EMPIRICAL MODELING OF FUTURES CRUDE PALM OIL IN MALAYSIA: AN OPEN GAP ANALYSIS

IZAAN AZYAN BIN ABDUL JAMIL

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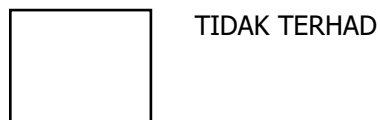
Disahkan Oleh,

_____
IZAAN AZYAN BIN ABDUL JAMIL
DB1811005T

_____
(Tandatangan Pustakawan)

Tarikh : 30 September 2022

_____
(Dr Mori Bin Kogid)
Penyelia Utama

DECLARATION

I hereby declared that the work in this thesis is my own except for the quotations, equations and summaries, which have been duly acknowledged.

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_____
Izaan Azyan Bin Abdul Jamil
DB1811005T

CERTIFICATION

NAME	:	**IZAAN AZYAN BIN ABDUL JAMIL**
MATRIC NUM.	:	**DB1811005T**
TITLE	:	**EMPIRICAL MODELING OF FUTURES CRUDE PALM OIL IN MALAYSIA: AN OPEN GAP ANALYSIS**
DEGREE	:	**DOCTOR OF PHILOSOPHY IN BUSINESS**
FIELD	:	**FINANCIAL ECONOMICS**
VIVA DATE	:	**1 SEPTEMBER 2022**

CERTIFIED BY;

Signature

1. MAIN SUPERVISOR
Dr. Mori Bin Kogid

_____

2. CO - SUPERVISOR
Assoc. Prof. Dr. Caroline Geetha A/P Arokiadasan

_____

3. CO - SUPERVISOR
Dr. Lim Thien Sang

_____

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ABSTRACT

This study aims to investigate the factors underlying the open gap that occurs daily in the Futures Crude Palm Oil (FCPO) market. This is crucial, as it directly impacts the profit and loss in market participants' portfolios. This study explored both causality and volatility empirical modelling in order to describe this daily phenomenon. The Autoregression Distributed Lags (ARDL) model was employed to investigate the causality between the closing price of Soybean Oil Futures (SBOF), Brent Crude Oil Futures (Brent), spot price of MYR against USD (EXR), and Kuala Lumpur Composite Index (KLCI), with the opening price of FCPO. This study then examined volatility spillovers by employing the Generalized Autoregressive Conditional Heteroscedasticity in Mean (GARCH-M) Model in order to investigate spillovers from SBOF, Brent, EXR, and KLCI to FCPO markets. Daily data spanning from 3rd January 2006 until 29th May 2020 was used, and was divided into five samples, namely full sample, Food Crisis 2006-2008, Global Financial Crisis, Oil Crash 2014-2016, and Trade Wars between USA and China. The results from ARDL showed that the closing prices of SBOF, Brent, and KLCI were statistically significant and caused changes in the opening prices of FCPO. Meanwhile, for GARCH-M, intraday activities from SBOF were spilled and caused a negative influence on the opening price of FCPO. The findings obtained explain the factors behind the open gap occurring almost every day in the FCPO market. In addition, this study also discovered the information extracted from the opening price and the importance of time zone differences in trading, especially in ways that intraday activities in foreign markets are able to negatively influence the opening price of domestic markets. Thus, the results reported in this study will place an open gap in the FCPO market under the spotlight, especially in assisting market participants' portfolios, and suggestions to the Bursa Malaysia Derivatives in improving their products.

Keywords: FCPO, Open Gap, Opening Price, Daily Phenomenon, Causality, Volatility spillover, Time Zone Differences, Market Participant.

