Oil Palm Industry Economic Journal Vol. 25 (2) September 2025 p. 50-59
DOI: https://doi.org/10.21894/opiej.2025.03

FROM LOCAL TO GLOBAL: EXAMINING THE IMPACT OF PRE- AND POST-INTERNATIONALISATION STRATEGY BY BURSA MALAYSIA OF GLOBAL OIL MARKETS TO THE FUTURES CRUDE PALM OIL

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ABSTRACT

This study investigates the level of cointegration between futures crude palm oil (FCPO) and competitor oils during the pre- and post-internationalisation strategy implemented by Bursa Malaysia Derivatives Berhad (BMDB). The Autoregressive Distributed Lags (ARDL) model is employed to analyse cointegration and causality among these variables using weekly data from January 1980 to December 2022. The empirical results show a reduction in the level of cointegration by 0.017% with soybean futures, 0.179% with exchange rates and no cointegration with Brent crude oil futures after implementing BMDB's international strategy. The results from this study contribute to more robust financial models for the FCPO market and provide empirical input to authorities on how policy or strategy shapes the relationship between FCPO and competitor oils so that BMDB can maintain FCPO status as a global index reference.

Keywords: ARDL, BMDB, FCPO, global commodities, internationalisation.

Received: 11 December 2024**; Accepted:** 12 February 2025**; Published online:** 8 July 2025.

INTRODUCTION

Malaysia's two markets manage palm oil businesses: Physical crude palm oil (CPO) and futures crude palm oil (FCPO). The first market is used by registered producers and refiners. The prices are compiled and released by the Malaysian Palm Oil Board (MPOB). The latter deals with market participants of retailers and institutions under the authorisation of Bursa Malaysia Derivatives Berhad (BMDB). Like other commodities, CPO is also exposed to price fluctuations. Thus, in October 1980, BMDB decided to launch FCPO with several economic objectives. This involves introducing Malaysia's top commodity to the international market, offering an effective price discovery system and providing a hedging mechanism against the risk of price fluctuations for the industry and market participants (Go & Lau, 2020). Since then, FCPO has been used as a standard index reference by market participants and policymakers.

Dedicated to upholding and enhancing the status of FCPO as a global index reference (GIR), Malaysia, through BMDB in 2009, established a strategic partnership and sold 25% of its stake to the Chicago Mercantile Exchange (CME) as part of its internationalisation strategy (IS). This strategy enables including all existing and upcoming BMDB products, particularly FCPO, into the CME Globex System. This electronic trading platform system is widely distributed, with multiple access points through various telecommunication centres and vast global distribution (Chow *et al*., 1996; Rentzler *et al*., 2006). Hence, this will enable foreign

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retailers and institutions to gain direct access and participate in the FCPO market through the CME Globex System.

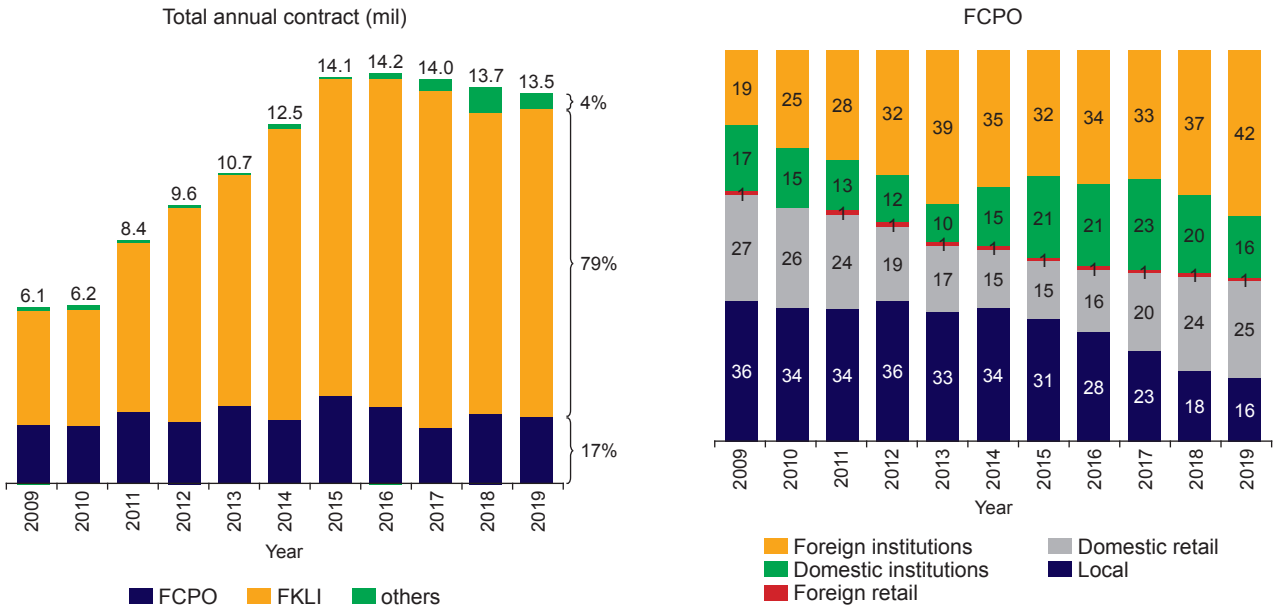
BMDB and CME formalised their partnership on 28th September 2010. *Figure 1* illustrates the discrepancies between FCPO and other futures contracts offered by BMDB in terms of traded volume and market demography before and after the internationalisation of FCPO. The total traded volume and the number of foreign institutions has been continuously increasing, indicating the positive outcomes of this IS (Bursa Malaysia, 2011). Since then, FCPO has emerged as one of BMDB's most successful products (Ahmad, 2010) and one of the most active futures markets globally (Go & Lau, 2015). Furthermore, FCPO has become a cornerstone of BMDB (Bacha & Sarojati, 2023) mentioning that FCPO generates nearly 80% of BMDB's income. BMDB will sustain this strategy until 2028 to ensure the ongoing global accessibility of FCPO and attract new market participants (Bursa Malaysia, 2023).

