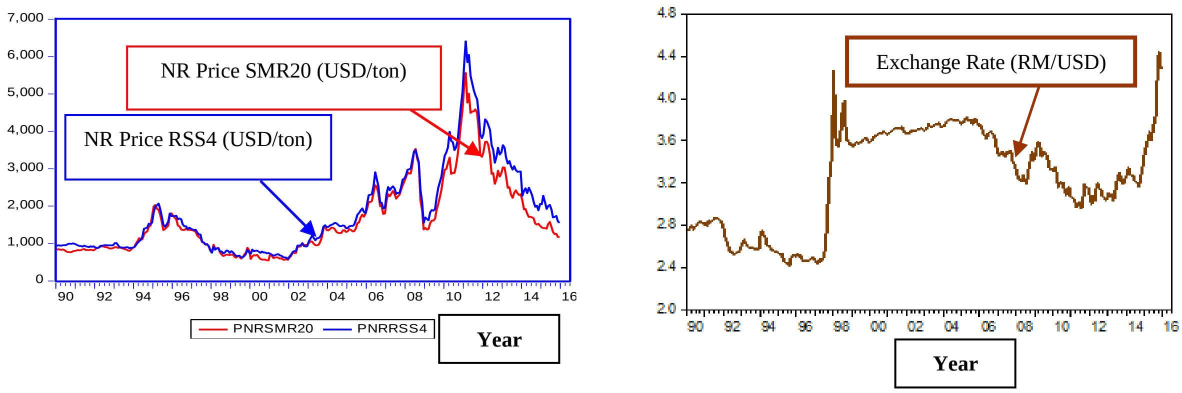

Fig. 1. Exchange rate volatility and NR prices trends in 1990 to 2016
Source: (MRB, 2015), ANRPC (2016) and (BNM, 2016)

Figure 1 shows that the USD was depreciated against Malaysia's currencies and Malaysia's real exchange rate started to decline from 1997-1998. When the NR price was decreasing, but the exchange rate for Malaysia (RM/USD) was gone up, it meant that exchange rate was still instability, and it was creating that uncertainty over future price levels. It would be complicated investment and discouraged economic growth, while the NR price was extremely low again as experienced during the estimating period in this study. Additionally, currency movements may show a discrepancy implication on competitiveness of the external trade, debt, and foreign direct investment. Therefore, Malaysia's competitiveness had been improved after taking into account the combination of the currencies of Malaysia's trading partners and correcting for inflation among the countries (NERP, 2014).

2. LITERATURE REVIEW

Osigwe and Uzonwanne (2015) suggested that there was a causality relationship between the foreign currency exchange rate and foreign direct investment (FDI). They used the unit root test for stationary of the variables. They explained that all the variables became stationary at the first differences level of the unit root test. Then, the variables were long-run relationship among the variables by Johansen co-integration test. The causality showed that unidirectional from foreign currency exchange rate and FDI at the lag section criteria mentioned the lag one to lag two selections. Moreover, there was bidirectional causality between foreign currency exchange rate and FDI at lag three selections. Therefore, it provided the knowledge and idea to establish for this research methodology about the exchange rate volatility. Jamil, *et al* (2012) investigated the exchange rate volatility on industrial production of common currency in European Monetary Union. They used the data from monthly data of 1980 to 2009. The study used autoregressive EGARCH models for volatility analysis compared with nominal and real exchange rates. They found that all the industries satisfied the benefits after the introduction of common currency and even some industries also looked increasing in the exchange rate volatility. Thus, it could also provide that the currency changes are affected for every country that joining the trading of their productivities.

Oskooee and Harvey (2014) studied the role of the exchange rate between the United State and Indonesia trading the agricultural commodities. Indonesia was the largest economy for trading the commodity in South East Asia. They estimated the currency depreciation on in-payments and out-payments in the trade. They disaggregated the trade flows between US and Indonesia. The sensitivity of in-payments was 108 United State export industries and out-payments were 32 United State import industries. They investigated that most industries responded the exchange rate changes in the short-term but some were significantly affected in the long-term. This article endowed with the further study methodology about Asian countries exchange rate currency. Numerous old-fashioned theoretical studies as discussed by Ethier (1973), and Peree and Steinherr (1989) have indicated that an increase in exchange rate volatility exhibited adverse effects on international trade volume. Simply put, the exchange rate volatility rose the exchange rate risk and thus reduced incentives of international trade. It was commonly acknowledged that increased exchange rate volatility restrained the growth of foreign trade. Negative effects of exchange rate uncertainty on trade flows supported the fact that exchange rate risk depressed trade flows (International Monetary Fund [IMF], 1984) and (Clark *et al*., 2004). If movements in exchange rates became unpredictable, the profits made would be uncertain and, thus, depressed the benefits of international trade.

