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Do foreign exchange administration rules strengthen the currency value? Policy lessons from an emerging market

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ABSTRACT

After the announcement of the US presidential election result on 8 November 2016, many ASEAN currencies became volatile relative to the US Dollar (USD). Despite being an emerging market, Malaysia took an unprecedented step. It implemented new rules in December 2016 to halt the decline of the Malaysian Ringgit (MYR). Under the new rules, exporters must convert 75 per cent of export proceeds from foreign currency to local currency with a licensed financial institution. Using the sample period from September 2015 to July 2018, this study examined the impact of the Supplementary Notice on Foreign Exchange Administration (FEA) rules on MYR. Our study revealed, first, that despite the initial uneasiness of Multinational Companies (MNCs), the FEA rules effectively strengthened the MYR against the USD and other major currencies; second, the rule mitigated the depreciation of FDI and crude oil price on MYR; third, the results were robust in terms of model specification and estimation. The policy suggestion is made that the export conversion rule should be applied to foreign firms in Malaysia and domestic oil exporters, as it would mitigate the depreciation impact of the increase in FDI and crude oil price. Malaysia's experience provides policy lessons for emerging economies to emulate when facing unexpected exchange rate volatility.

Contribution/Originality: This study contributes to the extant literature by examining the impact of Foreign Exchange Administration (FEA) rules on exchange rates. Most studies examine the impact of capital control on the economy. However, FEA rules are not a form of capital control. Although FEA rules are unique, our study demonstrates this policy tool's effectiveness in strengthening the currency of a small open economy.

1. INTRODUCTION

Unlike advanced economies, which have monetary policy tools such as Quantitative Easing to manage the money supply, emerging markets have few ways to overcome uncertainty in foreign exchange due to external shock. For example, Malaysia faced a sharp decline in its currency during the 1997/98 Asian Financial Crisis. Between July 1997 and August 1998, the Ringgit dropped from RM2.50 to RM4.80 per US Dollar (USD). The situation was salvaged with the bold implementation of capital control. A fixed exchange rate of RM3.80 was pegged to the US dollar from 1 September 1998.

Another incident of extreme currency volatility was recorded after the outcome of the US presidential election on 8 November 2016. Most Asian currencies witnessed unprecedented volatility concerning the US Dollar at the time. The Malaysian Ringgit (MYR) suffered a fate similar to that of the currencies of other member countries of

the Association of Southeast Asian Nations (ASEAN). Although the implementation of capital control may send a wrong signal to foreign investors, as an immediate response to slow down the decline of MYR, the Central Bank of Malaysia announced a new measure on 2 December 2016 to encourage the greater use of local currency in domestic trade and increase liquidity in the market.[1] In addition, any offshore trading of MYR, such as in non-deliverable forwards (NDFs), was not recognized (Lau, Yip, & Go, 2019)[2] under the Supplementary Notice on Foreign Exchange Administration (FEA) rules - Measures to Promote the Development of Malaysian Financial Market issued on 2 December and in effect from 5 December 2016. The new measure was expected to impact the value of MYR positively.

Under the new rule, exporters must convert 75 per cent of export proceeds to local currency using an onshore financial institution. They can only retain 25 per cent of the export proceeds in foreign currencies. Unlike capital control, in which the government restricts capital flow movement, the new FEA rules are considered a relatively favourable policy to manage foreign exchange intervention.

It can be observed that the new FEA ruling by BNM on 5 December 2016 could not lift the value of MYR immediately after its implementation as the external environment was still very volatile. The key question is whether the new rule effectively strengthens MYR. This point is crucial because if the new rules strengthen the MYR, the BNM has another tool to stabilize MYR in the case of future exchange rate volatility. In contrast, if the rule has no impact on exchange rate movement, BNM should consider alternative measures to strengthen the currency.

The FEA rules are a relatively new form of foreign exchange intervention. Only one study on the nexus between country-specific foreign direct investment (FDI) and the Malaysian currency was found. In their pioneering work, Lau and Yip (2021) evaluated the impact of the new FEA rules on the relationship between country-specific FDI and MYR. Inward FDI data from five major trading partners indicated that Japanese FDI strengthened MYR under the post-FEA rules. Secondly, FDI from Singapore was found to exert downward pressure on MYR; thirdly, FDI from China, the Netherlands, and the US had no significant effect on MYR. In short, inward FDI from different countries responded differently to the rule.

Empirical work on the effect of foreign exchange intervention on exchange rate movement has also explored the effects of pegging to certain currencies or controlling the foreign reserve. Most such studies have shown that foreign exchange intervention is effective in stabilizing the exchange rate movement (Adler & Mora, 2011; Broto, 2013; Chamon, Garcia, & Souza, 2017; Chipili, 2014; Daude, Yeyati, & Nagengast, 2014; Domac & Mendoza, 2004; Fratzscher, Gloede, Menkhoff, Sarno, & Stöhr, 2019; Guimaraes & Karacada, 2004; Humala & Rodríguez, 2010; Kim, Kortian, & Sheen, 2000; Mohanty, 2013; Pattanaik & Satyananda, 2003; Rossini, Quispe, & Serrano, 2013; Stone, Walker, & Yasui, 2009).

