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DOES OIL PRICE MATTER FOR THE MALAYSIAN STOCK MARKET?

Yasmin Bani[a,b] and Siti Noraini Ramli[a,c]

[a]*Department of Economics, Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Malaysia.*
(Email: [b]nor_yasmin@upm.edu.my, [c]noraini94.snr@gmail.com)

ABSTRACT

Uncertainty in the crude oil price has motivated researchers to analyze the relationship between oil prices and economic activities. In recent years, the literature has changed focus of the relationship to asset prices such as stock and gold prices. This paper investigates the effect of oil prices on Malaysian stock prices. We use monthly data for the period 2007-2016 and utilize the Auto Regressive Distributed Lag (ARDL) cointegration approach to estimate the short-run and long-run relationship between crude oil price and two different indices; namely FBMKLCI and FBMEMAS. We find that crude oil prices are cointegrated with both indices and the relationship is negative and significant in the long-run. This is consistent with theoretical expectations and existing empirical studies.

JEL Classification: C10, E44, G00

Keywords: Oil price, Stock market, FBMKLCI, FBMEMAS, ARDL

1. INTRODUCTION

Uncertainty in oil price has motivated researchers to study the effect of changes in crude oil prices on macroeconomic variables such as economic growth, employment, inflation and exchange rate globally. Malaysia, the second largest oil producer in Southeast Asia after Indonesia, is not immune to oil price affects. It is also one of the important crude oil exporters as it ranked as the 23rd largest natural-gas reserve and 30th largest crude oil reserve in the world (CIA, 2016). In 2014, the annual growth rate for the petroleum and natural gas industry increased around 3.4 percent with RM119.1 billion of gross output compared to RM115.1 billion in 2013. Recently, the price of crude oil increased and this trend already occurred during the last 30 years when the Malaysian government decided to use the Automatic Pricing Mechanism to regulate domestic prices. The increase in the world's oil price and depreciation of the Malaysian currency led to the spike in Malaysia's oil price. Since December 2014, the majority of oil producer countries had removed oil subsidies on consumption and had succeeded in applying a managed float system.

The Energy Information Administration (EIA) reported that the average daily production for Malaysia is approximately 669.71 barrels from 1994 to 2016, with the highest value of 791 barrels daily recorded in October 2004. The lowest record was at 489 barrels per day in May 2011. Malaysia's oil production started to decrease to 668 barrels daily in March compared to 674 barrels in February 2016. In November 2016, the New York Post reported that "the lowest oil prices fall to one-month" where it described the drop in oil due to hesitation of OPEC'S capability to execute its planned production cut, while global equity prices were wobbly. Malaysia was also affected. As a result, the fuel prices increased by 15 cents in November 2016.

According to Coronado, Rodriguez and Rojas (2018), stock price and oil price are closely related; however, the direction of the relationship is still ambiguous. Generally, as postulated by Jones, Leiby, and Paik (2004), crude oil price changes will influence the stock market price volatility through the effect on expected earnings. Miller and Ratti (2009) explained that oil is an important production input; hence the price changes will affect production costs and output demand in the domestic and global market. A world oil price shock will affect the cash flow discount rate as it influences the expected rate of inflation and real interest rate (Miller and Ratti, 2009).

In addition, as every stage of production needs oil as a resource, crude oil price increases will lead to higher production expenditure hence reducing company productivity and profit. Although some producers minimize their production costs by reducing labor, raw materials and operating costs to increase short-term profits, the long-run effect will be apparent. Concurrently, investors tend to recall firms' stock due to lower expected return in the future, which aligns with the concept of the weighted average cost of capital. Therefore, less capital investment will result in low economic activities.

Najaf (2016) stated that a country's economic situation can be reflected by the stock market movements. Currently, the

Malaysian stock market is one of the major leading financial markets in Southeast Asia and it plays a major role in supporting national growth. (FTSE Russel, 2016). However, since the financial market in Malaysia developed, it became more vulnerable to shocks and volatility of other markets. Among the indices traded in the market are the FBMKLCI index and FBMEMAS index. The FBMKLCI is Malaysia's headline index represented by the FTSE Group and Bursa Malaysia. The volume of FBMKLCI index is 130,889,100 with daily price ranging from 1,656.500 (low) until 1,669.810 (high). There are 30 popular companies under the FBMKLCI stock index. The most active companies in FBMKLCI index group are CIMB Group Holding, Sime Darby Berhad and Tenaga Nasional Berhad. The FBMEMAS index is a combination of the FBM Top 100 index and the FBM Small Cap index. This index is a free float adjusted market-capitalization weighted index representing the performance of approximately 98 percent of the Bursa Malaysia main market which passes the size, free float and liquidity screens.

