# Causal Relationship between Macro-Economic Indicators and Funds Unit Prices Behavior: Evidence from Malaysian Islamic Equity Unit Trust Funds Industry

Anwar Hasan Abdullah Othman, Ahamed Kameel, Hasanuddeen Abdul Aziz

*Abstract*—In this study, attempt has been made to investigate the relationship specifically the causal relation between fund unit prices of Islamic equity unit trust fund which measure by fund NAV and the selected macro-economic variables of Malaysian economy by using VECM causality test and Granger causality test. Monthly data has been used from Jan, 2006 to Dec, 2012 for all the variables. The findings of the study showed that industrial production index, political election and financial crisis are the only variables having unidirectional causal relationship with fund unit price. However the global oil price is having bidirectional causality with fund NAV. Thus, it is concluded that the equity unit trust fund industry in Malaysia is an inefficient market with respect to the industrial production index, global oil prices, political election and financial crisis. However the market is approaching towards informational efficiency at least with respect to four macroeconomic variables, treasury bill rate, money supply, foreign exchange rate, and corruption index.

*Keywords*—Fund unit price, unit trust industry, Malaysia, macroeconomic variables, causality.

## I. INTRODUCTION

IN the dual capital market system typical of the Malaysian capital market where conventional and Islamic equity market are traded side by side, this will bring in the impetus affording the Muslim investors with a choice of alternative to invest their funds in line with the *Sharī`ah* rules and principles consistent with their faith. In addition, the Islamic unit trust investment is considered as an alternative investment window through which Muslim investors can participate in the stock market with a clean Islamic conscience. Therefore, it is imperative for unit-holders (investors), fund managers, and policy maker to have a detailed and in-depth understanding of the investment rational mechanism on the funds units' prices behaviour of the Islamic equity unit trust fund industry.

Fund units prices are influenced by many factors some are linked to funds characteristics, sector specific while some other factors belong to the environment in which the funds are running their operations. In the financial literature, movements of securities prices are seen to be more depend on macroeconomic factors whether domestic or universal, political or social circumstances; market sentiments and future expectations about economic growth, country monetary policy declarations and pricing policy etc. [34].

In a sense stock markets can really be considered as the barometer of the economy as they reflect every action taken by the governments or economists and political decision-makers in the country. The efficient market hypothesis suggests that a competition among the profit-maximizing investors in an efficient capital market will ensure that all the relevant information currently known on the changes in the economic condition is fully reflected in the current share prices in which security prices adjust rapidly to the arrival of new information. Moreover, economic theory dictates that the future outlook of the corporate performance and its profits are often reflected in the stock market prices and in general mirror the level of economic activities [40]. If stock prices accurately reflect the underlying fundamentals, then the stock prices should be employed as leading indicators of future economic activities, and not the other way around [40]. Hence, the causal relations between macroeconomic indicators and equity market prices are significant for country's policy maker in the design of the country's macroeconomic policy.

Equity market trends are difficult to understand, and prediction is even more challenging and considered as one of the most challenging issues in modern finance research studies. Obviously, the research interest is due to its commercial applications among the stock market participants owing to its risk-return trade-off. Nevertheless, there have been a lot of researches in the field of equity price prediction across the globe of many stock exchanges; however, still it remains as a big question whether the trend of the equity market price can really be predicted. In general, there are two schools of thoughts regarding the equity price prediction. The first school of thought follows the Random Walk Hypothesis and the Efficient Market Hypothesis that believes the equity price is unpredictable, in which investors cannot achieve above average trading advantages based on the present and past information of the equity market. On the other hand, the second school of thought believes that the market is predictable to a certain extent when prices may move in the expected trends while calculative empirical analytical study of

Anwar Hasan Abdullah Othman, is Ph.D. candidate in Business administration, Faculty of Economic and Management Sciences, International Islamic University Malaysia, KL, 53100, Malaysia, (e-mail: anwar315a@yahoo.com).

Prof. Dr. Ahamed Kameel Mydin Meera and Prof. Dr. Hasanuddeen Abdul Aziz are Professors in the Faculty of Economics and Management Sciences, International Islamic University Malaysia. KL, 53100, Malaysia, (e-mail: akameel@iium.edu.my, ahassan@iium.edu.my)

past prices can help to forecast the future price directions [30].

Corresponding with the mission of predicting the fund unit price behavior, this study therefore attempts to address the problems by analyzing the causal relationships between the NAV of the Islamic equity unit trust funds and the macroeconomic factors, namely Consumer Price Index (CPI), Industrial Production Index (IPI), Three-Month Treasury bill Rate (TBR), Money Supply (M3), Crude Oil Price(OP), Foreign Exchange Rate (FER), National Political Elections (NPE), and Corruption Index (CI) as well as the current global financial crisis (FC) in the Malaysian capital market. In an effort to achieve the stated objectives, the study aims to answer the following research questions:

i.   Do the chosen macroeconomic variables have causal relationships during the sample time period? If so, what is the direction of the causality between NAV and each of these variables?

ii.  Does the global financial crisis cause significant changes on the NAV of the Islamic equity unit trust funds in Malaysia in short-run?