ABSTRAK

PEMODELAN EMPIRIKAL NIAGA HADAPAN MINYAK SAWIT MENTAH: ANALISIS JURANG TERBUKA

Kajian ini bertujuan untuk menyelidik faktor-faktor di sebalik jurang terbuka yang berlaku pada setiap hari di dalam pasaran Niaga Hadapan Minyak Sawit Mentah (FCPO). Menyelidik faktor-faktor di sebalik jurang terbuka adalah mustahak kerana ia memberi kesan yang terus pada untung rugi portfolio para peserta pasaran. Kajian ini meneroka model empirikal dari segi 'sebab dan akibat' serta 'tahap ruap' untuk menyingkap fenomena harian ini. Model Lat Tertabur Autoregresif (ARDL) telah diaplikasikan untuk meneliti hubungan antara harga tutup Niaga Hadapan Minyak Soy (SBOF), Niaga Hadapan Minyak Mentah (Brent), Pertukaran Matawang Ringgit Malaysia berbanding Dolar Amerika (EXR), dan Indeks Komposit Kuala Lumpur (KLCI) dengan harga buka Niaga Masa Hadapan Minyak Sawit Mentah (FCPO). Kajian ini kemudiannya menyelidik tahap kestabilan limpahan dengan mengaplikasikan Model Purata Heteroskedastisiti Bersyarat Autoregresif Umum (GARCH-M) bagi mengkaji limpahan dari SBOF, Brent, EXR, dan KLCI kepada pasaran FCPO. Data harian yang digunakan adalah dari 3 Januari 2006 sehingga 29 Mei 2021 dan telah diasingkan kepada 5 sampel, iaitu sampel penuh, Krisis Makanan 2006-2008, Krisis Kewangan Global, Krisis Minyak 2014-2016, dan Perang Dagang USA-China. Keputusan daripada ARDL menunjukkan harga penutup bagi SBOF, Brent, dan KLCI adalah secara statistiknya amat signifikan dan menyebabkan perubahan pada pembukaan harga FCPO. Sementara itu, bagi GARCH-M, aktiviti sehari daripada SBOF telah melimpah dan mengakibatkan pengaruh negatif terhadap pembukaan harga FCPO. Dapatan daripada kajian ini adalah penemuan besar yang menjelaskan faktor di sebalik jurangan terbuka yang berlaku setiap hari dalam pasaran FCPO. Selain itu, kajian ini juga telah mengungkap informasi yang dipetik dari pembukaan harga dan kepentingan perbezaan zon masa dalam perdagangan terutamanya mengenai bagaimana aktiviti perdagangan asing dalam sehari dapat memberi impak negatif ke atas pembukaan harga pasaran domestik. Oleh itu, penemuan daripada kajian ini dapat memberi lebih tumpuan ke atas jurang terbuka dalam pasaran FCPO, khususnya dalam memberi panduan kepada portfolio peserta pasaran, dan cadangan kepada Derivatif Bursa Malaysia untuk menambah baik produk unggul mereka.

Kata kunci: FCPO, Jurang Terbuka, Fenomena Harian, Akibat Kausal, Limpahan Kemeruapan, Perbezaan Zon Masa, Peserta Pasaran.

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LIST OF ABBREVIATIONS

BRENT	-	Brent Crude Oil Futures
BMD	-	Bursa Malaysia Derivatives
BNM	-	Bank Negara Malaysia
CBOT	-	Chicago Board of Trade
CEO	-	Chief Executive Officer
CME	-	Chicago Mercantile Exchange
COMMEX	-	Commodity and Monetary Exchange
CPO	-	Crude Palm Oil
EU	-	European Union
EXR	-	Exchange rate between USD against MYR
FCPO	-	Futures Crude Palm Oil
FKLI	-	FTSE Bursa Malaysia KLCI Futures
GMT	-	Greenwich Mean Time
ICE	-	Intercontinental Exchange
KLCE	-	Kuala Lumpur Commodity Exchange
KLCI	-	Kuala Lumpur Composite Index
KLOFFE	-	Kuala Lumpur Option and Financial Futures Exchange
KLSE	-	Kuala Lumpur Stock Exchange
MDEX	-	Malaysia Derivatives Exchange
MME	-	Malaysia Monetary Exchange
MPOB	-	Malaysian Palm Oil Board
MYR	-	Malaysian Ringgit
OPF	-	Oriental Pacific Futures
RHBIB	-	RHB Investment Bank
S&P500	-	Standard and Poor 500
SBO	-	Soybean Oil
SBOF	-	Soybean Oil Futures
USD	-	United States Dollar
WTI	-	WTI Crude Oil Futures

CHAPTER 1

INTRODUCTION

1.1   Background of Study

Bursa Malaysia Derivatives Berhad (BMD) is the single derivatives exchange available in Malaysia, which was previously known as Malaysia Derivatives Exchange (MDEX). BMD began on 11th June 2001 as the result from the merger of Commodity and Monetary Exchange of Malaysia (COMMEX) and Kuala Lumpur Option and Financial Futures Exchange (KLOFFE). COMMEX and KLOFFE were merged to form MDEX and were later re-named to BMD.