Investigating whether the oil price shock effect is transmitted to the Malaysian stock market is very important. This is because 30% of the Malaysian government revenue is contributed by the oil and gas sector. Although the government is trying to cut reliance on oil revenue by diversifying, oil and gas remains one of the major contributing sectors in Malaysia. In addition, oil is commonly used as an investment asset and any changes in investment portfolios will directly influence the stock market. Stock market movements will then affect macroeconomics variables. While the literature has highlighted that rising oil prices have negative effect on the stock market, the empirical evidence on Malaysia is scarce as many studies are done on developed countries and oil importers. As Malaysia is one of the major contributors in the world oil market, it is of interest to study this relationship.

Thus, this study aims at filling in the gap by examining the short-run and long-run relationship between monthly crude oil prices and stock prices for Malaysia over the period 2007 to 2016. This study is expected to help capital market analysts to predict future stock prices. It can also assist Malaysia's portfolio managers in constructing a more efficient investment portfolio besides attracting more foreign investors because our stock market exchange, Bursa Malaysia is predetermined, stable and less risky. The next section will briefly review existing related studies; section

3 is the methodology and data description while section 4 discusses the findings. We conclude in section 5.

2. LITERATURE REVIEW

Empirical studies on the relationship between volatility of crude oil price and stock price in Malaysia include Ciner (2001), Anoruo and Mustafa (2007), and Al-Hajj, Al-Mulali and Solarin (2018). Many studies focused on oil exporters and advanced countries. The relationship between oil price and stock price is still debated and inconclusive. Some studies found a negative relationship between oil price and the stock market. For example, Yurtsever and Zahor (2007) provide empirical evidence that higher oil prices are correlated with lower stock prices. Gogineni (2008) states that industry's stock price depends on demand and cost of production that is influenced by oil production and the oil price. Kilian and Park (2009) also found that stock price can be negatively affected by oil price shock when the price level of oil is associated by precautionary oil demand against future oil supplies.

O'Neill, Penm, and Terrell (2008) concluded that increased oil price is associated with decreased stock returns in the advanced countries, namely the United States, United Kingdom and France. Narayan and Gupta (2015) also studied United States stock returns and concluded that negative change in oil price is a more important predictor of the US stock returns. Another study on developed markets done by Park and Ratti (2008) reported that oil price and stock market movement are negatively correlated. Miller and Ratti (2009) investigated the relationship further in OECD countries and concluded the existence of a long-run relationship between the variables in different time periods and stock exchange is negatively affected by changes in oil prices. Cunado and Perez de Gracia (2014) investigated the relationship in 12 European oil importing countries by employing a VAR and VECM methodology within the period 1973-2011. Their study found that oil price fluctuation has an inverse relationship with stock market returns. Constantinos, Ektor and Dimitrios (2010) investigated Greece using the VAR model and Granger-causality tests from 2004 to 2006. They suggest that policy makers need to be aware of the oil price shock effect on market volatility and intercede if required. Thus, the stock market can be in stable condition and unaffected.

Another strand of literature found positive or indirect relationship between the two variables. Narayan and Narayan (2010) examined the relationship between oil prices and Vietnam's daily stock prices from 2000 until 2008. They found a long-run relationship between oil prices and exchange rates but not in the short-run. Arouri, Bellalah, and Nguyen (2011) investigated the short and long run relationship between oil prices shock and the stock market in GCC countries from June 2005 to October 2008. The stock market in Qatar, United Arab Emirates and other countries including Saudi Arabia had strong positive linkages with oil price changes but linkages were weak for Bahrain and Oman in the short run. In addition, there is no long run relationship except for Bahrain.

Arouri and Fouquau (2009) found a positive relationship between stock prices and oil prices in the GCC and Malaysia while Lin, Fang, and Cheng (2010) and Hussin et al. (2012) found the same relationship in China and Malaysia. El-Sharif et al. (2005) investigated the relationship in the United Kingdom and concluded that oil price shocks increase the returns in the oil and gas markets. According to Bjornland (2009), oil prices affected stock prices indirectly through monetary policy shocks. This is also in line with Nandha and Faff (2008) who found that oil shocks could have adverse indirect effects on firm output and profitability.

To summarize, it can be concluded that the relationship between oil prices and the stock market is still ambiguous. Furthermore, many studies conducted used developed countries as samples and applied different methodologies. Whether the same relationship and behavior exists in developing countries should also be a concern; hence the focus of this paper.

