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SPOT, FORWARD AND FUTURES OF CPO ANALYSIS: THE CASE OF INDONESIA COMMODITY AND DERIVATIVES

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ABSTRACT

In this study, we investigate the impact of futures and forward price to spot price in Crude Palm Oil (CPO) in Indonesia Commodity and Derivatives Exchange. Studies in futures, forward and spot price are mix, in term of predicting variables and also the data. Some studies use financial products while the others use comodities. In term of variables, some studies use spot price as dependent variable, while the others use spot price as independent variable. Since those mix studies and also base on Gunarsih et al. (2017)'s causality study, this study analyses the impact of future and forward to spot price of CPO base on daily data in September 15th, 2015 to October 15th 2017. Using multiple regression analysis, the study shows that future and forward price have positive impact to spot price of CPO. This suggest that if there are increasing in future and spot price, then there will we an increasing in spot price of CPO.

Key Words: CPO, Spot, Forward, Futures

1. INTRODUCTION

There are numerous studies in the area of spot, forward and futures, either in data or in variables. Some studies are in financial products [1] and [2], while some others [3]. [4], [5], [6] are in non financial (comodity) products. Some studies predict spot price as dependent variables, while some others predict spot price as independent variables. Another study analyses the causality between futures and spot price [7].

The results of the studyin spot, forward and futures are still inconsistent. Hai, Mark and Wu [1] find that the forward rate may be an unbiased predictor of the future spot rate even though an increase in the forward premium predicts a dollar appreciation. Then the forward rate

is predictor of spot rate. Chen and Zhang [2] show that the stock index futures not significant effects on the volatility of spot market; however, there exist a co integration relationship in both long term and short term. Setyawan [4] shows that spot positively influence futures price, while forward price doesn't influence futures price. Mahardika [5] finds that there is no strong evidence that trading activity in futures exchange cause increase spot price fluctuations.Yunanto [6] shows that spot prices and forward prices are best predictor for CPO futures prices base on market based forecasting approach.

The inconsistencies of research in spot, futures and forward then are interested area for further research. This study analyses the impact of futures and forward to spot price base on CPO daily trading in Indonesian Commodity and Derivatives Exchange (ICDX) for period of September 15th 2015 until September 13th 2017. It ishypothesized that among other things, forward and futures influence spot price. This study extends Gunarsih [7] that investigate the causality between futures and spot price. Applying Engle-Granger causality test, they found that futures causes spot, but spot does not cause futures. Then this study analyse the impact of futures and forward price to spot price.

CPO is interesting commodity product in ICDX since it has the highest percentage in contract. Table 1 shows the multinational commodity contract from 2013 until 2016 in Jakarta Futures Exchange (JFX) and ICDX. Total number of multilateral contract in JFX years 2013 until 1016 are 326,855; 410,711; 700,261 and 882,755 respectively. Total number of multilateral contract in ICDX years 2013 until 1016 are935,717; 698,464; 580,540 and 564,198 respectively. While the total number of multilateral contract in JFX and ICDX in years 2013 until 1016 are 1,262,572; 1,109,175; 1,280,801 and 1,446,953 respectively. The numbers are fluctuating in a positive trend. The number of multilateral contracts show that there is increasing trend in JFX but decreasing trend number in ICDX.

The multilateral contract of CPO (CPOTR) is the highest percentage contract in ICDX in years 2013 until 2016, even the percentage number is decreasing. The percentage of CPOTR in years 2013 until 2016 are 84.99%, 86.66%, 75.73% and 67.89% respectively.

Table 1: Multinational Transaction Volume per Commodity Contract

Type of contract	2013	2014	2015	2016
MULTILATERAL JFX	326,855	410,711	700,261	882,755
AGRICULTURE	137,636	283,683	446,405	541,799
OLE	55,725	20,592	30,056	69,305
OLE 10	30,607	29,420	30,187	44,824
CCS	49,206	43,835	69,921	36,274
ACF	1,066	47,379	82,529	98,975
RCF	1,032	142,457	233,712	292,421
METAL (13 COMMODITIES)	189,219	127,028	253,856	340,956

