Granger-causality between palm oil, gold and stocks (islamic and conventional): Malaysian evidence based on ARDL approach

Othman, Nurhuda and Masih, Mansur

INCEIF, Malaysia, Business School, Universiti Kuala Lumpur, Kuala Lumpur, Malaysia

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Granger-causality between palm oil, gold and stocks (islamic and conventional): Malaysian evidence based on ARDL approach

Nurhuda Othman[1] and Mansur Masih[2]

Abstract: This paper aims to ascertain the Granger-causality between Malaysian strategic commodities (namely palm oil and gold prices) and stock markets (both conventional and Islamic) using an ARDL or 'Bounds Test' The variables involved in this research are Crude Palm Oil Price Malaysia (POM), Kijang Emas / Gold Price (KE), FTSE Bursa Malaysia KLCI (CI) and FTSE Bursa Malaysia Emas Shariah Index (BMES). The empirical results tend to indicate that Kijang Emas / Gold Price (KE) being the most exogenous leads the changes followed by crude palm oil price, FTSE Bursa Malaysia KLCI (CI) and FTSE Bursa Malaysia Emas Shariah Index (BMES) which is the most endogenous. We found there are causalities between stock price and palm oil price. We also note, there are significant relationships between the variables in the long run with a strong causal link between FTSE Bursa Malaysia EMAS Shariah Index and FTSE Bursa Malaysia KLCI.

Keywords: Islamic stock market , Crude Palm Oil Price, Gold Price, ARDL

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[1] INCEIF, Lorong Universiti A, 59100 Kuala Lumpur, Malaysia.

2 **Corresponding author**, Senior Professor, UniKL Business School, 50300, Kuala Lumpur, Malaysia.

Email: mansurmasih@unikl.edu.my

1. INTRODUCTION: THE ISSUE MOTIVATING THE STUDY

The palm oil, currently the world's main vegetable oil crop, is characterized by a large productivity and a long-life span, estimated more than 25 years. Malaysia is recognized as the second largest exporter of palm oil behind Indonesia and together, both countries account for 85% of the total global supply chain of palm oil. To date, Malaysia produced about 39% of the world's palm oil productions and 44% of world exports. Malaysia GDP agriculture sector rebounded to a sturdy growth of 8.3% on a year-on-year basis s impelled by Oil Palm which accelerated to a double-digit growth of 17.7%[1]. This industry accounts for approximately 6% of the country's gross domestic product (GDP) and is responsible for directly employing up to 600,000 people, ranging from low-skilled to high-skilled labors. Due to the significant contribution of agriculture productivity, Malaysia government has allocated RM140 million allocation for oil palm replanting, new plantings and promotion of palm oil exports. The budget seeks to reinvigorate the commodity sector being the largest contributor of net exports in 2018, spearheading economic progress above and beyond the Transformasi Nasional 2050 agenda.

The second focus variables choose in this paper is gold where the investments are regarded as an inflation hedge and safe asset for stock markets during the downturn periods (Baur and Lucey, 2010). Gold is found positively correlated to inflation, a good instrument of inflationary hedge (Bampinas and Panagiotidis, 2015). Such nature provides sense of certainty to the investors during financial depressions and works as attractive alternative (Baur and McDermott, 2010). The investment in gold can at least retains its purchasing power during the periods of high inflation (Goodman, 1956). Gold can be used as portfolio diversifier since

[1] Press Release, Gross Domestic Products Q1 2017, Department of Statistics Malaysia.

it has low correlation with other assets therefore lowers the overall portfolio risk (Ciner et al., 2013). Notably, the central banks also retain gold for diversification purposes and to safeguard from economic uncertainties (Chen and Lin, 2014; Ciner et al., 2013; Kaufmann and Winters, 1989; Kumar, 2014). Despite the positive role of gold investments in portfolio diversification and hedging, market find volatility in gold prices has a negative impact on stock markets. Lower volatility in gold prices indicates safe investment conditions (Baur, 2012).

The price of stock markets is impacted by various economic factors. However, macroeconomic variables such as gold and oil are found to have profound impacts. In this research instead of studying oil we wished to know the links of palm oil considering the position of Malaysia as palm oil producer in the world. Previous studies on this topic (Beckmann and Czudaj, 2013; Kanjilal and Ghosh, 2014; Shahbaz et al., 2014; Wang et al., 2011) have mainly analyzed the stock, gold and oil linkages in a linear setting. Anoruo (2011) argues the practicality of linear regression than the non linear noting the nature of variable discussed.

