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INFORMATION SUPERIORITY AND VOLATILITY DYNAMICS: A STUDY USING VECM-EGARCH SPECIFICATION ON SHARIAH BASED INDEX AND GENERAL INDEX IN MALAYSIA

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Abstract

The fact that there is an increased demand for Shariah based financial products, this necessitates modeling the risk-return structures of such products for the benefits of investors, practitioners and policy makers. This study attempts to discover the information superiority and volatility patterns of Shariah based indices over general index traded in Malaysian stock exchange. Vector Error Correction Model with Exponential Generalized Auto Regressive Conditional Heteroscedasticity (EGARCH) is used to achieve the objectives of this study. The findings include long-term equilibrium relationship; contemporaneous as well as bi-directional lead-lag association between Shariah based index and general index, volatility spillover and mixed levels of persistence. Information superiority cannot be attributed to any of these indices. In addition, uniform volatility patterns are absent in the two Shariah based indices.

Keywords: Lead-lag Relationship, Shariah Based Index, VECM and EGARCH, Volatility

1.Introduction

There exists a substantial amount of empirical works exploring the dynamics among different kinds of markets, indices and sectors to determine which one is dominant with regard to information. A diverse range of methodology has been used in these studies, but the key result indicates that the main effect goes from one market to another, leaving opportunities for arbitrages at least for some time. Most of such investigations are reported between spot and derivatives or between two different markets.

The lead-lag relation between price movements of two markets illustrates the pace at which a particular market mirrors a new information related to another market. In a way, it reflects onto how the two markets are related. In a perfect situation without any friction, both the markets are not auto cross-correlated, rather contemporaneously correlated. Nevertheless, if it is such that any one of the market responds more rapidly compared to the other than a lead-lag relation is developed. Market participants capitalize on lead-lag patterns for arbitrage opportunities. While no arbitrage opportunities exist in a perfect market, it's not the case in imperfect markets. As private information and transaction costs are involved in imperfect markets, hence there is a tradeoff between the two liquidity parameters, low cost and high leverage (De Jong & Donders, 1998). Several technical reasons have been evolved to support the view that a particular market may lead other markets. For example, if derivatives market instantaneously reflects new information and the stocks within the index trade rarely, observed derivatives would lead observed spot index. However, Stoll & Whaley, (1990) noted that the economic significance of this behavior was none. Further, in a narrowly based index due to bid-ask bouncing, there is negative serial correlation in individual stock returns (Roll, 1984). This outcome reduced the positive serial correlation in the index returns brought by occasional trading and may conceal the real association among index and options or futures returns.

This paper examines the lead-lag relationship between Shariah based index and general index in Malaysian stock exchange, Bursa Malaysia. Malaysia is at the forefront in the development of Islamic banking, Islamic capital market and Takaful. Malaysia has 11 Takaful operators, two of which are foreign owned. The Takaful market has been steadily growing in spite of world economic crisis. Within ASEAN, Malaysia has around seventy one percent of the total gross Takaful contributions. Excluding oil rich economies of the Middle East, Malaysia accounts roughly 40% of the global Islamic Finance business. Malaysia has a robust multi-religious and multi-cultural society. The same success story of Islamic Finance can be replicated in other countries too.

The objective of this paper is to investigate if any information superiority is attributed to Shariah based index over general index. In addition, the study examines the volatility patterns in the market. The equilibrium relation is established with the help of co-integration and error correction models. This will further uncover the relationship between the two types of stocks, as it checks out the equilibrium relationship of the variables from short and long-term levels.

Section 2 of the study gives a short review of past literature on Shariah based stocks, indices and mutual funds. Econometric Methodology and data specification are shown in section 3 and section 4 respectively. Section 5 discusses the results and section 6 concludes the study and that is finally followed by references.

2.Literature Review

Many works have been carried out to study the relationship between the Shariah compliant financial products and the conventional financial products of various countries, but there is still a lot of room for conducting new research to find out the difference in performance of Shariah and conventional index. Most of the studies focus on the return aspects of assets.