However, rather than focusing on traded volume or revenue, this study aims to explore the level of cointegration between FCPO and its rival oils, pre- and post-BMDB's strategy for internationalisation by listing FCPO on the CME Globex System. Positioning FCPO in global markets will lead to price fluctuations and increased exposure to international market prices due to a surge in market participants with varying trading objectives (Buyuksahin & Robe, 2014; Fattouh *et al*., 2013). Therefore, this study investigates the impact of BMDB's IS on the cointegration level between FCPO and rival oils by comparing empirical findings from periods before and after the implementation of the strategy. Addressing this issue will enrich both the existing knowledge and BMDB's expertise.

Several studies Azam *et al*. (2020), Rifin and Nauly (2021), Sarmidi *et al*. (2022) and Declerck *et al*. (2023) have examined the relationship between FCPO and rival oils, but there is a gap where previous study did not consider the impact of the IS by BMDB. Furthermore, the crucial question is whether this IS has significantly altered the relationship between FCPO and its competitors' oils. This study aims to explore this question by evaluating the influence of IS and segmenting the data into pre- and post-series. This study aims to broaden our comprehension of how policies or strategies influence the relationship between FCPO and rival oils.

From a policy standpoint, the empirical outcomes of this study could aid BMDB in future planning by determining whether to prolong its IS post-2028 or explore new partnerships with other exchanges to access different segments of new market participants globally. Both contributions will offer novel insights into the transmission mechanisms of these relationships, enhance the robustness of financial models for the palm oil market and provide empirical insights to policymakers to further improve and uphold FCPO's standing as a GIR.

The study comprises five sections. Section 1 presents the background and motivation of the study, while Section 2 delves into a brief literature review. Section 3 details data selection and the methods for analysing the impact of BMDB's IS on the relationship between FCPO and rival



Source: Bursa Malaysia (2020).

Figure 1. Total volume traded and market demography.

oils. Section 4 summarises the discussion of the empirical findings, while Section 5 outlines the results, conclusions and recommendations.

Classical economic theory asserts that the price of goods is determined by market supply and demand. However, adhering to this theory's assumptions may be difficult in situations where substitution is easy and competition is intense. For example, one type of edible oil could influence the prices of others (Azam *et al*., 2020). Palm oil and soybean oil are two of the most crucial and popular edible oils globally, attracting the interest of many researchers aiming to understand the dynamic interplay between these markets.

Researchers such as Alias and Othman (1998), Talib and Darawi (2002), Khalid *et al*. (2018), and Lee *et al*. (2022) have delved into the relationship between CPO and soybean oil. Meanwhile, Azam *et al*. (2020), Rifin and Nauly (2021), and Declerck *et al*. (2023) focused on the connection between CPO and rapeseed oil. These studies have identified evidence of cointegration among FCPO and rival oils. Yet, none have considered the impact of BMDB's IS, particularly related to the level of cointegration between FCPO and its competitors.

