971

Int. J Sup. Chain. Mgt
Vol. 9, No. 1, February 2020

Supply Chain Strategy for World Price of Crude Palm Oil and Its Production on Palm Oil Marketing Margins in Indonesia: An Application of Pairwise Granger Causality

Syahril[1], Jumadil Saputra[2*], Alisman[1], Affandi[1], Helmi Noviar[1], Rollis Juliansyah[1], Mahrizal[1]

Department of Economics Development, Faculty of Economics, Universitas Teuku Umar, Meulaboh, Aceh Barat, Indonesia

[2]*Department of Economics, Faculty of Business, Economics and Social Development, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia*
[2]jumadil.saputra@umt.edu.my

Abstract- **This study aims to examine the supply chain strategy in causal relationship between world CPO price causality, production and marketing margin price using the Granger causality approach in the period January 2006-December 2017. This research proves that: (i) The results of the bivariate causality test explain that Indonesian CPO production has a single causality direction with world CPO prices. (ii) The results of the impulse response function and variance decomposition explain that the shock of the marketing margin variable gives a fluctuating response to fluctuations in world CPO prices, but the response is always positively given by the shock marketing margin in response to changes experienced by the variable world CPO prices. The results of this study are efforts to increase the price of CPO in the country by encouraging the development of palm oil derivative industries in increasing derivatives of high economic value products.**

Keywords- *World Price of Crude Palm Oil, Palm Oil Production, supply chain strategy, Palm Oil Marketing Margins, Granger causality and Vector Error Correction Model*

1. Introduction

The supply chain optimization and risk assessment were included in the framework proposed to manage the palm oil supply chain more effectively. Palm oil is Indonesia's mainstay commodity, which has importantly contributed to the Indonesia economy and has led to the achievement of the distribution of development towards a prosperous society [1-10]. It becomes a source of income, creating jobs, a source of foreign exchange, accelerating the reach of new economic centers for regional development in Indonesia [11-15]. Although palm oil is the biggest commodity and encourages the development of isolated regions in Indonesia, the disparity in the domestic and world prices of fresh fruit bunches (FFB) of palm oil, have a direct response due to fluctuations in the world CPO prices. It has an impact on farmers, collectors and exporters' marketing margins.

The study has been the substance of studies on marketing margins on palm oil commodities that have been widely carried out, including [6] looking at marketing margins from PKS to independent smallholders. Then a study conducted by [13] which sees a short-term and long-term balance between volatility in world CPO prices, Indonesian CPO production and palm oil marketing margins. Then look at the multivariate relationship between marketing margins with the volatility of world CPO prices and palm oil production. However, the study has not looked at the bivariate causality relationship between marketing margins with the volatility of world CPO prices and palm oil production. Then see shocks on the volatility of world CPO prices and palm oil production which is responded to by marketing margins. Next, look at the response and contribution of the variable volatility in world CPO prices and palm oil production to marketing margins. By examining more deeply related to the issue, this study can become an input for autonomy in formulating policies that maintain the balance and sustainability of oil palm plantations and their derivatives. This study examines the utilization of oil palm biomass residues in Indonesia. A cost–benefit analysis was performed to identify optimal ways to fully utilize residues along the palm oil supply chain

2. Literature Review

Studies relating to marketing margins have carried out both locally and abroad. Such as domestic studies that identified the large share prices in each marketing channel [2,16,17] with each study being coconut, cocoa and shallots. The overseas study conducted in Thailand by [3] looked how the transmission of retail prices of agricultural products and its marketing margin. It is even more interesting in this study focused on palm oil commodities because it proves that the increase in palm oil has responded positively to an increase in farmers' income, although from the other side it has an impact on rising food prices [4].

As a producer country, Indonesia is very positive in responding to the movement of palm oil

prices. It aims to encourage the attainment of farmers' welfare, but the problem is that the increase in palm oil prices is not necessarily a margin of increase in prices obtained by farmers, because good intermediaries may obtain this margin at the level of traders, palm processing factories and exporters. It proves that this concern is valid, wherein the spotlight in developing countries is that intermediary marketing is a parasite [8]. Then these findings are also in line with the study of [5] which proves that agricultural commodities if high marketing margins will have an impact on low prices at the farm level. Various studies on palm oil have used the VECM model, as conducted [13] whom both looked at causality, response impulse and variance decomposition, but differed in the substance of the study related to the impact of oil palm on the environment and also the different variables used.