The determinants of the natural rubber price would affect the volatility of natural rubber (latex) price in Malaysia (Sadali, 2013). Describing the high volatility in NR price, it was a relationship between the international trade (export and import), inflation and crude oil price. The data utilized the monthly data from 1998-2012. This paper was tested the regression analysis and hypothesis testing between variables. The volatility of the natural rubber price was how and how much relationship between the crude oil price, inflation, export and import. Sadali, (2013) mentioned that the natural rubber import was a negative relationship between the price. Also, showed that crude oil price was a positive relationship with volatility of natural rubber price. Based on this findings of the article, more import the natural rubber raw materials from other countries, it would be affected the decreasing of natural rubber price. Thus, this article also gave the knowledge of the methodology how to find the factors affecting the volatility of natural rubber price.

3. THEORETICAL FRAMEWORK AND METHODOLOGY

Past literatures on commodity prices focused three issues in common: i) the characteristics and determinants of commodity price volatility; ii) its macroeconomic effects and; iii) the optimal policy responses to such volatility (Cashin *et al.*, 2002; Deaton, 1999), and (Khin et al., 2011 and 2013). The forecasts of NR price of the study particularly would be based on the substitute product price of RSS4 and exchange rate variables (in Equation i) i.e. how much effect of the production and export controls in producing countries. A diagnosis checking for each variable is focused the data series for the stationary, using unit root test of the Augmented Dickey Fuller (ADF) and Phillips-Peron's tests (PP) (Gujarati, 2009) and (Studenmund, 2014). The causal relationship is first analyzed along the VECM model with more efficient causality procedure (Engle & Granger, 1991). Both a short-term forecasts of ERP and NR prices of (SMR20 and RSS4) will be tested by using method suggested by Pindyck and Rubinfeld (1998). Originally, a short-term NR price VECM model mentioned as a function logs in below:

$$\mathbf{\Delta\ PNRSMR20_t = c_0 + a_1PNRRSS4_{t-1} + a_2ERPM_{t-1} + a_3PNRSMR20_{t-1} + e1_t} \quad (1)$$

where:
PNRSMR20 = Price of natural rubber SMR20 in Malaysia (USD/tonne) deflated by the CPI
PNRRSS4 = Price of natural rubber RSS4 in India (USD/ton) deflated by the CPI
ERPM = Real exchange rate (Malaysia Ringgit (RM) per USD) (RM/USD)
T = Time trend monthly data from 1990 to 2015
e_i = error terms
Moreover, we can write the other variables' VECM equations (2) and (3) as follows:

$$\Delta \textbf{ PNRRSS4}_t = \mathbf{c_1 + a_4 ERPM_{t-1} + a_5\ PNRSMR20_{t-1} + a_6\ PNRRSS4_{t-1} + e2_t} \quad (2)$$

$$\Delta \textbf{ ERPM}_t = \mathbf{c_2 + a_7\ PNRSMR20_{t-1} + a_8\ PNRRSS4_{t-1} + a_9\ ERPM_{t-1} + e3_t} \quad (3)$$

c_s = Intercept
a_s = The coefficients of the related factors

Therefore, we can write the six (6) hypotheses of this study are:
HO1: PNRSMR20 does not Granger cause PNRRSS4
HA1: PNRSMR20 Granger cause PNRRSS4

HO2: PNRSMR20 does not Granger cause ERPM
HA2: PNRSMR20 Granger cause ERPM

HO3: PNRRSS4 does not Granger cause PNRSMR20
HA3: PNRRSS4 Granger cause PNRSMR20

HO4: PNRRSS4 does not Granger cause ERPM
HA4: PNRRSS4 Granger cause ERPM

HO5: ERPM does not Granger cause PNRSMR20
HA5: ERPM Granger cause PNRSMR20

HO6: ERPM does not Granger cause PNRRSS4
HA6: ERPM Granger cause PNRRSS4

Johansen co-integration test explained that there is a long-run relationship among the variables. It is a statistical concept of the regression theory framework that described the long run equilibrium among the variables. Engle and Granger (1991) indicated that if a multiple linear regression of two or more non-stationary series was stationary, it was called the co-integrating equation and may be interpreted as a long-run equilibrium relationship among the variables. The Johansen co-integration equation for a short-term NR prices of (SMR20 and RSS4) and ERP is in Equation (4) as follows:

$$\textbf{Co-intEquation: } \mathbf{b_1 PNRSMR20_{t-1} + b_2 PNRSS4_{t-2} + b_3 ERPM_{t-3} = 0} \quad (4)$$

b_s = The coefficients of the related factors

Engle and Granger (1991) definition of causality is being used to determine the direction causality. In this approach, granger causality relationship is expressed and showed examples in two pairs of regression equations by simply twisting independent (**PNRRSS4**) (**ERPM**) and dependent (**PNRSMR20**) variables as follows based on Equation (1) accordingly:

$$\mathbf{PNRSMR20}_t = \beta_1 \mathbf{PNRSMR20}_{t-1} + \beta_2 \mathbf{PNRSMR20}_{t-2} + \ldots + \beta_p \mathbf{PNRSMR20}_{t-p} + \alpha_1 \mathbf{PNRRSS4}_{t-1} + \alpha_2 \mathbf{PNRRSS4}_{t-2} + \ldots + \alpha_p \mathbf{PNRRSS4}_{t-p} + u_{2,t} \quad (5)$$

$$\mathbf{PNRSMR20}_t = \beta_3 \mathbf{PNRSMR20}_{t-1} + \beta_4 \mathbf{PNRSMR20}_{t-2} + \ldots + \beta_p \mathbf{PNRSMR20}_{t-p} + \alpha_3 \mathbf{ERPM}_{t-1} + \alpha_4 \mathbf{ERPM}_{t-2} + \ldots + \alpha_p \mathbf{ERPM}_{t-p} + u_{2,t} \quad (6)$$

α_s = The coefficients of the related factors
β_s = The coefficients of the related factors

4. EMPIRICAL RESULTS

The results of the unit root test are presented in Table 1. The PNRSMR20 price, PNRRSS4 price and ERPM are non-stationary at levels I(0) i.e. they have unit root. However, they are significantly stationary at the first differences I(1) at the 0.01 level, it means that they are integrated and no unit root of the same order of I(1). The hypotheses of unit root are, Ho: The time series data is unit root (nonstationary), and HA: The time series data is no unit root (stationary). If the ADF and PP tests' sig-P value is less than the significant α 0.05 level, the time series data is no unit root (stationary). After given them were I(1), they were tested for Johansen co-integration test in Table 2.

Table 1. Unit-Root Tests for Exchange Rate and Malaysian NR Prices

Variables	Unit Root Test				Stationary	
	Level		1st difference		Level	1st difference
	ADF	P-P	ADF	P-P		
PNRSMR20	-1.971	-1.792	-8.906***	-12.569***	Not St	St I(1)
PNRRSS4	-1.771	-1.689	-8.992***	-12.756***	Not St	St I(1)
ERPM	-1.136	-0.792	-15.138***	-15.083***	Not St	St I(1)

Note: St: Stationary; ***: Statistically significant at the 0.01 level.

Table 2. Johansen's co-integration test (intercept and no trend)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	P-Value
None *	0.0874	32.8824	29.7971	**0.0233**
At most 1	0.0101	4.5284	15.4947	0.7649
At most 2	0.0044	1.3689	3.8415	0.2371

Note: Denotes rejection of the hypothesis at the 0.05 level.

Table 2 shows Ho: there are no co-integration relationships and it is rejected. However, HA: there is one co-integrating relationship at the 5% level and it is accepted. This means that there is a long-run relationship between PNRSMR20 price, PNRRSS4 price and ERPM. Evidence of co- integration suggested the granger causality showed the one direction (unidirectional causality) between PNRRSS4 price and PNRSMR20 price and; PNRRSS4 price and ERPM at lag order 1, 2 and 3. The vector correction model (VECM) results also needs to explain for making certain the direction of causality analysis and becoming aware of the differences between the long-run and short-run relationship among the variables.

