Is shariah (islamic) stock price causally related to the macroeconomic variables ? Malaysian evidence

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Is shariah (islamic) stock price causally related to the macroeconomic variables ? Malaysian evidence

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Abstract

This study attempts to discern the causal relationship between the macroeconomic variables and the Shariah (Islamic) stock price. The four macroeconomic variables chosen are industrial production, Malaysian ringgit vis-à-vis US dollars, money supply, and the consumer price index (CPI). This study uses the standard time series econometric techniques that apply tests of co-integration and LRSM to explain the theoretical relationship of the variables, as well as the VECM and VDC methods to explain the Granger-causal relations. The study further aims to compare its results with the findings from parallel study conducted on conventional stock market. This study found that there is a long-run theoretical co-integrating relationship among the variables being considered and that both Shariah stock price and the macroeconomic variables contain information to predict the variations in each other. However, intriguingly the findings in this study contradict the findings of the chosen conventional stock market research.

Keywords: Shariah (Islamic) price, macroeconomic variables, VECM, VDC, Malaysia

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1.0 INTRODUCTION

The studies on what affect the stock prices have for long been an interest to academics, investors, financial analysts and policy makers. The most common causal relations associated with stock market are the various macroeconomic variables. Such study is more significant for developing countries such as Malaysia, as it contribute to important decisions on monetary policies by the policymakers.

Common economic theories stated that the stock price of a firm signifies the firm's present value (for e.g., under stock valuation model, stock price represents the firm's such as discounted future cash flow). Any change in macroeconomic variables such as inflation, interest rates, or money supply would have direct impact on the firm (depending on the firm's size and its exposure), and eventually the value of the firm's stock price. At the same time, several researches have also shown that stock prices may also inversely influence the variations in economic activities as well as the monetary decisions.

Researches have long concluded that macroeconomic variables and stock prices are interwoven in a dynamic and unique interaction. Macroeconomic variables affect stock prices, as well as being affected by the movement of the stock market. Despite the various studies conducted on the subject matter that came up with various findings, what make up as the true dominant determinant of stock prices still remain unclear. However, such studies are still very important in predicting the efficiency of equity markets and serve as valuable inputs for policy makers in designing credible and consistent monetary policies.

The rest of this write-up is arranged in the following order- the next chapter explains the objectives of this study, and followed by the literature review, as well as the methodology and data.

2.0 OBJECTIVES OF STUDY

Whereas most studies conducted on the subject relate macroeconomic variables to conventional stock markets, the purpose of this research is to extend such study to Shariah-compliant equity markets. There are two major aims to this study:

1. To find out the interactivity of Shariah stock index with macroeconomic variables that represent the four essential economic markets (i.e. domestic real market, monetary market, financial market, and international market), and,

2. To compare if the results from question above conform to the findings of parallel study previously done on conventional stock markets.

To be specific, for the first aim above, the questions poses are: How do the selected macroeconomic variables relate to Shariah stock index? What is the most dominant variable? Does Shariah stock index also influence the economic variations? As for the comparison purpose in the second objective, the results of this study will be benchmarked against the findings of Ibrahim and Yusoff (2001)[1]; that study similar macroeconomic variables' relationship with KLCI stock index (hereon refers as conventional).

The findings of Ibrahim and Yusoff (2001) are as follows :

1. There is co-integration between the macroeconomic variables and stock price (conventional market), and that both factors affect one another.

2. In the long-run, stock price has negative relation with currency exchange and money supply; but positive relation with industrial production and inflation.

3. In the short-run conventional KLCI responds highly to money supply, hence implying that equity market is domestically driven by monetary shocks.

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[1] Ibrahim, Mansor H and Wan Yusoff, Wan Sulaiman (2001). Macroeconomic Variables, Exchange Rate and Stock Price: A Malaysian Perspective. *IIUM Journal of Economics and Management* 9, No. 2(2001), pp. 141-63

3.0 LITERATURE REVIEW

Solnik (1984) found that changes in stock prices lead to an increase in the demand for real money and the interest rate. This makes it more attractive for individuals and firms to adjust their investment portfolio and demand for more domestic asset. Subsequently the value of domestic currency will appreciate.