MULTILATERAL ICDX	935,717	698,464	580,540	564,198
AGRICULTURE (2 COMMODITIES)	797,259	605,808	440,018	383,451
CPOTR	795,296	605,277	439,635	383,024
OLEINTR	1,963	531	383	427
METAL (7 COMMODITIES)	137,427	89,363	135,880	174,958
PALN	1,031	3,293	4,642	5,789
TOTAL MULTILATERAL	1,262,572	1,109,175	1,280,801	1,446,953

Source: BAPPEBTI ANNUAL REPORT 2016 [8], reinterpreted

2. LITERATURE REVIEW

2.1 Spot, Futures and Forward in Financial Product

Some studies in spot, futures and forward are in financial product, such as in exchnge rate and alsoindex. Hai, Mark and Wu [1] using spot and forward dollar prices of the pound, the franc, and the yen found the simple parametric model that is useful in understanding why the forward rate may be an unbiased predictor of the future spot rate even though an increase in the forward premium predicts a dollar appreciation. Then the forward rate is predictor od spot rate. In stock index, Chen and Zhang [2] analyze the impact of stock index futures on the stock market by using CSI 300 index. The result shows that the stock index futures not significant effects on the volatility of spot market; however, there exist a co integration relationship in both long term and short term. Granger causality analysis shows that the stock index future is not Granger cause to CSI 300, while the CSI 300 is Granger cause stock index futures.

2.2 Spot, Futures and Forward in Commodity Product

Some studies in spot, futures and forward are in commodity products, such as in CPO and also in metal. Setyawan [4] analysed the impact of spot price and forward to futures price of Crude Palm Oil (CPO) in Bursa Komoditi dan Derivative Indonesia (BKDI-Indonesia Comodity and Derivative Exchange). Using multiple regression analysis at 5% level of significance and secondary data, the results of the study show that spot positively influence futures price, while forward price doesn't influence futures price.

In metal commodity, Mahardika [5] analised the effects of six metals futures trading activity on London Metal Exchange (LME) to metal spot price fluctuations, using Augmented GARCH models. The data of this sudy were trading activities in September 2005 until March 2012. The result of this study, as well as the majority of previous studies show that there is no strong evidence that trading activity in futures exchange cause increase spot price fluctuations.

Other study in CPO are[3] and [6]. Yunanto [3] investigates the price relationship between the spot and future prices of CPO contracts traded in Malaysian Derivatives Exchange. Using historical variances of spot and futures price in 2003-2008, the expectation theory of

forward and random walk was applied in simple linier regresion and market based forecasting in multiple linier regression. The result shows that spot prices and forward prices are best predictor for CPO futures prices base on market based forecasting approach. Liu and Wan [6] investigate the asymmetries of exceedance correlations and cross correlations between West Texas Intermediate (WTI) spot and futures markets of crude oil. They employing the test statistic proposed by Hong et al. [11] as in [6] and find that the exceedance correlations were overall symmetric. However, the results from rolling windows show that some occasional events could induce the significant asymmetries of the exceedance correlations. They also employing the test statistic proposed by Podobnik et al. [12] as in [6] and find that the cross-correlations were significant even for large lagged orders. Using the detrended cross-correlation analysis proposed by Podobnika and Stanley[13] as in [6], they find that the cross-correlations were weakly persistent and were stronger between spot and futures contract with larger maturity. The results from rolling sample test also show the apparent effects of the exogenous events.

3 METHODOLOGY

3.1 Sample

Samples in this study are daily spot price, daily future prices and daily forward price of CPO in September 15th, 2015 to October 15th 2017 subject to data availability. The price of CPO that listed in Indonesian Commodity and Derivatives Exchange (ICDX)are downloaded from Bappebti website (http://www.bappebti.go.id).

3.2 **Diagnostic test**

Diagnostic tests are test of autocorrelation applying Durbin Watson (DW), Condition Index (CI) to test the multicollinearity and White general heteroskedasticity to test the heteroscedasticity. As a rule of thumb, there is no autocorrelation problem if DW statistic value is more than d_u (upper limit) and less than 4-d_u. There is no serious multicollinierity problem if CI less than 10 [14], if CI more than 10 but less than 30, there is a moderate multicollinearity problem but if CI more than 30, than there is a multicollinierity problem.

