ISBN 978-967-11350-4-4

WHICH FINANCIAL VARIABLE SIGNIFICANT TOWARDS THE OIL-ENERGY INCENTIVE COMMODITY PRICES RELATIONSHIP IN MALAYSIA?

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ABSTRACT

"*Financialization of the commodities*" due to the globalization lead to the agricultural commodities are started to treat as a financial asset and securities where players in the global financial market view it as alternative investment areas rather than the real economic activities renewed the interest in reinvestigating the oil-commodity price relationship with the financial variables among researchers. Consequently, the main purpose of this study is to examine which financial variables having long-run co-movement and causality effect on oil price and energy incentive commodity prices such as corn, soybean, sugar and wheat in Malaysia. To extending the knowledge in literature, in this study the time period as be divided into three sub-period such as pre-crisis (2000-2005), crisis (2006-2008) and post-crisis (2009-2013) period to spot the effect of financial variables before, in crisis period and after the crisis period. ARDL method has been used to check for the long-run relationship and Toda Yamamoto method has been used to analyse the causality effect. The empirical findings of this study shows that the oil price and financial factor having close integration towards the commodity prices in the crisis period only which is contrary to other related studies whereby less in pre and post-crisis periods. Some implications and policies have been proposed based on the findings of this study.

Keywords: Commodity price, oil price, financial variables, ARDL and Malaysia.

 ISBN 978-967-11350-4-4

INTRODUCTION

Since 1990's, commodities price received a significant consideration from researchers. It is not a recent occurrence, but the recent financial crises rehabilitated the interest among the researchers to give concentration on this dynamic relationship between energy price and commodity price again. During the 2007-08 food crises, the international price of main agricultural commodities such as wheat, rice, maize, and soybeans increased more than doubled. This issue has been given attention since 2003 due to the increasing trend in the pricing of the agricultural commodities. This phenomenon creates serious challenges to the commodity dependent and net food importing development countries such as Malaysia. Malaysia was distinguished as one of the crisis-affected countries, prompting the surprising currency depreciation. The currency depreciation would raise agricultural prices; expand interest rate and decreasing credit availability, for instance, money supply by the Central Bank. In this way, financial variables have been considered to be one of the huge components influencing agricultural economy in Malaysia. The commodities market in Malaysia is constantly assumed a critical role in the economic progress of the country, (Department of Statistics Malaysia). Statistics by the Department of Statistics Malaysia demonstrated that export income from goods and commodity-based items between 2011 and 2012 had diminished by RM13.8 billion from RM141.2 billion to RM127.5 billion. Given that Malaysia's economy has become dependent on commodities, any significant decrease in ware prices could posture impending risks as far as deficits in present and fiscal records.

In addition, the rising trend of food price in recent year highlighted question whether the oil market has the explanatory power on the food price or not. Most of the researchers such as Piesse and Thirtle (2009); Nazlioglu and Soytas (2011); Ji and Fan (2012) argued that agricultural commodities especially energy incentive commodities (wheat, corn, soybeans and sugar) have a close relationship with the energy since it used in production of alternative energy sources i.e. bio-fuels (including bio-ethanol and biodiesel) which become a substitution for gasoline and diesel. Therefore, the degree of market integration increases among the energy price and the price of commodities. Since the production of the bio-fuels keep on increasing, the demands for those commodities are expected to increase in coming years which will lead to increase in the food price as well (Nazlioglu, Erdem & Soytas, 2013). Piesse and Thirtle (2009) added that appropriate action is needed since agriculture has the potential to provide sufficient food and energy in the future.

Since agricultural commodities directly contribute in the production of the alternative energy sources, most of the studies on this area just focus on the relationship between the agricultural commodities price and energy price. Most of the researchers overlook the effect of financial factors towards the volatility of the commodities price. This is because there is no any evidence of direct effect of financial factors on energy or commodities price. Due to this matter, the researchers give less important in considering the financial factors into the model. The recent study of Nazlioglu *et al.* (2013) suggested including the financial factors such as exchange rate, futures markets, speculation and interest rate in addition to the energy-agriculture linkage since they suspect will play significant role in affecting the price of the agricultural commodities. This is due to the "*financialization of the commodities*" where the commodities are started to treat as financial asset where its creates investment opportunities to the investors. It is very important to analysis on this relationship since the price of commodities showing increase trend because of the increase trend on the renewal energy production. If significant relationship identified between the financial factors, energy price and commodities price, it able to contribute to the solid policies in the stabilization of the agricultural commodities price within the country even the energy price keep on increase. It will be a noteworthy input to the developing countries which are affecting by the increasing in the commodities price and still searching for the platform to stabilize their economy.