Mishkin (1998) stated that changes in money supply affect real activity via liquidity, exchange rate and stock price.

Mookerjee and Yu (1997) found the effect of money supply (M1 and M2) and aggregate foreign exchange reserves on Singapore stock market. The findings revealed a strong correlation between the two variables and the stock market returns.

Masih and DeMello (2009) found a significant correlation between stock markets and monetary policy.

Ibrahim and Aziz (2003) researched on the impact of stock prices, industrial production, money supply, consumer price index, exchange rate in Malaysia, and the results showed a long-term positive relationship for stock prices with industrial production and CPI and a negative correlation with money supply and Ringgit exchange rate.

Chen, Roll and Ross (1986) found out that industrial production, changes in risk premium and twists in the yield curve were significant to the changes in stock returns. And Chen (1991) again found about that the market returns could be explained by some macroeconomic factors such as default spread, one-month t-bill rate, and dividend-price ratio. Clare and Thomas (1994) revealed the impact of 18 macroeconomic factors on stock returns in UK.

Wongbangpo and Sharma (2002) research on South East Asian countries showed a long-term positive relation between stock prices and the growth in output ; while in short term stock prices were influenced by the past and current values of macroeconomic variables.

4.0 METHODOLOGY AND DATA

To measure the stock price, we use Malaysian FBM Shariah Benchmark Index (variable name FBM). For the macroeconomic variables, the four variables selected are industrial production (IP) (representing domestic real GDP), Malaysian ringgit vis-à-vis US dollars (EXC) (representing the money market), money supply (M2) (representing the financial market), and consumer price index (CPI) (representing inflation). The data which are taken from *Datastream* database, are monthly data covering a period of ten years.

Meanwhile the methodology follows a systematic time series econometric; which comprises of 8 steps. The first two steps are unit root test and determination of order of VAR lags. The third and fourth steps test the theoretical relationship of the variables; namely the test of co-integration and Long Run Structural Modelling (LRSM). This followed by the test for causal relationship, that are Vector Error Correction Model (VECM), Variance Decompositions (VDCs), Impulse Response Functions (IRF) and finally the Persistence Profile (PP).

5.0 RESULTS AND INTERPRETATION

5.1 STATIONARITY OF VARIABLE

The empirical exercise started by 'preparing' the secondary raw data collected into log level and log differenced form. This prepares the data for the next processes to follow, starting with unit root test that determine whether the observed variables are stationery or not. Determining the stationary of variables is important for several reasons: the major focus co-integration test (in the third step) requires that the mean of the variables remain non-stationery in order to retain the theoretical-part in the variable; while VECM, VDC and IRF tests require that the variables are differenced and in stationery state. In short, ideally the variables need be integrated of order I(1) - in which the level (logged) variables should be non-stationery while the differenced variables must be stationery.

To test for stationarity, the widely used Augmented Dickey Fuller (ADF) test is implemented to all the variables under consideration. TABLE 1 summarizes the results of the ADF test. Based on the highest level of AIC & SBC, the corresponding test statistic of each variable is compared against its respective 95% critical value of ADF statistic. It is found that for all the variables in level form, the ADF tests cannot reject the null hypothesis of non-stationary. Meanwhile, for all the differenced variables, the ADF tests reject the null hypothesis thus finding the differenced variables as stationery. Hence, it is concluded that all the variables fulfil the unit root test of I(1).

