EFFECTS OF CRUDE OIL PRICE ON CURRENCY STABILITY– THE CASE OF MALAYSIA RINGGIT PEG (SEPTEMBER 1998-JUNE 2005)

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ABSTRACT:
This study is carried out to investigate the impact of crude oil price fluctuationson Malaysian exchange rate as proxied by RM per USD.Even though there is no specific theory that explains the interaction between commodity and foreign exchange markets, the study is still pursued on Malaysia because of its resilient oil and gas industry. Using Engle-Granger Cointegration Test (1987) as an estimation tool over monthly secondary data from January 1988 through October 2018, the results from Error Correction Model uncoversthe existence of long-term equilibrium relationship between RM and crude oil prices. Interestingly, there is also a presence of short-run relation between themat 10% significance level. With respect to the short-run dynamics, there is a unidirectional causality running from crude oil prices to RM exchange rate. It appears that RM is less prone to changes in crude oil price during the period before Asian Debt Crisis in 1997-1998. After the removal of RM peg in June 2005, RM is found to be more sensitive towards changes in crude oil price in the short run.In summary, the equilibrium and dynamic relationships between RM exchange rate and crude oil price are thereforeconfirmed and perhaps the quotation of crude oil price in USD could be one of the reasons.

Keywords:
Malaysian Exchange Rate; Asian Debt Crisis; Engle-Granger Cointegration Test; West Texas Intermediate Price and Brent Price.
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INTRODUCTION

Malaysia is one of the major oil-producing countries in South East Asia and it is intriguing to investigate to what extent that changes in crude oil price over the past five years could affect Malaysia exchange rate. The fluctuation in crude oil prices since August 2014 has caused many oil-producing countries, particularly their governments to review their fiscal and monetary policy. The Asian Debt Crisis in 1997 was a major turning point that influenced the way Malaysian government managed its foreign currencies. At the onset of the event, the Central Bank of Malaysia did intervene in the foreign exchange market so as to stabilize RM. Nevertheless, this effort wasfutile as the currency speculative attack continued to be rife.The world has witnessed how Malaysia refused to subscribe the prescription given by International Monetary Fund (IMF) and decided to peg its Ringgit Malaysia (RM) to USD, coupled with massive domestic government borrowing(Baharumshah*et al.*, 2009).This study is pursued with the motivation to find out the causal-effect relationship between RM and movements of crude oil prices from January 1988 till October 2018. The RM/USD is the variable of interest, while crude oil price is assigned as the explanatory variable. The crude oil price has started to decline since September 2014 and it reached the bottom of USD37 per barrel in March 2016. Such a price swing detrimentally affects the oil and gas industry, particularly the revenue from export activities. This study is narrowed towards a number of pertinent issues within the international trade theory.

It has been argued that the soaring in the crude oil price has strengthened RM in tandem with the adjustment of base lending rate in the financial market. In the past, a rise in crude oil price led to increase in US Dollar exchange rate due to a change in current account deficit which depreciates the local currency (Beckmann and Czudaj, 2013; Nazlioglu and Soytas, 2011).

Previous studies have recognized the significant relationship between crude oil price and major currencies such as US Dollar and Euro (Bénassy-Quéré, Mignon, Penot, 2007). Johansen and Juselius(1990) acknowledge the presence of strong relationship between crude oil price and the currency rate such as USD/EURO rate. The relationship between crude oil price and currency also depends on the distribution of oil imports across oil-importing countries and non-oil-importing countries (Bénassy-Quéré, Mignon, Penot, 2007).

There are several theories that explain the market mechanisms of the crude oil price; the terms of trade channel (Buetzer et al, 2016), the wealth effect channel (Krugman, 1983), the portfolio reallocation channel (Bénassy-Quéré, Mignon, Penot, 2007) and international Fisher effect (Krugman, 2008). The terms of trade theory postulates that if the non-tradable sector of a country A is more energy intensive, the output price of this sector will increase relative to the output price of country B. Thus, effects on the nominal exchange rate arise if the price of tradable goods is no longer assumed to be fixed. In this case, inflation and nominal exchange rate dynamics are related via purchasing power parity. If the crude oil price increases, then the currencies of countries with large oil dependence in the tradable sector will depreciate due to higher inflation. The wealth channel theory reflects the resulting short-run effect, while the portfolio reallocation channel theory assesses medium- and long-run impacts on the crude oil price on the real exchange rate (Bénassy-Quéré, Mignon, Penot, 2007). When oil prices rise, wealth is transferred to oil exporting countries (in US dollar terms) and is reflected as an improvement in exports and the current account balance in domestic currency terms. Thus, the currencies of oil-exporting countries appreciate, and currencies of oil-importers depreciate in effective terms after a rise in oil prices (Beckmann and Czudaj, 2013). The wealth effect on the US dollar appreciates in the short-run because oil-exporting countries reinvest their revenues in US dollar assets. The portfolio effect on the currency are due to two factors: Oil exporters' relative preferences for US dollar assets and the dependence of the United States on oil imports relative to the share of US exports to oil-producing countries (Bénassy-Quéré, Mignon, Penot, 2007; Buetzer et al., 2016).