Studying the Malaysian indices for the period April 1999 to December 2005, Albaity, et al., (2008) found no indication of any significant statistical difference in risk-adjusted returns between Islamic and conventional stock market indices. It used cointegration and causality in its analysis. The study further indicated at bidirectional causality in the short run and that both the indices moved together in the long run. As both the indices behaved in a similar pattern, hence one can be predicted based on the other.

In another study on Malaysia for the period January 2000 to October 2011, Karim, et al, (2014) studied the dynamic causality between the Islamic stock market and conventional stock market using risk adjusted return measurements. They divided their study period into full period, pre-subprime, sub-prime, post subprime financial crisis period. It used cointegration and causality in its analysis. The result shows that the Shariah based stocks produce more returns compared to conventional in all sample periods and that there is bidirectional causality in the short run between them.

Hartono, et al, (2014) assessed the performance of Islamic and Conventional equity funds in Indonesia using sample consisting of 36 equity funds. Using ANOVA they found that the performance of Islamic equity fund is not significantly different from the conventional equity fund. They claimed that among the Sharpe Index rating portfolio, modified snail trail portfolio and Morningstar portfolio, except for Morningstar rating, the rest outperformed the benchmark portfolios.

Habib & Khalid, (2014) studied the performance of MSCI India Islamic index and MSCI Malaysia Islamic index with their corresponding conventional Indices from 2003 to 2013. The results showed that while Islamic indices underperformed in India, but these Islamic indices outperformed the conventional index in Malaysia. Nevertheless, in the period of financial crisis the Islamic index performed better than the conventional indices. The study further reported

that in terms of mean abnormal returns, there was no significant difference between Islamic indices and conventional indices.

Hassan & Girard, (2011) compared seven indices of Dow Jones Islamic Market Index (DJIM) with their non-Islamic counterparts using Sharpe, Treynor, Jensen and Fama's selectivity, net selectivity and diversification. The study used cointegration to examine how the Islamic indices comparatively performed in relation to their non-Islamic counterparts for a period of January 1996 to December 2005. For the overall period, the two groups of indexes were poorly integrated. The results stated that there was no difference between Islamic and non-Islamic indices. The Dow Jones Islamic indexes outperformed their conventional counterparts from 1996 to 2000 and underperformed them from 2001 to 2005. Generally, reward to risk and diversification were alike for both the type of indexes.

Kassab, (2013) analyzed the empirical properties of Islamic and Conventional daily returns of SP500 index using the GARCH model, Serial Correlation, Leptokurticity and Heteroscedasticity effect. The results explained that persistence of both indices was very significant and the 500 index Shariah was less volatile than the conventional index at a long run and possess less risk during crisis periods.

Reddy & Fu, (2014) suggested that there was significant difference in the performance of Shariah complaint stocks and the conventional stocks listed on the Australian Stock Exchange (ASX) for the period of 2001 to 2013. Using Mann Whitney U-Test and Independent Samples test they concluded that Shariah compliant stocks were more risky. They also add that there was strong relationship between the returns of Shariah complaint stocks and the conventional stocks. The relationship was analyzed using OLS regression and it found that the Shariah stocks returns were higher than the conventional ones.

Elfakhani, et al, (2005) stated that there was no significant risk-adjusted abnormal reward or risk associated with investing in Sharia compliant mutual funds. They even suggested that conventional investors should consider Islamic mutual funds in their portfolio collection, particularly when the market is slow.

Merdad, et al, (2010) analyzed 28 mutual funds managed HSBC Saudi Arabia Limited for the period January 2003 to January 2010 using various performance measures like Sharpe, Treynor etc. The study divided the study period into full, bull, bearish and financial crisis periods. The conventional funds outperform Islamic funds during the overall period and bull periods using all market indices. The study asserted that conventional funds outperform Islamic funds during the full period and the bullish period while in the bearish and financial crisis period conventional funds underperform the Islamic funds. During the period of financial crisis, the systematic risk was comparatively lower than that of the conventional counterpart. They viewed that Islamic Mutual Funds offer hedging opportunities for investors especially during economic downturns because of Shariah screening of the stock selection.