Another significant part that should be answered in this relationship is the individual causal effect between energy price, financial factors, and agricultural commodity price. This is because causality studies on this matter still remain indistinguishable (Nazlioglu *et al.*, 2013). Most of the studies such as Arouri *et al.* (2012); Ji & Fan (2012); and Du *et al.* (2011) test volatility spillover among different key stock market or between the crude oil market and financial market or between oil price and commodity market. Even volatility spillover analysis has significant contribution to the literature, but still contradict arguments has regarding this relationship among the researchers. Many researchers such as Chang & Su (2010), Collins (2008) and Abbothh *et al.* (2008) argued that increasing oil price is the main factor that influencing the agricultural commodity price. In contrast, Zhang *et al.* (2010) and Gilbert (2010) stated that there is no direct relationship between these two variables. To overcome these contradict findings, the recent study of Nazlioglu *et*

 ISBN 978-967-11350-4-4

al. (2013) employed the recently developed causality-in-variance test to examine the causality effect and the impulse responds on the agricultural commodity price and energy price. The findings of this study indicate that the interdependency between energy and agricultural market has increased recently. What will happen to this interdependency relationship if the financial factors are included in into the model is the interesting question that able to create new insight in commodities market.

Due to this, the main motif of this paper is to investigate the relationship between energy price, financial factors and agricultural commodity price in Malaysia. This work also helps investors to distinguish the economic stance of the country which give them a clean picture of the investment opportunities in this state. Malaysian agriculture has generally drawn up a great opportunity in discussion about Malaysia's future. It doesn't still take lots of consideration in the tenth Malaysia Plan (2011-2015). Yet, actually agriculture, alongside fisheries and forestry, still registers for certain per cent of Malaysia's gross domestic product, which is a big sum for a nation at Malaysia's phase of investment advancement (Colin & Guest, 2012). As a close, when the investment in Malaysia increases will result in an increment in the development of the nation. This will lead to increase in goodness activities which might be more beneficial to all the households in Malaysia and increase the existing style of the Malaysian citizens.

LITERATURE REVIEW

The relationship between world crude oil and agricultural commodity prices are well-studied in economic literature. The examples of the studies are such as Busse, Brummer and Ihle (2011), Ciaian and Kancs (2011), Du, Yu and Hayes (2011), Nazlioglu (2011), Chen, Kuo and Chen (2010). The use of a supply-demand framework as a foundation in analyzing the influence of commodity price is quite common in the literatures (for instance, Akram, 2009; Bhar & Hammoudeh, 2011; Chen, Kuo & Chen, 2010; Ciaian & Kancs, 2011; Dauvin, 2014). The framework implied based on the Law of Demand and Supply. Based on the fundamental of demand and supply, an increase in energy price causes agricultural commodity prices to increase due to increasing usage of crops in production of bio-fuels especially ethanol and biodiesel which are substitutes for gasoline and diesel (Chen, Kuo & Chen, 2010; Ciaian & Kancs, 2011). This statement has been strengthen by Hanson *et al.* (1993) previously by added that an increase in oil prices can be followed by an increase in input costs and causes agricultural prices to rise. In the other hand, Akram (2009) added that the price impact of shifts in demand and supply of commodities may be particularly large if the demand or supply of commodities is relatively price inelastic, which is generally believed to be the case for many commodities and especially crude oil. In the recent study of Dauvin (2014), stated that oil price is the good traded in the international market, therefore its price is determined by world demand and supply and not the domestic.