Compared to agricultural commodities like soybean and rapeseed, the correlation between CPO and crude oil has yielded mixed results. Although crude oil is classified as an energy commodity, the emergence of biodiesel produced from palm oil as a competitor to crude oil has elevated the relationship between palm oil and crude oil. Studies by Yu *et al*. (2006) and Campiche *et al*. (2007) found no cointegration between CPO and crude oil from 1999-2007. In contrast, Nazlioglu and Soytas (2012), Arshad and Hameed (2012), Jeong *et al*. (2023) and Supriya and Mamilla (2024) identified a significant relationship between CPO and crude oil, suggesting that market participants need to monitor crude oil markets to anticipate price changes in the palm oil market. Due to conflicting findings in prior studies, this research sought to explore whether BMDB's IS influences this relationship, positioning Malaysia's top traded commodity in global markets and enabling access to the FCPO market for participants in edible oil markets.

Literature review revealed an interesting trend on investigations related to market system changes. Barrett and Scott (2000) analysed the impact of electronic trading on the operations of major international financial futures exchanges, indicating opportunities for market access beyond traditional futures exchanges. Subsequent studies by Rentzler *et al*. (2006) and Tse *et al*. (2006) highlighted the efficiency gains in currency futures markets due to electronic trading platforms. Martinez and Tse (2008) focused on the impact of volatility changes in electronic markets and the role of informed traders in liquidity provision. Ahmed (2010) studied the effects of transitioning from open outcry to computerised trading systems in Malaysia, revealing slightly higher volatility persistence under automated trading for FCPO. It could be argued that based on empirical evidence, existing studies primarily examined the pros and cons of market system changes.

To extend the body of knowledge on IS, this study further explores the level of relationship between FCPO and rival oils before and after its listing on the CME Globex system. Assessing the cointegration level between these markets is essential for grasping their dynamics and the implications of BMDB's IS.

METHODOLOGY

This study utilised weekly data from 7th April 1995 to 28th June 2024 and divided it into two subsamples: Pre- and post-internationalisation of FCPO, as shown in *Table 1*. In this study, FCPO is the dependent variable quoted in Malaysian Ringgit (MYR). Meanwhile, competing oils, namely soybean oil futures (SOY), rapeseed oil futures (RAP) and Brent crude oil futures (BRENT), serve as regressors, all quoted in US Dollars (USD). The exchange rate (EXR) of USD against MYR is included as a controlled variable following the International Capital Asset Pricing Model, where the exchange rate plays a vital role in positioning any instrument in the international market (Solnik, 1974). This study will solely concentrate on the futures market, and all data were extracted from the Bloomberg trading terminal.

TABLE 1. DATA PERIOD

Internationalisation period	Date
Pre	7 April 1995-25 September 2009
Post	28 September 2009-28 June 2024

The basic model of this study is similar to previous studies (Alias & Othman, 1998; Azam *et al.*, 2020; Khalid *et al*., 2018; Lee *et al.*, 2022; Talib & Darawi, 2002*).* The basic function of this study can be written as follows:

$$FCPO = f(SOY, RAP, BRENT, EXR) \quad (1)$$

Equation (1) depicts the futures crude palm oil (FCPO) as a function of soybean oil (SOY), rapeseed oil (RAP), Brent crude oil (BRENT) and exchange

rate (EXR). To approximate a normal distribution, this study re-specifies Equation (1) in econometric form and converts all variables into logarithms (L). The econometric model can be written as follows in Equation (2):

$$LFCPO_t = \alpha + \beta_1 LSOY_t + \beta_2 LRAP_t + \beta_3 LBRENT_t + \beta_4 LEXR_t + \varepsilon_t \quad (2)$$

where, α is a constant, ε_t is a random error term, and β_1, β_2, β_3 and β_4 denote the unknown parameters to be estimated. The preliminary analysis starts with a descriptive analysis of general data, followed by a unit root test. Augmented Dickey Fuller (ADF) by Dickey and Fuller (1979) and Phillips-Perron (PP) by Phillips and Perron (1988) were employed in this study to determine the level of stationarity.