The rest of this paper is organized as follows: Section II reviews previous literature in equity market, Sections III and IV describes the data & methodology applied in the research analysis. Section V discussed the empirical results and finally Section VI draws the conclusion.

## II. LITERATURE REVIEW

The finance literature contains a large number of studies that examine the equity market price behavior with some emphasis on the determinants of the relationship between the stock prices and the economic activities. Most of these studies have paid attention on both markets, developed and developing (emerging) market. Studies in developed capital markets include [14]-[16], [9] for United States, [18] for United Kingdom, [41] for Japan, [29] for Canada, [2] for United States, Japan, United Kingdom, Germany and France, [8] for Australia, and [42] for Korea. These studies have reviewed the effects of several macroeconomic factors such as consumer price index, inflation, industrial products, unemployment, interest rates, money supply, foreign exchange rate, and oil price on the stock market. The overall findings of these studies revealed that there are strong relationships between macroeconomic variables and equity prices in developed countries.

Likeways in developing capital market the relationship between macroeconomic variables and equity market prices have been extensively studied. For instance, [21] and [37] for Malaysia stock market, [33] for Singapore, [40] for India, [1] and [7] for Turkey, [32] for Thailand, Malaysia, Korea, Hong Kong, Japan, and Australia stock market, [27] for Ghana, [38] for Karachi Stock Exchange. In general, the overall results of these studies revealed that macroeconomic variables are significantly influence the equity market prices behaviours in emerging market.

## III. DATA

The data for this study are characterized as monthly frequency running over the period January 2006 to December 2012 which collected from the secondary sources. The random sample utilized under the study included 30 Islamic equity unit trust funds. The selected macro-economic variables are transformed into the natural logarithm except the variables that contain zero and negative values, such as the NAV, and the dummy variables; namely, NPE and FC. The investigated model includes two forms of variable–endogenous and exogenous. The endogenous variables comprise variables that are commonly and regularly perceived in the Malaysian economic system, such as LIPI, LTBR, LM3, LFER, and LOP. While the exogenous variables represent the variables that are out of the Malaysian economic system, such as LCI, NPE and FC.

## IV. METHODOLOGY

In the statistical literature [24] illustrated how to identify the long-run relationship among the variables and conclude whether the variables involved in the model are cointegrated or not. However, studying asset (funds units) prices predication requires considering the relationship among the variables in the short run. This is due to the fact that correlation among the variables does not have anything to do without measuring "cause-and effect" even the variables are highly correlated [39]. Accordingly, the study applied the VECM causality test for the endogenous variables that were found to be cointegrated, as established by [13]. Reference [13] also documented that using a VECM model rather than a VAR in differences will not result in any loss in long-run information. However, the Granger causality test [17] is applied to test the short-run dynamic relationship between LCI, NPE, FC and NAV of the Islamic equity unit trust fund, since these variables are out of the system. The following sub-section discussion gives a brief illustration of these two methods.

### A. Unit Root Test

The study employs the unit root test to examine the stationarity of the series for both the NAV of the Islamic equity unit trust funds and the chosen macro-economic variables, by using the Augmented Dickey Fuller (ADF) [11] and Phillips-Perron (PP) tests [36], which are mathematically presented in the following:

$$\Delta Y_t = \alpha_0 + \alpha_{1t} + \gamma Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-i} + \varepsilon_t$$

$$\Delta Y_t = \alpha_0 + \alpha_{1t} + \gamma Y_{t-1} + \varepsilon_t$$

where, $Y$ represents the variables, $\alpha_i$ and $\gamma$ are constant terms, $t$ is the time period, $\alpha_{1t}$ the intercept and time trend that may be added, $\Delta$ represents the first difference operator, $\varepsilon_t$ is the white noise residual, and $p$ is the number lagged values.

*B. The Granger Test [17]*

Reference [17] developed the original causality method in 1969 to measure the causal effect from time series observations. It examines whether predictability exists among the variables of the interested model. Formally, the *X* Granger causes *Y* if the past values of *X* in the model can help to forecast *Y* value rather than using only past information of *Y* [3]. The Granger Causality test for the case of two stationary variables $Y_t$ and $X_t$ is estimated as follow:

$$Y_t = \alpha_1 + \sum_{i=1}^{n} \beta_i X_{t-i} + \sum_{i=1}^{m} \gamma_j Y_{t-1} + \varepsilon_{1t}$$

$$X_t = \alpha_2 + \sum_{i=1}^{n} \theta_i X_{t-i} + \sum_{i=1}^{m} \delta_j Y_{t-1} + \varepsilon_{2t}$$

where $Y_t$ and $X_t$ represent the variables of the time series under the investigation, $\alpha_1$ and $\alpha_2$ are constant terms, and $\varepsilon_{1t}$ and $\varepsilon_{2t}$ are white noise error terms. Also, the subscripts *t* and *m* represent time periods and the number of lags respectively for the applied model, while *n* represents the number of observations. The set of the null and alternative hypotheses is expressed in the following equation:

H0. $\sum_{i=1}^{n} \beta_i = 0$ ($X_t$ does not cause $Y_t$)

H1. $\sum_{i=1}^{n} \beta_i \neq 0$ ($X_t$ does cause $Y_t$)

In order to determine the direction of the relationship between *X* and *Y*, there are four different null hypotheses to be examined based on the OLS coefficient estimations, which are:

i.) If $\sum_{i=1}^{m} \gamma_j$ and $\sum_{i=1}^{m} \delta_j = 0$, it can be established that *X* and *Y* do not help to predict one another or both variables are independents.

ii.) If $\sum_{i=1}^{m} \gamma_j$ and $\sum_{i=1}^{m} \delta_j \neq 0$ we conclude that $X_t$ and $Y_t$ have bi-directional causality.

iii.) If $\sum_{i=1}^{m} \gamma_j \neq 0$ and $\sum_{i=1}^{m} \delta_j = 0$, the conclusion will be changes in *Y* can aid to predict future values of *X* then again not the other way around.

iv.) Finally, if $\sum_{i=1}^{m} \gamma_j = 0$ and $\sum_{i=1}^{m} \delta_j \neq 0$, the decision will be unidirectional Granger causality exist from *X* to *Y*. In other words, changes in *X* help to predict future values of *Y* but not vis versa.

The four null hypotheses are examined by using an *F*-test given by the following formula as reported in [3]:

$$F = \frac{(RSSr - RSSur)/m}{RSSur/(n-k)}$$

where, *m* represents the number of lagged terms, *n* is denoted for the number of observations, *k* indicates the parameters' number estimated in the unrestricted model, and *RSSr* and *RSSur* stated for residual sum of squares of both the restricted and unrestricted models respectively. The four null hypotheses

will be rejected if the F-statistic is more than the critical value for a selected level of significance [6].

*C. Engle and Granger Causality Test [13]*

Engle and Granger [13] proposed to include an error terms in the model to capture the long-run and short run relationships among variables that are cointegrated in their levels. More specifically, the Engle and Granger test of cause and effect based on a VECM model where the case of a two variable *X* and *Y* are integrated of order one can be expressed by the following equations:

$$\Delta Y_t = \alpha_1 + \sum_{i=1}^{n} \beta_i \Delta X_{t-i} + \sum_{i=1}^{m} \gamma_j \Delta Y_{t-1} + \psi_{11t-1} + \varepsilon_{1t}$$

$$\Delta X_t = \alpha_2 + \sum_{i=1}^{n} \theta_i \Delta X_{t-i} + \sum_{i=1}^{m} \delta_j \Delta Y_{t-1} + \psi_{22t-1} + \varepsilon_{2t}$$

where, $\psi_{1\,t-1}$ and $\psi_{2\,t-1}$ denote the error correction terms, while $\psi_i$ stands for the long-run causal relationships existing among the variables of interest in the system and is most likely to have an absolute value less than 1, with an expected negative sign. $\gamma_j$ measures the short run effect of change in *Y* on *X*, and $\theta i$ measures the short-run effect of changes in *X* on *Y*, and $\varepsilon_{it}$ is the standard error term. *t* and *m* denote time periods and the number of lags respectively for the applied model while *n* indicates the number of observations.

If the $\psi_i$ is not statistically significant, this will be a sign that the variables involve in the system are independent in the perspective of prediction. However, if $\psi_1$ is found to be statistically significant and $\psi_2$ is insignificant, then the system recommends there is unidirectional causality from *X* to *Y*, meaning that *X* drives *Y* toward a long run equilibrium but not vis versa. However, the contrary implication will be perceived when $\psi_2$ is statistically significant and $\psi_1$ is not. Furthermore, in the case where both coefficients of $\psi_1$ and $\psi_2$ are statistically significant, the bidirectional Granger causality relationships in the system will be suggested.

As a final point, the study performs diagnostic tests on the residual from the estimated VECM model to ensure that residual is white noise which means it is normally distributed, and free from serial correlation or heteroscedasticity effect.

## V. EMPIRICAL RESULTS

The empirical results of the study contains correlation matrix results, unit root test results, selecting the optimal lag-lengths, VECM causality tests results, and Granger causality tests results.

*A. Correlation Matrix Results*

The findings of estimated correlation matrixes in Table I showed that, there was a satisfactory degree of relationship among the variables. It also showed that variables were free from collinearity problems except correlation between consumer price index and money supply, which suggests possible multicollinearity as they have a high correlation of

0.97. For which the rule of thumb for collinearity is that sample correlation of more 0.90 per cent is evidence of a collinearity problem [3]. Hence the consumer price index was

dropped from the empirical analysis to maintain efficiency in further analysis.