DATA AND METHODOLOGY

This study focuses on explaining the theoretical link between Malaysia exchange rate and crude oil price. Given the fact that Malaysia is an oil-producing country, the tax collectionsfrom the oil and gas industry has been a worthy source of revenue, which in turn increase demand for RM from the oil export activities. As such, changes in crude oil price are likely to influence the relative strength of RM against USD. The crude oil price is proxied by West Texas Intermediate (WTI) whilst RM per USD represents Malaysia exchange rate. The study uses monthly secondary data spanning from January 1988 through October 2018, involving 370 data points. The data of RM exchange rate are obtained from Bank NegaraMalaysia Statistical Bulletin, while WTI prices are extracted from U.S Department of Energy.

1.1 Empirical Model

The time series model is deployed and empirically formulated as follows:

$ER_t = a - \beta 1 WTI_t + \varepsilon_t$ ..... (1)

Where: ER= Exchange Rate as proxied by RM/USD

a = intercept

WTI = Crude Oil Price as proxied by West Texas Intermediate

t = time series (t= 1,2.3…k)

ε_t= Model Error Terms

From the empirical model, the study stipulates negative relationship between ER and WTI. In theory, an increase in crude oil price will generate incremental revenue from oil export activities which in turn increase demand for RM.The

relative strength of RM against USD is observed over the full sample period from 1988 till 2018.Similarly, the period before RM peg is also put into test. Due to Asian Debt Crisis from mid-1997 through1998, Malaysian government decided to implement RM peg to USD at RM3.80 per USD in order to ward off currency speculative attacks over RM. It is somehow still debatable as to what extent that this intervention policy has been deemed successful.As such, a sub-period after RM peg dating from July 2005 till October 2018 is analysed and its empirical evidence is compared to other sub-periods.

The movements of RM against USD and WTI are analysed over the study period and presented in Chart 1 below. It is evident that WTI seems more volatile as demonstrated by its erratic movements. The highest level of WTI was recorded in June 2008 standing at USD133.88. At this point, RM was trading at RM3.2665 per USD.

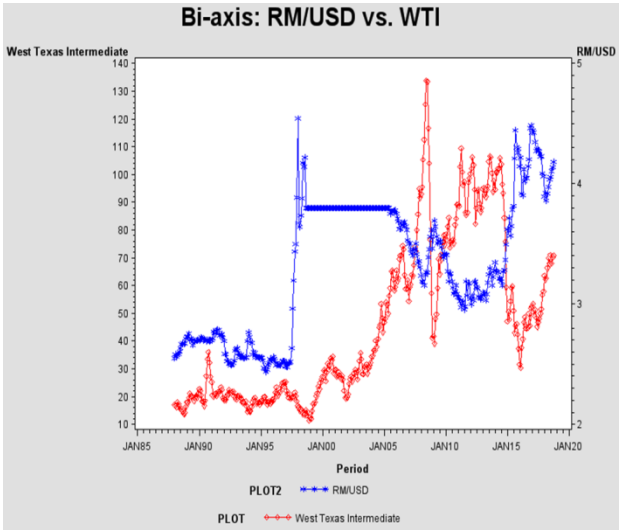

Chart 1: Movements of RM Exchange Rate and WTI: 1988-2018

In investigating the lead-lag relationship in the empirical model, the study employs Engle Granger Cointegration Test (1987). This estimation method (henceforth, EG) is selected due to its unique strength in explaining short-term and long-term relationships. EG is consideredas one of the best econometrics time series tools and this error corrections technique was first advanced by Granger (1981) and later improved by Granger-Weiss in 1983.The modification process was continued by Granger andeventually finalized in the following year by both Engle and Granger. As a result of its dynamism, EG estimation technique is preferred by researchers who use it in testing the validity of various financial and economic theories.

To perform the cointegration analysis via EG 2-step approach, the following equation is specified:

$$\Delta Y_t = \mu_i + \sum_{i=1}^{n} A_i \Delta Y_{t-i} + \sum_{i=1}^{n} \xi_i \Theta_{t-i} + v_t \quad \text{.....2)}$$

where:Y_t has the form of n x1 vector

A_i and ξ_i are the estimated parameters

Δ is the difference operator

v_t is the reactional vector which explains unanticipated movements in Y_t and Θ (error correction term)

As mentioned earlier, the ECM technique allows separation of short-term adjustment from long-

term relationships. The Ordinary Least-Squares method (OLS) is still part of the EG estimation technique, together with Classical Normal Linear Regression assumptions. These fundamental assumptions must be observed in addressing the validity of the empirical findings.In probing the directional relationship involving the variable of interest and its explanatory variable, the study assumes that WTI influences RM exchange rate. This is based on the premise that changes in crude oil prices will later on affect oil-exporting country's terms of trade, which in turn influences its currency's value.