This study utilised the Autoregressive Distributed Lags (ARDL) model, as it efficiently addressed endogeneity and residual correlation issues (Manasseh *et al*., 2017; Ullah & Lin, 2024). Although ARDL allows variables to be stationary at different levels, its maximum order is at I(1). The long-run relationship was tested using the ARDL F-statistic bound test by Pesaran *et al.* (2001) within the ARDL framework to examine cointegration among the variables. The F-statistic bound test uses two asymptotic bounds with critical values based on the I(d) regressors ($0 \leq d \leq 1$), and the value of F-statistic that exceeds the upper bound [I(1)] critical value implies cointegration (Pesaran *et al*., 2001). Conversely, this study accepts the null hypothesis if the F-statistic value falls below I(1), showing that no cointegration is found in the model. Hence, the specific null hypothesis is $H_0 : \varphi_i = 0$ shows no cointegration in the model, while alternative hypothesis $H_a : \varphi_i \neq 0$ implies the evidence of cointegration. The specific ARDL model can be expressed [Equation (3)]:

$$\Delta LFCPO_t = a_0 + \sum_{i=1}^{p} \beta_{1i} \Delta LFCPO_{t-i} + \sum_{i=0}^{q} \beta_{2i} \Delta LSOY_{t-i} + \sum_{i=0}^{q} \beta_{3i} \Delta LRAP_{t-i} + \sum_{i=0}^{q} \beta_{4i} \Delta LBRENT_{t-i} + \sum_{i=0}^{q} \beta_{5i} \Delta LEXR_{t-i} + \varphi_1 \Delta LFCPO_{t-1} + \varphi_2 \Delta LSOY_{t-1} + \varphi_3 \Delta LRAP_{t-1} + \varphi_4 \Delta LBRENT_{t-1} + \varphi_5 \Delta LEXR_{t-1} + \varepsilon_t \quad (3)$$

where, β_i is the short-run dynamic and φ_i represents the corresponding cointegration multiplier of the underlying ARDL. In addition to examining cointegration, this study also aims to analyse the short-term impact of the IS by BMDB on FCPO. The causal relationship between these variables was tested by employing the error correction model based on ARDL (ECM-ARDL), provided that $LFCPO_t$ in Equation (3) is cointegrated with the competitor oils in the previous cointegration test. The specific ECM-ARDL model is as follows in Equation (4):

$$\Delta LFCPOt = a_0 + \sum_{i=1}^{p} \beta_{1i} \Delta LFCPO_{t-i} + \sum_{i=0}^{q} \beta_{2i} \Delta LSOY_{t-i} + \sum_{i=0}^{q} \beta_{3i} \Delta LRAP_{t-i} + \sum_{i=0}^{q} \beta_{4i} \Delta LBRENT_{t-i} + \sum_{i=0}^{q} \beta_{5i} \Delta EXR_{t-i} + \theta ECT_{t-1} + \varepsilon_t \quad (4)$$

where, ECT_{t-1} in Equation (4) signifies the performance of the dependent variable about the lagged deviation from the long-run equilibrium, while θ represents the coefficient of the speed of adjustment of the error correction term. ECT_{t-1} is statistically significant, provided the coefficient value is less than 1.

In the case of no cointegration, this study employed the short-run model-based ARDL framework in the first difference form without ECT_t in determining the causality relationship between FCPO and the competitor oils. Short-run causal impact was tested using the Wald test. The null hypothesis is $H_0 : \beta_i = 0$ and the alternative hypothesis is $H_a : \beta_i \neq 0$. Failing to reject the null hypothesis indicates no short-run causal impact from the competitor oils on FCPO.

Finally, this study conducted diagnostic tests, specifically autocorrelation and heteroskedasticity, to evaluate the adequacy and robustness of the selected ARDL models. Stability tests were also conducted by utilising Ramsey's regression equation specification error test (RESET) to identify potential misspecifications in the model, followed by cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) tests to identify systematic changes in the regression coefficients and to detect sudden changes from the constancy of the regression coefficient, respectively.

RESULTS AND DISCUSSION

This study begins with a general overview of the data series. *Table 2* provides a summary of the descriptive statistics for 754 and 770 data points, which represent observations made pre- and post-internationalisation of FCPO. The first moment (mean) for LFCPO indicates a positive mean value and a slight increase from 7.338 (Pre) to 7.972 (Post). Compared to other variables, LFCPO exhibits the highest mean value for both periods. The second moment shows a decrease in the volatility of LFCPO, from 0.351 (Pre) to 0.279 (Post). The LBRENT experienced the highest volatility during the pre-internationalisation period. Furthermore,

the LFCPO variable exhibited a positive skewness value (third moment), indicating a longer tail on the right side. All other variables, with the exception of LEXR and LBRENT (post), also experienced a positive skewness value, indicating a lack of symmetric distribution. The fourth moment (kurtosis) shows that LFCPO experienced negative excess kurtosis, where the kurtosis value is less than 3 during pre-internationalisation and turned into a leptokurtic distribution (value greater than 3) in post-internationalisation.

Table 3 provides a summary of the unit root test results for the stationarity of the variable series. All variables are stationary at the first difference [I(1)], and none of the variables are stationary at I(2) or higher. Therefore, the ARDL model is the most effective, suitable and appropriate model for cointegration analysis between LFCPO and the regressors.