As such, foreign exchange intervention reduces the exchange rate volatility and improves investors' sentiments, resulting in greater demand for local currency and an appreciation of the currency's value. Conversely, limited studies have found that foreign exchange intervention hurts exchange rate stability, which results in depreciation pressure on the currency value (Adler, Lisack, & Mano, 2019; Miyajima & Montoro, 2013). As observed, therefore, there is empirical ambiguity regarding the effect of foreign exchange intervention on exchange rate movement. Moreover, no recent literature has examined the effectiveness of the new rule in strengthening MYR. Motivated by these considerations, this study examined the impact of the new FEA rules on MYR.

Our empirical results show that the new FEA rules effectively strengthen the MYR against the USD and a selection of other major currencies. The export conversion rule compels exporters to demand MYR, leading to greater appreciation in the currency value. Secondly, through the 75% export conversion rule, the new rule mitigates the

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[1] Refer to Supplementary Notice on Foreign Exchange Administration Rules – dated 2 Dec 2016.

http://www.bnm.gov.my/index.php?ch=en_announcement&pg=en_announcement&ac=481&lang=en

https://www.ambankgroup.com/eng/Announcements/Pages/Supplementarynoticeonforeignexchangeadministrationrules.aspx

[2] https://www.bnm.gov.my/-/prohibiting-facilitation-of-ndf-related-transactions, dated 13 Nov 2016.

depreciation impact of FDI and crude oil prices on MYR. Thirdly, the results obtained are robust to different model specifications and estimation methods.

The findings yield important policy implications. First, the results demonstrate the usefulness of the new FEA rules in strengthening the MYR against the USD and other major currencies. Hence, the results suggest that the new rule can stabilize MYR in a future period of extreme exchange rate volatility. Second, the export conversion rule should be applied to foreign firms in Malaysia and domestic oil exporters, mitigating the depreciation impact of increasing FDI and crude oil prices.

The remainder of this paper is organized as follows. Section 2 discusses the empirical model, followed by a description of the data and methodology. Next, Section 4 sets out the results of the estimation and analysis, followed by the robustness checks. The last section concludes the study and provides policy recommendations.

2. THEORETICAL MODEL

The new FEA rules aimed to stabilize the MYR on the back of the capital outflow triggered by the US presidential election. The new rules facilitated the demand for MYR, leading to appreciation in the currency value. Given the limited empirical work on the effect of the new rule on currency performance, this paper aims to assess the effectiveness of the new foreign exchange rule in stabilizing MYR. Accordingly, this paper uses Malaysia's exchange rate model proposed by Lau and Yip (2021), which can be expressed as below:

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\begin{aligned}
LnMYRUSD_t = {} & \beta_0 + \beta_1 LnReserve_t + \beta_2 LnFDI_t + \beta_3 LnPortfolio_t + \beta_4 LnCrude_t \\
& + \beta_5 Rule_t + \beta_6 Rule_t * LnReserve_t + \beta_7 Rule_t * LnFDI_t \\
& + \beta_8 Rule_t * LnPortfolio_t + \beta_9 Rule_t * LnCrude_t + \mu_t
\end{aligned} \tag{1}
$$

Where Ln denotes natural logarithm, and MYRUSD denotes US Dollar per Malaysian Ringgit (MYR). Hence, an increase in the exchange rate indicates appreciation in MYR and vice versa.

For the independent variables, first, the international reserve (Reserve) is essential in explaining the movement of the MYR. The prior literature has demonstrated that a high level of international reserve tends to reduce the likelihood of a currency crisis or a "sudden stop" – that is, a sudden unwillingness by international lenders to renew their credit lines at times of market uncertainty (Calvo & Reinhart, 1999; Caramazza, Ricci, & Salgado, 2004). As such, a higher reserve level tends to improve public confidence in the country's currency and minimize the probability of being exposed to currency risk.

Second, inward FDI is crucial to the performance of MYR. An influx of FDI increases the demand for MYR as foreign firms require local currency to pay for their operational expenditure. Consequently, MYR appreciates. For instance, Tan (2017) stated that the sluggish MYR would likely break below 4.0 against the USD in 2018 on the back of more significant FDI inflows from China and the US. Therefore, the inflow of FDI is a crucial determinant of the value of the MYR.

Third, strong links exist between portfolio investment (Portfolio) and the value of a currency. An influx of foreign portfolio investment increases the demand for local stocks and currency, leading to higher stock prices and more liquidity. Historically, the returning tide of foreign money into local bond and equity markets helps to strengthen the local currency against foreign currencies (Idris, 2016). For this reason, the portfolio investment inflow is added to the model to track the performance of MYR.

Forth, it is widely recognized that Ringgit's value tracks the crude oil price (Crude) movement. Higher crude oil prices tend to strengthen MYR and vice versa. For instance, MYR depreciated sharply due to falling global crude oil prices in the last few months of 2014 (Leong, 2015). Hence, the crude oil price is a suitable variable to gauge the currency's performance.

