Lead-lag relationship between islamic ETF price and strategic commodities: evidence from Malaysia

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Lead-lag relationship between islamic ETF price and strategic commodities: evidence from Malaysia

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Abstract

This paper investigates the lead-lag relationship between Islamic ETF price and strategic commodities such as, oil and gold price. Standard time-series techniques are employed. Malaysia is used as a case study.

The findings tend to indicate that Islamic ETF price is co-integrated with the strategic commodities and the selected macroeconomic variables. Based on the cointegration analysis, the Islamic ETF price is positively related to exchange rate of Malaysian Ringgit (MYR)-United States Dollar (USD), gold price and FTSE Bursa Malaysia KLCI ETF price (FBM3), while negatively related to crude oil price. The findings discern the lead-lag relationship and evidence that the gold price (GOLDBLN) is the most exogenous variable whereas the oil price is the most endogenous variable. The findings are plausible and have strong policy implications.

Keywords: Islamic exchange traded fund (ETF) price, oil price, gold price, lead-lag, Malaysia

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1.0 Introduction and the Issue Motivating this Paper

The Islamic Finance industry has seen a tremendous growth and innovation during the last decade. The demand of Islamic financial instruments is growing at a high pace. Many individual and institutional investors, mainly from Islamic countries, seek to invest only in stocks that are compliant with the Islamic laws (or Shariah).

The Islamic stock market has therefore captured the interest of not only Muslims but non-Muslim investors as well, who are interested in placing more assets in socially responsible portfolios. This has led to the establishment of Islamic indexes such as Dow Jones Islamic Market Index (DJMI) and FTSE Global Islamic Index Series, which tracks the stocks of corporations whose business and activities are compatible with Islamic laws.

The innovation in the capital market has seen the existence of a new breed of investment portfolio namely the Exchange Traded Funds or ETF as they are commonly used. ETFs are tradable securities which derive their value from a pre-defined basket of securities which are constituents of an index. These types of ETFs derive their value (and volatility) from the market movements of the underlying stocks, which comprise the portfolio, and these funds are similar to index funds managed by institutional portfolio managers. Index-linked products, such as ETFs, have been increasingly successful because they provide investors with benefits of diversification through one investment product[1]. Conventional ETFs have attracted many investors as one of the most innovative products of financial engineering. Islamic ETF on the other hand is similar product that falls under the category of Islamic Capital Market. In essence, ETF is unit trust listed and traded on a stock exchange. The structure of Islamic ETF is very much unique as compared to its conventional counterpart, with the extension of Shariah compliant component in the main structure which includes Shariah stock screening methodology. This is due to the fact that Islamic ETF requires strict Shariah compliance from all aspects of the process beginning with the creation and redemption aspect of the Islamic ETF.

With the success and growth of Islamic ETF, Malaysia has also taken the initiative to introduce its own Islamic ETF product in January 2008; whereby MyETF-DJIM Malaysia Titans 25 (MyETF) was established with a net asset value of USD260 million (RM910 million), an initial fund size of 840 million units and authorised fund size of 10 billion units.

[1] Gallagher, David, Reuben Segara (unpublished).

This establishment provided global asset managers and investors with a unique vehicle for attaining desirable portfolio exposure to a new asset class in Asia. Its benchmark index - DJIM Malaysia Titans 25 Index - is reviewed quarterly and is based on the securities of 25 leading Shariah-compliant companies that are traded on Bursa Malaysia. It is managed by *i*-VCAP Management Sdn. Bhd., a wholly owned subsidiary of Valuecap Sdn. Bhd.[2]

This research, in examining the short and long run interaction between Islamic ETF price, strategic commodities prices (such as oil and gold price), and selected macroeconomic variables (such as exchange rate of Malaysian Ringgit (MYR)-United States Dollar (USD) and FTSE Bursa Malaysia KLCI ETF price) in Malaysia, is motivated by a number of ways. First, given the limited evidence on the performance of Islamic ETFs, and the absence of empirical research with regards to the short and long run analysis between the above variables, this study contributes to the literature by providing analysis of the relationship between the above variables using Vector Error Correction Model (VECM) and variance decompositions techniques. This gap in the literature is surprising given the significant growth and size of assets invested in Islamic ETFs. Secondly, while some research have been conducted to study the performance of Islamic ETFs[3], research which compares the long term or causality relationship between Islamic ETF price and other macroeconomics variables such as oil price, gold price, exchange rate of MYR-USD, and FTSE Bursa Malaysia KLCI ETF price still remain unheard of.

Based on the above motivation, this paper is structured as follows. Next section covers the literature review related to this area. Section 3 will cover the objective of the study and the research methodology used, while Section 4 will cover the major section of this paper which is the discussion on the data and empirical results. Fittingly, the conclusion and the policy implication of the study is in Section 5.

2.0 Literature Review

There is in fact dearth of research being conducted in studying the relationship between Islamic ETF prices and other macroeconomic variables. However, Mohd Yahya et al. (2013) came the closest. In their research, they investigate the relationship between Islamic stock market and macroeconomic variables involving oil price shock in Malaysia.

[2] Abdou Diaw et al (2010)

[3] See also Abdou Diaw et al (2010), which give a good analysis on the performance of Islamic ETF in Malaysia by looking at the performance of MyETF-DJIM Malaysia Titan 25 (MyETF).

The Authors found that the Islamic share prices have a positive relationship with the economic growth rate, money supply (M3) and crude oil price but has negative relationships with inflation rate Islamic interbank rate, foreign exchange rate (MYR) and Kijang Gold Price. According to them all of these variables demonstrate a significant relationship except for inflation rate, money supply and Kijang Gold Price. In another research, Mohd Yahya et al (2012) discusses the relationship between oil price, macroeconomic variables and Islamic stock market in Malaysia. In this study it was shown that in cointegration relationship analysis, the Islamic stock price is positively and significantly related to the oil price variable but inversely and not significantly related to the exchange rate variable. They empirically proved that oil price shock will affect the Islamic stock return in the short and long run in Malaysia.