Table 4 presents the results of the ARDL F-bound test together with the optimal ARDL lags for both periods based on the lowest value of the Akaike information criterion. The bounds test results for cointegration in *Table 4* show evidence of cointegration relationships between LFCPO, LSOY, LRAP, LBRENT and LEXR for both time periods. This result indicates the potential co-movement and impact of LFCPO from the regressors on LFCPO towards long-run equilibrium.

Meanwhile, *Table 5* presents the estimated long-run regression coefficients, indicating a significant influence of LSOY on LFCPO during both pre- and post-internationalisation periods. The coefficient of LSOY during post-internationalisation is slightly lower compared to pre-internationalisation, from 1.220%-1.203%. A 1% increase in soybean oil leads to 1.220% (Pre) and 1.203% (Post) increases in the price of FCPO, implying a positive relationship between the two oils. Therefore, the implementation of the IS by BMDB has a minimal impact, resulting in a reduction of 0.017%. The overall result of a positive relationship between FCPO and soybean oil is in line with previous studies conducted by Alias and Othman (1998), Talib and Darawi (2002), Khalid *et al*. (2018) and Lee *et al*. (2022).

Concerning LRAP, the results show no cointegration between these oils, indicating that the price movement of rapeseed oil has no

TABLE 2. DESCRIPTIVE STATISTICS

Variable	Period	Mean	SD	Skew	Kurtosis
LFCPO	Pre	7.338	0.351	0.364	2.908
	Post	7.972	0.279	0.877	3.426
LSOY	Pre	3.205	0.323	0.858	3.883
	Post	3.722	0.278	0.227	1.760
LRAP	Pre	5.881	0.219	0.208	3.066
	Post	6.325	0.255	1.023	3.389
LBRENT	Pre	3.472	0.609	0.383	2.209
	Post	4.309	0.337	-0.539	2.754
LEXR	Pre	1.244	0.152	-1.419	3.538
	Post	1.338	0.148	-0.350	1.591

Note: Data observation for Pre and Post is 754 and 770 respectively. SD - standard deviation; Skew - skewness. All variables are expressed in logarithm form. L - logarithms; FCPO - futures crude palm oil; SOY - soybean oil futures; RAP - rapeseed oil futures; BRENT - brent crude oil futures; EXR - exchange rate between US Dollar (USD) against Malaysian Ringgit (MYR).

TABLE 3. UNIT ROOT TEST

Variable	Period	ADF		PP	
		I(0)	I(1)	I(0)	I(1)
LFCPO	Pre	-2.074	-12.189***	-1.945	-24.968***
	Post	-1.907	-12.428***	-1.961	-29.136***
LSOY	Pre	-1.435	-17.359***	-1.304	-27.108***
	Post	-1.529	-27.889***	-1.500	-27.889***
LRAP	Pre	-1.984	-16.957***	-1.915	-27.684***
	Post	-1.976	-27.592***	-1.949	-27.598***
LBRENT	Pre	-1.082	-14.378***	-1.052	-28.745***
	Post	-1.896	-8.877***	-2.163	-26.419***
LEXR	Pre	-2.465	-7.757***	-2.179	-33.472***
	Post	-0.561	-13.377***	-0.518	-26.674***

Note: ADF - Augmented Dickey-Fuller and PP - Philip Perron. I(0) and I(1) represent the stationarity level. *** - 1% level of significance respectively. All variables are expressed in logarithm form. L - logarithms; FCPO - futures crude palm oil; SOY - soybean oil futures; RAP - rapeseed oil futures; BRENT - brent crude oil futures; EXR - exchange rate between US Dollar (USD) against Malaysian Ringgit (MYR).

impact on FCPO during both pre- and post-internationalisation periods. The result of this study contradicts the previous study conducted by Azam *et al*. (2020), who found that palm oil led the price of rapeseed oil from 2006 until 2014. This suggests that the relationship between these oil prices in the physical and futures markets varies, likely due to the diverse types of market participants and their varying trading objectives. The empirical outcome of LBRENT is quite surprising. The results indicate that LBRENT had a significant 1% influence on LFCPO during the pre-internationalisation phase, but this influence became insignificant once BMDB implemented its IS. During pre-internationalisation, the coefficient of LBRENT, which stands at -0.213, suggests that a 1% increase in Brent crude oil corresponds to a -0.213% decrease in the price of FCPO, indicating a negative relationship between these oils. The result of this study is in line with Yu *et al*. (2006) and Campiche *et al.* (2007) but contradicts Nazlioglu and Soytas (2012), Arshad and Hameed (2012), Jeong *et al*. (2023) and Supriya and Mamilla (2024).