TABLE 1 : ADF UNIT ROOT TEST

Variable	Test Statistic	95% Critical Value	Implication
Variables in Level Form			
LFBM	-1.5240	-3.4497	Not Stationary
LIP	-2.3772	-3.4497	Not Stationary
LEXCR	-3.4395	-3.4497	Not Stationary
LM2	-1.2036	-3.4497	Not Stationary
LCPI	-.14624	-3.4497	Not Stationary
Variables in Differenced Form			
DFBM	-6.9166	-2.8872	Stationary
DIP	-12.5512	-2.8872	Stationary
DEXCR	-7.6521	-2.8872	Stationary
DM2	-6.1676	-2.8872	Stationary
DCPI	-5.9862	-2.8872	Stationary

5.2 ORDER OF THE VAR

Having fulfilled the unit root test of I(1) in the first step, the next requirement towards testing co-integration is finding the order of the Vector Auto-regression

(VAR), or the sufficient number of lags length at which the error terms are serially uncorrelated. TABLE 2 below shows conflicting results, in which SBC criterion corresponds with order 0, while the AIC criterion suggested higher order of 1.

TABLE 2 : ORDER OF VAR

	AIC	SBC
Order Corresponds With The Highest Value	1	0

To justify which order to be chosen, we further test for the existence of serial correlation in each variable. TABLE 3 below summarizes the results. Results for majority four out of the five variables (i.e. DFBM, DIP, DEXC, DCPI) hold true the null hypothesis that serial correlation does exist. Hence, given the higher number of serial correlation, a higher order of VAR (than the suggested AIC/SBC criteria) is needed to resolve this problem; which in this case is the optimal order of 2. The risk of over-parameterization is minimized given that the number of observations is relatively long.

TABLE 3 : TEST FOR SERIAL CORRELATION

Variables	Chi Square Result (P-Value)	Implication (at 10%)
DFBM	0.648	Serial correlation exists
DIP	0.273	Serial correlation exists
DEXC	0.584	Serial correlation exists
DM2	0.096	Serial correlation does not exist
DCPI	0.571	Serial correlation exists

5.3 TEST OF COINTEGRATION

Now that the variables have fulfilled the requirement of I(1) unit root test and the order of VAR has been chosen, the variables are tested for co-integration using Eigenvalue and Trace tests. TABLE 4 below shows that the null hypothesis of no co-integration was rejected at r=0 for both Eigenvalue and Trace tests; thus implying that there is at least 1 co-integrating vector.

TABLE 4 : TEST FOR COINTEGRATION

Null	Statistic	90% Critical Value	Implication
Maximal Eigenvalue			
r = 0	37.7235	35.0400	Co-integration vector = 1
r<= 1	22.7324	35.0400	
Trace			
r = 0	100.0739	82.8800	Co-integration vector = 1
r<= 1	62.3504	59.1600	

Hence, this supports theoretically that there is long-run relationship between all the variables under consideration. Macroeconomic variables industrial production (as a proxy of real GDP), exchange rate, M2, and CPI (as a proxy of inflation) are co-integrated with Malaysian FBM Shariah benchmark index, and in the long run they are in equilibrium.

5.4 LONG RUN STRUCTURAL MODELLING (LRSM)

To further estimate the theoretically meaningful co-integration among the variables, we attempted to quantify the long-run coefficients of the variables based on economics theories and further test whether those coefficients hold true.

We do this by first running the exact-identification process; by normalizing one variable, and subsequently observe whether the other variables are significant or otherwise in the long-run equation. TABLE 5 below summarizes the results. The variable LFBM that represents FBM Shariah Index is normalized to 1. To see the

significance of the other variables, we manually divide the coefficient values with its corresponding standard error. Interestingly, the results showed less than 2 for all the four variables, thus implying that none of the four variables are significant to the normalized variable.

TABLE 5 : LRSM – EXACT IDENTIFICATION

Variables	Coefficient & (Standard Error)	T-ratio	Implication
LFBM	1.0000 (*NONE*)	-	-
LIP	-7.1452 (7.8984)	-0.9046	Variable is not significant
LEXCR	-4.5082 (5.5291)	-0.8154	Variable is not significant
LM2	6.0038 (10.3876)	0.5780	Variable is not significant
LCPI	-51.1359 (73.9533)	-0.6915	Variable is not significant

However, this does not conform to the various studies included under our Literature Review, in which industrial production, exchange rate, money supply and inflation are strongly co-integrated with stock price. As such, we need to run over-identification process to test whether the exact-identification coefficients hold true. Each of the variables found not significant was restricted to 0. TABLE 6 summarizes the results. Except for LEXCR, the p-values for all variables being restricted reject the null that the restriction of 0 is true. Thus, these findings superseded the previous results, and that the variables LIP, LM2 and LCPI are significant after all within the long-run structural equation.