However, the use of simple supply-demand framework cannot entirely account the factors influence the commodity prices. Based on the Law of one price for tradable goods, a decline in the value of the dollar to raise the purchasing power of commodity demand of foreign consumers and other way round able to affect commodity prices (Ridler & Yandle, 1972; Akram, 2009; Browne & Cronin, 2010). This is where the financial factor took part in the energy-commodity relationship. Hence, Akram (2009) developed the model to show the relationship between the value of the dollar and commodity prices in dollars can be shown as follow:

$$pc^f = e + pc \quad (1)$$

where pc, e and pc^f represent the commodity price in dollars, nominal dollar exchange rate in terms of units of a foreign currency and commodity price in units of a foreign currency respectively. Rather than supply-and-demand factors, financialization of commodity markets is also the cause of influence commodity price. One may argue that increasing in speculative and investor activity due to a low real interest rate will reduces the cost of storage, therefore, the investors will include the real commodities as hedge against inflation to reduce the risk and to diversify portfolios to make a profit. Frankel (1986), on the other hand, added that commodity prices tend to overshoot in response to interest rates changes, as exchange rates do in Dornbusch's (1976) model and the relationship between commodity prices and interest rates can be presented as follow:

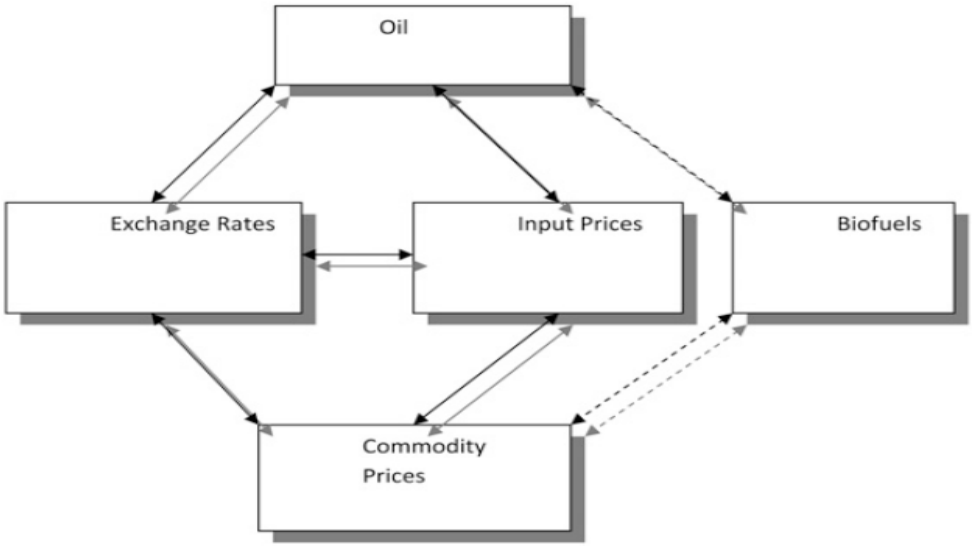
$$E_t pc_{t+1} - pc_t = i_t + s(i_t) \quad (2)$$

ISBN 978-967-11350-4-4

where $E_t pc_{t+1} - pc_t$ is the expected revaluation of a commodity over the period, measured by the expected price increase from period *t* to *t+1*, given information available at time. On the other hand, *i* and *s(i)* represent the nominal interest rate and storage costs of a given commodity net of convenience yield respectively.

However, study on relating the financial variable towards the energy-agricultural commodity relationship still very limited in the literatures. As review, there are very few studies try to incorporate financial variables such as exchange rate and interest rate in their study such as Dauvin (2014), Hamulczuk and Klimkowski (2012), Nazlioglu and Soytas (2012, 2011), Bhar and Hammoudeh (2011), Akram (2009) and Harri, Nalley and Hudson (2009). The idea of this study developed based on the framework proposed by Harri, Nalley and Hudson (2009). According to Abbott *et al.* (2008), the link between oil prices to agricultural commodity prices can be also explained through the exchange rates due to oil trade is conducted mainly in US dollars and may have impact on local currencies of all influences the agricultural commodity prices in turn of imports or exports and local prices of the commodities. This statement supported by Harri, Nalley and Hudson (2009) where they concluded that there are two links from oil prices to agricultural commodity prices: a direct link from oil prices to commodity prices and an indirect link through exchange rates which can be shown in Figure 1. The authors argued that the exchange rate affect the commodity price by value of dollar and the oil price affect the commodity production by input prices.