Despite all the control variables, the focus of this study is on the estimated coefficient of the dummy variable "Rule". The dummy variable "Rule" takes the value 1 after the implementation of the new FEA rules (December 2016

to July 2018) and 0 before. Given that the objective of the new rule was to strengthen the MYR, it can be expected that the estimated coefficient for "Rule" will be positive.

Given the presence of a dummy variable, the estimated coefficients of β_1 to β_4 in Equation 1 measure the average impact of the reserve, FDI, portfolio, and crude oil price on MYR in the pre-FEA rules period, respectively. However, those variables might impact MYR differently under the new FEA rules. An interaction term between dummy variables and explanatory variables was included in the model. Accordingly, the estimated coefficients for the interaction term (β_6 to β_9) were used to denote the reserve, FDI, portfolio, and crude oil price effects on MYR in the post-FEA rules period. The inclusion of the interaction term aimed to provide a clearer picture of the effect of those variables on MYR before and after the new rule, thereby providing the correct model specification. In other words, interaction terms were included to provide insight into the mitigating role of the FEA rules.

3. DATA AND METHODOLOGY

3.1. Data

This study used monthly data from September 2015 to July 2018. The sample period ended in July 2018 because exporters were then no longer required to convert export earnings into MYR. From August 2018 onwards, exporters were permitted to automatically sweep export proceeds into their Trade Foreign Currency Accounts maintained with onshore banks to meet up to 6 months' foreign currency obligations without the need to first convert proceeds into MYR.[3] Therefore, the period from December 2016 to July 2018, which captures the full impact of the FEA rules on MYR performance, was indicated as the post-FEA sample period in this study. Table 1 describes the variables employed in this study.

Table 1. List of variables.

Variable	Description	Unit of measurement	Source
Main variables			
MYRUSD	Ringgit to Dollar exchange rate	Exchange rate	MSCI
Reserve	International reserve	Million USD	BNM
FDI	Inward foreign direct investment	Million USD	Data stream
Portfolio	Net portfolio investment	Million MYR	BNM
Crude	Brent crude oil price	USD per barrel	EIA
Variables for robustness checks			
REER	Real effective exchange rate	Index	IMF
Inflation	Inflation rate	% y-o-y	DOSM
OPR	Overnight policy rate	%	BNM
NetEX	Net export	MYR million	DOSM
M3	Money supply M3	% y-o-y	BNM
IPI	Industrial production index	Index	DOSM

Note: The sample period was September 2015 to July 2018.
MSCI denotes Morgan Stanley Capital Investment. BNM denotes Bank Negara Malaysia.
Data Stream denotes Thomson Reuters Data Stream.
EIA denotes the Energy Information Administration of the United States.
IMF denotes International Monetary Fund. DOSM denotes the Department of Statistics Malaysia.

3.2. Methodology

The study employed the Ordinary Least Square (OLS) estimator to estimate the baseline model in Equation 1 above. Other control variables, such as inflation rate, overnight policy rate, net export, money supply, and industrial production index, were included to ensure the robustness of the baseline model. Including those variables allowed the model to capture the impact of purchasing power parity, interest rate, current account balance, monetary policy, and gross domestic product on exchange rate movement. Moreover, these macroeconomic variables are deemed important

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[3] https://www.theedgemarkets.com/article/bnm-statement-enhancement-foreign-exchange-administration-policies

determinants of the exchange rate from the viewpoint of fundamental analysis (Anifowose, Ismail, & Sukor, 2018; Quadry, Mohamad, & Yusof, 2017).

Further robustness checks were conducted to ensure the validity of the baseline model of Equation 1. The first robustness check was to use different measures of the exchange rate. The bilateral exchange rate with the Dollar (MYRUSD) was replaced by the Real Effective Exchange Rate (REER) index. This robustness test provided further insight into whether the new FEA rules would also strengthen the MYR against a selection of other major currencies. The second robustness check was to use different estimators. Specifically, this study estimated Eq. (1) using the Phillips and Hansen (1990) Fully-Modified OLS (FMOLS) and Park (1992) Canonical Cointegrating Regression (CCR). The adoption of the two regressions addressed the endogeneity issue in the model. These two methods are not described in detail here but are provided in the studies mentioned above.

3.3. Cubic Spline Interpolation

Cubic spline interpolation is a method for converting economic indicators from one time frequency to another. The quarterly inward FDI and inflow of portfolio investment were converted to monthly data. The interpolation method was similar to that employed by Chow and Lin (1971), Fernandez (1981), Harvey and Pierse (1984), Guerrero (1990), and Litterman (1983).

4. RESULTS

4.1. Descriptive Statistics

Table 2 presents the descriptive statistics of the main variables. For the sample period from September 2015 to July 2018, one Ringgit Malaysia was, on average, equivalent to 0.24 USD. Moreover, the Brent crude oil price stood at 52.86 USD per barrel. Next, net portfolio investment had the highest standard deviation, indicating that the series was highly volatile relative to other series. This observation might be attributed to the flow of hot money into the domestic stock market. The flow of hot money is generally highly volatile as investors react and change their portfolios quickly in response to any news in the financial market.