Hence, the above literature review form the basis of this research as both results provided good indication on the relationship between the macroeconomic variables of interest such as oil price, gold price and exchange rate. Although these two studies focus on Islamic stock market in Malaysia, it should give a good basis as the variable of interest in this research is on the Islamic ETF price in Malaysia which is in effect the subset of Islamic stock market in Malaysia, although in a different form.

3.0 Objective of the Study and Research Methodology

Given the crucial importance of understanding the long term relationship and direction of causality between Islamic ETF price and selected macroeconomics variables in Malaysia especially for investors, this study attempts to address this issue through the application of time-series techniques of vector error correction and variance decompositions including the recent long run structural modelling (LRSM) technique.

This study will use the cointegration test and the Granger causality test to investigate the relation between Islamic ETF (MyETF) price and the strategic commodities prices (oil and gold prices), exchange rate of MYR-USD, and FTSE Bursa Malaysia KLCI ETF price. If the variables are significant, they should be cointegrated. This cointegrated relation between Islamic ETF price and underlying factors is a necessary to see the investment opportunity available for investors.

The cointegration analysis requires two steps: the unit-root test to determine their non-stationarity and, when the results indicate that the first-differenced series of each variables are stationary, a subsequent test will be conducted to determine whether these two

variables are cointegrated.

No study has been conducted to investigate potential relations between Islamic ETF price, strategic commodities prices (oil and gold price), exchange rate of MYR-USD, and FTSE Bursa Malaysia KLCI ETF price. The presence of cointegration between Islamic ETF price and strategic commodities prices will provide firm evidence that those commodities variables are significant factors in explaining the price of Islamic ETF and there exists an interactive relation between them.

Finally, this study will investigate the causal relations between Islamic ETF price, oil price, gold price, exchange rate of MYR-USD, and FTSE Bursa Malaysia KLCI ETF price. If a pair of the variable series are cointegrated, the bivariate cointegrated system must have a causal ordering in at least one direction. Therefore, if the results show that the strategic commodities prices causes the Islamic ETF prices, it can be claimed that strategic commodities prices variability is fundamentally linked Islamic ETF price and the change in strategic commodities prices lags or leads the Islamic ETF price.

4.0 Data, Empirical Results and Discussions

This study employs a time series technique, in particular, cointegration, error correction modelling and variance decomposition, in order to find empirical evidence on the nature of relations between Islamic ETF (MyETF) price, oil price, gold price, exchange rate of MYR-USD, and finally FTSE Bursa Malaysia KLCI ETF price. The time series method is favoured for the following reasons.

First, most finance and economics variables are non-stationary. Performing ordinary regression analysis on non-stationary variables will render the results as misleading, because statistical test such as t-ratios and F statistics are not statistically valid. Although using regressions on the differenced form of these variables will solve one problem, but it is at the expense of committing bigger mistake. When variables are regressed in differenced form, the long term trend is effectively removed. Therefore, the regression only captures short term, cyclical or seasonal effects. In other words, the regression is not testing the long term or the theoretical relationship.

Secondly, using traditional regression analysis, the endogeneity and exogeneity of the variables are pre-determined by the researcher, usually on the basis of prevailing or a priori theories. In this study, since we are dealing in a relatively new variable such as Islamic ETF price, there is notable absence of established theories. Therefore it is apt to apply

cointegration techniques as it does not presume the endogeneity and exogeneity of the variables upfront. Instead, both will be determine in the analysis itself, i.e. which variables are exogeneous and which are endogeneous. Using regression, causality is presumed whereas in cointegration, causality is empirically proven in the analysis of the data.

The third reason is that the cointegration techniques embrace dynamic interaction between variables whereas regression methods exclude or discriminate against interaction between variables.

The overall sample period of the study is based on 298 observations starting from February 2008. The data used is in weekly format, and sourced mainly from DataStream (Thompson Reuters). The first variable used is the weekly data for MyETF-DJIM Malaysia Titans 25 index (MYETF). It basically shows the price index for each unit of the Islamic ETF. Second is the weekly data of exchange rate between Malaysian Ringgit (MYR) and United States Dollar (USD) (MYRUS), which specifies how much one US dollar is worse in terms of Malaysian Ringgit. Thirdly is the weekly data for oil price which is reflected by the Crude Oil WTI Spot price (as proxy for the world oil price). The fourth variable is the FTSE Bursa Malaysia KLCI ETF price (FBM3) which is the unit price index for a conventional ETF in Malaysia. The usage of this variable is for additional variable data to ensure robustness of the empirical analysis. All the variables are transformed into logarithm to achieve stationarity in variance. In other words, all the 'level' forms of the variable were transformed into the logarithm scale. The source of all these variables is from DataStream (by Thompson Reuters).

Theoretically, the expectation would be that the Islamic ETF price would have a positive relationship with FTSE Bursa Malaysia KLCI ETF (FBM3) price, as the Islamic ETF is tracking an Islamic benchmarked index which is a subset of the FBM3. Finally, the gold price data which is reflected by the Gold Bullion LBM $/Troy Ounce act as proxy for world price of gold.

Table 1: Summary of Monthly Data used for this study

Variable*	Description	Abbreviation in log form**
MYETF	MyETF-DJIM Malaysia Titans 25 price (Islamic ETF price in Malaysia)	LMYETF
MYRUS	Exchange Rate of MYR-USD	LMYRUS
CRUDOIL	Oil Price (using Crude Oil WTI Spot price as proxy)	LCRUDOIL
FBM3	FTSE Bursa Malaysia KLCI ETF Index	LFBM3
GOLDBLN	Gold Price (using Gold Bullion LBM $/Troy Ounce as proxy)	LGOLDBLN

**Source: DataStream (Thompson Reuters)*

***The log form has been used for all the variables to achieve stationarity in variance*

4.1 Testing Stationarity of Variables

The empirical testing is started by determining the stationarity of the variables[4]. All the 'level' forms of the variables were transformed into logarithm scale. It should be noted that in order to proceed with cointegration test at later stage, our variables should be I(1) or unit root, which mean that in their original form, they are non-stationary variables and in their differenced form, they are stationary variables (sometimes also called I(0)). The differenced form for each variable is created by taking the difference of their log forms. For example, in the case of MYETF variable, after calculating the log of the variable i.e. LMYETF, the differenced form i.e. DMYETF is calculated using the formula DMYETF = LYETF – $LMYETF_{t-1}$. The test of the unit-root hypothesis was initially introduced by Dickey and Fuller in their seminal work in 1979[5] and 1981[6] respectively. To test the unit-root hypothesis, the augmented Dickey-Fuller test (ADF) is used for all the 5 variables in both level form and differenced form. Testing on the unit roots of all the variables, it was found that they could be taken as I(1) on the basis of ADF tests. Summary of the results is presented in the table below.