Mansor & Bhatti, (2011) found strong relationship between Islamic and Conventional Mutual Fund portfolios in Malaysia. The study found that Islamic portfolio when compared to the conventional portfolio had somewhat less returns and high risk. This high risk in terms of standard deviation implied that Islamic portfolio had relatively higher volatility and faster reaction to the market than its conventional counterpart. Though both these portfolios were influenced by market, the Islamic portfolio was closely relatively more mirrored to the market movement. Further, the returns on Shariah and Conventional MF portfolios were higher than that of FBMKLCI index, proxy to the market returns for the period of January 1996 to April 2009.

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The mixed evidence calls for further examinations into the matter. In addition, market specific characteristics of each sample data necessitate case-to-case analysis in order to make effective portfolio selections and other investment decisions.

3. Econometric Methodology

Econometric methodology has been employed to study the possible lead-lag relation between Shariah compliant index and general index of Malaysian stock market. Towards this, the properties of data are examined in an econometric perspective and cointegration is proposed to ascertain the nature of relationship between the indices. In addition, to study the short-run relationship and volatility spillover, Vector Error Correction Model (VECM) combined with EGARCH specification is applied. The methodology adopted in this study is similar to the one used by Mallikarjunappa & Afsal, (2010). Detailed methodology is provided below.

Co-integration is applicable only with non-stationary time series. Presence of a unit root is detected by Dickey-Fuller test. Further, co-integration checks out the presence of causal relationship between two sets of variables and gives the number of independent co-integrating relations. According to Johansen & Johansen, (1988), two test statistics namely trace statistic, and the maximum Eigen value test are used to determine the co-integration rank. Johansen, et al., (1990) provide the critical values.

Considering the features of time series such as varying variance, mean reversion, clustering and persistence, ARCH/GARCH models are generally applied on financial time series. Various models are used for different types of analysis. With standard GARCH, asymmetric nature of the volatility parameter cannot be studied (Afsal & Haque, 2016). Further, as response of volatility to positive and negative information is different, EGARCH model of Nelson, (1991) is appropriate.

In order to test the causality between Shariah compliant index and general index of Malaysian stock market, the following VECM is estimated combined with EGARCH framework for each symbol.

..... (1) .....(2) ... (3) ... (4)

In equations (1) and (2), and represent the first log difference of Shariah index and general index price, and being the error correction term, obtained from lagged residuals of co-integrating function of Shariah index on general index price and general index on Shariah index prices respectively. The error correction term reflects the relationship between the index price changes and represents the error terms and the coefficients represents the information set at time. Furthermore, the causality models are greatly dependent on the lag length applied in the model (Gujarati, p. 703). The lag length is determined using the Schwarz Information Criterion (SIC).

Equations (3) and (4) provide the conditional variance for Shariah index and general index values respectively and reveal the EGARCH (1,1) representations of the variances and measure the conditional or time varying variances of Shariah index and general index values. This is the measure of persistence of volatility. The conditional variances are finite if ARCH effects and asymmetric behavior are captured by the coefficients respectively. The ARCH terms determine the spillover behavior of the markets. The lag truncation length of (1,1) for EGARCH is given by Likelihood Ratio (LR) tests.