TABLE I
PAIRWISE CORRELATION OF THE MACRO-ECONOMIC VARIABLES UNDER STUDY

|  | LCPI | LIPI | LTBR | LM3 | LFER | LOP | LCI | NPE | FC |
|---|---|---|---|---|---|---|---|---|---|
| LCPI | 1 | | | | | | | | |
| LIPI | 0.34** | 1 | | | | | | | |
| LTBR | -0.24** | 0.47** | 1 | | | | | | |
| LM3 | .97*** | 0.37** | -0.25** | 1 | | | | | |
| LFER | -0.78** | -0.58** | -0.09 | -0.82*** | 1 | | | | |
| LOP | 0.47** | 0.69** | 0.33** | 0.44** | -0.7 | 1 | | | |
| LCI | -0.54** | 0.16* | 0.66** | -0.52** | 0.39** | -0.02 | 1 | | |
| NPE | -0.01 | 0.42** | 0.43** | 0.14** | -0.25** | 0.19* | 0.57** | 1 | |
| FC | -0.11* | -0.27** | -0.22* | -0.19* | 0.30** | -0.06 | 0.19* | -0.07 | 1 |

Notes: '***', '**', and '*' are significant at the 1%, 5%, and 10% levels, respectively. LCPI = natural Logarithm of Consumer Price Index, LIPI = natural Logarithm of Industrial Production Index, LTBR = natural Logarithm of 3-month Treasery Bill Rate, LM3 = natural Logarithm of Money Supply, LFER = natural Logarithm of Foreign Exchange Rate, LOP = Oil Price, LCI = natural Logarithm of Corruption Index, NPE = National Political Election, FC = the global Financial Crisis.

TABLE II
UNIT ROOT TEST FOR THE NAV AND MACRO-ECONOMIC VARIABLES

| Variables | On Levels | | | On First Differences | |
|---|---|---|---|---|---|
| | Intercept and Trend | | | Intercept & No Trend | |
| | ADF | PP | KPSS | ADF | PP |
| NAV | -1.480158 | -1.480158 | ------- | -9.44707*** | -9.447070*** |
| LIPI | -2.750377 | -5.065686*** | 0.145254 | -17.24583*** | -18.00045*** |
| LTBR | -2.39592 | -1.367352 | ------- | -4.522738*** | -8.742479*** |
| LM3 | -2.239421 | -2.508239 | ------- | -8.001418*** | -8.001418*** |
| LFER | -2.384834 | -2.384834 | ------- | -9.835818*** | -9.835818*** |
| LOP | -3.885165** | -2.750221 | 0.120141 | -6.017594*** | -5.923456*** |

Note: 1)- the critical values for unit root tests at 1%, and 5% levels of significance are -4.07, and -3.46 (with trend) and 3.51, -2.89 (without trend), respectively, for both the Augmented Dickey Fuller (ADF) and Phillips Perron (PP) tests.

2) - ***, and ** indicate statistical significance at 1 %, and 5 %, respectively. The critical values of Phillips, Schmidt and Shin (KPSS) test at 1% and 5% levels of significance are 0.216 and 0.146 (with trend), respectively.

3) -Lag-length are selected automatic - based on SIC, maxlag = (11) for Augmented Dickey Fuller (ADF) and Bandwidth: 0.889 (Andrews automatic) using Bartlett kernel for Phillips Perron (PP) tests.

### B. Unit Root Test Results

The results of the unit root test are presented in Table II. It is apparent from Table II that the null hypothesis of unit root cannot be rejected at level because the variables are not statistically significant at the 1 and 5 per cent levels of significance. This indicate that the variables are not stationary at level $I(0)$, but that the series becomes stationary at the first difference $I(1)$.

Furthermore, as there was a contradictory result from both tests for the LIPI and LOP variable, in which the ADF test shows that the LIPI variable is non-stationary at level while the PP test result displays a stationary result. Conversely, in the case of the LOP variable, the ADF test indicates it is stationary at level, while the PP test shows it is non-stationary. To this end, the study applied the KPSS test to confirm the result that we have to follow for further analysis. The KPSS test contrasts with the ADF and PP tests, in that it examines the null hypothesis of the series being stationary, against the alternative hypothesis of the series being non-stationary [28]. The KPSS findings show that both variables LIPI and LOP are non-stationary at level, $I(0)$ at the 1 and 5 per cent levels of significance. Hence, the evidence across the tests shows that

the given macro-economic variables are stationary in the first difference, namely I (1). This suggests that the unit trust industry in Malaysia is not weak form efficient. It recommends that the series of all variables does not follow the random walk model and the NAV of the Islamic equity unit trust fund displays predictable behaviour.