[4] A variable is stationary when its mean, variance and covariance are constant over time.
[5] Dickey, D. A., & Fuller, W. A. (1979). "Distribution of the estimators for autoregressive time series with a unit root."
[6] Dickey, D. A., & Fuller, W. A. (1981). "The likelihood ratio statistics for autoregressive time series with a unit root."

Table 2: Unit root test using ADF

Variable	Test Statistic	Critical Value	Implication
Variables in Level Form			
LMYETF	-3.2938 (SBC) -3.3184 (AIC)	-3.4266	Variable is non-stationary
LMYRUS	-2.1903	-3.4266	Variable is non-stationary
LCRUDOIL	-2.3293 (SBC) -2.5674 (AIC)	-3.4266	Variable is non-stationary
LFBM3	-2.2604	-3.4266	Variable is non-stationary
LGOLDBLN	-1.0057	-3.4266	Variable is non-stationary
Variables in Differenced Form			
DMYETF	-10.8258	-2.8716	Variable is stationary
DMYRUS	-11.1355	-2.8716	Variable is stationary
DCRUDOIL	-9.5590 (SBC) -7.4550 (AIC)	-2.8716	Variable is stationary
DFBM3	-12.0434	-2.8716	Variable is stationary
DGOLDBLN	-12.5045 (SBC) -11.4287	-2.8716	Variable is stationary

Basing our analysis on the AIC and SBC criteria, it can be concluded that all the variables are I(1)[7]. We can now proceed to cointegration testing. However, it is important to note that in testing the stationary or non-stationary of the variables, the test statistic that is used to compare with the 95% critical value for the ADF statistics is selected based on the ADF regression order with the highest computed value for AIC and SBC in their lagged form. We can see in Table 2 above that in some cases, AIC and SBC give different orders and in this instances, we took both orders and compared them against the critical value. In fact, this is not really an issue here as the results are consistent.

The interpretation under this test is that a stationary series mean that the variables

[7] The null hypotheses for the ADF test is that the variable is non-stationary. In all the tests in level form, the test statistic is lower than the critical value. Therefore we cannot reject the null (variables are non-stationary). On the other hand, in all the test in differenced form, the test statistic is higher than the critical value, hence we can reject the null (variables are stationary).

has a mean (to which it tends to return), a finite variance, shocks are transitory, the autocorrelation coefficient die out as the number of lags grows. Non-stationary series on the other hand mean that the variables has an infinite variance (it grows over time), shocks are permanent (on the series) and its autocorrelations tend to be unity.

4.2 Determination of Order of the VAR Model

Determining the order of the vector autoregression (VAR) is another important step before we proceed with cointegration test. The order of VAR means the number of lags to be used in subsequent test. The result of the analysis shows that the recommended order of VAR based on AIC is of order 3, whereas based on SBC is of order 0.

Table 3: Order of VAR

	Choice Criteria	
	AIC	SBC
Optimal Order	3	0

Since there is a conflict between the recommendation of the order of VAR by AIC and SBC, we must now examine the serial correlation for each variables. The results are tabulated in Table 4 below. See below for details[8].

Table 4: Autocorrelation Diagnostic Test

Variable	Chi-Square p-value	Implication (at 10% significant level)
DMYETF	0.444	There is no serial correlation
DMYRUS	0.865	There is no serial correlation
DCRUDOIL	0.024	There is serial correlation
DFBM3	0.844	There is no serial correlation
DGOLDBLN	0.733	There is no serial correlation

In this test the null hypotheses is that there is no serial correlation. It is evident from the above table that there is autocorrelation in one (1) out of the five (5) variables. Therefore, looking back at our order of VAR analysis earlier, if we adopted a lower order (i.e. SBC),

[8] Based on highest computed values for AIC and SBC, after stipulating an arbitrary high VAR order of 6

then we may encounter the effects of serial correlation. On the other hand, there is also the disadvantages of taking a higher order (i.e. AIC) in that we may risk over parameterization. But in this case since we are using a relatively long time series (298 observations) than it is actually a lesser concern on this analysis. Based on this trade-off between lower and higher order of VAR, this study decided to choose the higher order of VAR of 3 (optimal order).

4.3 Cointegration Test

Choosing the vector auto regression (VAR) of order 3, the Johansen cointegration test (as depicted in Table 5), reveals that at least one (1) cointegrating vector exist among the variables. As can be seen in the table below, the maximum Eigenvalue, Trace and HQC indicate that there is one (1) cointegrating vector, but according to AIC and SBC, there are four (4) and zero (0) cointegrating vectors respectively. See below for details.[9]

Table 5: Cointegration Test

Criteria	No. of cointegrating vectors
Maximal Eigenvalue	1
Trace	1
AIC	4
SBC	0
HQC	1

We can conclude that from the cointegration test we have found one (1) cointegrating vector at 95% significance level on the basis of maximal Eigenvalue and trace statistics. What it means here is that the evidence of cointegration implies that the relationship among the variables is not spurious but there is a theoretical relationship among the variables and that they are in equilibrium in the long run.