EMPIRICAL FINDINGS

To begin with, the correlation matrix among all the tested variables is presented in Table 1. From the exchange rate viewpoint, the RM demonstrates higher correlation with WTI as compared with BRENT. For this reason, WTI is preferred as the explanatory variable. Looking at WTI and BRENT, the two crude oil proxies are significantly correlated with one another.

Table 1: Pearson Correlation Analysis

Pearson Correlation Coefficients, N = 370 Prob > |r| under H0: Rho=0			
	RM	**WTI**	**BRENT**
RM RM/USD	1.00000	0.19035 0.0002	0.16832 0.0012
WTI West Texas Intermediate	0.19035 0.0002	1.00000	0.99107 <.0001
BRENT European Brent	0.16832 0.0012	0.99107 <.0001	1.00000

Table 2 below depicts the test results from Error Correction Model at lag 1 (Henceforth, ECM) over full sample period.The *lr* is the model's coefficient of error correction term that explains both equilibrium relationship between tested variables plus their speed of adjustment. Basing on *lr's*negative value and its p-value in Table 2, we can deduce that there is a statistically significant long-run relationship between RM and WTI.Statistical procedure requires the p-value to be divided by two because ECM lies on the premise of one-tail residuals distribution (Granger's Representation Theorem, 1987).The *lr's* negative value of 0.0126 infers 1.26% speed of adjustment at which RM returns to equilibrium after a change in other variables. This is a converging process made by RM at relatively slow pace in the long run. At this point, it is confirmed that both RM and WTI are cointegrated. Furthermore, the presence of short-term dynamic relationship between RM and WTI is also observed in this model.

Table 2: Error Correction Model at Lag 1: Full Period (Jan 1988-Oct 2018, N=370)

Parameter Estimates **Dependent Variable: drm**						
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**Variance Inflation**
Intercept	**1**	0.00466	0.00475	0.98	0.3272	0
Ldwti	**1**	-0.00215	0.00110	-1.95	0.0516*	1.02659
Lr	**1**	-0.01269	0.00857	-1.48	0.1395*	1.00814
Ldrm	**1**	-0.00319	0.05289	-0.06	0.9519	1.03481

Unlike the test results from Table 2, the empirical findings from Table 3 are completely the opposite. There is no significant long-term and short-term relationships that could be established over the period before the introduction of RM Peg in September 1998.The foreign exchange market seemed informationally efficient and working very well during this period until massive market manipulations were initiated by currency speculators in mid-July 1997.

Table 3: Error Correction Model at Lag 1: Period Before RM Peg (Jan 1988-Aug 1998, N=128)

Parameter Estimates **Dependent Variable: drm**						
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**Variance Inflation**
Intercept	**1**	0.01359	0.01081	1.26	0.2110	0
Ldwti	**1**	-0.00345	0.00657	-0.53	0.6004	1.00743
Lr	**1**	0.01668	0.03242	0.51	0.6079	1.13372
Ldrm	**1**	-0.04429	0.09659	-0.46	0.6473	1.14134

From the trend line in Chart 2, it is evident that RM is stable over the observed period and relatively less volatile compared to WTI. This is also the golden period when Malaysia was enjoying robust economic growth with staggering stock market performance. July 1997 was the turning point for the South East Asia economies and Thailand was the first country that took the direct hit from currency speculation.

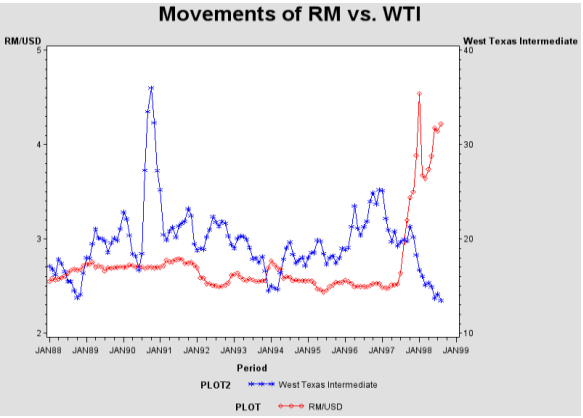

Chart 2: Movements of RM Exchange Rate and WTI: Jan 1988-Aug 1998

After the removal of RM peg to USD on 21 July 2005, RM is finally allowed to float in the foreign exchange market. From that moment, the short-

term volatility of RM has been seen and vulnerable to many internal and external factors. Table 4 presents one of the important cases. Although there is an absence of equilibrium relationship between RM and WTI, their dynamic short-term relation is found to be significant at 10% level. The negative coefficient of *ldwti* signifies the inverse relationship between RM and WTI. An increase in WTI will result in the strengthening of RM against USD in the short-run.