2. LITERATURE REVIEW

Hussin et.al. (2013) concluded in their findings that Islamic stock returns were not co-integrated with strategic commodities in the long run. From the Granger causality viewpoint, it was observed that there was a bi-directional causality relationship between Islamic stock returns with oil prices. On the other hand, the FBMES was not affected by the gold prices or vice versa. Therefore, it can be concluded that, among strategic commodities, only oil price variables will affect the Islamic stock return in the short run in Malaysia. They further concluded that Kijang Gold Price is not a valid variable for predicting changes in Islamic share prices.

While for the palm oil study many studies have been conducted to study the investigation with crude oil. Since there is a lack of literature that includes palm oil in this nexus, we will be extrapolating the ideologies behind those applied to crude oil onto palm oil. Even if there are studies on palm oil they are using more advanced method of nonlinear ARDL. Haron, et.al. (2015) did a volatility analysis on palm oil where according to them, the Malaysian CPO commodity market is volatile. However, the study does not detail out the factors affecting the volatilities.

Therefore, in this section, we will be discussing the underlying theoretical framework and review the existing body of knowledge.

3. THE OBJECTIVE OF THE STUDY

(i) To know the Granger-causal direction between Malaysia palm oil, Gold and Malaysian stock market (both Islamic and Conventional)?

(ii) Can palm oil price be used as inflation hedge for stock price fluctuation? If yes, is it better than Kijang Emas (Gold)?

4. THEORETICAL UNDERPINNINGS

The dynamic relationship that exists between share returns and macroeconomic variables have been extensively discussed, the basis of these studies being the use of models which state that share prices can be appropriately written as the expected discounted cash flow. It can be said, then, that share price determinants are the required rate of return and expected cash flows (Elton and Gruber, 1991).

Malaysian crude palm oil has been a major export commodity and contributing signifcantly to the Malaysian economic development. PALM OIL is an agricultural commodity traded in a standardized exchange – Bursa Malaysia derivatives Berhad (BMdB). In addition, since Malaysia host the largest and third largest public listed palm oil companies in the world, i.e. Sime Darby Berhad and Felda Global Ventures Holdings Berhad and other large companies control up to 60% of Malaysia's palm oil plantations. Noting on the same we then form hypothesis that palm oil prices would have a significant impact on the Malaysian stock market. In this research, the stock market of Islamic and conventional is differentiated learning the player in Islamic stock can participate the conventional market without shariah restriction.

Crude palm oil and gold are strategic resources that are largely used in various national economic activities and in national security. Due to this, we include the 4the variable of Kijang Emas (Gold) to see the causality to the model. Large fluctuations in crude palm oil and gold markets may lead to increased price volatility, which affects price stabilization policies and imposes more challenges on market participants (producers, consumers, and investors), who often try to predict the future prices of the commodities.

5. THE METHADOLOGY & DATA USED

DATA

A total of two strategic commodities variables and two stock indices monthly data duration from July 2017 – Nov 2017 representing Islamic and Conventional have been used in the analysis. The definitions of each variable and sources described as below:

Table.1: Definitions and Source of Variables

No	Variable	Description	Source
1.	KE	Kijang Emas, Gold Price	BNM website
2.	POM	Crude Palm oil price (Malaysia)	Thompson Reuters DataStream
3.	BMES	FTSE Bursa Malaysia Emas Shariah	
4.	CI	FTSE Bursa Malaysia KLCI	

METHODOLOGY

In hypothesis testing lead – lag relationship, researcher may choose to adopt the either cross-sectional or time-series approaches. The cross-sectional approach has a major shortcoming in testing lead-lag relationships because they are not appropriate in capturing the dynamics of the variables involved. Moreover, cross-sectional studies are underlying with many assumptions that is not realistic. In findings the lead – lag relationship, time series study to individual country is more suitable.

Although the time-series techniques are an improvement to cross-sectional studies in testing Granger causality, they are still limited where the error correction/variance decompositions methods are based on the estimates of the cointegrating vectors, which are a theoretical in nature. Such limitation then taken care by the development of ARDL technique. The ARDL bounds testing approach is more appropriate compared to those traditional cointegration approaches. The approach avoids endogeneity problems and the inability to test long run relationships of variable associates with the traditional Engel-Granger method. Both short run and long run parameters are calculated simultaneously and the ARDL approach can be used regardless of whether the data are integrated of order I(0) or I(1). Narayan (2005) argues that the ARDL approach is superior in small samples to other single and multivariate cointegration methods. The following 5 regressions are constructed without any prior information as to the direction of the relationship between the variables. The ARDL model specifications of the functional relationship between palm oil (POM), Kijang Emas (Gold) (KE), Carbon Emission(CO), FTSE Bursa Malaysia Emas Shariah (BMES) and FTSE Bursa Malaysia KLCI (CI) can be estimated below:

$$LPOM = \beta_0 + \beta^1 LBMES + \beta^2 CI + \beta^3 KE + \epsilon_t$$

The relationships between the four variables are analyzed using econometric tools namely;

1) Unit Root Test

2) Auto Regressive Distributed Lag (ARDL) - a more advance cointegration test usable even if the variables are stationary at different levels I(0) and I(1).