The author tend to inclined and believed that there is one (1) cointegrating vector based on intuition and familiarity with asset diversification by investors whereby there is a relationship between price of strategic commodities vis-à-vis stock price. Basically, the message that the author would like to put forward here is that the price of one strategic

[9] In the case of Maximal Eigenvalue and Trace, the test statistic for null of r = 0 is greater than the 95% critical value whereas for other null hypotheses, statistic is less than the critical values. For AIC, SBC and HQC, the number of cointegrating vectors is obtained by selecting the highest numbers.

commodity (either oil or gold) tends to have effect on other asset prices. Based on the cointegration test above and author's own insight, the number of cointegrating vector to be used is one (1).

Statistically, the analysis above indicates that the variables, in some combination, result in a stationary error term. From the author's view, the 5 variables are theoretically related, in that they tend to move together in the long term. In other words, the 5 variables are cointegrated and their relations to one another is not merely a spurious or by chance.

4.4 Long Run Structural Modelling (LRSM)

After we have found that here exist one (1) cointegrating vector amongst the variables, we will now attempt to quantify this apparent theoretical relationship among the variables. We run the Long Run Structural Modelling (LRSM) in order to test the causal relationship between Islamic EIF price, exchange rate of MYR-USD, oil price (crude oil price), FTSE Bursa Malaysia KLCI ETF price and gold price. When the variable of interest i.e. LMYETF is normalized by imposing the exact identification of unity for its coefficient, only the variable LCRUDOIL is found to be significant[10]. The result obtained is shown in the following table.

Table 6: Long Run Structural Modelling (LRSM) – Exact Identifying restriction

Variable	Coefficient	Standard Error	t-ratio	Implication
LMYETF	1.000	-	-	-
LMYRUS	0.89933	0.83329	1.0793	Variable is insignificant
LCRUDOIL	-0.37034	0.16983	-2.1807	Variable is significant
LFBM3	0.28532	0.55758	0.5117	Variable is insignificant
LGOLDBLN	0.10940	0.14574	0.7507	Variable is insignificant

These initial results were generally perplexing, as to why only one variable is considered as significant with regards to our variable of interest. The author intuitiveness initially would also expect that gold price should also be significant. Driven by this curiosity we now need to verify the significance of the variables by subjecting the estimates to over

[10] By calculating the t-ratios (coefficient ÷ standard error), we found one (1) variable to be significant. In t-ratio analysis, the variable of interest in considered as significant if t-ratio > 2 (ignoring minus sign of the ratio).

identifying restrictions. In fact we did this for all the variables by making one over-identifying restriction at a time for each variables. The results which is shown in the table below confirm our earlier finding that only the variable LCRUDOIL is significant.

Table 7: Long Run Structural Modelling (LRSM) – Over Identifying restriction on LMYRUS, LCRUDOIL, LFBM3, and LGOLDBLN

Variable	Chi-Square p-value	Implication (10% significant level)
LMYETF	-	-
LMYRUS	0.184	Variable is insignificant
LCRUDOIL	0.001	Variable is significant
LFBM3	0.533	Variable is insignificant
LGOLDBLN	0.436	Variable is insignificant

To test for robustness, we made several other over-identifying restrictions i.e.

1) LMYRUS, LFBM3 and LGOLDBLN as not significant
2) LMYRUS and LFBM3 as not significant
3) LFBM3 and LGOLDBLN as not significant
4) LMYRUS and LGOLDBLN as not significant

When we made over identifying restrictions all at once, i.e. testing the null hypotheses that LMYRUS, LFBM3 and LGOLDBLN were all insignificant, the null hypotheses is accepted (meaning that LMYRUS, LFBM3 and LGOLDBLN were insignificant). The same result were also obtained for other permutable over-identifying restriction. For example by over-identifying LMYRUS and LFBM3, the null hypotheses is accepted (i.e. insignificant) and the variable LGOLDBLN was also insignificant (t-ratio 0.2825). This latest observations confirmed that only LCRUDOIL is a significant variable. The author intuition on this is that since oil price (crude oil price) is a major commodity globally, therefore any movement in the price of oil will directly impact the price of Islamic ETF.

It is found that the Islamic ETF price (MYETF) in Malaysia denote a positive relationship with the exchange rate of MYR-USD (MYRUS), gold price (GOLDBLN) and FTSE Bursa Malaysia KLCI ETF price (FBM3) but has a negative relationship with crude oil price (CRUDOIL). With regards to relationship between Islamic ETF and gold price, the intuition is that as the gold price rises investors has additional income and thus tend to

diversify their investments to other portfolios such as Islamic stocks and Islamic ETF. This result are opposite from the results by Mohd Yahya et al (2012), whereby in their study the results was that Islamic share price have positive relationship crude oil price and negative relationship with exchange rate. Both their study and the author's research above prove that oil price is a valid variable in predicting changes in Islamic share price and in this research, is a valid variable in predicting changes in Islamic ETF price (which in author's opinion is also a subset of Islamic stock market). The different in results may also due to the sample size used where Mohd Yahya et al (2012) used monthly data from January 2007 – December 2011, which is just before the global financial crisis and also post global financial crisis.

With regards to the relationship between Islamic ETF price and exchange rate, the above result is also opposite to the study conducted by Mohd Yahya et al (2013), whereby the findings in that study showed that these the two variables share a long-term relationship which is negative and significant relationship. Whereas in this research it is a positive relationship but insignificant. As discussed above, the different in results was due to the sample size used by Mohd Yahya et al (2013), which is again from January 2007 – December 2011. Whereas for this current research the sample size is from February 2008 – October 2013, where the sample data covers the period of global financial crisis, all the way through the European debt crisis and post crisis period.