The evolutionary cycle of derivatives in Malaysia reached its final point with the establishment of BMD. In late 1998, Malaysia had three derivatives exchanges with three different contracts. The rationalisation of economics changed from several rounds of mergers into one single exchange, yet offering all available contracts in Malaysia. BMD was wholly owned by Bursa Malaysia until September 2009 when the Chicago Mercantile Exchange (CME) Group Incorporated took 25% of the equity stake and established a strategic partnership with Bursa Malaysia.

This business strategic collaboration aimed to bring commodities listed in BMD to the global marketplace, whereby this collaboration was expected to further develop Malaysia's derivatives industry and to internationalise all products listed in BMD. On the whole process, this partnership indirectly boosted contributions in terms of revenue of BMD. Nevertheless, among all products available, one of the most outstanding is Crude Palm Oil Futures (FCPO), where a majority of the total volume traded and revenue generated for BMD are actually from FCPO.
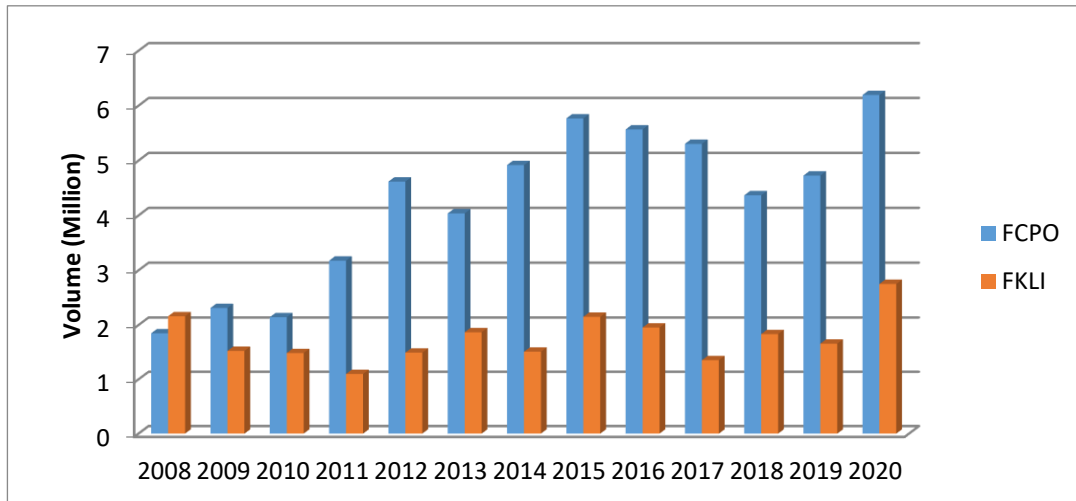
Figure 1.1 : **Total Annual Volume Traded for FCPO and FKLI**

Source : Bursa Malaysia Derivatives Berhad (2019)

Figure 1.1 shows the differences in volume traded between FTSE Bursa Malaysia KLCI Futures (FKLI) and FCPO. The link with CME that results in access to their trading platform is among the factors that contribute to the higher traded volume of FCPO. BMD sells 25% of its stake, which is worth Malaysian Ringgit (MYR) 55.6 million, to CME. The purpose of this partnership was solely to bring Malaysia's top commodity and derivatives products, which were physical crude palm oil and FCPO, to the global marketplace. This is a major milestone for both the exchange and the country's derivatives market. Subsequently, upon the start of this partnership, BMD's derivative products were available for trading in the CME global electronic trading, known as Globex. In 2011, a year after the migration onto the CME Globex trading platform, the FCPO volume traded reached a historical year high. The internationalisation strategy practised by BMD managed to attract foreign institutions and retailers to participate in the business of FCPO, which helped to consolidate Malaysia's position as the leader of palm oil's price discovery centre.