White general heteroskedasticity test is conducted to test the heteroskedasticity. As an illustration of the basic idea, the test for two independent variables are as follows [14]:

$$Y_t = \beta_1 + \beta_2 X_{2t} + \beta_3 X_{3t} + u_t \quad (1)$$

$$\hat{u}^2_i = \alpha_1 + \alpha_2 X_{2t} + \alpha_3 X_{3t} + \alpha_4 X^2_{2t} + \alpha_5 X^2_{3t} + \alpha_6 X_{2t} X_{3t} + v_t \quad (2)$$

1. Estimate (1) to obtain β_1,β_2, and β_3.
2. Compute u_t and then squared.
3. Estimate (2), used $\hat{u}^2_i$ as dependent variable.
4. Compute NR^2, N is number of samples and R^2 is unadjusted R^2 in the step 3.
5. Reject the null hypothesis that $\alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = 0$ if $NR^2 > X^2_5$ with 5 df.

3.3 Regression Model

This study employs regression modelto analyse the influence of forward and futures to spot price, as in (3).

$Sp_t = \beta_1 + \beta_2 Forw_t + \beta_3 Fut_t + u_t$ (3)

Where:

Sp_t = Daily Spot Price in day t

$Forw_t$ = Daily Forward Price in day t

Fut_t = Daily Futures Price in day t

4 RESULTS AND DISCUSSION

This section describes descriptive statistics, research finding and discussions.

4.1 Descriptive Statistics

Data in this study are 491 daily CPO prices of spot (IDR/kg), futures price (IDR/kg) and forward price (US$/ton). The spot price of CPO obtained by Bappebti from Medan, the Futures price are based on ICDX and the Forward price are base on Rotterdam market.The descriptive statitic of those three variabes are in Table 2. The minimum spot price (IDR/kg)of CPO is 6,201 the maximum price is 10,853 and the mean is 8,413.84. The minimum futures price (IDR/kg)ofCPO is 6,520 the maximum price is 10,410 and the mean is 8,716.73.The minimum for forward price (US$/ton) is 450 the maximum price is 858 and the mean is 691.44. The spot price and futures price which have the same unit of measure (IDR/kg) seem have almost the same number in descriptive statistics.

Table 2:Descriptive Statistics

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Spot (IDR/kg)	491	6,201.00	10,853.00	8,413.84	1,066.41
Futures (IDR/kg)	492	6,520.00	10,410.00	8,716.73	940.57
Forward (US$/ton)	492	450.00	858.00	691.44	79.60
Valid N (listwise)	491				

Figure 1 shows the movement of those three prices from September 15th, 2015 until September 15th, 2017. Spot and futures price seem have the same movement. The three prices seem have positive trend, even all prices are fluctuate. The tend of relatively similar trend in futures and forward is a candidate for the two variables have multicollinierity.

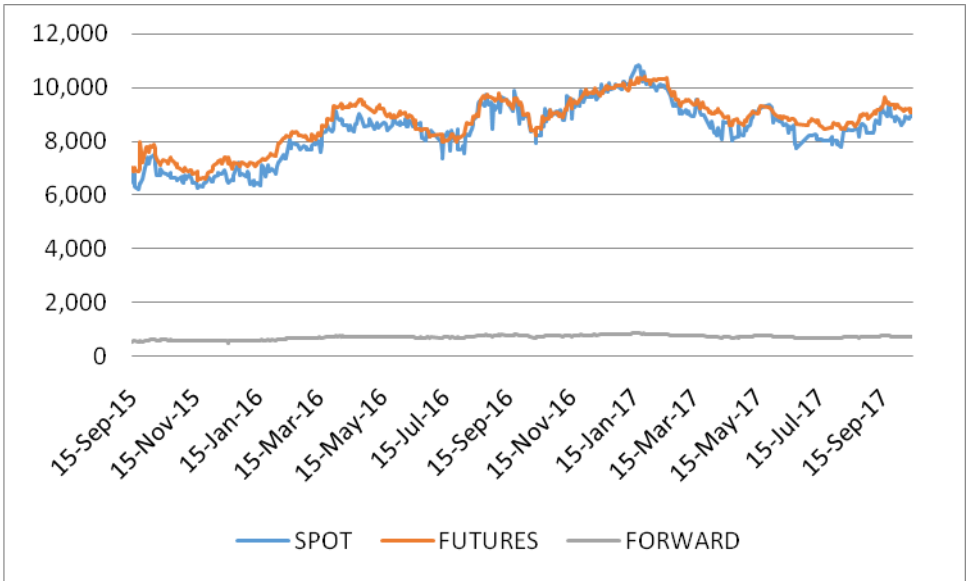

Figure 1: Daily Spot, Futures and Forward Price

4.2 Research finding

This section describes the diagnostic test and regression analysis results base on equation (3). The data were analyzed using SPSS and also eviews.