The exchange rate, as denoted by LEXR, demonstrates a significant result at the 1.000% level for both the pre- and post-internationalisation of FCPO. This result is in line with the ICAPM, where the exchange rate works as an explanatory variable for CPO, especially after positioning this commodity in the global market. However, the result shows that the coefficient of LEXR decreased from 1.120% (pre) to 0.941% (post). This is due to changes in the exchange rate regime, where Malaysia pegged the MYR against the USD starting in September 1998 and de-pegged it after seven years in July 2005. Therefore, a stronger or weaker MYR increases the attractiveness of FCPO for foreign market participants who hold foreign currencies.

Further analysis of the causality relationship, as depicted in *Table 6*, between the regressors and FCPO provides substantial statistical evidence of short-term impacts. Strong evidence existed for causal impacts from LSOY and LEXR to LFCPO, both pre- and post-internationalisation. Thus, soybean futures and exchange rates play a significant role in predicting FCPO's behaviour and movements in the short term.

The results of LRAP and LBRENT differ from other regressors. Rapeseed oil did not have a significant causal impact during the pre-internationalisation phase but wed a strong causal impact after BMDB listed FCPO on the CME Globex system. One possible explanation is that foreign market participants involved in the rapeseed oil business may enter FCPO, either to hedge or arbitrage during specific economic events. The causal impact analysis from LBRENT to FCPO reveals a similar relationship pattern to the cointegration test. Brent crude oil had a significant causal impact before the internationalisation of FCPO and became insignificant during post-internationalisation. A plausible explanation is that the price of crude oil dropped from USD140-USD35 per barrel in 2008 as a result of the Global Financial Crisis. Consequently, the lower crude oil prices make biofuel less appealing, as crude oil traders are not compelled to engage in FCPO to hedge against higher crude oil prices.

TABLE 4. ARDL F-BOUND TEST

LFCPO = *f*(LSOY, LRAP, LBRENT, LEXR)				
Period	**Model**	**Critical value**		**F-Stat**
		I(1)		
		10%	**5%**	
Pre	(4, 4, 1, 2, 1)	3.09	3.49	3.440*
Post	(4, 3, 1, 0, 1)	3.09	3.49	3.365*

Note: Model is optimal lag model selection criteria based on the lowest Akaike Information Criterion (AIC) where the maximum number of lags is set to four. F-Stat for F-Statistic. * - 10% level of significance respectively. All variables are expressed in logarithm form.

TABLE 5. ARDL LONG RUN COEFFICIENTS

LFCPO = *f*(LSOY, LRAP, LBRENT, LEXR)				
Period	**LSOY**	**LRAP**	**LBRENT**	**LEXR**
Pre	1.220***	0.090	-0.213***	1.120***
Post	1.203***	-0.364	-0.205	0.941***

Note: *** - 1% level of significance respectively. All variables express in logarithm form. L - logarithms; FCPO - futures crude palm oil; SOY - soybean oil futures; RAP - rapeseed oil futures; BRENT - brent crude oil futures; EXR - exchange rate between US Dollar (USD) against Malaysian Ringgit (MYR).

Meanwhile, the result for the cointegrated model's ECT for both periods are statistically significant at the 1.0% level, as the coefficient value (θ) is less than 1 with a negative sign. The associated ECT coefficient values are -0.047 and -0.038 respectively. These values indicate that during pre-internationalisation, a 4.7% deviation from the long-run equilibrium was corrected each week for about 21.3 weeks ($1/\theta$). During post-internationalisation, a 3.8% deviation from the long-run equilibrium was corrected each week for about 26.3 weeks. The adjustment speed of correction rate towards long-run equilibrium is longer during post-internationalisation compared to the pre-internationalisation.

This study examines the goodness of fit of the ARDL model, with results presented in *Table 7* and *Figure 2* and *3*. According to the Jarque-Bera test statistic, normality testing rejects the null hypothesis of a normal distribution for both pre- and post-internationalisation periods, indicating a non-normal distribution of the residual series. Nevertheless, with 754 observations for the pre-internationalisation phase and 770 for the post-internationalisation phase, the series are considered normally distributed based on the central limit theorem due to the substantial observations (N>30).