3. Methodology

This research uses secondary data from various sources, including Bank Indonesia, Central Statistics Agency, WTO and FAO. We use time-series data that is monthly data in the period from January 2008 - December 2017. The data meets the conditions of the minimum number of time series data (Narayan & Narayan, 2005). Then this study uses equations to answer the research objectives formulated as follows:

$$MMC_t = a_0 + a_1 CPV_t + a_2 ICP_t + \varepsilon_t \quad (1)$$

Where MMC is marketing margin, CPV is the volatility of world CPO prices, ICP is Indonesian CPO production, and ε is the error term.

The first step in this study is the data stationary test using the Dickey-Fuller (ADF) and Phillips-Perron (PP) Augmented Unit-Root test. Second, if the data proven stationary, proceed with the Johansen Cointegration test. Then the estimation model of the bivariate causality relationship performed using Pairwise Granger Causality Tests, shocks and contribution of world CPO price, production and marketing margin price are analyzed using the Impulse Response and Variance Decomposition approach. Thus, the VECM equation is as follows:

$$\Delta MMC_t = a_0 + a_1 \sum_{i=1}^{n} CPV^\wedge_{t-1} + a_2 \sum_{i=1}^{n} ICP_{t-1} + ECT_{1_{t-1}} \quad (2)$$

$$\Delta CPV^\wedge_t = a_0 + a_1 \sum_{i=1}^{n} MMC_{t-1} + a_2 \sum_{i=1}^{n} ICP_{t-1} + ECT_{2_{t-1}} \quad (3)$$

$$\Delta ICP_t = a_0 + a_1 \sum_{i=1}^{n} MMC_{t-1} + a_2 \sum_{i=1}^{n} CPV^\wedge_{t-1} + ECT_{3_{t-1}} \quad (4)$$

4. Results and Discussion

4.1 Stationary and co-integration test results

The elements of supply chain accounting quality, namely; value relevance, earnings management and timely loss recognition had significant positive relationship with supply chain management. The result of unit root test shows that the data stationer in first difference or I (1). Whereas the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) Indonesian CPO (ICP) production methods are not stationary and the Kwiatkowski-Philips-Schmidt Shin (KPSS) method) volatility in stationary world CPO prices at a 5 percent significance level and marketing margin (MMC) and stationary Indonesian CPO (ICP) production at a 10 percent significance level. Then to determine the optimum lag with the criteria LR, FPE, AIC, SC and HQ order 1, the optimum lag length is lag 1. The cointegration test results prove that the trace statistic and maximum eigenvalue values are higher than the critical value at the level alpha confidence of 5%, thus it concluded that cointegration occurs, meaning that all variables used in this study are all cointegrated.

4.2 Analysis of bivariate causality and multivariate causality between world CPO prices and palm oil production on marketing margin volatility

The results of the bivariate causality test by using the Granger causality test show that the Indonesian CPO production variable (ICP) has a causality of one with volatility in world CPO prices (CPV) using a 10 percent probability level, but not vice versa. It shows that Indonesia's role as the world's largest CPO producer [15-17] and this has the potential to influence the global CPO price movements.

Table 1. Bivariate Marketing Margin Estimation Results

Null Hypothesis	Font	P rob.	Null Hypothesis	F-Statistic	ob.	Pr
CPV ≠MMC	1.16502	0.3157	CPV ≠MMC	0.02393	764	0.9
MMC ≠ CPV	0.07597	0.9269	MMC ≠ CPV	3.45256	351	0.0
ICP ≠ MMC	0.80111	0.4514	ICP ≠ MMC	0.00875	913	0.9

Note: = there is a significant relationship and ≠ there is no significant relationship.

However, this has not realized because Indonesia's position in the economy is so vulnerable that it seems only as a price taker of the control of importing countries and especially countries producing palm oil substitutes.

4.3 Shocks analysis of the volatility of world CPO prices and palm oil productions

Figure 1 shows the impact of changes in Indonesia's palm oil marketing margin by one standard deviation on fluctuations growth in global CPO price volatility, using a 20-month time horizon. In the first month the increase of Indonesia's palm oil marketing margin did not affect the shock of world CPO price growth of one standard deviation. Then from the first period to the second period the marketing margin responds negatively to the volatility of world CPO prices (CPV). Furthermore, the second period and so on marketing margins respond positively to the volatility of world CPO prices until it influences equilibrium.