In summary, the Long Run Structural Modelling (LRSM) endeavors to estimate theoretically meaningful long-run (or cointegrating) relations by imposing on those long-run relations (and then testing) both identifying and over-identifying restriction based on theories and other information of the variables under review. Therefore, from the above analysis, we arrive at the following cointegration equation (numbers in parentheses are standard deviations):

$$\underset{(0.16983)}{MYETF - 0.37034CRUDOIL} \rightarrow I(0)$$

4.5 Vector Error Correction Model (VECM)

Based on our analysis we have established that only two (2) variables are cointegrated to a significant degree i.e. MYETF and CRUDOIL. Cointegration, however, cannot tell us the direction of Granger causality as to which variable is leading and which is lagging (i.e. which variable is exogenous and which variable is endogenous). Information on direction of Granger causation can be useful for the investors. By knowing this relationship, it will facilitate investors to forecast or predict the expected result of their investment in Islamic ETF product in Malaysia. For discerning the endogeneity/exogeneity of the variables, we applied the Vector Error Correction Modelling (VECM) techniques. In this technique, in addition to decomposing the change in each variable to short-term and long-term components, we are able to ascertain which variables are exogenous and which are endogenous The principle in action here is that of Granger-causality a form of temporal causality where we determine the extent to which the change in one variable is caused by another variable in a previous period. In this test, we can check whether the variable is exogenous by examining the error correction term, e_{t-1}, for each variable, and also by checking whether the error correction term is significant.

Table 8: Vector Error Correction Model

Variable	ecm1 (-1)				Implication
	Coefficient	Standard Error	T-ratio	P-value	
LMYETF	-0.016309	0.016132	-1.0110	0.313	Variable is exogenous
LMYRUS	-0.021803	0.0076355	-2.8554	0.005	Variable is endogenous
LCRUDOIL	0.29711	0.048499	6.1261	0.000	Variable is endogenous
LFBM3	0.0065892	0.015721	0.41913	0.675	Variable is exogenous
LGOLDBLN	0.054549	0.025179	2.1664	0.031	Variable is endogenous

Looking at the significant or otherwise of the error correction model (ECM(-1)), i.e. by using t-ratio or p-value, we find that MYETF and LFBM3 variables are exogenous, whereas LMYRUS, LCRUDOIL & LGOLDBLN are endogenous variables. This tends to indicate that exchange rate (MYRUS), oil price (CRUDOIL) and gold price (GOLDBLN)

variables response to Islamic ETF (MYETF) index and FTSE Bursa Malaysia KLCI ETF index variables. The error correction term in the MYRUS, CRUDOIL and GOLDBLN equations is significant. It implies that the deviation of the variables (represented by the error correction term) has a significant feedback on the three (3) variables that bears the burden of short run adjustment to bring about long-term equilibrium. The error correction terms stands for the long term relations among the variables. The diagnostic of all the equations of the error correction model (testing for the presence of autocorrelation, functional form, normality and heteroskedasticity) tend to indicate that the equations are well specified.

The implication of this result is perplexing. As far as investor is concerned, the results shows that as if the variables of interest would now be Islamic ETF price and FTSE Bursa Malaysia KLCI ETF price as it will have bearing to the oil price, gold price and exchange rate. This result is a matter of concern to the author as it goes against some establish theories related to relationship between macroeconomics variables.

Nonetheless, to further our discussion, the coefficient of e_{t-1} tells us how long it will take to get back to long term equilibrium if that variable is shocked. The coefficient represents proportion of imbalanced corrected in each period. For example the coefficient of oil price is 0.297. What it means is that when there is a shock applied to this variable, it would take on average 3.7 weeks for the price to get back into equilibrium with other variables. The summary of the time taken for each variables to get back to long term equilibrium if that variable is shocked is summarized in the table below.

Table 9: Time to reach equilibrium for each variable

Variable	Coefficient of ecm1 (-1)	Time to reach equilibrium*
LMYETF	-0.016309	61.3 weeks
LMYRUS	-0.021803	45.9 weeks
LCRUDOIL	0.29711	3.4 weeks
LFBM3	0.0065892	152.8 weeks
LGOLDBLN	0.054549	18.3 weeks

*obtained by using formula (1/coefficient of ecm(-1))

4.6 Variance Decomposition (VDC)

Although error correction model tends to indicate the endogeneity/exogeneity of the variables, up till this moment we have not been able to say anything about the relative endogeneity/exogeneity of the variables. The basic idea about this is that between the 2 exogenous (leader) variables, which variable is the strongest leader and which variable is the second strongest. On the same token for the remaining variables, which is the most laggard (endogeneous or follower) variable compared to others, and which is the least laggard. The relative endogeneity/exogeneity of a variable can be determined by the proportion of the variance explain by its own past. The variable that is explained mostly by its own shocks (and not by others) is deemed to be the most exogeneous of all. We now turn our analysis to variance decomposition (VDC) in order to ascertain the relative endogeneity/exogeneity in the following way.

Basically VDC decomposes the variance of forecast error of each variables into proportions attributable to shocks from each variable in the system including its own. The VDC analysis is presented by first applying orthogonalized DVCs and the results obtained are per tables below.

Table 10: Orthogonalized VDCs for forecast horizon at 26 weeks

Variable	MYETF	MYRUS	CRUDOIL	FBM3	GOLDBLN
MYETF	**55.75%**	19.99%	0.06%	18.08%	6.12%
MYRUS	3.91%	**85.69%**	7.22%	3.16%	0.02%
CRUDOIL	43.83%	7.29%	**20.99%**	25.11%	2.79%
FBM3	5.04%	22.20%	0.08%	**70.38%**	2.31%
GOLDBLN	9.94%	7.96%	1.10%	0.45%	**80.56%**

Table 11: Orthogonalized VDCs for forecast horizon at 52 weeks

Variable	MYETF	MYRUS	CRUDOIL	FBM3	GOLDBLN
MYETF	**54.83%**	20.45%	0.05%	18.37%	6.30%
MYRUS	5.91%	**80.37%**	9.04%	4.66%	0.02%
CRUDOIL	50.43%	6.73%	**10.14%**	29.80%	2.90%
FBM3	5.18%	22.34%	0.04%	**70.06%**	2.38%
GOLDBLN	12.58%	8.01%	1.63%	0.87%	**76.90%**

For the above two tables, the interpretation are as follows. First the rows read as the percentage of the variance of the forecast error of each variable into proportions attributable to shocks from other variables (represent in the column), including its own. Secondly, the columns read as percentage in which that variable contributes to other variables in explaining observed changes. The diagonal line of matrix (as per the one in '**bold**' above) represents the relative exogeneity. Therefore, the ranking of the variables by degree of exogeneity (i.e. the extent to which variation is explained by its own past variations) is as per the table below.