3. DATA AND METHODOLOGY

To examine the relationship between oil price and stock market, we adopted the empirical models for each stock index type from Narayan and Narayan (2010) and Coronado et al (2018) among others as follows:

(1) Model 1 : $LFBMKLCI_t = \alpha_1 + \gamma_1 LCOP_t + \varepsilon_t$

(2) Model 2 : $LFBMEMAS_t = \alpha_2 + \gamma_2 LCOP_t + \theta_t$

FBMKLCI and FBMEMAS are from Bursa Malaysia stock indices. Both stock indices are used as the proxy for the Malaysian stock market. While COP is crude oil price and ε_t and θ_t are white noise error terms.

The method employed for this study is Autoregressive Distributed Lag (ARDL) cointegration approach to investigate the short-run and long-run relationship between the variables. The ARDL model is represented in the following equation:

(3) Model 1 : $\Delta LFBMKLCI_t = \delta_1 + \beta_1 LFBMKLCI_{t-1} + \gamma_1 LCOP_{t-1} + \sum_{i=1}^{q} \emptyset_i \Delta LFBMKLCI_{t-i} + \sum_{j=1}^{q} \omega_i \Delta LCOP_{t-j} + \varepsilon_{3t}$

(4) Model 2 : $\Delta LFBMEMAS_t = \delta_2 + \beta_2 LFBMEMAS_{t-1} + \gamma_2 LCOP_{t-1} + \sum_{i=1}^{q} \sigma_i \Delta LFBMEMAS_{t-i} + \sum_{j=1}^{q} \rho_i \Delta LCOP_{t-j} + \theta_{3t}$

Where ε_{3t} and θ_{3t} are the white noise term and Δ is the first difference operator. $\beta_1, \gamma_1, \beta_2$ and γ_2 are the long run coefficients and $\emptyset, \omega, \sigma$ and ρ are the short run coefficients. The long-run coefficient and error correction model (ECM) are estimated within the ARDL method as the second step if the bound test result showed cointegration. The estimated long-run coefficients show the dynamic relationship between crude oil prices, FBMKLCI and FBMEMAS indices prices variables in the long term. The following long run equations are produced from the reduced equation form of the Long run model:

(5) Model 1 : $\Delta LFBMKLCI_t = \mu_1 + \sum_{i=1}^{q} \beta_1 LFBMKLCI_{t-i} + \sum_{j=1}^{q} \gamma_1 LCOP_{t-j} + \varepsilon_t$

(6) Model 2: $\Delta LFBMEMAS_t = \mu_2 + \sum_{i=1}^{q} \beta_2 LFBMEMAS_{t-i} + \sum_{j=1}^{q} \gamma_2 LCOP_{t-j} + \varepsilon_t$

Where all variables are as previously defined. In addition, the lag lengths for the long run equations, q, is determined by the Akaike Information criterion (AIC) because the time series data in this study shows more reliability results compared to the Schwartz Bayesian Criteria (SBC). The maximum number of lags use is 8 because of the large number of observations.

The last procedure in the ARDL approach is to estimate the error correction model (ECM) to obtain the short run dynamic parameters. The ECM can simply be derived from ARDL equations by transformation of the linear regression. Moreover, the condition that ECM must follow must be estimated by Ordinary Least Square (OLS) and then use of the Akaike Information criterion (AIC) to select the optimal lag structure for the ARDL specification of the short-run dynamics coefficients. Below is a specific short run model:

(7) Model 1: $$\Delta\, LFBMKLCI_t = \vartheta_1 + \sum_{i=1}^{q} \emptyset_i \Delta LFBMKLCI_{t-i} + \sum_{j=1}^{q} \omega_i \Delta LCOP_{t-j} + \emptyset ECM_{t-1} + \varepsilon_t$$

(8) Model 2: $$\Delta\, LFBMEMAS_t = \vartheta_2 + \sum_{i=1}^{q} \sigma_i \Delta LFBMEMAS_{t-i} + \sum_{j=1}^{q} \rho_i \Delta LCOP_{t-j} + \theta ECM_{t-1} + \varepsilon_t$$

Where $\emptyset, \omega, \sigma\ and\ \rho$ for both models are the short run dynamic coefficients to equilibrium and θ is the speed of adjustment coefficient to restore the equilibrium in the long run.

To confirm the validity and efficiency of ARDL, we conducted several diagnostic tests which are the LM-test of serial correlation, Ramsey's RESET test for functional form, heteroscedasticity and normality. The stability test was also applied in this study by using the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) to check the stability of variables and ensure the trend of residual are within the bounds.