The change in Indonesia's palm oil marketing margin variable is one standard deviation to the change in Indonesia's CPO production growth, using a 20-month time horizon. At that point, in the first month the growth of Indonesia's palm oil marketing margin did not affect the shock of Indonesia's CPO production growth of one standard deviation. Then from the first period onwards the marketing margin responds positively to Indonesia's CPO production until it reaches balance. It indicates that the increase in marketing margins is caused by an increase in prices so that it encourages business players to increase production in the short term by using fertilizer and intensive care and expanding new areas in the long run. The results of the impulse response function model 2 can be shown in Figure 1 as follows:
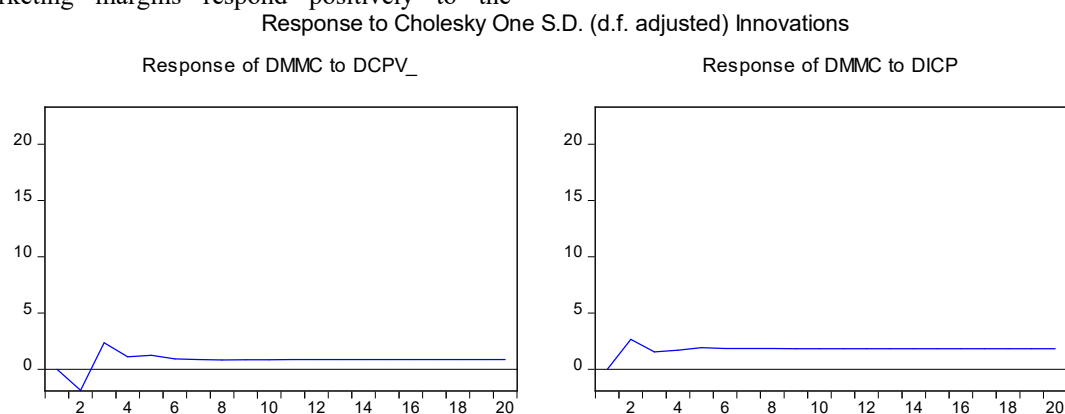
Response to Cholesky One S.D. (d.f. adjusted) Innovations

Figure 1. The Impulse Response Function

Variance Decomposition

Table 2 shows that when the shock of the marketing margin, it can explain as well as the marketing margin itself is 98.57 percent. It explained by the CPV variable of 0.97 percent and DICP of 1.36 percent. It means that shocks that occur in marketing margins are more dominated by explaining the marketing margin variables themselves. Fluctuations in Indonesia's CPO production can be explained by shock to the marketing margin is higher than the world CPO price of 1.36 percent. It illustrates that there is a relationship between Indonesian CPO production and marketing margins as explained in bivariate causality, multivariate causality and impulse response function. Once the world CPO price shocks, the contribution of the variable itself is more dominant at 99.40 percent. Meanwhile, the MMC and ICP variables explained were 11.86 percent and 9.19 percent respectively. The marketing margin variable is higher than the CPO production variable to explain the shock of world CPO prices.

Table 2. The Result of Variance Decomposition (VD)

Variable	MMC		CPV		ICP	
MMC	(2)	98,53	(10)	11,86	(3)	0,22
CPV	(3)	0,97	(1)	99,40	(10)	1,97
ICP	(10)	1,36	(10)	9,19	(1)	99,43

Note: () = period with the highest value

Furthermore, when there is a shock in the production of CPO, the contribution of the variable itself is more dominant at 99.43 percent. While the MMC and CPV variables explained were respectively 0.22 percent and 1.97 percent. The marketing margin is smaller than the global CPO price variable to explain the shock of Indonesia's CPO production

5. Conclusions

The challenges faced by the palm oil industry in Indonesia lie in the supply chain risk management, specifically in the integration of decision-making at the operational level. Bivariate causality test results illustrate that Indonesian CPO production has one-way causality with the volatility of world CPO prices. It shows that Indonesia's CPO production as the world's largest producer influences the world CPO price movements. Multivariate causality test results show that Indonesian CPO production has a one-way causality relationship with the volatility of world CPO prices. It shows that Indonesia's CPO production as the world's largest producer influences the world CPO price movements. Increased production will be responded negatively by the importing country where the importing country limits the CPO demand by the contract, meaning that there is price stickiness. The results of the impulse response function and variance decomposition explained that the shock of the marketing margin assigned a fluctuating response to changes in world CPO prices. However, a positive response is always given by the shock marketing margin in response to changes experienced by the variable world CPO prices. For improving the welfare of oil palm farmers, the government needs to adopt a policy of determining FFB prices with more intensive supervision through the design of a digital control system that links to all PKS and collecting traders, so that at any time the movement of FFB prices can be identified. Also, studies are needed in each palm oil-producing region in Indonesia related to palm oil marketing margins, especially looking at the supply chain from upstream to downstream.