3) Variance Decomposition (VDC) - to rank the leading variables or the most independent.

4) Impulse Function Response (IRF) - a test of their inter-temporal linkages, and

A) UNIT ROOT TEST

In time series, variables a non-stationary in their raw form. That means, choosing these variables to perform an ordinary regression will produce us misleading results. The below is ADF test where we test the stationarity of the variables selected from the analysis all the variable are stationary at 1st difference. Hence, we proceed our test to VAR lag order.

Table 2: Augmented Dickey–Fuller (ADF) tests table

	VARIABLE	ADF	VALUE	T-STAT.	C.V.	RESULT
LOG FORM	LPOM	ADF(3)=SBC	66.0318	-3.659	-3.448	Stationary
		ADF(3)=AIC	74.3691	-3.659	-3.448	Stationary
	LCI	ADF(3)=SBC	147.8993	-2.517	-3.448	Non-Stationary
		ADF(5)=AIC	156.6267	-3.048	-3.448	Non-Stationary
	LBMES	ADF(3)=SBC	144.8054	-3.114	-3.448	Non-Stationary
		ADF(3)=AIC	153.1428	-3.114	-3.448	Non-Stationary
	LKE	ADF(1)=SBC	83.4301	-1.5901	-3.4478	Non-Stationary
		ADF(1)=AIC	88.9883	-1.5901	-3.4478	Non-Stationary

	VARIABLE	ADF	VALUE	T-STAT.	C.V.	RESULT
1ST DIFF. FORM	DPOM	ADF(2)=SBC	63.4894	-4.603	-2.886	Stationary
		ADF(2)=AIC	69.0308	-4.603	-2.886	Stationary
	DCI	ADF(2)=SBC	153.4094	-6.247	-2.886	Stationary
		ADF(2)=AIC	147.8680	-6.247	-2.886	Stationary
	DBMES	ADF(2)=SBC	142.9747	-5.802	-2.8859	Stationary
		ADF(2)=AIC	148.5161	-5.802	-2.8859	Stationary
	DKE	ADF(1)=SBC	81.895	-7.786	-2.8859	Stationary
		ADF(1)=AIC	86.0511	-7.786	-2.8859	Stationary

Next we test the variables to confirm that none of the variables is I(2) using Augmented DF test and observed that variables are I(1) when we checked at level form and I(0) at first difference. Using VAR order in serial correlation is a common feature and useful where stationary time series move together. We need to determine the order of the Vector auto regression (VAR), how many lags to be used. The result below shows that AIC recommends order of 3 while SBC favors 0 lag.

Table 3: VAR Lag order table

Order	LL	AIC	SBC	LR test	Adjusted LR test
6	742.1328	642.1328	503.5986	-	-
5	732.5955	648.5955	532.2268	CHSQ(16)=19.0745[.265]	15.0333[.522]
4	719.6197	651.6197	557.4164	CHSQ(32)=45.0263[.063]	35.4868[.307]
3	711.2177	659.2177	587.1799	CHSQ(48)=61.8302[.087]	48.7306[.443]
2	693.7008	657.7008	607.8285	CHSQ(64)=96.8640[.005]	76.3419[.139]
1	678.1416	658.1416	630.4348	CHSQ(80)=127.9824[.001]	100.8675[.057]
0	643.7005	639.7005	634.1591	CHSQ(96)=196.8647[.000]	155.1561[.000]

	Choice Criteria	
	AIC	SBC
Optimal order	3	0

But given the conflicting results we checked for serial correlation in each variable and obtained the following results as below:

Table 4: Serial Correlation tests table

VARIABLE	Chi-Sq P-Value	Implication at 5%
DPOM	0.450	No serial correlation
DCI	0.003	There is serial correlation
DBMES	0.001	There is serial correlation
DKE	0.045	There is serial correlation

As evident from the above results, there is autocorrelation in 3 out of 4 variables. Based on result we choose AIC since tends to produce the most accurate for bigger sample size for which SBC is more accurate for lower than 120 (Ivanov and Kilian, 2005). Noting most of our variables suffered auto – correlation problem, we choose 3 lags in order to eliminate the auto correlation problem.