4. RESULTS AND ANALYSIS

4.1 UNIT ROOT TEST

In order to ensure the variables in both models are I (0) or I (1), we have chosen to perform Augmented Dickey Fuller (ADF) and Phillips Perron (PP) at level and first difference. All the variables are stationary at first difference shown by the significance of the ADF and PP test *p*-values. This implies that the variables are I (1). The result of unit Root test is shown in Table 1 as follows:

TABLE 1
Unit Root Test

	Augmented Dickey Fuller (ADF)		Phillips Perron (PP)	
	Level			
Variable	Constant Without Trend	Constant With Trend	Constant Without Trend	Constant With Trend
LCOP	-2.564* (1)	-2.621 (1)	-2.080 (2)	-2.160 (2)
LFBMKLCI	-0.872 (0)	-1.815 (0)	-1.262 (6)	-2.368 (6)
LFBMEMAS	-0.843 (0)	-1.892 (0)	-1.240 (6)	-2.441 (6)
	First Difference			
LCOP	-6.508*** (0)	-6.469*** (0)	-6.501*** (4)	-6.462*** (4)
LFBMKLCI	-4.526*** (12)	-6.062*** (12)	-8.860*** (5)	-8.826*** (5)
LFBMEMAS	-8.391*** (0)	-5.822*** (0)	-8.551*** (4)	-8.525*** (4)

Note: *, **, *** Significant at 10%, 5% and 1%, respectively. The figure in parentheses (…) represents optimum lag length selected based on Akaike Info Criterion. The figure in bracket […] represents the Bandwidth used in the KPSS test selected based on Newey-West Bandwidth criterion.

4.2 BOUND TEST

The bound test is then conducted to confirm the existence of a long run relationship between crude oil price and stock indices prices in the models. The result is presented in the following Table 2 which shows the cointegration of the selected variables. In this study, the maximum lag length is fixed to 8 because of the large sample size (109 observations).

The calculated *F*-statistics need to be higher than the bound critical values provided in the table. The upper critical bound values, are based on the Pesaran Table (Pesaran, Shin, and Smith, 2001). Table 2 indicates that the calculated *F*-statistics for Model 1 (stock 1: FBMKLCI) is 7.4120 which is higher than 6.68; the upper bound value and significant at 2.5% critical value. On the other hand, Model 2 is the model for stock number two (FBMEMAS) and it is also higher than I (1) of 1% critical values (*F*-statistic is 12.4845). So, we can conclude that the variables are cointegrated; hence, we can proceed to estimate the short and long run coefficients.

TABLE 2
Bound Test

Model 1		
F-statistic:	7.4120[0.001]	
	Bound critical values	
Significance level	I(0)	I(1)
1%	6.84	7.84
2.5%	5.77	6.68
5%	4.94	5.73
10%	4.04	4.78
Model 2		
F-statistic:	12.4845[0.000]	
	Bound critical values	
Significance level	I(0)	I(1)
1%	6.84	7.84
2.5%	5.77	6.68
5%	4.94	5.73
10%	4.04	4.78

4.3 LONG RUN COEFFICIENT

Table 3 reports the estimated long-run coefficient that confirms the existing long-run correlation between crude oil price, FBMKLCI index and FBMEMAS index price. The optimal length lag in this estimation result is decided by the Akaike Information Criterion (AIC).

Based on the results, the coefficients for crude oil price are negative and significant. The result is as expected and consistent with the theory that increase in crude oil price in the market leads to the decrease in stock price index. Therefore, these findings conclude that crude oil price and Malaysia indices price have a negative long run relationship and these results are in line with previous literature such as Park and Ratti (2008), Miller and Ratti (2009) and Narayan and Narayan (2010). Nevertheless, the short run model (Table 4) shows that the coefficients of the ECM are negative and significant. This is important to ensure that the long-run equilibrium can be restored in this study.

TABLE 3
Long Run Result

Model 1		
Lag structure	(2,6)	
Dependent variable	$LFBMKLCI_t$	
Independent Variables	Coefficient	*t*-Statistic (p-value)
$LCOP_t$	-1.2064**	-1.8123[0.074]
Constant	14.3603***	3.7079[0.000]
Model 2		
Lag structure	(1,6)	
Dependent variable	$LFBMEMAS_t$	
Independent Variables	Coefficient	*t*-Statistic (p-value)
$LCOP_t$	-0.59039***	-2.7758[0.007]
Constant	12.7697***	10.1127[0.000]

Note: *, **, *** significant at 10%, 5% and 1%, respectively.