BMD offers three types of derivatives, namely equity, commodity, and interest rate derivatives as shown in Table 1.1. It consists of 13 products but among all the products offered, only FKLI and FCPO are traded more than a million annually by foreign, local, and retail participants, and institutions.

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Table 1.1: Bursa Malaysia Derivatives Berhad List of Products

Equity Derivatives	Commodity Derivatives	Interest Rate Derivatives
•FTSE Bursa Malaysia KLCI Futures (FKLI) •FTSE Bursa Malaysia KLCI Options (OKLI) •Single Stock Futures (SSF)	•Crude Palm Oil Futures (FCPO) •USD Crude Palm Oil Futures (FUPO) •Crude Palm Kernel Oil Futures (FPKO) •USD Refined, Bleached, Deodorised (RBD) Palm Oil Futures (FPOL) •Options on Crude Palm Oil Futures (OCPO) •Gold Futures (FGLD) •Tin Futures (FTIN)	•3 Months Kuala Lumpur Interbank Offered Rate (KLIBOR) Futures (FKB3) •3 Years Malaysian Government Securities (MGS) Futures (FMG3) •5 Years Malaysian Government Securities (MGS) Futures (FMG5)

Source   : Bursa Malaysia Derivatives Berhad (2022)

While FKLI is derived from the Kuala Lumpur Composite Index (KLCI), it represents the performance of the Malaysian stock market, with FCPO going ahead as the only exchange traded crude palm oil in the world although Malaysia is the second largest producer after Indonesia. Market participants are using FCPO as the reference price for palm oil around the world. Go and Lau (2015) stated that FCPO is one of the active futures markets in the world under BMD, while Noriza, Noraini, Noredi, and Normaisarah (2013) and Noryati (2010) claimed that FCPO is the most successful product offered by BMD.

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                    ┌──────────────┐
                    │    CRUDE     │
                    │   PALM OIL   │
                    └──────────────┘
          ┌────────────────┴────────────────┐
┌─────────────────────────┐   ┌─────────────────────────┐
│ MALAYSIA PALM OIL Board │   │ BURSA MALAYSIA DERIVATIVES│
│         (MPOB)          │   │          (BMD)          │
└─────────────────────────┘   └─────────────────────────┘
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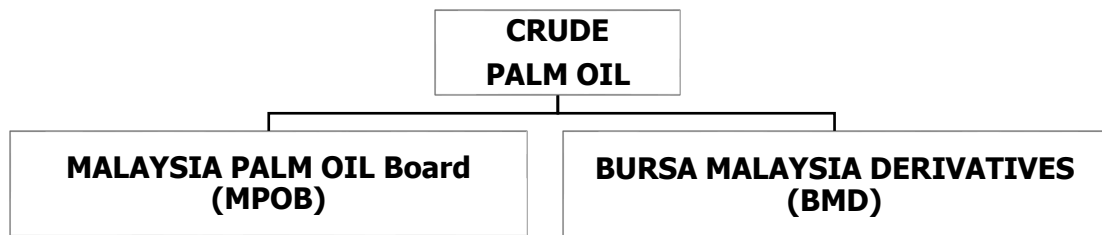
Figure 1.2   : Crude Palm Oil Markets in Malaysia

Source   :   Malaysian Palm Oil Board (2019)

Understanding the function of FCPO requires knowledge of the two markets for palm oil in Malaysia, as shown in Figure 1.2. The first is the physical crude palm oil used by registered farmers, producers, exporters, and refineries, where all the prices are compiled and released by the Malaysian Palm Oil Board (MPOB). The second market is managed and run by BMD where all players can participate without any registration with MPOB. While MPOB deals with registered farmers, producers, and refineries, market participants under BMD include hedgers, arbitragers, and speculators. A primary difference between these markets is that the users under MPOB transact physical crude palm oil on the spot or negotiate prices with immediate delivery in one to three months, whereas the FCPO market participants, under BMD, provide contracts that expire in one to eight months.