B. TESTING COINTEGRATION

There are numbers of co-integration test that we learnt which is Engle – Grager, Johansen and ARDL. However, there are benefits of ARDL that suitable for this research purpose i.e it works better for small sample size. Due to that we decide to proceed with ARDL a model was introduced by Paseran et al. (2001) in order to incorporate stationary variables I(0) and non stationary I(1) variables in same estimation. Previously OLS test is used with assumption that variables are all at I(0) level in time series data but obviously they are not held constant as most of them changing all the time.

AUTO REGRESSIVE DISTRIBUTED LAG (ARDL)

To empirically analyze the dynamic relationship of multi dimensions variables, we use ARDL co-integration procedure developed by Pesaran et al. (2001) due to a few reasons.

i) It is a unique technique against other multivariate cointegration like Johansen and Juselius (1990) where it allows co-integrating relationship to be estimated by OLS once the lag order is selected.

ii) It doesn't require the pre-testing of the variables in finding unit root.

iii) The error correction method integrates the short run dynamics with long run equilibrium without losing long run information (Joshi, 2015).

The ARDL procedure involves two stages. First, testing the existence of the long-run relation between the variables and secondly, estimating the coefficients of it.

In its basic form, an ARDL model looks like this:

$$y_t = \beta_0 + \beta_1 y_{t-1} + ...+ \beta p y_{t-p} + \alpha_0 x_t + \alpha_1 x_{t-1} + \alpha_2 x_{t-2} +.....+ \alpha_q x_{t-q} + \varepsilon_t$$

where ε_t acted as random 'disturbance' term.

When we perform the 'Bound Testing', we are testing the absence of a long-run equilibrium relationship between the variables with H_0 is there is no-lung run relationship. ARDL technic supply bound on the critical values with lower and upper number on the critical values. If the computed F statistic falls below the lower bound, we can conclude that the variables are I(0) so there is no-cointegration and if it exceeds the upper bound, then we conclude that we have co-ingetration. If the F-statistic falls between the bounds, the test is inconclusive.

The null hypothesis for the F-test is $H_0 = \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = 0$ which indicates there is no long-run co-integration among variables, against the alternative hypothesis that long run co-integration does exist among variables ($H_1 = \gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq \gamma_5 \neq 0$)

Given 4 variables are tested in this paper, according to the F-table, the lower bound is at 3.063 for I(0) and the upper bound I(1) is at 4.084. The result below shows there are 2 of the variables have co-integration in the long run which is stock prices of conventional and Islamic. This is probably due to the variables' observation taken by monthly data.

Table 5: ARDL co-integration tests table

VARIABLES	F-STATISTIC	IMPLICATIONS
DPOM	3.9987	NO CO-INTEGRATION
DBMES	4.9390	THERE IS CO-INTEGRATION
DCI	4.3540	THERE IS CO-INTEGRATION
DKE	3.1533	NO CO-INTEGRATION

LONG RUN STRUCTURAL MODELLING (LRSM)

Based on our result that there is one co-integration with assumption that there must be at least more than one variable co-integrated in the long, we move to the long run equilibrium relationship between the variables. Here we attempt to quantify the theoretical relationship among the variables in order to compare our statistical findings with theoretical (or intuitive) expectations. We found that only one variable that is Brent oil is not significant while others are very significant. We also found that only Unit Trust growth will affect positively to FTSEBMS while others are negatively correlated. This support our intuition that the Unit Trust growth has a significant impact on Shariah Index. Other variables like inflation and USD/MYR exchange will have a negative impact with an increase of one percent.

Table 6: LRSM table

Estimated Long Run Coefficients using the ARDL Approach
ARDL(4,0,4,0) selected based on Akaike Information Criterion
****
Dependent variable is LPOM
110 observations used for estimation from 2007M12 to 2017M1
****

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LCI	6.5556	4.3991	1.4902[.139]
LBMES	-5.2216	3.7875	-1.3786[.171]
LKE	-0.15222	0.25045	-.60779[.545]
C	52.5939	32.6247	1.6121[.110]

****

The result can be written as below:

*LPOM = 52.59 + 6.5556.LCI** – 5.2216LBMES** – 0.1522LKE*

ERROR CORRECTION MODEL

In error-correction term the coefficient of ECM(-1) is the most important as the result must falls between -1 and 0 to prove that there exists partial adjustment . A value smaller than -1 indicates that the model over adjusts in the current period while a positive value implies that the model moves away from equilibrium in the long-run.

In our result on the e_{t-1} we notice that the coefficient of the error-correction term is negative (-0.10504) and very significant (0.003). The magnitude of this coefficient implies that nearly 11% of any disequilibrium between the variables is corrected within one period or one month.