4.2.1 Diagnostic test

The results of multicollinierity test show that both independent variables have CI more than 10 but les than 30 (19.27 for futures and 17.64 for forward). Thesesuggest that the independent variables have moderate multicollinearity problem. Since the problem is moderate, then this study doesn't overcome the multicollinearity.

The results of autocorrelation test show the first DW value is 0.942. Since this value indicates that there is a positive autocorrelation problem, then this study overcome the problem. The result of the second DW statistic value is 2.022, indicates that there is no autocorrelation problem, since DW statistic value is more than d_u (upper limit) and less than 4-d_u.

The result of White general heteroscedasticity test shows that there is a problem of heteroscedasticity, since the F statistic is 40.709 and Obs*R-squared is 145.147. Both values are significant at α1%. This study then apply White heteroscedasticity-consistent standard errors & covariance to overcome the heteroscedasticity problem.

4.2.2Regression Analysis

Table 2 shows the results of regression analysis as in model (3). F statistic value is 11,276.81 significant at α1%. This suggests that the model is fit. *Adjusted* $R^2$is 0.9787, suggests that fluctuation of spot value 97.87% is explained by futures and forward while the rest (2.13%) is explained by another variables.

The results of table 3 show that coefficient of variable futures is positive, 0.307 and t value is 12.081 significant at α1%. This suggests that futures influence spot price positively. The spot price of CPO will increase if there is an increasing in futures price. The coefficient of variable forward is positive, 9.736 and t value is 32.3531 significant at α1%. This suggests that variable has positive impact to spot price of CPO. The spot price of CPO will increase if there is an increasing in forward price, and vice versa. This result supports [1] that found that forward is predictor in spot rate.

Table 3: Regression Analysis

Table2shows the results of regression model: $Sp_t = \beta_1 + \beta_2 Forw_t + \beta_3 Fut_t + u_t$ (3) to analyse the impact of futures and forward price to spot price. Number in parentheses is t value. *** significance atα1%. C.I. is Condition Index to test the multicollinearity. F Statistics, R^2 and *Adjusted* R^2 values from model (3). Durbin Watson stat is DW value from the first regression, while Durbin Watson stat OLS method is DW value from the second regression to overcome the autocorrelation problem. The results of White heteroscedasticity testare the last F statistics and Obs*R-squared.

	Spot	C.I.
Constant	-990.97 (15.11)***	1
Futures	0.307 (12.081)***	19.27
Forward	9.736 (32.353)***	17.64
F Statistics	11,276.81***	
R^2	0.9788	
Adjusted R^2	0.9787	
Durbin Watson stat	0.942	
Durbin Watson stat OLS method	2.022	
White heteroscedasticity tet		
F Statistik	40.709***	
Obs*R-squared	145.147***	
N (Number of observation)	491	

The results of this study show that there is relationship between futures and forward to spot price. Futures price and so the forward price are associated with the higher spot price. This result supports the argument thatforward and futures influence spot price. The investor then could use the trend of futures and forward price estimate the spot price. If futures and forward have increasing trend, then the spot price will have incresaing trend also.

5 CONCLUSION

The objective of this study is to analyse the impact of futures and forward price to spot price of CPO using daily price from September, 15, 2015 until September 15, 2017. Data in this study are 491 daily CPO prices of spot (IDR/kg), futures price (IDR/kg) and forward price (US$/ton). All of the data are download from Bappebti with different sources. The spot price of CPO obtained by Bappebti from Medan, the Futures prices are based on ICDX and the Forward prices are base on Rotterdam market.

The results of the study show that forward and futures price impact spot price positively and significant at α1%. This suggest that if there are increasing in futures and forward price, then there will be increasing in spot price. Then the investors may use this information as one of the considerations in CPO spot investment.

6 SUGGESTIONS

This study, subject to data limitation, only use three years daily data of CPO. Further resarch may use longger periode data. Further research may also use another comodity such as olein, coconut oil, cocoa, coffee, rubber, corn, gold, tin, to test wether those commodities have the same pattern as CPO or not.

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