### C. Selecting the Optimal Lag-Lengths

To obtain the optimal lag-length for the VECM system, five different criteria are applied: the sequential modified likelihood ratio (LR) test statistic, the final prediction error criteria (FPE), the Akaike information criterion (AIC), the Schwarz information criterion (SIC), and the Hannan-Quinn information criterion (HQ). These criteria are commonly used in the literature [12], [31]. Table III reports the outcomes of each criterion with a maximum of eight lags, because of the small sample of the study (84 observations). The determinants of the optimal lag results shows conflicting results, in which the recommended lag-length based on Likelihood Ratio (LR) is (4), and Final Prediction Error (FPE), Hannan Quinn (HQ) and Schwartz Criterion (SC) are (2). In addition, the Akaike Information Criterion (AIC) is (8). To overcome this issue, the

study elected for another method based on the residual of the VECM model. Various lag-lengths were imposed on the VECM specification until all the residuals of the correllograms were uncorrelated. Based on this technique, the optimal lag-length is found to be (P = 8).

Specifically, the p-values associated with the Lagrange multiplier (LM) tests in Table IV strongly indicate the absence of serial correlation in the estimated residuals generated from the VECM (8) models up to $p$=12.

TABLE III
OPTIMAL LAG-LENGTHS OF THE VECM

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | 605.7437 | n.a | 9.05e-15 | -15.30905 | -14.57302 | -15.0149 |
| 1 | 1015.814 | 712.2274 | 4.85e-19* | -25.153 | -23.31295* | -24.41763* |
| 2 | 1041.421 | 40.43235 | 6.56e-19 | -24.87951 | -21.93542 | -23.70291 |
| 3 | 1077.126 | 50.73780 | 7.05e-19 | -24.87173 | -20.82361 | -23.2539 |
| 4 | 1120.714 | 55.05855* | 6.48e-19 | -25.07141 | -19.91926 | -23.01236 |
| 5 | 1155.963 | 38.95953 | 7.99e-19 | -25.05165 | -18.79547 | -22.55138 |
| 6 | 1204.505 | 45.98723 | 7.73e-19 | -25.3817 | -18.02149 | -22.44021 |
| 7 | 1257.950 | 42.19342 | 7.65e-19 | -25.84078 | -17.37654 | -22.45806 |
| 8 | 1322.015 | 40.46224 | 7.21e-19 | -26.57934* | -17.01107 | -22.7554 |

* indicates lag order selected by the criterion

TABLE IV
RESIDUAL SERIAL CORRELATION LM TESTS FOR THE VECM

| Lags | LM-Stat | Prob |
|---|---|---|
| 1 | 36.61378 | 0.4402 |
| 2 | 36.23275 | 0.4578 |
| 3 | 38.72067 | 0.3479 |
| 4 | 33.33764 | 0.5959 |
| 5 | 21.22279 | 0.9761 |
| 6 | 46.89846 | 0.1055 |
| 7 | 38.30986 | 0.3651 |
| 8 | 33.83060 | 0.5722 |
| 9 | 34.60519 | 0.5349 |
| 10 | 38.77167 | 0.3458 |
| 11 | 27.87283 | 0.8317 |
| 12 | 44.52453 | 0.1558 |

Probs from chi-square with 36 df.

Moreover, the estimated residuals of the VECM (8) models are behaving like "white noise" as displayed in Fig. 1, which offers visual proof to support the adequacy of the VECM (8) model.
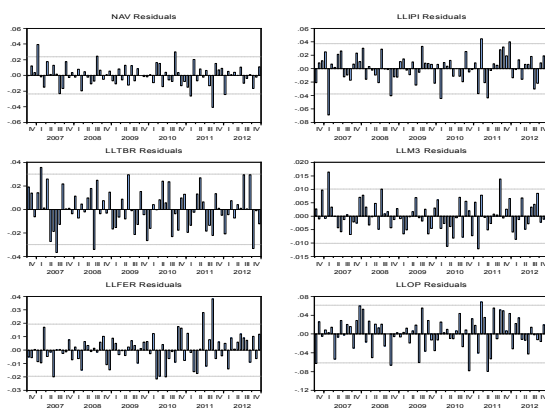


Fig. 1 Estimated Residuals of the VECM (8) models

### D. VECM Causality Tests Results

The short- and long-run causality tests for the VECM results are presented in Table V.

The first row in Table V shows the short-run and long-run causal relationship between the NAV of the Islamic equity funds and the rest of the system's macro-economic factors as the independent variables. The VECM results display a significant long-run causal effect, based on the $t$-statistics of -2.911 with the coefficient of the lagged error-correction term having the expected negative sign. This indicates that the variables in in the model are cointegrated and share long-run relationship. The first column in Table V displays the short-run contribution of NAV of the Islamic equity funds as an independent variable to the other models in the system. Different results were found for the short causality tests. The p-values reported in the first row indicate significant unidirectional short-run causal effects associated with industrial production index LIPI, and bidirectional with global crude oil prices LOP to the NAV of the Islamic equity unit trust fund in Malaysia. That is, the industrial production index and international crude oil prices predict the NAV of the Islamic equity unit trust funds in the short-run. One possible conclusion that can be drawn from this finding is that the equity unit trust fund industry in Malaysia is an inefficient market with respect to the LIPI and the LOPI. This is because the unit price of Islamic equity funds can be predicted using the available information about these two variables in the short-run during the time frame of the study. Robust evidence is provided by Ibrahim [22] who examined the dynamic interactions between the KLSE Composite Index and macro-economic variables in Malaysia. The findings of his studies indicate that the Malaysian stock market is informationally inefficient.