TABLE 5 : LRSM – OVER IDENTIFICATION

Variables	p-Value of Chi-Square	Implication
LFBM	-	-
LIP	0.039	Variable is significant

LEXCR	0.216	Variable is not significant
LM2	0.041	Variable is significant
LCPI	0.000	Variable is significant

We arrived at the coefficient of the co-integration equation as follows:

$$FBM -7.1452IP - 4.5082EXCR + 6.0038M2 - 51.1359CPI$$

This equation implies that FBM has positive relationship with M2 but moves negatively with IP, EXC and CPI. This implies that increase in money supply will boost the Shariah stock price, but an increase in exchange rate, industrial production and inflation will somehow decline the Shariah stock price.

On the other hand, we find intriguing facts when comparing with Ibrahim and Yusoff (2001), as our results are almost completely of the opposite. Firstly, is the insignificance of exchange rate. Various previous studies however, like Solnik (1984) Solnik (1984) Ibrahim and Aziz (2003) have found that exchange rate is strongly correlated with stock price. Secondly are the coefficient signs of the other three variables. As Ibrahim and Yusoff (2001) found that (conventional) stock price in the long-run is negatively related to money supply, our results found that the Shariah stock price and money supply are positively related. Also contrary to Ibrahim and Yusoff (2001) is that Shariah stock price is inversely related to industrial production and inflation (i.e. CPI).

Back to the exchange rate variable, if we recall Ibrahim and Yusoff (2001) again, they stated that exchange rate is associated with the (conventional) stock market due to Malaysian high dependency on international trading. Hence, one alternative to explain the insignificance of exchange rate to Shariah stock price could be due to the low exposure to international trading of the listed companies. Since this study is limited in exploring the causes that can explain the insignificance, we would prefer to rely on the co-integration result that found the variables to be related in the long-run. With that hunch, the variable LEXCR will still be regarded as significant.

5.5 VECTOR ERROR CORRECTION MODEL (VECM)

Now that we have established the theoretical relationship among the variables, next is to test the causal relationship between them; specifically to identify which among the variables are the "leading" ones and which are the "followers". This is significant to investors and policy makers alike in predicting the movement of the Shariah stock index by recognizing which economic variables that act as the major determinants. The VECM ascertains which of the variables are exogenous and which are endogenous; using the Granger-causality that tells the extent to which a change in a variable is caused by its own variations as well as the variations of other variables.

TABLE 6 summarizes the results. The error correction term found that variables LIP, LEXCR, and LCPI are significant, hence being the endogenous variables. Meanwhile, the variations of variables LM2 and LFBM were mostly due to its own respective variations; hence making them as the "insignificant" or the exogenous variable.

TABLE 6 : VECM

Variable	ECM(-1) T-Ratio P-Value	Implication
LFBM	0.310	Variable is **exogenous**
LIP	0.002	Variable is endogenous
LEXCR	0.001	Variable is endogenous
LM2	0.456	Variable is **exogenous**
LCPI	0.002	Variable is endogenous

To note, Ibrahim and Yusoff (2001) orthogonalized VDCs and arrived at different exogenous/endogenous variables as they gave samples of two different ordering of variables.

5.6 VARIANCE DECOMPOSITION (VDC)

Having decomposed the variables into exogenous and endogenous, next we would like to determine their relative degree of the causal relation. For this, the variables are run through Generalized VDCs with 50 time horizons. To note, the Orthogonalized VDCs is not applied due to its limitations (i.e. biased to the ordering of variables, and the assumption that "switches off" other variables when a variable is being shocked). However, with Generalized VDCs, the given values within a row do not total up to 1.0; hence the values need to be manually re-calibrated in order to sum up to 1.0.