Table 2. Descriptive statistics.

Variable	Mean	Standard deviation	Skewness	Kurtosis	J-B statistics	Obs.
MYRUSD	0.240	0.01	0.14	1.93	1.79 (0.41)	35
Reserve	99023.17	4319.90	0.90	2.87	4.76 (0.09)	35
FDI	2566.84	977.75	-0.67	2.42	3.08 (0.22)	35
Portfolio	4852.67	7231.13	1.21	3.04	8.54 (0.01)	35
Crude	52.86	11.75	0.39	2.56	1.18 (0.55)	35

Note: MYRUSD denotes Ringgit to Dollar exchange rate; Reserve denotes International Reserve; FDI denotes Inward foreign direct investment.
Portfolio denotes Net portfolio investment; Crude denotes Brent crude oil price.
All statistics are based on original data values. Values in parentheses are p-values.
Sample period: September 2015 to July 2018.

Table 3. Correlation matrix and VIF.

Variable	LnReserve	LnFDI	LnPortfolio	LnCrude	VIF
LnReserve	1.000				2.579
LnFDI	-0.220	1.000			1.556
LnPortfolio	-0.385	0.126	1.000		1.272
LnCrude	0.771	-0.410	-0.575	1.000	3.828

Note: MYRUSD denotes Ringgit to Dollar exchange rate; Reserve denotes International Reserve; FDI denotes
Inward foreign direct investment. Portfolio denotes Net portfolio investment; Crude denotes Brent crude
oil price. Ln denotes the natural logarithm.

Before the estimation, correlation analysis was used to check whether the explanatory variables were highly correlated. Table 3 presents the corresponding results and shows that the correlation between series is less than 0.8 (Gujarati, 2003), indicating the absence of a multicollinearity issue in the model. Furthermore, the Variance Inflation

Factor (VIF) was less than five for all the explanatory variables. This further indicates that all the explanatory variables were independently determined.

4.2. Baseline Results

Table 4 shows the baseline results for Equation 1. Based on Column 1, the estimated coefficient of *Rule* was positive and statistically significant at the 1 per cent level. This finding implies that the new FEA rules effectively strengthened the MYR against the US Dollar. Moreover, the results in Column 1 passed the diagnostic checks. There were no autocorrelation or heteroscedasticity issues in the model.

Next, other important determinants of the exchange rate, such as inflation rate, overnight policy rate, net export, money supply, and industrial production index, were included in the model to ensure the robustness of the relationship between MYRUSD and the new FEA rules. The results are shown in Columns 2 to 7. Despite changes to the model specification, the estimated coefficients of *Rule* were consistently significant and positively impacted MYRUSD. Hence, this provides further evidence that the new rule effectively strengthened the MYR against the US Dollar. The results concur with the policy target of Bank Negara Malaysia (BNM), in which the new rule was expected to increase the demand for MYR through the 75% conversion rule for export earnings among exporters, resulting in an appreciation in the value of the Ringgit. The results in Columns 2 to 7 were used as robustness checks of Equation 1. They were not used as the basis of inferences.

Next, the study analysed the interaction of each variable with the FEA rules dummy to assess the impact of the international reserve, FDI, portfolio, and crude oil price on MYR performance before and after the implementation of the FEA rules. The regression results are shown in Column 1 of Table 4. Three facts stand out from Column 1. First, all four variables are significant, indicating that these variables are essential in explaining MYRUSD in the pre-FEA rules period. Second, the estimated coefficients for the interaction term, namely *Rule*LnReserve* and *Rule*LnPortfolio*, are negative, suggesting that the marginal effect of the variables on MYRUSD is lower for the post-FEA rules period than the pre-FEA period. Third, two of the coefficients, *Rule*LnFDI* and *Rule*LnCrude*, are positive and statistically significant at the one per cent level, implying that the marginal effect of the variables on MYRUSD is more significant in the post-FEA rules period than the pre-FEA period.

Table 5 summarises the estimated partial coefficients of *LnReserve*, *LnPortfolio*, *LnFDI*, and *LnCrude* for the pre- and post-FEA rules periods. As observed, both international reserve and portfolio investment strengthened the MYR against the USD in both the pre- and post-FEA rules periods. The results align with the empirical work of Calvo and Reinhart (1999) and Caramazza et al. (2004), who noted that the international reserve is the critical determinant of exchange rate movement. Similarly, the positive impact of portfolio investment on the MYR is in line with the argument of Idris (2016) that a greater inflow of portfolio investment would facilitate the demand for local currency, leading to greater appreciation of the local currency.