Figure 1: Expected linkages between oil, exchanges rates, and commodity prices



Source: Adopted from Harri, Nalley and Hudson (2009)

Nevertheless, in term of financial variables, there is still no any clear evidence in indicating which financial variable has significant impact on the energy-agricultural commodities relationship. Most of the authors used financial variables such as exchange rate (Dauvin, 2014; Hamulczuk & Klimkowski, 2012; Nazlioglu & Soytas, 2012; and Nazlioglu & Soytas, 2011) and interest rate (Bhar & Hammoudeh, 2011 and Akram, 2009) in the study[1]. Most of the authors argued that the exchange rate has a significant influence in explaining the price of agricultural commodity directly or indirectly. In contrast Bhar and Hammoudeh (2011) added that the prices are responsive to their own supply and demand but it not able to explain the financial variables in the model. Based on the reviews, result of the previous studies not consistent over the period. The results also differ based on the methodology and variables that the researchers used in the study.

[1] Akram (2009) used both exchange rate and interest rate in linked with the energy-agricultural commodity relationship and identified that there is a negative relationship between interest rate and commodity prices and interest rate may be a useful indicator of the movement in commodity prices.

ISBN 978-967-11350-4-4

METHODOLOGY

The model for this study is adopted from the study of Nazlioglu & Soytas (2012)[2], as below:-

$$Agricultural\ commodity\ prices = f(World\ oil\ price, financial\ factors) \quad (3)$$

The model illustrated that the agricultural commodity price is the function of oil price and selected financial factors. The model can be deriving as below:-

$$lnACP_{it} = \beta_{0i} + \beta_{1i} lnOP_t + \beta_{2i} lnFIN_t + \varepsilon_{it} \quad (4)$$

The empirical model present in the log-log for whereby ACP_{it} represent the price of selected agricultural commodity over time (i = the list of agricultural commodity prices, refer to Table 1). OP_t represent the world oil price over time (ringgit Malaysia) and FIN_t represent the selected financial variables which will be regress with the selected commodity prices and oil price one by one (refer to Table 1).

Data on oil price, selected agricultural commodities prices and selected financial variables collected from the DataStream. The frequency of the monthly data collected from year 2000 (January) until 2014 (March). Campiche *et al.* (2007) argued that the agricultural commodities price does not respond for the energy price until 2006. This indicates that the strong correlation exist between those variables due to the crisis in 2006 onward. In addition, Nazlioglu and Soytas (2011, 2012) and Nazlioglu (2011) argued that the agricultural prices after 2006 through 2008 had high fluctuation due to the oil price increase which highlighted as the food crisis period. To overcome the effect of structural break and as a contribution to the literatures, the data has been divided into three subgroups: (i) the pre-crisis period from 2000 to 2005, (ii) the crisis period from 2006 to 2008 and (iii) post-crisis period from 2009 to 2014. Those three periods data characteristics has a significant impact in the policy making process later on.

In order to empirically analyze the long-run relationships and short run dynamic interactions among the variables, the autoregressive distributed lag (ARDL) cointegration technique has been used. It has three advantages in comparison with other previous and traditional cointegration methods. The first one is that the ARDL does not need that all the variables under study must be integrated of the same order and it can be applied when the under-lying variables are integrated of order one, order zero or fractionally integrated. The second advantage is that the ARDL test is relatively more efficient in the case of small and finite sample data sizes. The last and third advantage is that by applying the ARDL technique we obtain unbiased estimates of the long-run model (Harris and Sollis, 2003).

Table 1: List of Variables in Details

Variables	Unit measurement
Selected agricultural commodities(i)	
• Corn	Price per metric Ton (Ringgit Malaysia)
• Sugar	Price per pound (Ringgit Malaysia)
• Soybean	Price per metric Ton (Ringgit Malaysia)
• Wheat	Price per metric Ton (Ringgit Malaysia)
Selected Financial variables (FIN_t)[3]	
• Consumer price index (CPI)	Price index
• Domestic credit (lnnet)	Ringgit Malaysia
• Export price (lnexp)	Unit value
• Import price (lnimp)	Unit value
• Currency in circulation (lnm0)	Ringgit Malaysia

[2] Nazlioglu & Soytas (2012) in their model used 24 selected agricultural commodity prices regress with oil price and exchange rate to represent the financial effect. They argued that exchange rate needs to be considering in the model since its reflecting the commodity trade.

[3] Financial variables selected based on the availability of the data from the DataStream. All the financial variables have been log except CPI, market rate and inflation rate which are in index in nature.