The ECM reported as equation below.

$$\Delta LPOM_t = \alpha + \sum_{i=1}^{p} \phi \Delta LBMES_{t-1} + \sum_{i=1}^{p} \theta \Delta LCI_{t-1} + \sum_{i=1}^{p} \lambda \Delta LKE_{t-1} + \eta ECM_{t-1} + \epsilon_t$$

Table 6: Error Correction Model table

Error Correction Representation for the Selected ARDL Model
ARDL(4,0,4,0) selected based on Akaike Information Criterion
****

Dependent variable is dLPOM
110 observations used for estimation from 2007M12 to 2017M1
****

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLPOM1	0.31429	0.095496	3.2912[.001]
dLPOM2	-0.033706	0.098231	-.34313[.732]
dLPOM3	0.35672	0.099551	3.5833[.001]
dLCI	0.68861	0.49578	1.3889[.168]
dLBMES	0.46297	0.45954	1.0075[.316]
dLBMES1	-0.26894	0.17984	-1.4954[.138]
dLBMES2	0.051883	0.17819	.29116[.772]
dLBMES3	-0.32257	0.16751	-1.9256[.057]
dLKE	-0.01599	0.026449	-.60454[.547]
dC	5.5246	3.7542	1.4716[.144]
ecm(-1)	**-0.10504**	0.034983	-3.0026[.003]

****

VARIANCE DECOMPOSITION (VDC)

Variance decomposition finds out to what extent shocks to specified variables are explained by other variables in the system. Variance decomposition measures the amount of forecast error variance in a variable that is explained by innovations or impulse in it and by the other variables in the system. For instance, it discloses to what proportions of the changes in a variable can be associated to changes in the other lagged explanatory variables. Moreover, if a variable explains most of its own shock i.e exogenous, then it does not permit variances of other variables to assist to its explanation and is therefore said to relatively exogenous. There are two types of VDC that is orthogonalized and generalized. The difference between these two is that in orthogonalized forecast error variance decomposition, the amount of percentage of the forecast error variance of a variable which is counted for by the innovation of another variable in the VAR will sum to one across all the variables. On the other hand, generalized forecast error VDC permits one to make robust correlation of the strength, size and persistence of shocks from one equation to another (Payne, 2002) and for that reason we employ generalized VDC as opposed to orthogonalized VDC.

The generalized VDC analysis shows that variable that is explained by its own past variations will be the most exogenous. According the results below, the ranking of variables according to the degree of exogeneity.

Table 7: Variance Decomposition Table

	HORIZON	DPOM	DCI	DBMES	DKE	TOTAL	SELF-DEP	RANKING
DPOM	12	48.64%	25.89%	24.05%	1.42%	100.00%	48.64%	2
DCI	12	17.47%	41.74%	37.95%	2.83%	100.00%	41.74%	3
DBMES	12	17.30%	40.48%	39.95%	2.26%	100.00%	39.95%	4
DKE	12	7.01%	5.14%	4.37%	83.47%	100.00%	83.47%	1

	HORIZON	DPOM	DCI	DBMES	DKE	TOTAL	SELF-DEP	RANKING
DPOM	36	48.58%	25.82%	23.95%	1.65%	100.00%	48.58%	2
DCI	36	17.66%	41.60%	37.76%	2.97%	100.00%	41.60%	3
DBMES	36	17.50%	40.35%	39.73%	2.42%	100.00%	39.73%	4
DKE	36	7.44%	5.32%	4.53%	82.71%	100.00%	82.71%	1

	HORIZON	DPOM	DCI	DBMES	DKE	TOTAL	SELF-DEP	RANKING
DPOM	48	48.58%	25.82%	23.95%	1.65%	100.00%	48.58%	2
DCI	48	17.66%	41.60%	37.76%	2.97%	100.00%	41.60%	3
DBMES	48	17.50%	40.35%	39.73%	2.42%	100.00%	39.73%	4
DKE	48	7.44%	5.32%	4.53%	82.71%	100.00%	82.71%	1

From the above results, we can make the following key observations:

1. The Generalized VDC result shows that Kijang Emas (Gold) price is the most exogenous variable followed by palm oil, conventional stock price and lastly islamic stock price. The ranking is consistent through the period of 50 observations.
2. Kijang Emas (Gold) Price responded strongly to its own shock around 83% with very minimal contribution from other variables. This variable also does not contribute much when we shock the rest of the variables, mainly less than 3%. We find this