Figure 1.3 demonstrates the movement of the price of FCPO. The highest points printed were 4,330 in July 2007, while the lowest was 1,370 in October 2008. With the range of 2,603 points, it attracts all the market participants around the world to participate in the trading of FCPO. Every point change indicates a price movement of FCPO and is very important to the market participants' portfolio. Mohd Bakke Salleh, the previous chairperson of MPOB and CEO of Sime Darby Plantation Berhad, gave a statement in 2014 where he claimed that every 100-point drop in the index of FCPO translates into a loss of RM250 million in Sime Darby's profit. Therefore, every one-point change will lead to RM2.5 million of profit and loss. Clearly, FCPO, the benchmark of crude palm oil, becomes very important for every market participant's portfolio.
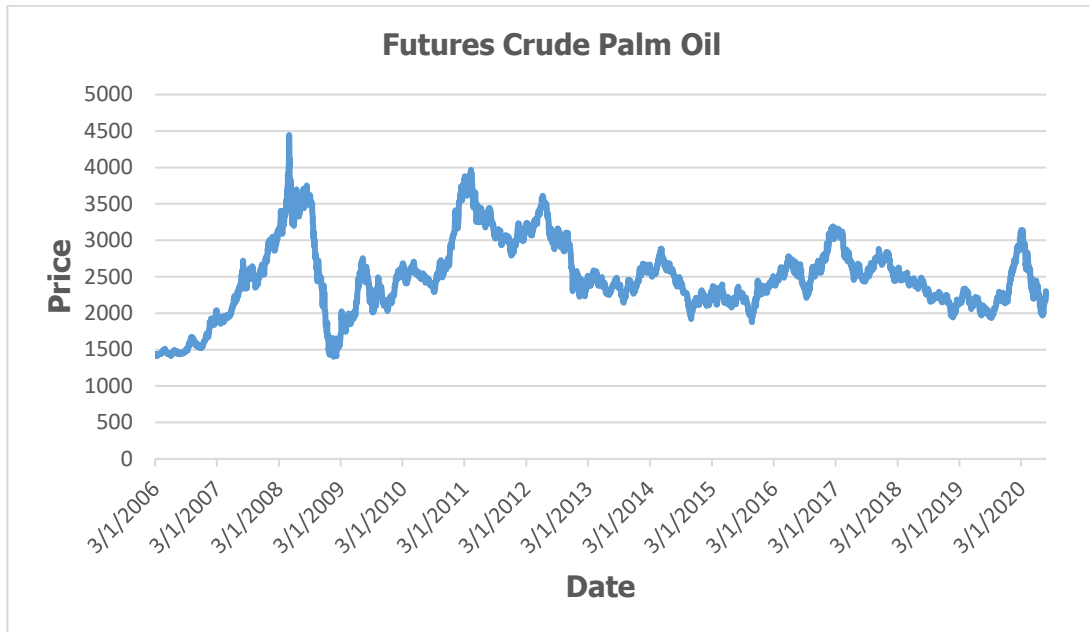
Figure 1.3 : Futures Crude Palm Oil price from 2006 to 2020

Source : Investing.com Streaming Chart

1.2 Futures Crude Palm Oil

FCPO is a commodity derivative listed in BMD. An FCPO contract is denominated in MYR with the underlying instrument of palm oil, and provides market participants with a global price benchmark since October 1980. Although Malaysia is the second largest producer of crude palm oil after Indonesia, FCPO is the only benchmark index available. Therefore, it becomes the reference point for market participants around the world in the edible oils and fats industry.

The FCPO trading method significantly differs from the Malaysian stock market. Specifically, the former requires a minimum trade of one lot, whereas the latter sets the minimum requirement at 100 units. The initial margin is the minimum requirement to trade FCPO, an amount that is set by BMD, though this amount can change depending on the occurrence of an event or level of volatility. BMD would increase the initial margin, and vice versa. In order to participate in FCPO trading,

market participants have no choice but to comply with all the rules and regulations set by regulators.

Table 1.2: Part of Contract Specification for Futures Crude Palm Oil

Contract Code	FCPO
Underlying Instrument	Crude Palm Oil
Contract Size	25 metric tone
Minimum Price Fluctuation	RM1 per metric tone

Source : Bursa Malaysia Derivatives Licensing Handbook.