 ISBN 978-967-11350-4-4

• M1 (lnm1)	Ringgit Malaysia
• Money supply (lnm2)	Ringgit Malaysia
• M3 (lnm3)	Ringgit Malaysia
• Market rate (mmr)	Ringgit Malaysia to 1 USD
• Visible trade balance (lntrade)	Ringgit Malaysia
• Inflation rate (inf)	Price index
• Stock Market	Ringgit Malaysia

After checking for the long-run relationship, Toda Yamamoto (non-granger causality test) used to examine the direction of causality between variables. It has been noted that the customary Granger (1969) causality test for surmising leads and laughs among integrated variables will wind up in spurious regression results, and the F-test is not substantial unless the variables in levels are cointegrated. New advances in econometric offers the error correction model (because of Engle and Granger (1987)) and the vector auto regression error-correction model (because of Johansen and Jesulius, 1990) as options for the testing of non-causality between economic time series. Shockingly, these tests are lumbering and delicate to the ideas of the aggravation parameters in limited samples and in this way their results are problematic (Toda and Yamamoto, 1995; Zapata and Rambaldi, 1997).

Toda and Yamamoto (1995) proposed a basic methodology obliging the estimation of an 'augmented' VAR, actually when there is cointegration, which ensures the asymptotic dissemination of the MWald statistic. Thus, the Toda-Yamamoto causality system has been commemorated as the long-run causality tests. Everything one needs to do is to focus the maximal order of integration dmax, which hope to happen in the model and build a VAR in their levels with a sum of (k + dmax) lags. Toda and Yamamoto call attention to that, for d=1, the lag selection process is continuously valid, at least asymptotically, subsequently k>=1=d. If d=2, then the procedure is valid unless k=1. Furthermore, rendering to Toda and Yamamoto, the MWald statistic is valid regardless whether a series is I(0), I(1) or I (2), non-cointegrated or cointegrated of a random order.

RESULT AND DISCUSSION

As notice prior, unit root test is a stationary test that used to focus the order of integration of the variables. Consequently, we utilize Phillips-Perron (PP) test at level and first difference structure by making into note of both trend and intercept, and intercept without trend for level and for the first difference we took intercept and none to analyze the stationary status for every variables (Phillips and Perron, 1988).

Table 2: Unit Root Test results

Variables	Phillips-Perron (PP) test					
	Pre-crisis Period		Crisis Period		Post-crisis Period	
	Level	1st Difference	Level	1st Difference	Level	1st Difference
Financial Variables						
CPI	2.033(0)	-6.761(5)*	-0.820(1)	-3.340(1)*	2.655(4)***	-
Domestic credit	-2.713(3)	-8.424(0)*	1.495(2)	-3.792(2)*	-0.704(0)	-7.811(0)*
Exports	-0.108(3)	-9.373(4)*	-2.092(3)	-7.260(2)*	-3.898(3)**	-
Imports	-0.365(3)	-10.41(4)*	-1.577(2)	-4.887(2)*	-3.738(5)**	-
M0	-6.516(0)*	-	-7.362(6)*	-	-7.296(9)*	-
M1	-4.355(2)*	-	-3.606(3)**	-	-5.348(5)*	-
M2	-0.727(3)	-6.828(4)*	-2.250(2)	-4.798(0)*	-2.168(4)	-8.505(3)*
M3	-1.973(2)	-8.208(3)*	-2.299(2)	-4.470(1)*	-2.052(3)	-8.186(2)*
Market rate	-3.463(2)***	-	-1.790(2)	-3.772(2)*	7.344(0)*	-
Trade balance	-6.828(5)*	-	-3.337(2)***	-	-5.025(5)*	-
Inflation rate	-1.992(0)	-7.646(4)*	-1.699(0)	-5.563(1)*	-1.654(1)	-7.138(1)*
Stock market	-2.813(3)	-8.996(3)*	-1.802(4)	-8.179(3)*	-3.576(0)*	-
Agricultural Commodity Prices						
Corn	-2.157(2)	-6.208(1)*	-1.721(4)	-4.845(4)*	-1.413(2)	-6.159(1)*
Sugar	-1.379(4)	-6.646(3)*	-1.721(4)	-5.219(2)*	-2.784(2)	-5.801(1)*

ISBN 978-967-11350-4-4

Soybean	-2.385(3)	-5.142(3)*	-1.031(1)	-4.872(3)*	-2.297(2)	-5.996(1)*
Wheat	-2.131(3)	-6.685(3)*	-1.541(3)	-4.892(3)*	-2.221(0)	-5.689(7)*
Crude Oil Price						
Oil price	-1.733(3)	-8.331(6)*	-1.424(3)	-1.83(1)***	-3.072(5)	-6.902(1)*

Notes: All variables are transformed to natural logs except the CPI, market rate and inflation rate. Asterisks (*), (**) and (***) indicate statistically significant at the 1%, 5% and 10% levels, respectively. The optimum lag length for PP test was automatically selected based on Newey-West Bandwidth.