Next, contrary to the perception held by many, FDI and crude oil prices were found to weaken MYRUSD in the pre-FEA rules period. The former might be due to the types of FDI the country receives. Export-oriented FDI tends to promote economic growth and appreciate the MYR. However, FDI concentrated in the property market would inflate property prices through the import channel. Subsequently, higher local prices would reduce the competitiveness of the domestic property market, leading to the depreciation of the local currency (Lau & Yip, 2021; Maierbrugger, 2017). A negative estimated coefficient for FDI might be due to the effect of FDI on the property market outweighing the effect of export-oriented FDI. The effect of crude oil prices is because Malaysia has been a net importer of oil since 2014, as revealed by the former Secretary-General of the Ministry of Finance. The report shows Malaysia's net crude oil exports have declined since 2005.[4]

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[4] Refer to https://www.thestar.com.my/business/business-news/2015/01/21/clearing-the-air-treasury-sec-gen-malaysia-net-importer-of-crude-oil-petroleum-products-since-2014/, accessed on 1 June 2022.

Table 4. Estimation results for Eq. (1). Dependent variable: LnMYRUSD.

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LnReserve	4.706*** (0.672)	4.410*** (0.735)	4.708*** (0.718)	4.807*** (0.629)	2.702** (1.098)	4.697*** (0.682)	3.119*** (0.925)
LnPortfolio	0.002*** (0.000)	0.002*** (0.000)	0.002* (0.001)	0.002** (0.001)	0.001 (0.001)	0.002** (0.001)	0.001 (0.001)
LnFDI	-0.120*** (0.027)	-0.124*** (0.028)	-0.120** (0.035)	-0.119*** (0.026)	-0.106*** (0.027)	-0.117*** (0.028)	-0.092*** (0.029)
LnCrude	-0.139** (0.053)	-0.199** (0.078)	-0.139** (0.056)	-0.175*** (0.052)	-0.084 (0.055)	-0.128** (0.056)	-0.220** (0.091)
Rule	43.680*** (7.557)	40.320** (8.426)	44.910*** (7.915)	44.540*** (7.133)	20.040 (12.550)	43.240*** (7.711)	23.995** (10.567)
Rule*LnReserve	-4.008*** (0.687)	-3.737** (0.751)	-4.128*** (0.733)	-4.053*** (0.648)	-1.919 (1.119)	-3.948*** (0.699)	-2.334** (0.946)
Rule*LnPortfolio	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)
Rule*LnFDI	0.141*** (0.028)	0.145*** (0.029)	0.139*** (0.036)	0.141*** (0.027)	0.122*** (0.029)	0.136*** (0.029)	0.109*** (0.030)
Rule*LnCrude	0.297*** (0.073)	0.349*** (0.095)	0.243*** (0.080)	0.329*** (0.071)	0.233*** (0.075)	0.282*** (0.077)	0.307*** (0.102)
Inflation		-0.015 (0.015)					-0.029 (0.019)
Rule*Inflation		0.013 (0.016)					0.027 (0.020)
OPR			-0.001 (0.081)				0.055 (0.078)
Rule*OPR			0.123 (0.103)				0.050 (0.102)
LnNetEX				0.043** (0.020)			0.058*** (0.018)
Rule*LnNetEX				-0.051** (0.022)			-0.073*** (0.020)
M3					-0.024** (0.010)		-0.011 (0.012)
Rule*M3					0.020 (0.013)		0.001 (0.013)
LnIPI						-0.092 (0.163)	-0.358** (0.147)
Rule*LnIPI						-0.035 (0.208)	0.246 (0.185)
Constant	-53.950*** (7.407)	-50.260*** (8.270)	-53.970*** (7.754)	-55.380*** (6.955)	-31.200** (12.344)	-53.480*** (7.559)	-34.602** (10.383)
Diagnostic checks							
Serial [2]: p-value	0.423	0.561	0.050*	0.108	0.765	0.137	0.000***
ARCH [2]: p-value	0.940	0.813	0.889	0.823	0.233	0.964	0.084*

Note: MYRUSD denotes Ringgit to Dollar exchange rate; Reserve denotes International Reserve; FDI denotes Inward foreign direct investment. Portfolio denotes Net portfolio investment; Crude denotes Brent crude oil price; REER denotes Real Effective Exchange Rate; Inflation denotes Inflation rate; OPR denotes Overnight Policy Rate; NetEX denotes Net export; M3 denotes Money supply M3; IPI denotes Industrial Production Index.
*, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.
Values in ( ) are standard errors. Values in [ ] are the lag length chosen.
Ln denotes the natural logarithm. Serial is Breusch-Godfrey LM test.
ARCH is Engle's test for no autoregressive conditional heteroskedasticity.

For example, Malaysia produced 60,000 barrels per day in 2005 but only around 48,000 barrels in 2014.[5] Interestingly, Malaysia exports its premium Tapis crude oil and imports low-grade oil to refine in its downstream facilities.[6] However, net imports of petroleum products are higher than net exports, resulting in a deficit of RM 1.2 billion. This information explains why the crude oil price has a negative effect on the Ringgit (Lau. & Yip, 2021).

Notably, in the post-FEA rules period, the sum of the coefficients for *LnFDI* and *Rule*LnFDI* (0.021 = -0.120 + 0.141), *LnCrude*, and *Rule*LnCrude* (0.158 = -0.139 + 0.297) are positive and significant at the 1 percent level. This

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[5] https://www.thestar.com.my/business/business-news/2015/01/21/clearing-the-air-treasury-sec-gen-malaysia-net-importer-of-crude-oil-petroleum-products-since-2014 (retrieved on 23 March 2020).