Table 1.3: Event of Crude Palm Oil Price Drop 20 Percent

Action	Position Today	Position at Maturity	Profit/Loss
Long inventory position	RM275,000	RM220,000	(RM55,000)
Short 10 FCPO	RM281,632.50	(RM220,000)	RM61632.50
Less storage cost	-	(RM2750)	(RM2750)
Net gain			RM3882.50

Initial value of position	RM275,000
Unhedged value at maturity	RM220,000
Profit from short FCPO	RM61,632.50
Less storage cost	(RM2750)
Value of hedged position	RM278,882.50

Source : Financial Derivatives Markets and Applications in Malaysia 4th Edition

The Securities Commission, Bursa Malaysia, and Obiyathulla (2016) generally stated three broad applications for FCPO, which are hedging, arbitraging, and speculating. Hedgers are commodity producers or refinery companies who place a trade in order to protect their positions against price fluctuations in commodities. BMD typically allows them to hedge their position for up to two years. Normally, a crude palm oil producer sells the FCPO contract when the price of palm oil is in a downward trend, and the crude palm oil refinery buys the FCPO contract when the

price of palm oil is in the uptrend. Tables 1.3 and 1.4 show examples of hedging in FCPO.

Table 1.4: Event of Crude Palm Oil Price Up 20 Percent

Action	Position Today	Position at Maturity	Profit/Loss
Long inventory position	RM275,000	RM330,000	RM55,000
Short 10 FCPO	RM281,632.50	(RM330,000)	(RM48367.50)
Less storage cost	-	(RM2750)	(RM2750)
Net gain			RM3882.50

Initial value of position	RM275,000
Unhedged value at maturity	RM330,000
Loss from short FCPO	(RM48,367.50)
Less storage cost	(RM2750)
Value of hedged position	RM278,882.50

Source : Financial Derivatives Markets and Applications in Malaysia 4th Edition

Regardless of the increase or decrease in the price by 20%, the value of hedged positions remains the same. This is the main objective of hedging, which is to lock the value. Under both events, the value of hedged positions is higher than the initial value of RM275,000, which was RM3,882.50. This gain represents the return from the hedging activity and also represents the risk-free rate. Arbitrage occurs when two markets are engaged in the trading of the same product.

The arbitrager seizes an opportunity when the price of physical crude palm oil deviates from the price of FCPO. Then, the arbitrager buys crude palm oil and then sells FCPO contract, or vice versa. On the other hand, a speculator is a trader who benefits from the movement of the price of crude palm oil by predicting price changes and extracting profit from the price movement of FCPO. Therefore, speculators do not intend to own or take delivery of crude palm oil.

Table 1.5: Event of FCPO Price in Uptrend

Current price of FCPO	RM2360
Buy 1 contract of FCPO	RM2360
Close buy contract of FCPO	RM2380
Gross profit	20 points x RM25 = RM1000

Source : Bursa Malaysia Derivatives FCPO Brochure

Table 1.6: Event of FCPO Price in Downtrend

Current price of FCPO	RM2360
Short 1 contract of FCPO	RM2360
Close short contract of FCPO	RM2340
Gross profit	20 points x RM25 = RM1000

Source : Bursa Malaysia Derivatives FCPO Brochure

The role of the speculator in FCPO trading is shown in Tables 1.5 and 1.6. Hedgers, arbitragers, and speculators are the main market participants in the FCPO market, according to Bursa Malaysia and Securities Commission. Although they have different purposes and objectives, all of them deploy fundamental and technical analysis in their decision-making on whether to buy or sell at certain levels of price. Speculators participate in both uptrend and downtrend markets in order to make a profit. However, they are only involved in the FCPO market, in contrast with hedgers and arbitragers who deal with palm oil markets. Prices of FCPO demonstrate both uptrend and downtrend, prompting all participants to apply various strategies to address and mitigate consequent risks.

Catlett (1977) defined the fundamental analysis user as a fundamentalist and technical analysis user as a market technician. A fundamentalist basically relies on the supply and demand of the commodity, to determine the futures commodities physical price movement. Macroeconomic data that include export, production, stockpile, and weather are taken into account in forecasting the next movement of the commodity price. On the other hand, a market technician uses the historical price chart to forecast the next futures price. As would be explained in subsequent