Table 2 presents the aftereffects of Phillips-Perron unit root test on 17 variables for three periods. The result from the table demonstrates that all the series are integrated either I(0) or I(1) which indicates mixed results. However none of them are integrated at I(2), recommending their qualification to be inspected in the ARDL bounds test method. Before we directing the ARDL bound test, as a first step, the order of lags ought to be gotten from either utilizing the Akaike Information Criterion (AIC) or Schwartz-Bayesian Criterion (SBC). Taking after on Pesaran and Pesaran (1997), in this study have choose the ideal model by utilizing Schwartz-Bayesian Criteria (SBC) by selecting minimum lag length due this study give little size of observation which is 57 (Shrestha & Khorshed, 2005; Nathan & Liew, 2013)[4]. The ascertained F-statistics are contrasted and the critical values got from Pesaran, Shin and Smith (2001) and Pesaran and Pesaran (2009). Based on the empirical finding, a summary of which financial variables having long-run relationship oil-commodity price relationship for the selected three periods provided in Table 3. Based on the table, can be observing that in pre-crisis period the integration of oil price and financial variables towards commodity price is less. Whereby, in crisis period the integration increases and drops back on post-crisis period. Financial variables such as M0, M1, M2 and stock price showing integration with the commodity prices in the crisis period. In contrast, the price of sugar and wheat highly integrated with the financial variables in the pre-crisis period and the integration drops in crisis period

The second aim of this work is to verify the causality effect of oil price and financial variables on commodity prices using Toda Yamamoto causality test. The estimates of MWALD test show that the test result follows the chi-square distribution with the appropriate lag length along with their associated probability. If the probability value is less than 10 per cent, then we conclude that the variable having causality relationship while, probability more than ten per cent state there is no causality relationship among the variables. The causality test results are represented in Table 4. For the pre-crisis period, able to see that mostly there is no causality effect among the variables except for sugar whereby oil price driven the sugar price. Interestingly, the causality relationship exists among the variables in the crisis period for all the commodities. Mostly the causality runs from oil price and financial variables towards the commodity prices except for wheat price. For the post-crisis period, the causality effects become minimum except for the sugar price.

[4] The lag selection is not reported in the paper. It will be provided upon requested.

ISBN 978-967-11350-4-4

Table 3: Summary of Long-run relationship

Dependent / Independent	Pre-Crisis Period				Crisis Period				Post-Crisis Period			
	Corn	Sugar	Soybean	Wheat	Corn	Sugar	Soybean	Wheat	Corn	Sugar	Soybean	Wheat
$(lnoil, cpi)$				√			√			√	√	
$(lnoil, lnnet)$	√	√		√							√	
$(lnoil, lnexp)$				√								
$(lnoil, lnimp)$				√	√	√				√		√
$(lnoil, lnm0)$		√			√	√	√					
$(lnoil, lnm1)$		√			√		√	√				
$(lnoil, lnm2)$					√	√		√				
$(lnoil, lnm3)$		√			√						√	
$(lnoil, lntrade)$		√	√									
$(lnoil, inf)$				√					√			
$(lnoil, lnstock)$		√		√	√	√	√	√		√		
$(lnoil, mmr)$		√				√				√	√	

Notes: The critical values are obtained from Table CI(iii) Case III: Unrestricted intercept and no trend reported in Pesaran et al. (2001). The optimum lag selected using Schwarz Bayesian Criterion (SBC). √ represent the existence of long-run relationship among the variables.