Table 3. Granger Causality Analysis

Null Hypothesis	Lag order	F-statistic (P)	Decision
PNRSMR20 → does not Granger cause PNRRSS4	1	0.172(0.6780)	Ho rejected
PNRSMR20 → does not Granger cause ERPM		0.441(0.5067)	Ho rejected
PNRRSS4 → does not Granger cause PNRSMR20		5.318**(0.0211)	**HA accepted**
PNRRSS4 → does not Granger cause ERPM		5.475**(0.0245)	**HA accepted**
ERPM → does not Granger cause PNRSMR20		0.0176(0.8946)	Ho rejected
ERPM → does not Granger cause PNRRSS4		0.073(0.7869)	Ho rejected
PNRSMR20 → does not Granger cause PNRRSS4	2	3.900(0.1422)	Ho rejected
PNRSMR20 → does not Granger cause ERPM		1.151(0.5625)	Ho rejected
PNRRSS4 → does not Granger cause PNRSMR20		16.957***(0.0002)	**HA accepted**
PNRRSS4 → does not Granger cause ERPM		18.894**(0.0389)	**HA accepted**
ERPM → does not Granger cause PNRSMR20		1.740(0.4190)	Ho rejected
ERPM → does not Granger cause PNRRSS4		2.491(0.2888)	Ho rejected
PNRSMR20 → does not Granger cause PNRRSS4	3	3.325(0.3441)	Ho rejected
PNRSMR20 → does not Granger cause ERPM		2.134(0.5450)	Ho rejected
PNRRSS4 → does not Granger cause PNRSMR20		16.772***(0.0008)	**HA accepted**
PNRRSS4 → does not Granger cause ERPM		19.432**(0.0384)	**HA accepted**
ERPM → does not Granger cause PNRSMR20		3.144(0.3698)	Ho rejected
ERPM → does not Granger cause PNRRSS4		3.611(0.3067)	Ho rejected

***, ** Denotes rejection of the null hypothesis at the 0.01 and 0.05 level, respectively.

Table 3 shows Ho: PNRSMR20 does not Granger cause PNRRSS4 and HA: PNRSMR20 Granger causes PNRRSS4 and so on. The PNRRSS4 price only Granger-causes the PNRSMR20 and ERPM with unidirectional causality relationship at the lag order 1, 2 and 3 and at the 0.01 and 0.05 level, respectively. Figure 2 describes both a short-term NR prices (PNRSMR20 and PNRRSS4) and ERPM ex-ante forecasts would be slightly increasing trend from January to June 2016.

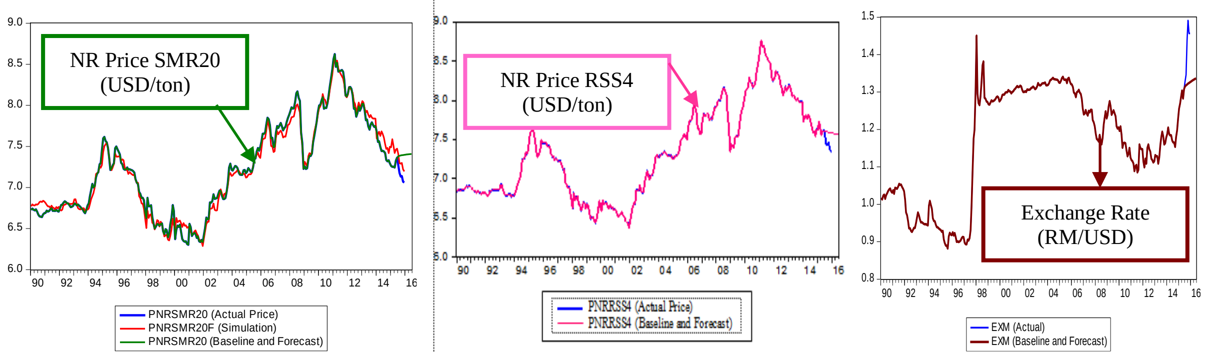

Fig. 2. Short-term ex-ante forecasts of both NR prices (log data) and ERP (log data) in the Asian region, Malaysian NR market

5. CONCLUSION

This study investigated the granger causal relationship of the RSS4 price Granger-cause changed the SMR20 and ERP with unidirectional causality relationship. Both a short-term NR prices and ERPM ex-ante forecasts would be slightly increasing trend from January to June 2016. It may be due to the government and traders in changing their behaviour by increasing domestic consumptions for the stabilization of the NR supply-demand balance. Products like rubber tyres, footwear, gloves, condoms and catheters of rubber products and latex products selling industries and rubber wood products selling furniture industries, which used raw materials and exporting the rubber products in US dollars, would have benefited from this study's findings. Significantly, it is also encouraged the information for Malaysian rubber industries because they are still producing the positive net trade flows, provided steady employment, and consistent earnings for the government.

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