Having done that, we arbitrarily select the values given under two different time horizons (i.e. at time horizon 25 and 50). TABLE 7 and 8 organize the values; with the diagonal highlights showing the extent to which the variation of a "shocked" variable is explained by its own past variations. TABLE 9 gives the ranking based on the order from the highest value to the least value.

The ranking of both time periods are consistent. The results also conform to the previous VECM, in which the money supply is found to be exogenous and most dominant variable. Following the ranking, the most endogenous among the other four variables are inflation rate. To note also is the variable exchange rate that was initially tested as insignificant, is the second last most endogenous variable.

Looking closely at LFBM for both time horizons, its variations are predominantly attributed to its own variations and LCPI variations, hence arriving at the conclusion that Shariah stock price responds to inflation rate more than the money supply (as found by Ibrahim and Yusoff (2001)). In fact, with the exception of the dominant money supply (LM2), all variables respond relatively high to innovation by inflation (LCPI).

TABLE 7 : VDC – FORECAST AT TIME HORIZON 25

	LFBM	LIP	LEXCR	LM2	LCPI
LFBM	83.46	1.00	1.51	3.02	11.01
LIP	0.70	59.14	1.57	0.53	38.05
LEXCR	2.14	1.45	52.45	3.85	40.10
LM2	0.10	1.14	0.32	96.46	1.99
LCPI	1.47	25.99	1.94	18.99	51.62

TABLE 8 : VDC – FORECAST AT TIME HORIZON 50

	LFBM	LIP	LEXCR	LM2	LCPI
LFBM	82.37	1.05	1.61	2.91	12.06
LIP	0.79	53.87	1.75	0.29	43.30
LEXCR	2.24	1.52	50.27	3.90	42.08
LM2	0.12	1.21	0.34	96.00	2.32
LCPI	1.14	32.62	1.44	24.08	40.72

TABLE 8 : VDC – RANKING

| RANKING	AT HORIZON = 25	AT HORIZON = 50
1	M2	M2
2	FBM	FBM
3	IP	IP
4	EXCR	EXCR
5	CPI	CPI

5.7 IMPULSE RESPONSE FUNCTIONS (IRF)

It is found that the graphical representations produced by Impulse Response Function (IRF) are consistent to the findings of VDCs. IRF charts the dynamic

response path of the variables due to a standard deviation shock set on one of them. For instance, FIGURE 1 illustrates the movement of all variables when the exogenous variable LM2 is put to shock. LM2 itself remained the most stable proving its exogeneity; as compared to the volatility of the other endogenous variables especially during the first ten periods.

FIGURE 1 – IRF TO ONE STANDARD DEVIATION SHOCK IN THE EQUATION FOR LM2
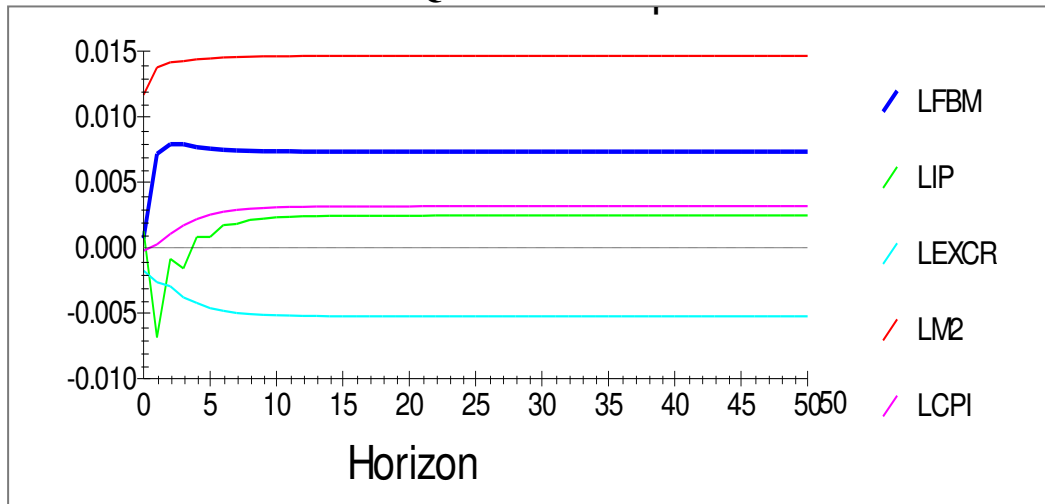
5.8 PERSISTANCE PROFILE (PP)