ISBN 978-967-11350-4-4

Table 4: Summary of Causality relationship

Dependent / Independent	Pre-Crisis Period				Crisis Period				Post-Crisis Period			
	Corn	Sugar	Soybean	Wheat	Corn	Sugar	Soybean	Wheat	Corn	Sugar	Soybean	Wheat
Oil price	NA	→	NA	NA	→	NA	→	←	→	→	→	NA
CPI	NA	NA	→	NA	⇄	←	⇄	←	NA	⇄	NA	←
Oil price	NA	→	NA	NA	⇄	←	→	←	→	⇄	NA	NA
Domestic credit	NA	NA	NA	←	⇄	NA	←	NA	←	NA	NA	NA
Oil price	←	←	NA	NA	NA	←	→	←	NA	→	→	NA
Export	NA	⇄	NA	NA	NA	NA	⇄	NA	NA	⇄	NA	NA
Oil price	NA	NA	NA	NA	←	→	⇄	→	→	→	NA	⇄
Import	NA	⇄	NA	NA	⇄	←	⇄	NA	←	←	←	→
Oil price	NA	→	NA	NA	→	→	→	←	NA	NA	NA	←
M0	NA	NA	NA	NA	→	←	⇄	→	NA	←	NA	NA
Oil price	⇄	→	NA	←	→	NA	→	←	→	⇄	NA	NA
M1	NA	←	NA	NA	→	NA	⇄	NA	NA	←	NA	NA
Oil price	NA	NA	NA	NA	→	⇄	←	←	→	→	→	NA
M2	NA	NA	NA	NA	⇄	→	←	←	←	NA	NA	NA
Oil price	←	→	NA	NA	→	⇄	NA	←	NA	→	→	NA
M3	NA	⇄	NA	NA	⇄	←	NA	⇄	←	NA	NA	NA
Oil price	NA	⇄	NA	NA	→	←	→	←	←	→	NA	NA
Trade balance	NA	⇄	NA	NA	NA	→	NA	NA	←	NA	←	NA
Oil price	NA	→	NA	NA	←	NA	NA	NA	→	→	NA	NA
Inflation rate	NA	→	→	→	NA	NA	←	NA	NA	NA	→	NA
Oil price	NA	→	NA	←	→	NA	→	⇄	←	→	NA	NA
Stock market	NA	→	NA	NA	←	←	→	NA	NA	NA	NA	NA
Oil price	NA	NA	NA	NA	NA	→	⇄	NA	⇄	NA	⇄	NA
Money market	NA	NA	NA	NA	→	→	←	←	NA	NA	NA	NA

Notes: ← represent bi-directional causality. ⇄ represent uni-directional causality and NA represent no causality relationship among the variables. The optimum lag selected using Schwarz Bayesian Criterion (SBC).

 ISBN 978-967-11350-4-4

Conclusion and recommendation

At that place are few researches done in this study regarding oil price and agricultural commodity prices in the late years. The present report analyzes the relationship between financial variables, oil price and the agricultural commodity costs by focusing on Malaysia. By using the technique of ARDL, a model to ascertain the result of financial variables on agricultural commodity-oil prices is estimated for Malaysia, with the sample period from 2000Q1 to 2014Q3. As a main contribution for the literature, the sample period has been divided into three sub-period i.e. pre-crisis, crisis and post-crisis period, to see the effect of financial variables and oil price on commodity prices. As an overall, can be observe that the level of integration and the causality effect of oil price and financial variables towards commodity prices high in crisis period and drop dramatically after the crisis period. As argued by Campiche *et al.* (2007), the oil price not correlated with the commodity prices until the crisis. The integration increases in the crisis period only. This phenomenon can be clearly shown by the results of this study.

In term of policy, it is confirmed that monetary instrument able to play a significant role in stabilizing the commodity prices in the crisis period. This is due to the existence of causality effect in the crisis period. Financial variables such as CPI, import rate, M0, M1, M2, M3, stock market and money market rate are the variables that able to influence the price of commodities in the crisis period. Therefore, an effective option market should be developed in Malaysia, so a large scale of put options contracts can be purchased to hedge the risk of changes in commodity price during the crisis. In addition, due to a possibility that the commodities are not always available in option contracts, then Central Bank should focus on expand the monetary policy to overcome the inflation problem which cause by the positive relationship between financial variables and price of commodities.

Acknowledgement:
Research grant (IPSR/RMC/UTARRF/2013-C2/T19) funded by the Universiti Tunku Abdul Rahman, Malaysia is gratefully acknowledged.

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