TABLE V
VECM CAUSALITY TESTS AND COEFFICIENTS OF ERROR CORRECTION TERMS

| Dependent Variable | Independent Variables | | | | | | ECTt-1 coefficient (t-ratio) |
|---|---|---|---|---|---|---|---|
| | $X^2$-statistics of lagged $1^{st}$ differenced term [P-Value] | | | | | | |
| | Δ NAV | Δ LIPI | Δ LTBR | Δ LM3 | Δ LFER | Δ LOP | |
| Δ NAV | 1 | 24.01*** | 6.11 | 6.65 | 9.6 | 19.74** | -0.418** |
| | | [0.002] | [0.63] | [0.57] | [0.28] | [0.01] | (-2.911) |
| Δ LIPI | 10.05 | 1 | 2.3 | 6.06 | 3.65 | 3.879 | 0.403 |
| | [0.26] | | [0.97] | [0.64] | [0.88] | [0.86] | (+1.76) |
| Δ LTBR | 24.71*** | 25.458*** | 1 | 8.27 | 2 8.88*** | 8.11 | 0.34 |
| | [0.001] | [0.001] | | [0.40] | [0.0003] | [0.42] | (+1.89) |
| Δ LM3 | 18.58** | 9.39 | 8.41 | 1 | 8.143 | 7.14 | -0.072 |
| | [0.01] | [0.30] | [ 0.39] | | [0.41] | [0.52] | (-1.17) |
| Δ LFER | 5.05 | 6.03 | 10.97 | 9.97 | 1 | 4.54 | -0.026 |
| | [0.75] | [0. 64] | [0.20] | [0.26] | | [0.80] | (-0.22) |
| Δ LOP | 17.31** | 33.20*** | 2 3.3*** | 15.81** | 15.32* | 1 | -1 .20** |
| | [0.02] | [0. 001] | [0.002] | [0.04] | [0.05] | | (-3.23) |

Note: ***,** and * denotes significant at 1% , 5% and 10 % significance level, respectively. The figure in the squared brackets [...] represent as P-value and the figure in the parenthesis (...) denote *t*-statistic. The ECT is the short run adjustment coefficient of the VECM.

However, the rest of the macro-economic variables – LTBR, LM3, and LFER do not seem to have a significant relationship with the Islamic equity unit trust prices in the short-run according to their p-values (first row in Table V). In other words, all the information available on the changes of the LTBR, LM3, and LFER are already incorporated in the prices of the Islamic equity fund units. This result may be seen as empirical evidence that the Islamic equity funds meet the efficient-market hypothesis with respect to only these three macro-economic indicators in the short-run.

In addition, in Table V, the p-values reported in the first column show that the NAV of the Islamic equity unit trust funds is a leading indicator for the monetary policy in Malaysia represented by the Treasury bill rate and money supply. Furthermore, the bi-directional relationship and the correlation of the NAV of the Islamic equity funds with the future oil price perhaps reflects the statement that Malaysia is a net oil exporting country. This is consistent with [23], [4], which suggested that the Malaysian oil market contributes significantly to changes in the global oil market. Further, Hussin et al. [19], [20] who examined the relationship between oil prices and the Islamic Stock Market in Malaysia, found that there is a bi-directional causal relationship between the growth of crude oil prices and the Islamic stock returns in Malaysia. They concluded that, in Malaysia, oil price shocks affect the Islamic stock return in the short and long run.

However, Table V displays that the NAV of the Islamic equity funds is not a leading indicator for the other macro-economic factors, such as the industrial production index and foreign exchange rate. This result is contradictory to previous studies that found that the Malaysian stock market is leading the country's economic growth. For example, [35] investigated the relationship between the stock market and economic growth (measured by real GDP) in Malaysia, using the Granger causality test over the period of 1977 to 2006. Their findings indicate that stock market Granger-caused economic activity in Malaysia. This contradictory result could be due to the small size of the unit trust industry, as by

including the equity unit trust investments with other types of unit trust funds it still only represents 20 per cent of the Malaysian market capitalization as reported by Securities Commissions financial statistical report in 2012. Thus, real economic activity does not react serially to changes in the unit trust industry; however, in the future, it will be when the unit trust industry becomes a potential substitute for the stock market.
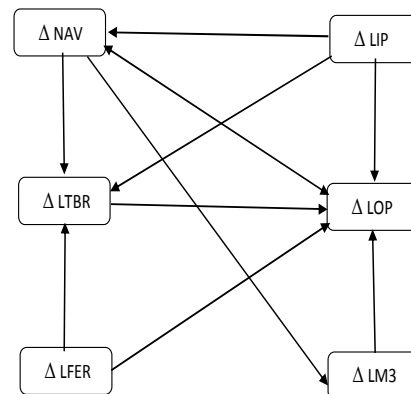