Furthermore, the results indicate that the models are devoid of autocorrelation. However, both models failed the heteroskedasticity test, suggesting residual errors in the model. Subsequently, this study re-estimated ARDL models, employing the heteroskedasticity and autocorrelation consistent (HAC) estimator. The RESET test affirmed the correct specification of the ARDL regression models. Additionally, the CUSUM test portrays stable regression coefficients within the 5% critical bounds. Nevertheless, CUSUMSQ reveals variance inconsistencies as displayed in *Figure 2* and *3*.

The presence of non-normality and variance inconsistency in the series suggests potential autoregressive conditional heteroskedasticity (ARCH) effects. This warrants the application of models such as ARCH or Generalised ARCH to better capture the dynamics of time-varying volatility. Hence, these findings highlight the need for further investigation. Consequently, future studies should delve into the level of volatility spillover and transmission before and after positioning FCPO in the global market using this international strategy. This approach will enhance our comprehension of the relationship between FCPO and rival oils by scrutinising the associated risks.

CONCLUSION

Positioning FCPO in global markets can expose it to significant global market price fluctuations due to an increase in market participants with diverse trading objectives. This study presents the outcomes of the IS implemented by BMDB using the ARDL model to evaluate the level of cointegration between FCPO and competing oils in both pre- and post-samples. The empirical findings indicate that soybean oil futures, the primary competitor of CPO, are cointegrated with FCPO both before and after internationalisation. The degree of cointegration, based on the ARDL long-run coefficient, slightly decreased from 1.220%-1.203% post-internationalisation compared

TABLE 6. SHORT RUN CAUSALITY TEST

LFCPO = *f*(LSOY, LRAP, LBRENT, LEXR)					
Period	**LSOY**	**LRAP**	**LBRENT**	**LEXR**	**ECT**
Pre	37.410***	1.122	3.173**	69.977***	-0.047***
Post	61.988***	6.662***	1.589	8.833***	-0.038***

Note: *** and ** - 1% and 5%, level of significance respectively. ECT - an error correction term and only applicable to the models in the presence of cointegration. All variables express in logarithm form. L - logarithms; FCPO - futures crude palm oil; SOY - soybean oil futures; RAP - rapeseed oil futures; BRENT - brent crude oil futures; EXR - exchange rate between US Dollar (USD) against Malaysian Ringgit (MYR).

TABLE 7. DIAGNOSTIC TEST

LFCPO = *f*(LSOY, LRAP, LBRENT, LEXR)				
Period	**JB**	**SC**	**HET**	**RESET**
Pre	143.764***	3.963	59.680***	2.576
Post	77.521***	2.275	71.329***	1.523

Note: JB - Jarque Bera test; SC - autocorrelation test based on the Breush-Godfrey Serial Correlation Lagrange multiplier test; HET - heteroscedasticity based on the White test; RESET - Ramsey Regression Equation Specification Error Test. *** - 1% level of significance respectively.

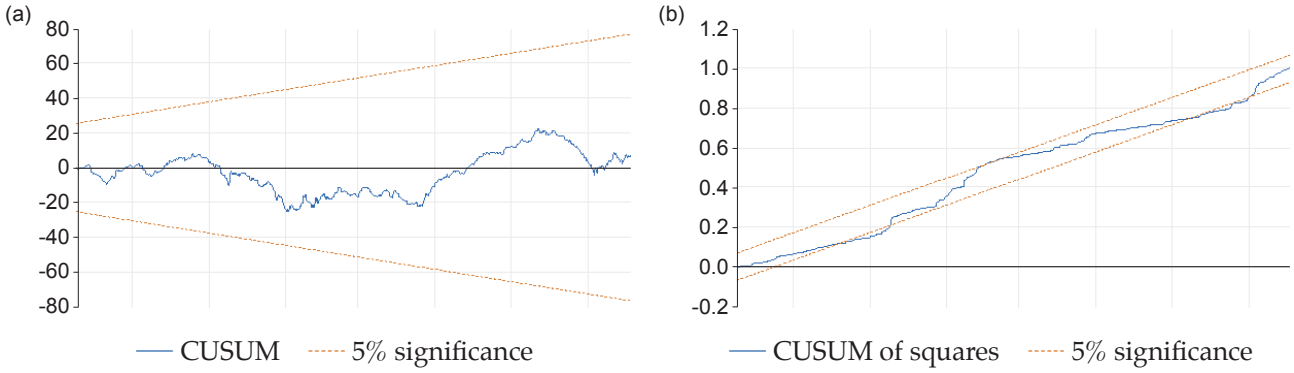


Figure 2. (a) CUSUM and (b) CUSUMSQ for the period of pre-internationalisation.