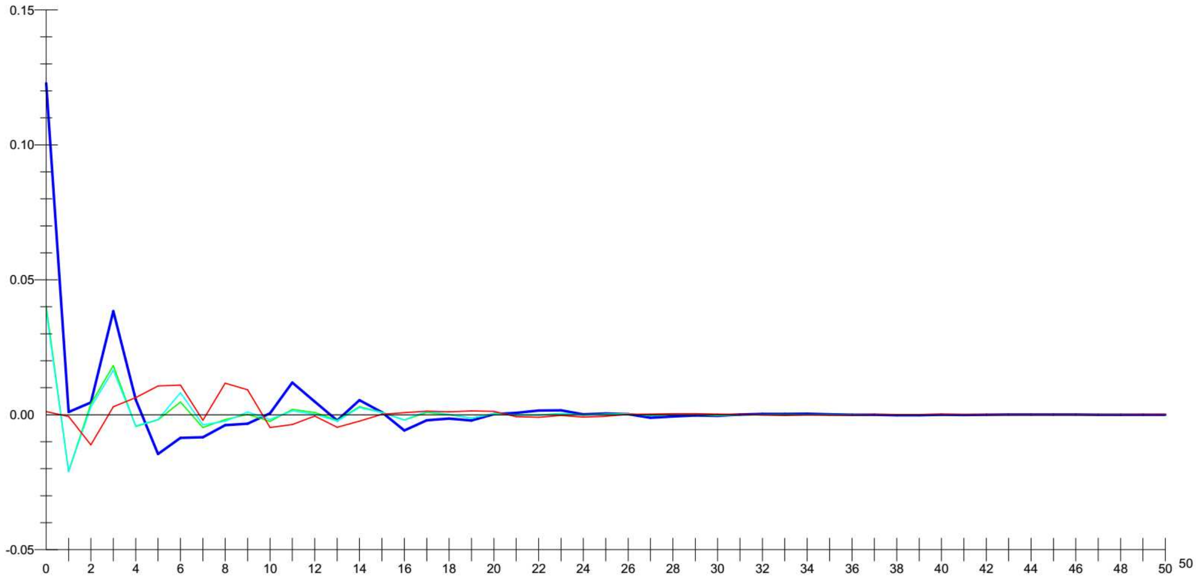
contradict with findings of Baur 2012, where it mentioned the volatility in gold prices has a negative impact on stock markets. Lower volatility in gold prices indicates safe investment conditions. This findings however inline with Hussin et.al (2013) where concluding Kijang Gold Price is not a valid variable for the purpose of predicting changes in Islamic share prices.

3. The palm oil price change around 50% to its own innovation. From our observation, this variable shock change also contributed by stock price, conventional and Islamic, sharing nearly equal portion of 25% where the conventional always take the lead.
4. FTSE Bursa Malaysia KLCI change is contributed by its own innovative shock around 42 per cent for the whole period of 50 observations. This variable can be predicted by FTSE Bursa Malaysia Shariah Emas and palm oil price that contributed around 38% per cent and 18 per cent across all period observations respectively.
5. FTSE Bursa Malaysia Emas Shariah change is observed contributed more by FTSE Bursa Malaysia KLCI which normally stood at 41% more than itself around 40%. Palm oil price that contributed marginally at 18 per cent across all period observations respectively.

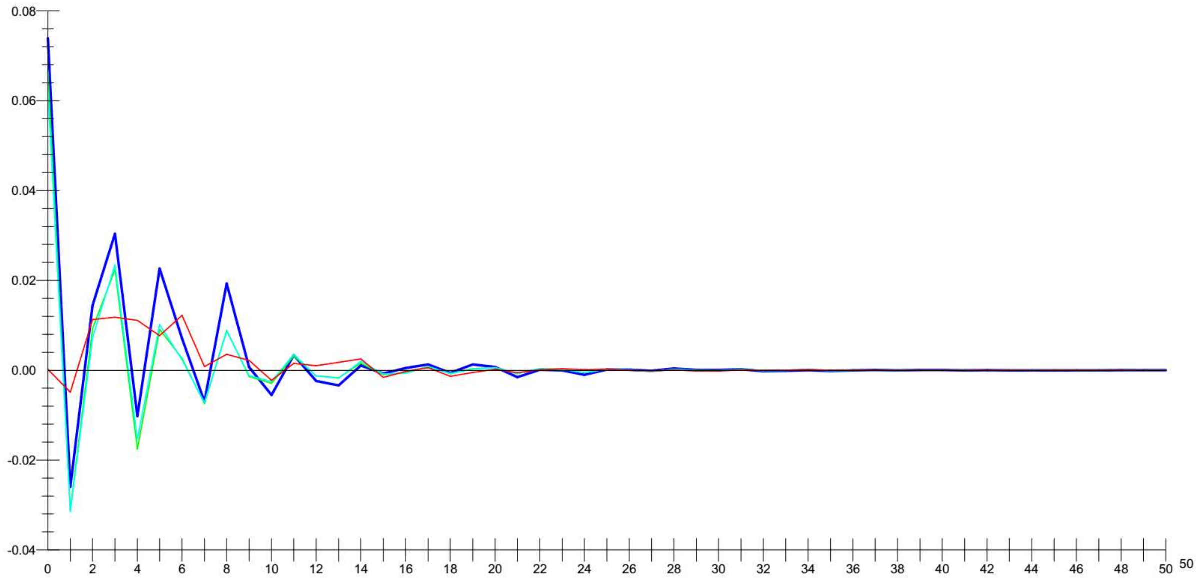
The result of exogeneity between palm oil and kijang emas (gold) show that the former is more exogenous than the latter, followed by FTSE Bursa Malaysia KLCI and FTSE Bursa Malaysia Emas Shariah position at the last as the most endogenous.