Indicator: → uni-directional causality ↔ bi-directional causality

Fig. 2 Granger Causal Association in Macro-Economic System

Furthermore, Table V shows that the equity unit trust industry prices are independent of the changes in the foreign exchange rate since there is no causality effect from both sides in the short-run. Hussin et al. [19], [20] found a similar result in that the Islamic stock market in Malaysia does not have a causal effect on the Exchange Rate of MYR/USD) in the short run. Further, as shown in Table V (row 5); the foreign exchange rate is not caused by any macro-economic variable in the economic system. This means that speculators cannot speculate any extra profit by using macro-economic information to predict the exchange rate fluctuation in the

short-term. Therefore, the Malaysian government must cautiously maintain their implementation of the current exchange rate policies because such policies may offer a chance for the speculators to attack the market and impact the performance of equity and financial sectors in the short run. The design of this short-term Granger causal association is summarized in Fig. 2.

*E. Granger Causality Tests Results*

Table VI displays the results of the Granger causality test for the macro-economic variables, namely, natural logarithm of corruption index (LCI), national political election (NPE), global financial crisis (FC) and the NAV of the Islamic equity funds.

TABLE VI
PAIRWISE GRANGER CAUSALITY TESTS

| Null Hypothesis: | obs | F-Statistic | Prob. |
|---|---|---|---|
| LCI does not Granger cause NAV | 72 | 0.49004 | 0.9104 |
| NAV does not Granger cause LCI | | 1.60021 | 0.1243 |
| NPE does not Granger cause NAV | 72 | 1.74326 | 0.0874* |
| NAV does not Granger cause NPE | | 1.20805 | 0.3059 |
| FC does not Granger cause NAV | 72 | 2.22484 | 0.0256** |
| NAV does not Granger cause FC | | 0.77814 | 0.6694 |

The results indicate that the corruption index and the NAV of the Islamic equity unit trust fund does not Granger cause one another in the short run during the study time frame. The absence of a relationship between the Islamic equity market and corruption index in the short run is an indication that the Malaysian government is fighting against corruption and the anti-corruption policies contribute well to protect the industry from corrupt people or speculators who make up-normal profit in the short term. Thus, the current anti-corruption policies could help to establish a good trust and confidence for the investment environment that will support in developing unit trust industry and economic growth as a whole.

Table VI shows that the null hypothesis that national political elections do not Granger cause the NAV of the Islamic equity unit trust funds is rejected at the 10 per cent level of significance. This means that the NPE does Granger cause a change in the NAV of the Islamic equity unit trust funds at the 10 per cent level of significance in the short term. This indicates that Malaysian Islamic equity market is more highly correlated with political uncertainty in short-run. This perhaps due to that during the election period political uncertainty get an increase, which means the market risks increase accordingly (sign of a political risk premium), as consequences the market equity's price will be more volatile and subsequently more lucrative. This result is in line with several studies that investigate whether security returns are impacted by political elections. For example, [5] documented that the stock market in the US tends to perform better in the second half of the presidential election term. They assume that this phenomenon could be a reflection of the political business cycle; however, it may be also explained behaviourally. A similar result was found by [25] which examined the relationship between elections and the market return. They

found that the average market return in the fourth year of a presidential term is double that of the return in the first year of a president's term.

Table VI indicates that there is a unidirectional relationship between the global financial crisis rate (FC) and the NAV of the Islamic equity unit trust funds since the null hypothesis that FC does not Granger cause the NAV is rejected at the 5 per cent level of significance. This means that current global financial crisis Granger causes a change in the NAV of the Islamic equity unit trust fund in Malaysia. This result is steady with the result that was found by [26] in that the Islamic unit trust funds performed better during the global financial crisis than the sub-period of non-crisis. Further evidence is provided by [10] who found that the Islamic unit trust funds outperformed the market during the global financial crisis. This result therefore, suggested that the Islamic equity funds could be used as hedging instruments during an economic slowdown or any economic crisis period.

*F. Diagnostic Tests*

The results of the diagnostic tests are presented in Table VII.