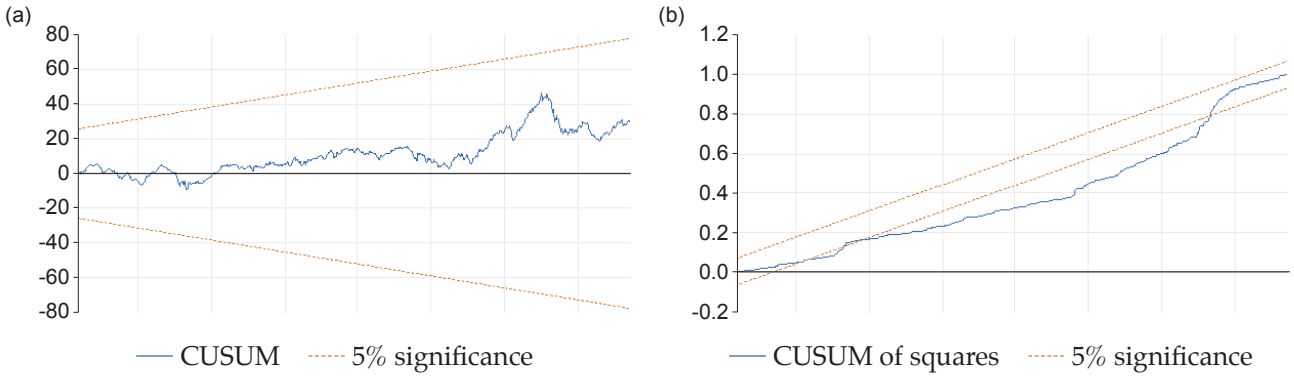


Figure 3. (a) CUSUM and (b) CUSUMSQ for the period of post-internationalisation.

to pre-internationalisation. BMDB's IS has resulted in a minimal impact, with a reduction of 0.017%. This implies that FCPO and soybean oil will move together regardless of variations in trading systems involving diverse market participants.

Conversely, another competitor, rapeseed oil, did not show cointegration with FCPO before or after internationalisation. Nevertheless, causal analysis reveals that rapeseed oil significantly influenced FCPO after being listed by BMDB in the CME Globex system. Foreign market participants involved in the rapeseed oil sector may enter FCPO's market during specific economic events for hedging or arbitrage opportunities.

In contrast, Brent crude oil yielded contrary and unexpected results. The study shows that Brent crude oil significantly affected FCPO before internationalisation, but this influence diminished post-internationalisation following BMDB's strategy. The causal impact analysis mirrors this relationship. Prior to FCPO's internationalisation, Brent crude oil had a significant causal impact, which lost significance post-internationalisation. A possible explanation is the drop in crude oil prices from USD140-USD35 per barrel in 2008 before the international strategy, reducing the attractiveness of biofuels and the need for hedging due to low crude oil prices, thereby lowering incentives for crude oil traders to engage in the FCPO market.

Although this study focuses on the relationship between FCPO and competing oils, the influence of exchange rates on FCPO remains crucial. Exchange rates significantly affect the price of FCPO both pre- and post-internationalisation. However, the exchange rate coefficient decreased from 1.120% pre-internationalisation to 0.941% post-internationalisation. This is attributed to changes in the exchange rate regime before BMDB positioned FCPO in the global market via its listing in the CME Globex system. Malaysia pegged the MYR to the USD from September 1998-July 2005, attracting foreign market participants holding foreign currencies to participate in the FCPO market during fluctuations in the MYR.

The ARDL model results indicate that BMDB's IS, listing FCPO in the CME Globex system, has mitigated the impact of price fluctuations from competing oils and exchange rates on FCPO. As a result, FCPO's positioning in global markets has not exposed it to additional risks, effectively preserving palm oil's status as a primary edible oil and FCPO as a GIR. BMDB should continue this international strategy beyond September 2028

with CME and explore partnerships with other exchanges, especially The Dalian Commodity Exchange in China and the National Commodity and Derivatives Exchange in India, the two largest palm oil exporters, to broaden the participation of market players from these regions.

As one of the most crucial and controversial edible oils, CPO has faced export restrictions from the European market. Malaysia, through MPOB and BMDB, has implemented numerous strategies, policies, and initiatives to tackle this issue. Apart from positioning FCPO in global markets, BMDB ensures that local and foreign market participants opting for physical delivery receive CPO from mills complying with Malaysian Sustainable Palm Oil (MSPO) certification criteria. This ensures that the physical delivery of FCPO drives the palm oil industry towards sustainability, aligning with the United Nations' Sustainable Development Goals Agenda 2030. In conclusion, MPOB and BMDB play essential roles by meticulously executing policies and strategies to safeguard one of Malaysia's most valuable assets.

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