IMPULSE RESPONSE FUNCTIONS (IRF)

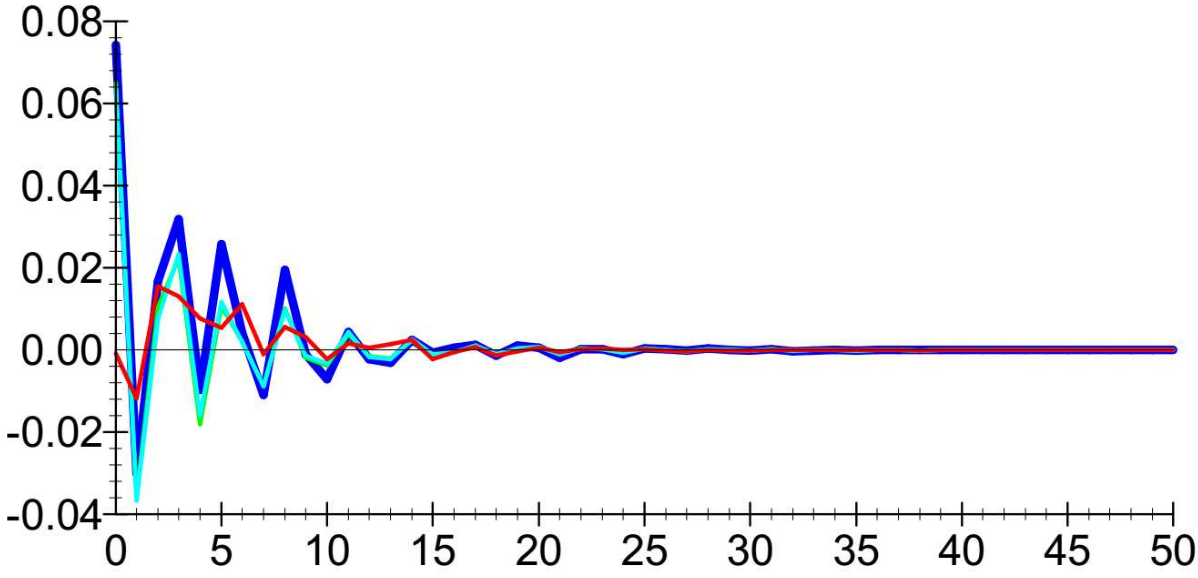
To examine the dynamics of exogenous variables and their impact, we employ Impulse Response Function (IRF) to illustrate the dynamic patterns of all variables especially FTSE Bursa Emas Shariah Index and our focus variable, Islamic unit trust. The IRF are calculated over a 50-monthly time horizon. The initial shock in a variable is set to be equal to one standard error of innovation; the vertical axis in the figures reports the approximate percentage change in other variables in response to a one-percentage shock in issue. The results are shown in figure below. The Impulse Functions Response (IRF) essentially produce the same information as the VDC, except that they can be presented in graphical form.