TABLE VII
DIAGNOSTIC TESTS

| Test Statistics | | F-statistic [P-value] |
|---|---|---|
| A: Serial Correlation | Breusch-Godfrey | F- (12,11) =1.991371 [0.1320] |
| B: Heteroscedasticity | Breusch-Pagan-Godfrey | F- (57,17) = 1.339237[0.2575] |
| C: Heteroscedasticity | ARCH | F- (1,72) = 0.072598 [0.7884] |

Table VII indicates that the VECM model passes all the diagnostic tests since all the *F*-statistics are insignificant at the 5 per cent level of significance. This indicated that the residuals of the VECM model are free from serial correlation, and no autoregressive conditional heteroscedasticity in the error variance. In addition, the histogram presented in Fig. 3 indicates that the residual error term is normally distributed. The normality of the residuals is confirmed by the Jarque-Bera test statistics of 3.095046 [p-value = 0.212774] that is more than the critical value at the 5 per cent level of significance.
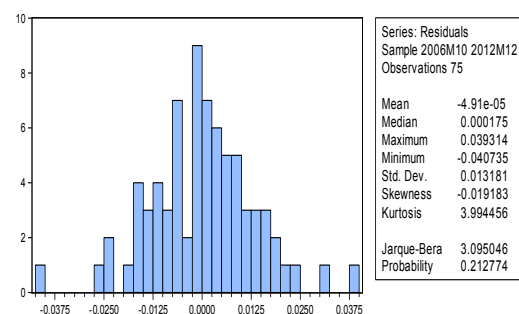


Fig. 3 Histogram of Residuals and Jarque-Bera Test Results

Finally, the CUSUM and CUSUMQ plots displayed in Figs. 4 and 5 from a recursive estimation of the model imply structural stability in the coefficients over the sample period,

since the graphs of CUSUM and CUSUMQ do not lay outside the critical boundaries of the 5 per cent level of significance.
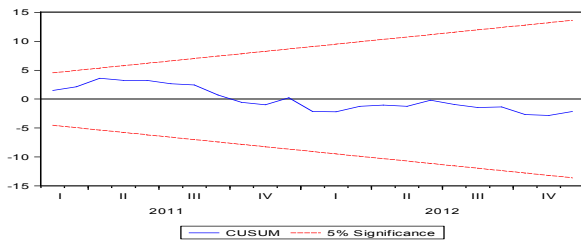


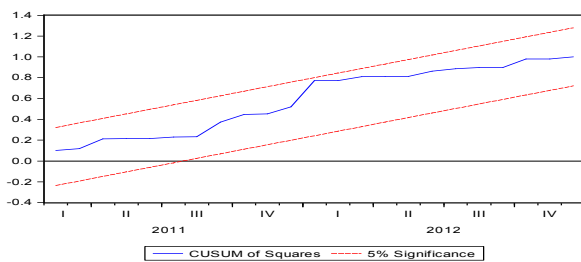Fig. 4 Plot of CUSUM for Coefficients Stability for the VECM Model



Fig. 5 Plot of CUSUMQ for Coefficients Stability for the VECM Model

## VI. CONCLUSION

The objective of this study is to find out the causality, if any, between NAV of Islamic equity unit trust funds and the chosen macroeconomic variables in Malaysian unit trust fund industry. The VECM causality approach was used to detect causal relationships among the cointegrated variables, i.e., NAV, LIPI, LTBR, LM3, LFER, and LOP, while the Granger [17] causality approach was used to detect causal relationships between the LCI, NPE, FC and the NAV, since these three variables were out of the system. The VECM findings showed a significant long-run causal effect between the NAV and the macroeconomic variables. This was represented by the VEC term, where, the NAV of the Islamic funds converged to its equilibrium by quickly adjusting to about 42 percent each month. In particular, the results of the causality tests were mixed. The VECM causality indicated significant unidirectional short-run causal effects related with the Industrial Production Index (LIPI), and the bidirectional relationship with the crude oil price (LOP) to the NAV of the Islamic equity funds. However, the rest of the macroeconomic variables such as the LTBR, the LM3, and the LFER did not seem to have a significant causality with the NAV of the Islamic equity funds in the short run. These domino effects suggested that the Islamic equity unit trust funds in Malaysia violated the efficient market hypothesis with respect to the LIPI and the LOP. This imply that the Islamic equity unit trust fund in Malaysia has somewhat violated the efficient market hypothesis, where the fund unit price variability could be predicated to some degree in the short-term. Furthermore, the Granger Causality test results found that FC and NPE has causal effect on the NAV of Islamic equity unit trust fund in Malaysia, while the LCI does not cause change in the fund NAV.

Therefore, the study suggests that the macroeconomic policies should be designed in tandem with the anticipated response of the unit trust industry. In other word, the macroeconomic factors that have been found has cause and effect relationships with the NAV of the Islamic unit trusts in the short-run should be given more attention by the relevant authorities, specifically, the Securities Commissions (SC), the Federation of Investment Manager Malaysia (FMUTM), and the banking sectors to protect the unit trust industry from an opportunity for speculative investment. Furthermore, a number of extension could be recommended for further future research. Based on the fact that this study is focused only on the Malaysian equity unit trust funds, it is still not enough to generalize the results on the Malaysian unit trust industry as a whole. However, its expansion to include other types of the listed Islamic unit trusts in Malaysia, such as, balance funds, bond funds and money market funds will go a long way to facilitate the generalization for determining the funds unit prices behaviours.

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