Finally, the variables are run under Persistence Profile (PP) to see how long it takes for all the variables to settle back to equilibrium should the whole system is shocked. FIGURE 2 illustrated that following a system-wide shock, the variables take approximately 8 time period to return to equilibrium.

FIGURE 2 – PERSISTENCE PROFILE OF THE EFFECT OF A SYSTEM-WIDE SHOCK TO CV'S
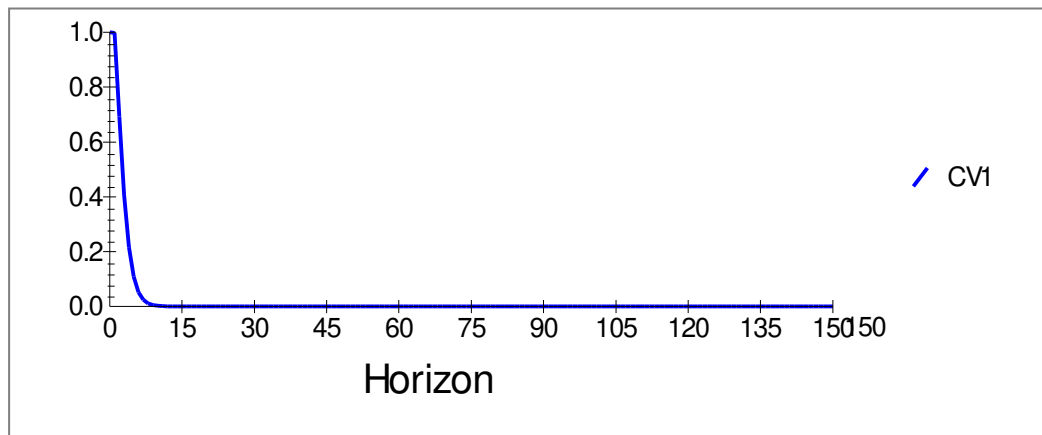
6.0 CONCLUDING COMMENTS

In a nutshell, our study found that there is a dynamic relation between Shariah stock price with the macroeconomic variables inflation, money supply, industrial production and exchange rate, and that they are theoretically related in terms of equilibrium in the long-run. Short-run system-wide shock also assumes that the variables will get back into equilibrium within relatively short time period of 7-8 months.

It is also noted that with the exception of money supply, all the variables seem to respond mostly to shocks coming from inflation; despite that inflation is found to be the most endogenous variable. Inflation and industrial production also have relatively strong relation in which shock to either one will cause relatively high variation in the other (as compared to the relations in other variables).

To conclude, policy makers should be more concerned with monetary policies as money supply being the most exogenous variable has the most impact on all other variables. Since inflation also caused a sizable forecast error variance in most of the variables (and especially in the Shariah stock price), the stakeholders concerned with Shariah stock performance should also take heed of the effect of inflationary shocks.

However, the findings should not deter our attention from the intriguing relative exogeneity of Shariah stock that acts unaffected by major economic variables such as inflation, exchange rate and industrial production. Given the limitations of this study, further study should be carried out to better investigate the dominant causality between Shariah stock price and macroeconomic variables. This will contribute greatly to the effort of practitioners, policy makers, investors and academics in their concerted effort to improve not only the performance of Shariah stock index, but also the achievement of Islamic finance overall.

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