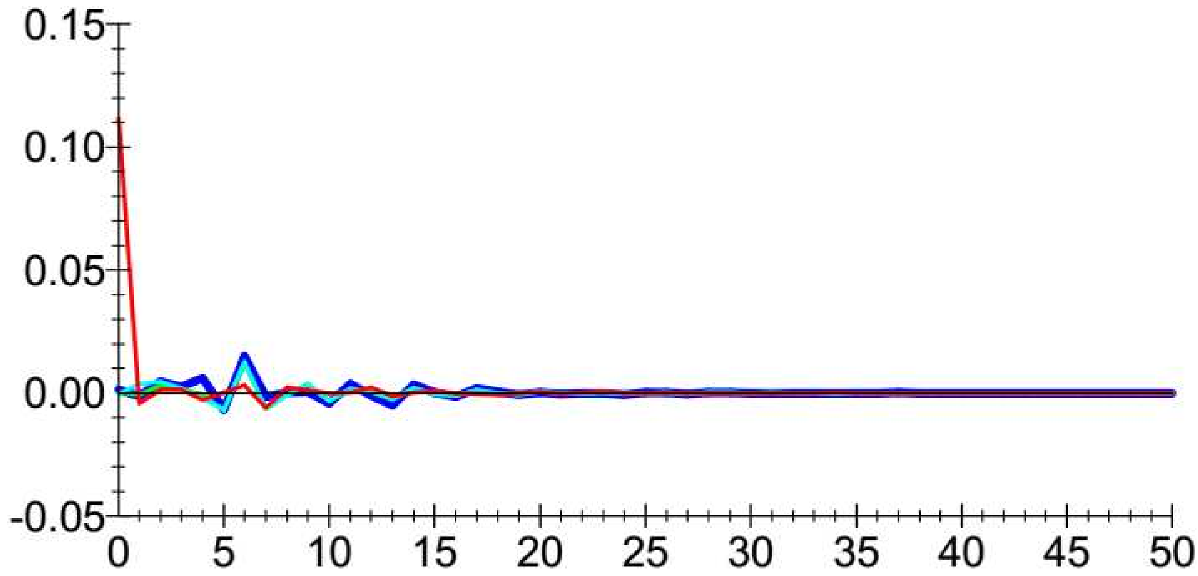
Crude palm oil price (Malaysia)



FTSE Bursa Malaysia Emas Shariah



FTSE Bursa Malaysia KLCI



Kijang Emas, Gold Price

6. CONCLUSION

This study was conducted with the main goal of ascertaining the co-movement between palm oil price returns with Kijang Emas (Gold) and the index returns of two stock indices, namely FTSE Bursa Malaysia Emas Shariah and FTSE Bursa Malaysia KLCI. Monthly data from Nov 2007 up until Nov 2017 where we apply time series econometrics technics of unit root, Auto Regressive Distribution Lags (ARDL) or 'Bound Test', Variance Decomposition (VDC) to study the long run relationship among the variables and discern their dynamic causal interactions.

From the result we conclude, firstly, the Kijang Emas / Gold Price (KE) – who own the most exogeneity lead the changes followed by crude palm oil price, FTSE Bursa Malaysia KLCI (CI) and FTSE Bursa Malaysia Emas Shariah Index (BMES) having the most lag. We also found there are causalities between stock price and palm oil price.

However, we found no causality between gold and the other variables where we observed while the variable Kijang Emas (Gold) is the most exogenous, but it does not contribute to the change of the other 3 variables. The ranking is consistent throughout the 50 months of observation. It also shows that each time series describes the prevalence of its own values with clear bi-directional causality. Gold stood strong on its own innovation and does not affect the other variables when changes are made to the other variables, implying the features of good hedging alternative. Learning from the power of exogeneity owned by Kijang Emas (Gold) and the negative correlation towards the rest of variables, having Kijang Emas (Gold) on the portfolio mix could be a good idea.

We found that both the conventional and Islamic stock markets are strongly correlated with each other. They do contribute to the change of palm oil, but the change of palm oil is mostly contributed by innovation made to itself. The co-movements of these stock markets towards price of palm oil were similar in nature. Therefore, for the portfolio strategic management, we humbly suggest to investor to carefully observe the mix of palm oil in their portfolio.

Our empirical results are practically useful for policy makers who have been using palm oil and gold and as instruments to manage stock price change in Malaysia. The portfolio manager can be benefitted most. The results are also valuable to investors and commodity hedgers in reducing the risk of their portfolios. With the causality result this can be applied as risk management tools, market participants can use them as derivatives in hedging the risk in the gold, crude palm oil, and Malaysian stock markets investment and in equity-commodity portfolio management.

Nevertheless, this study may not be entirely comprehensive. In this study, we did not consider another significant event of boycott held by other countries on the palm oil based on the accusation that this industry is violating the sustainability and ecosystem of our earth. Future studies may include the horizon of this event started and learn how does this sentiment affects the Malaysia market. This study is important for us to know the vulnerabilities of palm oil market in Malaysia and neighbouring ASEAN and Asian region as this is where the demand for palm oil is high. Lastly, we sincerely hope that this study and its findings would be able to contribute to the growing importance of the palm oil industry as knowledge in this nexus is still relatively scarce. Any shortcomings and unintended errors in this study reflect the author alone.

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