Table 12: Ranking of the variables based on Orthogonalized VDCs

Ranking (top to bottom)	Variable
1	MYRUS
2	GOLDBLN
3	FBM3
4	MYETF
5	CRUDOIL

We can observed from the above table that MYRUS (the exchange rate of MYR-USD) is the highest ranking. This result is puzzling as from the VECM analysis, we have found that MYRUS was an endogeneous variable. To understand the above results, it is important that we recognized two important limitations of orthogonalized VDCs. Firstly, it assume that when a particular variable is shocked, all other variables are 'switched off'. Secondly, orthogonalized VDCs do not produce any unique solution. The generated numbers are very much dependent upon the ordering of variables in the VAR. In other words, the first variable would report the highest percentage and thus would likely to be specified as the most exogenous variable.

In addressing the above issue, the generalized variance decomposition (VDC) technique is then applied to rank the variables in order of exogeneity, which is illustrated by the proportion of variance from the variable's own past. Generalized VDCs are invariant to the ordering of the variables, hence it is expected that the results would be more robust. The result is shown in the table below..

Table 13: Generalized VDCs for forecast horizon at 26 weeks

Variable	MYETF	MYRUS	CRUDOIL	FBM3	GOLDBLN
MYETF	**42.94%**	16.39%	3.84%	36.74%	0.09%
MYRUS	3.45%	**76.20%**	0.38%	16.02%	3.94%
CRUDOIL	31.63%	5.76%	**22.83%**	39.19%	0.59%
FBM3	4.13%	18.56%	1.94%	**75.31%**	0.06%
GOLDBLN	8.83%	7.37%	0.44%	3.15%	**80.21%**

Table 14: Generalized VDCs for forecast horizon at 52 weeks

Variable	MYETF	MYRUS	CRUDOIL	FBM3	GOLDBLN
MYETF	**42.21%**	16.75%	3.80%	37.19%	0.05%
MYRUS	5.25%	**72.03%**	0.33%	18.93%	3.47%
CRUDOIL	37.02%	5.47%	**13.57%**	43.63%	0.31%
FBM3	4.26%	18.71%	1.79%	**75.21%**	0.03%
GOLDBLN	11.14%	7.43%	0.24%	4.41%	**76.78%**

In interpreting the numbers or results obtained under generalized VDCs, additional manual computation is required. This is because in the original results of the simulation of generalized VDCs, the numbers do not add up to one (1). For a given variable, at a specified horizon, we total up the numbers in the each row, and then we divide the number for that variable (which represent the magnitude of variance explained by its own past) by the computed total. By doing this activity, we will ensure that numbers in each row will now add up to one (1).

Therefore, based on all the tests above we can now re-ranking the variables following its relative exogeneity. This is shown in the table below.

Table 15: Ranking of the variables based on Generalized VDCs

No.	Variable Relative Exogeneity	
	At Horizon = 26 weeks	At Horizon = 52 weeks
1	GOLDBLN	GOLDBLN
2	MYRUS	FBM3
3	FBM3	MYRUS
4	MYETF	MYETF
5	CRUDOIL	CRUDOIL

Based on the above results, we can make a number of observations:

1) The results of the above generalized DVCs does not confirm the results of VECM obtained previously. This is because in VECM analysis, it was found that MYETF and FBM3 were considered as exogenous variables. Whereas in the Generalized VDCs result above, both MYETF and FBM3 variables were ranked either at number 2 or number 4 depending on the horizon that was observed.
2) The author is of the view that, based on theoretical study we ought to depend on the generalized VDCs result with regard to the exogeneity and endogeneity of the variables. Also, there might have been result that were obtained in the VECM analysis may cause the variables to be mis-specified.
3) The relative rank is somewhat stable as time passes. Between 26 and 52 weeks horizon, there is only one change in the ranking (between MYRUS and FBM3).

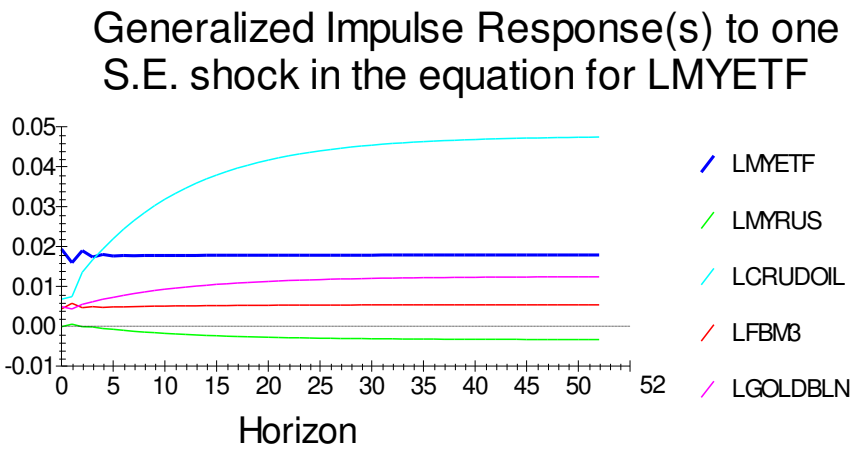
The above discussion would have the following plausible implications. Based on the above result, it is now seems that gold price is the most exogenous of all and also, it explain only 3.5% of the variance of MYETF variable, whereas the MYETF variable explains 11.14% of the variance of the GOLDBLN variable. The change in gold price has some effect on the price of Islamic ETF and vice versa. As an exogenous variable, any significant changes in the price of gold, will have implication in the price of Islamic ETF, as well as other variables such as exchange rate of MYR-USD, FTSE Bursa Malaysia KLCI ETF price, and even oil price.