Parameter Estimates **Dependent Variable: drm**						
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**Variance Inflation**
Intercept	**1**	0.00262	0.00660	0.40	0.6917	0
Ldwti	**1**	-0.00204	0.00111	-1.83	0.0692*	1.09937
Lr	**1**	-0.00975	0.02686	-0.36	0.7172	1.06899
Ldrm	**1**	0.04057	0.08424	0.48	0.6308	1.12460

Table 4: Error Correction Model at Lag 1: Period After RM Peg (July 2005 – Oct 2018, N=160)

*significant at 10% level

Chart 3 demonstrates the co-movements of RM and WTI since the removal of RM Peg to USD in July 2005. It is so obvious that the two trend lines are moving in the opposite direction and both seem relatively volatile. The turbulence period started in September 2008, triggered by U.S subprime mortgage crisis and detrimentally affects the worldwide financial markets sentiment. Given technological breakthrough in U.S shale oil production since 2008, there has been excess supply of crude oil in the world market. This supply glut results in plummeting crude oil prices and income of oil-producing countries like Malaysia.

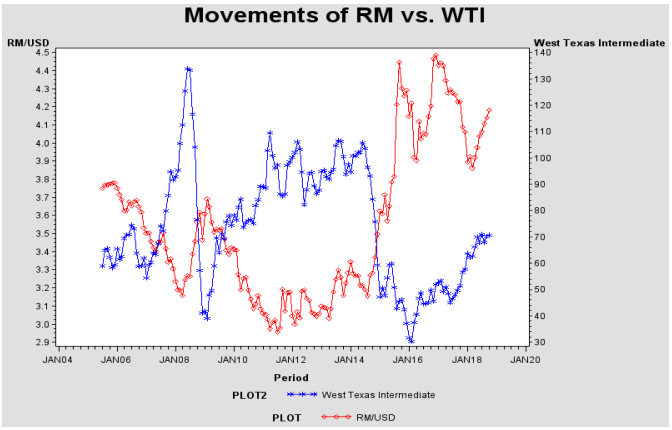

Chart 3: Movements of RM Exchange Rate and WTI: July 2005-Oct 2018

CUSUM analysis (or cumulative sum of residual test) is an important tool in econometric modelling. It is employed to tackle diagnostic problems related to parameter instability. From Figure 1 below, the existence of parameter (short-run and long-run parameters) stability in this model is therefore confirmed. It is clear that the short-run residuals from the estimated model are lying within the lower and upper boundaries. As a whole, the predictive RM-WTI model, developed from this study, can be considered

credible since no major diagnostic shortcomings are detected.

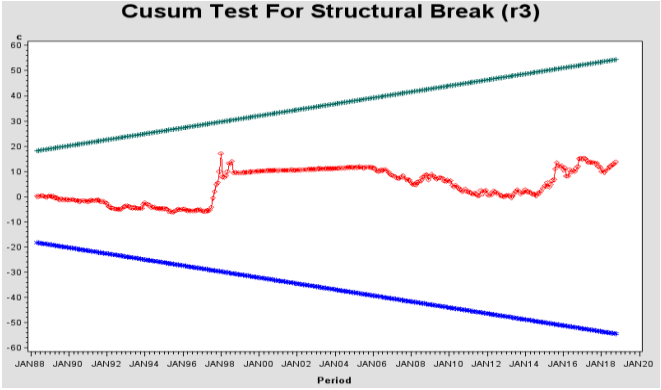

Figure 1: Cusum Test of RM-WTI Model (Full Sample: Jan 1988-Oct 2018)

It is important to understand the economic implications of changes in crude oil price on oil-producing country's exchange rate. In the case of Malaysia, the observed period from 1988 through 2018 has provided some useful insights on how changes in commodity prices could influence the stability of RM against USD.With regard to policy implication, this study has clearly shown that the plummeting crude oil prices in the long run will adversely affect RM stability. From the empirical evidence, the period after the RM peg is the most challenging for the Central Bank of Malaysia to deal with due to the market uncertainties in the oil and gas industry.

CONCLUSION

From the empirical evidence presented, the study unveilsthe presence of long-term and short-term relationships between RM and WTI over full sample period. The RM is found to be less prone to changes in crude oil price during the period before Asian Debt Crisis in 1997. However, the present RM seems more vulnerable to changes in crude oil price in the short-run since the removal of RM peg in June 2005. It is a known fact that there is no single monetary policy that any central bank could adopt to stabilize currency fluctuations. As a whole, this study provides one imperative perspective for policy makers. This study has proven that an export-driven policy by oil-producing countries has been the effective enabler that influences relative strength of domestic currencies in the long-run.

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