[6] https://www.export.gov/article?id=Malaysia-Oil-and-Gas-Equipment (retrieved on 23 March 2020).

result indicates that both FDI and crude oil price strengthen MYRUSD in the post-FEA rules period, in contrast to the pre-FEA period, in which both variables are found to depreciate the Ringgit value. In other words, the FEA rules mitigate the negative impact of FDI and crude oil prices on MYRUSD. Specifically, in the pre-FEA rules period, a one percent increase in FDI and crude oil price led to a 0.12 and 0.14 per cent depreciation in the value of the Ringgit. In the post-FEA rules period, on the other hand, a one per cent increase in FDI and crude oil price would strengthen the MYR by 0.021 and 0.158 percent, respectively. The mitigating effect of the FEA rules can be explained by the 75% conversion rule for export earnings among exporters. For FDI, a greater FDI inflow would improve the productivity of domestic exports, thereby increasing the export volume of a country. The positive relationship between capital inflow and export in Malaysia was well documented by Saadi (2014). The production of high-productivity goods can explain the relationship between foreign firms and the effect of spillovers from capital inflow on domestic firms. As such, foreign firms use Malaysia as an export platform and engage in higher productivity than goods previously exported by the host country. Furthermore, capital inflow helps domestic firms to improve their processes, adopt technologies, and increase the income-productivity level associated with their exported goods. Therefore, it can be argued that higher levels of capital inflow facilitate domestic export. With the new FEA rules, more MYR will be converted; thus, demand for MYR increases, leading to greater currency appreciation.

For crude oil prices, an increase in the price level would improve the export earnings of domestic oil exporters. Under the new FEA rules, higher export earnings would lead to more foreign currencies being converted into MYR, increasing the demand and appreciating the currency value.

Table 5. Partial effect of independent variables in Equation 1.

Dependent variable	LnMYRUSD	
Independent variable	Pre-FEA	Post-FEA
LnReserve	4.706***	0.698***
	(0.672)	(0.144)
LnPortfolio	0.002***	0.001**
	(0.000)	(0.000)
LnFDI	-0.120***	0.021**
	(0.027)	(0.007)
LnCrude	-0.139**	0.158***
	(0.053)	(0.051)

Note: MYRUSD denotes Ringgit to Dollar exchange rate; Reserve denotes international reserve.
FDI denotes inward foreign direct investment. Portfolio denotes Net portfolio investment.
Crude denotes Brent crude oil price. Ln denotes the natural logarithm.
** and *** denote statistical significance at the 5% and 1% levels, respectively.
Values in ( ) are standard errors.

The estimated coefficient for pre-FEA is equal to the estimated coefficient of the generic term, as shown in Table 4. The estimated coefficient for post-FEA is equal to the sum of the estimated coefficient of the generic term and the estimated coefficient for the respective interaction term. For example, the estimated partial coefficient of *LnReserve* is 4.706 for the pre-FEA rules period and 0.698 = 4.706 - 4.008 for the post-FEA rules period.

The baseline results highlight the importance of the new FEA rules in stabilizing the value of MYR. Specifically, the new rule effectively strengthens the MYR against the US Dollar. Furthermore, the new rule mitigates the negative impact of FDI and crude oil prices on the value of the Ringgit. In the pre-FEA rules period, both FDI and crude oil prices exerted depreciation pressure on MYR. After implementing the new FEA rules, increases in FDI and crude oil prices are found to have an appreciation impact on MYR. The mitigating effect of the FEA rules can be attributed to the 75% conversion rule for export earnings among the exporters in Malaysia.

5. ROBUSTNESS CHECKS

5.1. Different Measures of Exchange Rate

The first robustness check replaced the bilateral exchange rate with the USD (MYRUSD) with the REER index. This result provided further information on whether the new FEA rules strengthened the MYR against other major currencies.

Table 6. Estimation results for Equation 1.