As the second most exogenous variable, FBM3 variable explains 37% of the variance of the MYETF variable. This is quite logic in a sense that most of the constituent of

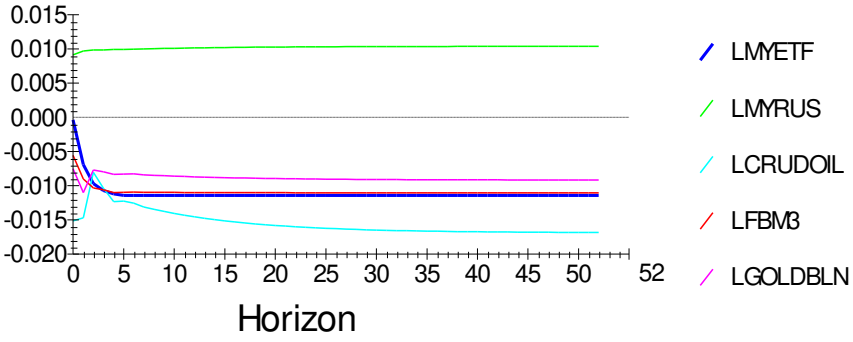
individual stocks in MYETF is also a subset of the constituent of stocks in FBM. Oil price seems to be the most endogeneous perhaps because of the reason that under the Malaysian scenario, oil price is heavily subsidized by the government, and since this study is using market crude oil price (WTI data) as proxy data, it may not have any significant impact to the other macroeconomics variables.

4.7 Impulse Response Functions (IRF)

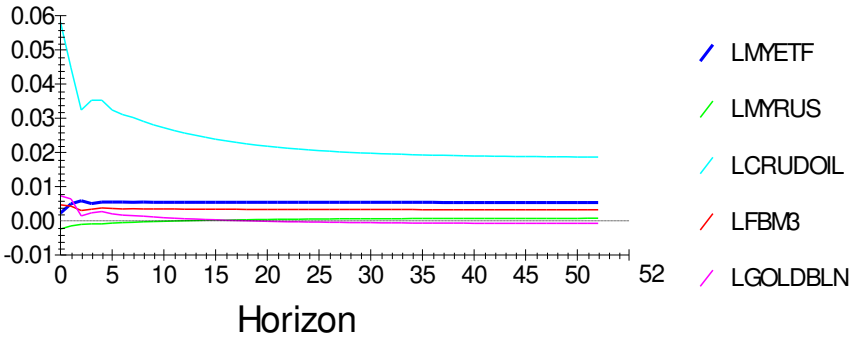
The information contain in VDCs can be equivalently represented by IRFs. IRFs essentially map out the dynamic response path of a variable due to a one-period standard deviation shock to another variable. The IRFs are normalized such that zero represents the steady state value of the response variable. In essence the impulse response function (IRFs) essentially produced the same information as the VDCs, except that they can be presented in in graphical form. And the results are consistent with the generalized variance decomposition results reported in Table 14 since both are information obtained from moving average (MA) representation of the original VAR model.



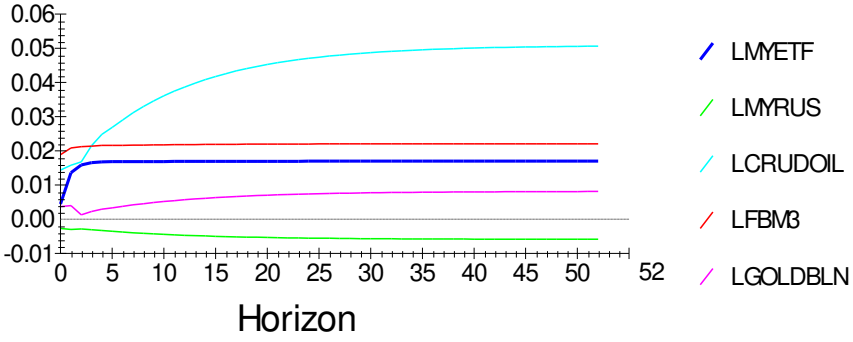
Generalized Impulse Response(s) to one S.E. shock in the equation for LMYRUS