According to Table 4, the coefficient of the ECM for Model 1 is equal to -0.0340 which means that the deviation from the disequilibrium in stock indices prices is corrected by 3.4% in the following year. The coefficient of ECM in Model 2 is -0.0529 which shows that the speed of adjustment of FBMEMAS index price is 5.3%. Hence, Model 2 suggests that it needs approximately 19.3 years to adjust fully to hundred percent to achieve the equilibrium condition. The result also provides an insight that FBMEMAS has faster speed of adjustment in adapting to changes in the crude oil price variable before converging to equilibrium stage in the long term compared to FBMKLCI. The short run crude oil price is 0.0503 and significant at the 5% significance level. But, for long run, the crude oil price is about 1.2064. Whereas, for Model 2, the result shows that the coefficient of short run oil price is 0.0229 and significant at 10% while the long run coefficient for crude oil is 0.59039.

TABLE 4
Short-Run and ECM

Model 1 : FBMKLCI and Crude Oil			
Variables	Coefficient	Standard Errors	*t*-values
$dLFBMKLCI_t(-1)$	0.15401	0.1096	1.4056[0.164]
$dLCOP_t$	-0.0503***	0.0201	-
$dLCOP_t(-1)$	0.0132	0.0174	2.4973[0.015]
$dLCOP_t(-2)$	0.0182	0.0174	0.7589 [0.450]
$dLCOP_t(-3)$	0.0265	0.0176	1.0430[0.300]
$dLCOP_t(-4)$	0.0328*	0.0179	1.5066[0.136]
$dLCOP_t(-5)$	-0.0557**	0.0185	1.8362[0.070]
dINPT	0.4889**	0.1716	-3.006 [0.004]
$ECM_t(-1)$	-0.0340*	0.0198	2.8487[0.006]
			-
			1.7159[0.090]
Model 2: FBMEMAS and Crude Oil			
Variables	Coefficient	Standard Errors	*t*-values
$dLCOP_t$	-0.0229**	0.0097	-
$dLCOP_t(-1)$	0.0097	0.0090	2.3688[0.020]
$dLCOP_t(-2)$	0.0098	0.0090	1.0766[0.285]
$dLCOP_t(-3)$	0.0120	0.0090	1.0879[0.280]
$dLCOP_t(-4)$	0.0190**	0.0090	1.3376[0.185]
$dLCOP_t(-5)$	-0.0267***	0.0091	2.1082[0.038]
dINPT	0.6749***	0.1968	-
$ECM_t(-1)$	-0.0529***	0.0200	2.9286[0.004]
			3.4295[0.001]
			-
			2.6396[0.010]

Notes: *, **, *** significant at 10%, 5% and 1%, respectively.

4.4 DIAGNOSTIC TESTS

The results of the diagnostic tests are shown in Table 5. The results indicate that the long-run and short-run model passed all diagnostics tests. In this study, there is no evidence of serial correlation among variables in both models. In addition, the functional form of Model 1 and Model 2 based on Ramsey RESET test results are not significant so there is no misspecification. There is no evidence of heteroscedasticity in both models and finally, the stability of the long-run coefficients is shown by the cumulative sum (CUSUM) and cumulative-sum squares (CUSUMSQ).

TABLE 5
Diagnostic Tests

Model 1		
Type of Test	LM Version	F Version
LM test	11.3874[0.496]	.82084[0.629]
Ramsey RESET test	2.4955[0.114]	2.2530[0.137]
Heteroscedasticity	3.4431[0.064]	3.5005[0.650]
CUSUM	Stable	Stable
CUSUM SQUARED	Stable	Stable
Model 2		
Type of Test	LM Version	F Version
LM test	5.5289[0.938]	.37635[0.968]
Ramsey RESET test	1.5433[0.214]	1.3957[0.241]
Heteroscedasticity	1.7235[0.189]	1.7235[0.189]
CUSUM	Stable	Stable
CUSUM SQUARED	Stable	Stable

Notes: *p*-value in parentheses, *, **, *** significant at 10%, 5% and 1%, respectively.

5. CONCLUSION

This paper achieved the main objective which is to examine the short and long-run relationship between crude oil prices, FBMKLCI index and FBMEMAS index price for Malaysia. The presence of the long-term relationship between crude oil price and Malaysia indices price are investigated using the cointegration approach on data from 2007 to 2016. We find that both stock prices and oil prices are cointegrated, which means the long-run relationship can be determined. When we estimate the long-run elasticities, we find negative and significant long-run relationship between crude oil price, the FBMKLCI index and FBMEMAS index price. Our findings are consistent with existing theory, where higher crude oil prices reduce the stock price.

This study provides a better understanding of the relationship between oil price and stock market in Malaysia. The results can be used to formulate appropriate strategies or policy on reducing the adverse effects of oil price shock on the stock market. Although our study does not take into account other variables that may affect the stock market, the finding is still significant and valid as discussed by Herzer and Nunnenkamp (2012).

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