4. Data and Properties

The present work studies the lead-lag relationship and volatility behavior of Malaysia's Shariah indexes (FTSE Bursa Malaysia EMAS Shariah Index, FTSE Bursa Malaysia Hijrah Shariah Index and FBMKLCI Bursa Malaysia). The data set comprises of daily price values of these indices for a period from January 04, 2011 to November 28, 2015 making 1209 observations. The FTSE Bursa Malaysia Kuala Lampur Composite Index (FBMKLCI) is a capitalization-weighted index of 30 largest stocks traded on Malaysian stock market Bursa Malaysia. FTSE Bursa Malaysia Hijrah Shariah Index (HSI) was introduced in 2007 mainly for Shariah conscious investors to invest in select equities complying the principles. The screening norms of the Shariah are applied by the Malaysian Securities Commission's Shariah Advisory Council (SAC) and the conditions strictly follow Shariah norms to avoid non-permitted or *'Haram'* sectors and meet certain limitations of financial ratios. It is constituted by 30 scripts and has a base value of 6,000. Another Shariah based index called the FTSE Bursa Malaysia EMAS Shariah Index (EMAS) was launched in 2007 and has a base value of 6,000. It has broader constituents of 189 stocks.

The Table 1 provides the descriptive statistics of KLCI, HSI and EMAS for both prices and returns separately. It is evident that returns of both Shariah based indices outperformed that of general index. Standard deviation is higher in the case of KLCI returns than other two returns. In all the cases, the closing price series is found to be non-stationary while the return series is stationary. Table 2, provides the test results of Dickey-Fuller test for unit root.

As noted earlier, Johansen & Johansen, (1988) procedure is used to test for co-integration. Maximal Eigen value and trace test statistics presented in Table 3, imply that the null hypothesis of no co-integration when r=0, is rejected at one percent level and it is not rejected when r=1 for all three indices. It is concluded that there exists one co-integrating vector for each series.

5. Results and Discussions

We present the results is in two parts; price discovery process and volatility analysis. Tables from 4 to 7 present the VECM-EGARCH estimates for HSI to KLCI, EMAS to KLCI, KLCI to HSI and KLCI to EMAS respectively.

5.1 Price Discovery Process

The return in the case of Hijrah Shariah index (HSI), shows significant serial dependence up to the first lag and a strong correlation with general index KLCI return value. However, the lagged values does not influence significantly except the first lag. Considering another Shariah based index EMAS Shariah index (ESI), the serial dependence is not significant. But the daily returns of KLCI and ESI are strongly correlated and this relation disappears when it comes to lagged values of return. The similar behavior is reported in the case of KLCI also. The result reveals that neither general index nor Shariah based index lead or lag the other substantially even though a short feedback mechanism exists between the two markets. There is a contemporaneous and bi-directional lead-lag relationship between indices and price discovery happens in both the indices simultaneously.

Importantly, the coefficient of error correction is not statistically different from zero for both the HSI to KLCI and KLCI to HSI values. This implies that one market adjusts to changes in the other in the same period to maintain short-run equilibrium. This leads to conclude that no relative advantage is attributed either to general index (KLCI) or to Shariah based index (HIS), and both achieve equilibrium instantly. The error correction term (ECT) is statistically different from zero in the case of ESI to KLCI given by a significant negative coefficient. It indicates that if EMAS index is above its long-run relationship (equilibrium) with KLCI index, EMAS stock price will decrease to return to equilibrium level. On the other hand, KLCI to HSI shows significant

positive value for ECT suggesting relatively slow pace of KLCI index to adjust to EMAS stock price to restore equilibrium level. It is evident that the response level originates in EMAS prices to adjust with the general index KLCI.

5.2 Volatility Patterns

We separately study the volatility behavior of market, by analyzing spillover, persistence and asymmetric factors. The tables report the parameter estimates which measure the degree of volatility persistence (), volatility spillover () and asymmetric volatility spillover () for all the three indices under consideration. At five percent level, volatility spillover from HSI stocks to KLCI stocks is significant. The spillover coefficient is negative implying a reduction in HSI volatility leads to a reduction in KLCI volatility. The spillover effects in this case are symmetric and the degree of volatility persistence is very low. Similar observation is made with the volatility spillover from KLCI to HSI stocks.