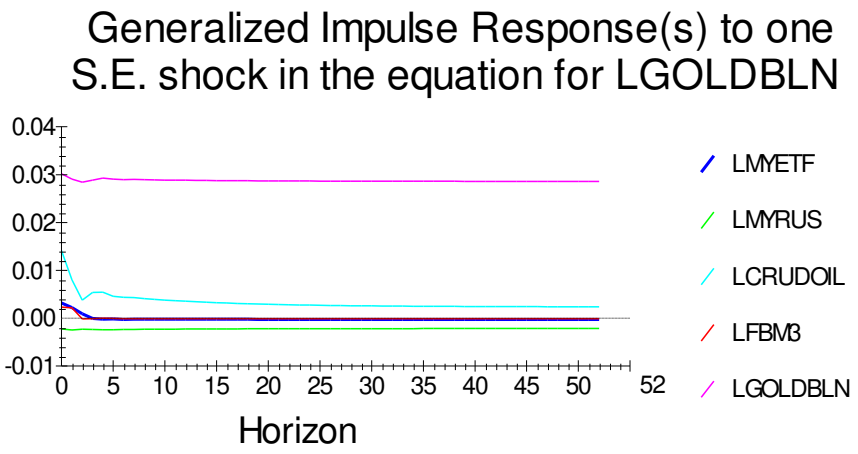


Generalized Impulse Response(s) to one S.E. shock in the equation for LCRUDOIL



Generalized Impulse Response(s) to one S.E. shock in the equation for LFBM3

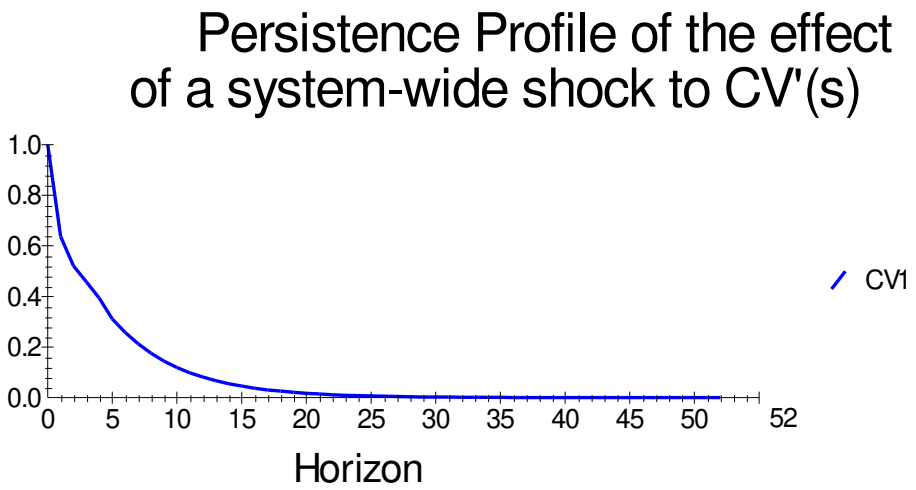




4.8 Persistence Profile (PP)

Persistence profile is an analysis to illustrate the situation in which the entire cointegrating equation is shocked, and it also indicates the time for the relationship to get back to equilibrium. In Persistence Profiles, the effect of a system-wide shock on the long-run relations is the focused (instead of variable specific shocks as in the case of IRFs). The charts below shows the Persistence Profile (PP) for the cointegrating equation of this study.

The chart indicates that it would take approximately 23 weeks for the cointegrating relationship to return to equilibrium following a system-wide shocked.



5.0 Conclusions and Policy Implications

The focus of this article was an attempt to investigate the relationship and the possible directions of causality between the Islamic ETF (MyETF) price and the prices of two strategic commodities namely gold and oil, including the exchange rate of MYR-USD and also an additional ETF price which is the FTSE Bursa Malaysia KLCI ETF price. This is accomplished by applying a time series approach to overcome the shortcomings of OLS (ordinary least square) regression method through the use of cointegration, a vector error correction model (VECM) and variance decomposition (VDC) analysis with 298 observation points of weekly data starting from February 2008.

The study reported a number of important and sometimes perplexing results. In the cointegration analysis, it is found that the Islamic ETF price (MYETF) in Malaysia denote a positive relationship with the exchange rate of MYR-USD (MYRUS), gold price (GOLDBLN) and FTSE Bursa Malaysia KLCI ETF price (FBM3) but has a negative relationship with crude oil price (CRUDOIL). Only CRUDOIL demonstrate significant relationship. This finding proves that between the two strategic commodities, only crude oil price is an important variable predicting the changes in Islamic ETF price in Malaysia, based on the cointegration test conducted. This is very much in line with the study done by Mohd Yahya et al. (2013), which proves that only oil price will affect the Islamic ETF price (which is in fact a subset or a larger Islamic stock price indices), and also proves that gold price is not an important variable for the purpose of predicting changes in the Islamic ETF price in Malaysia.

Surprisingly, the results from VECMs and VDCs analysis portray a completely different results as the gold price, i.e. GOLDBLN variable in considered as endogeneous variable in VECM analysis but later become the most exogeneous variable under generalised VDC analysis. The oil price variable was quite consistent in the analysis of both VECM and VDC whereby both result shows that CRUDOIL variable is endogeneous (it is in fact the most endogeneous in VDC analysis). These 2 completely opposing results (cointegration vis-à-vis VECM & VDC) suggest that based on VDC analysis, gold price will affect the Islamic ETF price.

It is however very interesting to note that, Bank Negara Malaysia (BNM) in its 10-year 'Financial Sector Blueprint 2011-2020' report (*page 118*)[11], has shown the Malaysian

[11] Source: www.bnm.gov.my Retrieved on 02 December 2013

government and regulators commitment to support further development of Islamic exchange traded fund (ETFs) for the Islamic capital market, in order to enhance the liquidity of Islamic financial market in Malaysia. Indeed the introduction of the first Islamic ETF (MyETF) in the Malaysian capital market in early 2008 was the first such step in achieving the above objective.

Islamic ETF represent a significant innovation across Islamic financial market globally and in Malaysia particularly. It can provide investors with diversification benefits through one investment arrangement. One significant future of Islamic ETF is that, as stocks, they can be traded throughout the trading day, unlike mutual funds which can only be traded at the end of the day at their Net Asset Values (NAVs).

Risk management strategy is important for investors to protect themselves from ETF market risk and also to ensure that they make informed decision with regards to their investment. It is the role of the ETF's administrator and policy maker to educate the investors on the risk for such investment. This include knowledge on the macroeconomics variable effecting or predicting the changes in Islamic ETF price especially in Malaysia. This include the effect of movement of crude oil price, gold price and the exchange rate between MYR and USD on the Islamic ETF price. This practice will ensure that the Islamic ETF market is more robust and transparent in the eyes of foreign investors. This best practice will also provide sufficient information for market participants to engage in trading activity that would work to keep the market price of Islamic ETF shares close to their net asset values. The author believe that a regulatory regime, which promotes investor confidence and market transparency, will also enable sufficient liquidity and, thereby, reduce systemic risk, as espouse by Bank Negara Malaysia's Financial Sector Blueprint above.

6.0 Limitations and Suggestion for Future Research

The following are some limitation of this study and hence does present opportunities for similar future research in the empirical research area of Islamic ETF.

The choices of the variables are somewhat arbitrary. Although this research was somewhat based on the study conducted by Mohd Yahya et al. (2013), nonetheless the choices on macroeconomic variable is limited to the price of oil, price of gold, exchange rate between MRY and USD. Other economics variable such as inflation (CPI), industrial production index (IPI) or money supply (M3) could also be considered and might produce different results. To represent a robust Shariah compliant investing scenario, other Shariah

compliant indices available in Malaysia could also be taken into consideration. The choice for FTSE Bursa Malaysia (FBM) KLCI ETF was arbitrary.

Although the results are statistically robust, it would be useful to look at other Shariah compliant indices data available in Malaysia, in order to obtain more information on the robustness of Shariah compliant investing scenario. It would also be desirable to investigate more Islamic ETFs prices across the region in order to provide more empirical information about Islamic ETF market.

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