References

[1] Nasution, A. H. "*Analisis Faktor-faktor Yang Mempengaruhi Pajak Ekspor Terhadap Perdagangan Minyak Sawit Di Indonesia",* PEKBIS (Jurnal Pendidikan Ekonomi Dan Bisnis), Vol 8, No. 1, pp. 62-72, 2016.

[2] Jumiati, E., Darwanto, D. H., & Hartono, S. "*Analisis Saluran Pemasaran dan Marjin Pemasaran Kelapa Dalam di Daerah Perbatasan Kalimantan Timur",* Agrifor, Vol 12, No. 1, pp. 1-10, 2013.

[3] Kinnucan, H. W., & Zhang, D, "*Notes on farm-retail price transmission and marketing margin behavior*", Agricultural Economics, Vol 46, pp. 729–737, 2015. https://doi.org/10.1111/agec.12188

[4] Kochaphum, C., Gheewala, S. H., & Vinitnantharat, S, "*Energy for Sustainable Development Does biodiesel demand affect palm oil prices in Thailand ?*", Energy for Sustainable Development, Vol 17, No. 6, pp. 658–670, 2013. https://doi.org/10.1016/j.esd.2013.07.005

[5] Magfiroh, I. S., Rahman, R. Y., & Setyawati, I. K, "*Respon Harga Produsen Terhadap Perubahan Harga Konsumen Bawang Merah di Indonesia*", JSEP, Vol 10, No. 3), pp. 7–15, 2017.

[6] Maharani, E, "*Analisis Saluran Pemasaran dan Transmisi Harga Tandan Buah Segar (TBS) Kelapa Sawit pada Petani Swadaya*", Pekbis Jurnal, Vol 5, No. 1, pp. 13–23, 2013.

[7] Perkebunan, D. J, "*Statistik Perkebunan Kelapa Sawit Indonesia*", Jakarta: Direktorat Jenderal Perkebunan Kementerian Pertanian Republik Indonesia, pp. 1–78, 2015.

[8] Pokhrel, D. M., & Thapa, G. B, "*Are marketing intermediaries exploiting mountain farmers in Nepal ? A study based on market price, marketing margin and income distribution analyses*", Agricultural Systems, Vol 94, pp. 151–164, 2007. https://doi.org/10.1016/j.agsy.2006.08.004

[9] Rauf, R. A, "*Dampak Kebijakan Pajak Ekspor Minyak Sawit Mentah (CPO) Terhadap Kinerja Makroekonomi dan Sektoral di Indonesia: Pendekatan Model Kesimbangan Umum*", Agroland, Vol 14, No. 3, pp. 172–180, 2007.

[10] Busyra, R. G, "*Dampak Revitalisasi Perkebunan Pada Komoditas Kelapa Sawit Terhadap Perekonomian Propinsi Jambi*", Jurnal Ilmiah Universitas Batanghari Jambi, Vol 14, No. 1, pp. 30–36, 2014.

[11] Indonesia, S. N. R, *Undang-Undang Republik Indonesia Nomor 34 Tahun 2004 tentang Tentara Nasional Indonesia*, Jakarta, 2004.

[12] Masbar, R., MAJID, M. S. A., & Syahnur, S, "*Does Indonesia As The World Largest Palm Oil Producing Country Determine The World Crude Palm Oil Price Volatility?*", Regional Science Inquiry, Vol 11, No. 1, pp. 93-104, 2019.

[13] Syahril, S., Masbar, R., Syahnur, S., Majid, S. A., Zulham, T., Saputra, J., ... & Irmayani, I. "*The effect of global prices of crude palm oil, marketing margins and palm oil plantations on the environmental destruction: An application of Johansen cointegration approach",* International Journal of Energy Economics and Policy, Vol 9, No. 4, pp. 305-312, 2019.

[14] Widyaningtyas, D., & Widodo, T, "*Analisis pangsa pasar dan daya saing CPO Indonesia di Uni Eropa*", Jurnal Manajemen Dayasaing, Vol 18, No. 2, pp. 138-145, 2017.

[15] Pillai, S, "*Rhoticity in Malaysian English: The emergence of a new norm? In U. Gut, R. Fuchs & E. M. Wunder (Eds.), Universal or diverse paths to English linguistics (pp. 23-40)*", Berlin: Mouton de Gruyter, 2015.

[16] Wardah, "*To what extend can the WTO Agreements help to combat poverty in developing countries? (Unpublished Master's thesis)*", University of Southampton, Southampton, 2008.

[17] Yusuf, Y. Q., Pillai, S., & Ali, N. T. A. M, "*Speaking acehnese in Malaysia*", Language & Communication, Vol 33, No. 1, pp. 50-60, 2013.