Dependent variable	LnREER						
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LnReserve	2.596***	2.420***	2.783***	2.575***	2.203**	2.568***	2.212***
	(0.448)	(0.429)	(0.463)	(0.460)	(0.789)	(0.374)	(0.522)
LnPortfolio	0.001*	0.002**	0.001**	0.001*	0.001	0.001*	0.001*
	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
LnFDI	-0.059***	-0.062***	-0.074***	-0.060***	-0.057***	-0.050***	-0.049***
	(0.018)	(0.018)	(0.023)	(0.019)	(0.019)	(0.015)	(0.016)
LnCrude	-0.056	-0.092*	-0.071**	-0.048	-0.045	-0.023	-0.124**
	(0.035)	(0.052)	(0.036)	(0.040)	(0.040)	(0.031)	(0.051)
Rule	24.800***	22.850***	27.490***	24.130***	19.100**	23.341***	17.601***
	(5.043)	(5.636)	(5.110)	(5.206)	(9.028)	(4.236)	(5.967)
Rule*LnReserve	-2.261***	-2.104***	-2.533***	-2.203***	-1.750**	-2.189***	-1.756***
	(0.458)	(0.502)	(0.474)	(0.473)	(0.805)	(0.384)	(0.534)
Rule*LnPortfolio	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Rule*LnFDI	0.065***	0.067***	0.078***	0.065***	0.056**	0.054***	0.048**
	(0.019)	(0.019)	(0.023)	(0.019)	(0.021)	(0.016)	(0.017)
Rule*LnCrude	0.156***	0.186***	0.132**	0.145***	0.133**	0.120***	0.167**
	(0.049)	(0.063)	(0.052)	(0.051)	(0.054)	(0.042)	(0.057)
Inflation		-0.009					-0.027**
		(0.010)					(0.011)
Rule*Inflation		0.007					0.026**
		(0.011)					(0.011)
OPR			-0.050				0.020
			(0.052)				(0.044)
Rule*OPR			0.138**				0.053
			(0.066)				(0.057)
LnNetEX				-0.009			0.010
				(0.014)			(0.010)
Rule*LnNetEX				0.004			-0.021*
				(0.016)			(0.012)
M3					-0.004		0.002
					(0.008)		(0.007)
Rule*M3					-0.001		-0.007
					(0.009)		(0.008)
LnIPI						-0.292***	-0.417***
						(0.090)	(0.083)
Rule*LnIPI						0.185	0.326***
						(0.114)	(0.105)
Constant	-24.631***	-22.432***	-26.450***	-24.330***	-20.160**	-23.150***	-18.220***
	(4.943)	(5.532)	(5.006)	(5.076)	(8.879)	(4.153)	(5.863)
Diagnostic checks							
Serial [2]: p-value	0.899	0.507	0.022**	0.891	0.662	0.264	0.000***
ARCH [2]L p-value	0.910	0.337	0.195	0.541	0.444	0.239	0.745

Note: MYRUSD denotes Ringgit to Dollar exchange rate; Reserve denotes International reserve; FDI denotes Inward foreign direct investment.
Portfolio denotes Net portfolio investment; Crude denotes Brent crude oil price; REER denotes Real effective exchange rate; Inflation denotes Inflation rate.
OPR denotes Overnight policy rate; NetEX denotes Net export; M3 denotes Money supply M3; IPI denotes Industrial production index.
*, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.
Values in ( ) are standard errors. Values in [ ] are the lag length chosen.
Ln denotes the natural logarithm. Serial is Breusch-Godfrey LM test.
ARCH is Engle's test for no autoregressive conditional heteroskedasticity.

Table 6 shows the OLS estimation result. In Columns 1 to 7, the dummy variable *Rule* is consistently significant and has a positive relationship with REER. This indicates that the FEA rules strengthened the MYR against the US Dollar and other major currencies. Next, Table 7 shows the partial effect of the independent variable. Similarly, the FEA rules were found to mitigate the depreciation effect of crude oil prices.

5.2. Different Estimation Methods

The previous results were based on the assumption of zero correlation between the error term and explanatory variables. However, the independent variables in Equation 1 are likely to be endogenous. Failure to address endogeneity would produce biased estimate parameters and incorrect inferences of the effects of the reserve, portfolio, FDI, and crude oil price on MYR. This study employed FMOLS and CCR to mitigate the endogeneity issue in estimating Equation 1 for the MYRUSD bilateral exchange rate and the REER.

Table 7. Partial effect of independent variables in Equation 1.

Dependent variable	LnREER	
Independent variables	Pre-FEA	Post-FEA
LnReserve	2.596***	0.336***
	(0.448)	(0.096)
LnPortfolio	0.001*	0.001
	(0.000)	(0.001)
LnFDI	−0.059***	0.005
	(0.018)	(0.005)
LnCrude	−0.056	0.010***
	(0.035)	(0.034)

Note: MYRUSD denotes Ringgit to Dollar exchange rate; Reserve denotes International reserve; FDI denotes Inward foreign direct investment; Portfolio denotes Net portfolio investment; Crude denotes Brent crude oil price.
* and *** denote statistical significance at the 10% and 1% levels, respectively.
Values in ( ) are standard errors. Ln denotes the natural logarithm.

Table 8. Estimation results for Equation 1.

Dependent variable	LnMYRUSD		LnREER	
Methods	FMOLS	CCR	FMOLS	CCR
Independent variable	(1)	(2)	(3)	(4)
LnReserve	4.634***	4.632***	2.621***	2.691***
	(0.344)	(0.487)	(0.251)	(0.364)
LnPortfolio	0.002***	0.002***	0.001**	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
LnFDI	−0.109***	−0.115***	−0.058***	−0.063***
	(0.022)	(0.018)	(0.016)	(0.014)
LnCrude	−0.115***	−0.121***	−0.051*	−0.056**
	(0.037)	(0.036)	(0.027)	(0.027)
Rule	42.958***	42.678***	25.046***	25.644***
	(3.821)	(5.454)	(2.794)	(4.079)
Rule*LnReserve	−3.932***	−3.914***	−2.284***	−2.340***
	(0.351)	(0.496)	(0.257)	(0.371)
Rule*LnPortfolio	−0.001*	−0.001**	−0.001	−0.001*
	(0.000)	(0.000)	(0.001)	(0.000)
Rule*LnFDI	0.131***	0.137***	0.065***	0.069***
	(0.023)	(0.019)	(0.016)	(0.014)
Rule*LnCrude	0.281***	0.285***	0.159***	0.164***
	(0.045)	(0.046)	(0.033)	(0.034)
Constant	−53.303***	−53.202***	−24.942***	−25.696***
	(3.747)	(5.372)	(2.740)	(4.014)

Note: MYRUSD denotes Ringgit to Dollar exchange rate; Reserve denotes International reserve.
FDI denotes Inward foreign direct investment; Portfolio denotes Net portfolio investment; Crude denotes Brent crude oil price.
*, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.
Values in parentheses are standard errors. Ln denotes the natural logarithm.

Table 8 presents the estimation results. Notably, the dummy variable *Rule* was found to have a positive and significant impact on MYR (Columns 1 to 4), indicating the effectiveness of the new FEA rules in strengthening MYR. Moreover, the partial effect in Table 9 shows that the new rule mitigates the negative impact of FDI and crude oil prices on MYR.

By and large, the estimation results from the robustness check were consistent with the baseline results obtained above. Hence, the baseline results were robust and not affected by different model specifications and estimation methods. Notably, the results highlight the importance of the new FEA rules in strengthening the MYR against the US Dollar and a selection of other major currencies. The strengthening effect occurs through the 75% conversion rule for export earnings applied to exporters. The export conversion rule increases the demand for MYR, leading to appreciation in the value of the currency. Furthermore, through the 75% export conversion rule, the new FEA rules mitigated the depreciation effect of FDI and crude oil prices on MYR. The optimal lag length for FMOLS and CCR was set at one, based on the Schwarz Information Criterion (SIC).

Table 9. Partial effect of independent variables in Equation 1.

Dependent variable	Ln MYRUSD		Ln REER	
Period	Pre-FEA	Post-FEA	Pre-FEA	Post-FEA
Panel A: Partial effect based on FMOLS				
LnReserve	4.634***	0.701***	2.621***	0.337***
	(0.344)	(0.072)	(0.251)	(0.053)
LnPortfolio	0.002***	0.001***	0.001**	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)
LnFDI	−0.109***	0.021***	−0.058***	0.006**
	(0.022)	(0.004)	(0.016)	(0.003)
LnCrude	−0.115***	0.166***	−0.051*	0.108***
	(0.037)	(0.025)	(0.027)	(0.018)
Panel B: Partial effect based on CCR				
LnReserve	4.632***	0.717***	2.691***	0.351***
	(0.487)	(0.078)	(0.364)	(0.057)
LnPortfolio	0.002***	0.001***	0.001***	0.001*
	(0.000)	(0.000)	(0.000)	(0.000)
LnFDI	−0.115***	0.022***	−0.063***	0.006**
	(0.018)	(0.005)	(0.014)	(0.003)
LnCrude	−0.121***	0.164***	−0.056**	0.107***
	(0.036)	(0.026)	(0.027)	(0.019)

Note: MYRUSD denotes Ringgit to Dollar exchange rate; Reserve denotes International reserve.
FDI denotes Inward foreign direct investment; Portfolio denotes Net portfolio investment. Crude denotes Brent crude oil price.
*, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.
Values in parentheses are standard errors. Ln denotes the natural logarithm.

6. CONCLUSIONS

This study investigated the impact of the FEA rules implemented from December 2016 to July 2018 on the value of the Malaysian Ringgit. Based on monthly data from September 2015 to July 2018, the results show that the new rule effectively strengthened the MYR against the US Dollar and other major currencies. The conversion rule increased the demand for MYR and led to an appreciation of the currency value. The new FEA rules were also found to mitigate the depreciation impact of FDI and crude oil prices on MYR. Finally, the results were shown to be robust to different model specifications and estimation methods.

Despite the critics of the new FEA rules claiming they would reduce the profit margin of foreign firms and consequently crowd out FDI, leading to a more significant depreciation in the MYR, it is clear from this empirical study that the new rule strengthened MYR. Notably, the findings align with the policy target of Bank Negara Malaysia (BNM), which stated that the new rules were expected to facilitate the demand for MYR, leading to appreciation in the currency value. Furthermore, the new FEA rules proved vital in mitigating the depreciation impact of FDI and crude oil prices on MYR.

Two policies are suggested: first, the 75/25 export conversion rule can be used to stabilize the MYR in a future period of exchange rate volatility and decline in its value relative to other currencies; second, the export conversion rule should be applied to foreign firms in Malaysia and domestic oil exporters, as it would further mitigate the depreciation impact from an increase in FDI and crude oil prices. The FEA rules could also provide a good policy lesson for other ASEAN members and developing economies that may face extreme exchange rate volatility in the future.

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