In the case of EMAS to KLCI, there is significant transmission of volatility patterns from one set of stocks to the other as reported by a significant coefficient of spillover effect. Interestingly, the coefficients are positive values for volatility spillover in both cases and this suggests that volatility of the two indices is not certainly in the same direction. Persistence behavior of volatility is mixed in a way that EMAS to KLCI, volatility is persistent over a time, but the persistence is low in the reverse direction. As in the earlier case, the volatility shows symmetric patterns, but the available evidence is not strong enough to state that market is more sensitive to negative information as widely seen.

Conclusion

The objectives of finding the lead-lag relationship and volatility patterns in Shariah based indices and a general index traded on Malaysian stock market are fulfilled with the help of VECM-EGARCH framework. We modeled the index returns from January 2011 to November 2015. It is evident that contemporaneous and bi-directional lead-lag relationship exists among Shariah based index and general index. All indices almost move in tandem and price discovery occurs in both types of indices simultaneously. Information superiority can't be claimed by any of the indices. At the same time, Shariah based indices and a general index share a long-term relation, but it is violated in the short run. On the other hand, any short-term disequilibrium is rectified simultaneously or in the next period. Volatility spillover exists in all the cases but in mixed directions. Mixed evidences are reported with the persistence of volatility. In short, the volatility patterns with regard to the general index are different in both Shariah based indices. This suggests that investors in Malaysian market have not taken Shariah based index just on risk or return fronts. Rather it may be because of preference for Shariah compliant norms adopted by companies in their dealings and operations. As there is no much difference between Shariah based index and general index in terms of performance as evidenced in the study, better stock market penetration can be possible among Shariah sensitive investors.

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APPENDIX

Tables

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
HSIP	1209	11885.38	1758.374	8796.62	15112.38
HSIR	1208	0.0003869	0.0057702	-0.025789	0.0310481
EMASP	1209	11042.4	1462.715	8291.46	13515.17
EMASR	1208	0.0003464	0.0058515	-0.029242	0.0324724
KLCIP	1209	1610.565	177.3722	1072.69	1892.65
KLCIR	1208	0.0002945	0.0084736	-0.155682	0.1602038

Source: Data Analysis

Table 2: Unit Root Test

		Test Statistic	p value
HSIP	Z(t)	-0.293	0.9264
EMASP	Z(t)	-1.074	0.7253
KLCIP	Z(t)	-1.602	0.4825
HSIR	Z(t)	-31.529	0.0000
EMASR	Z(t)	-30.796	0.0000
KLCIR	Z(t)	-44.376	0.0000

*Critical values at 1%= -3.430, 5%=-2.860 and 10%= -2.570

Source: Data Analysis

Table 3: Johansen's Co-integration Test

HSI(2)	87.13** (65.21)	9.82 (6.38)	78.06** (58.67)	5.12 (4.44)
EMAS(2)	42.62** (20.92)	7.70 (8.21)	39.89** (23.84)	7.16 (5.51)
KLCI(2)	96.63** (56.24)	6.83 (4.14)	115.05** (29.58)	8.23 (5.69)

Source: Data Analysis

Table 4: VECM- EGARCH Estimates (HSI to KLCI)

HR	Coef.	z	P>z
HR_01	-0.044	-1.560	0.119
HR_02	-0.017	-0.660	0.506
KLCIR	0.966	95.480	0.000
KLCIR_01	0.030	1.010	0.311
KLCIR_02	0.030	1.120	0.261

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$\alpha_{,o}$	0.000	2.680	0.007
δ	-0.013	-0.260	0.795
	-0.016	-0.340	0.736
	-0.208	-3.280	0.001
	0.862	2.940	0.003
ω	-0.239	-2.160	0.031

Source: Data Analysis

Table 5: VECM- EGARCH Estimates (EMAS to KLCI)

ER	Coef.	z	P>z
ER_01	-0.002	-0.060	0.949
ER_02	-0.005	-0.170	0.865
KLCIR	0.987	103.450	0.000
KLCIR_01	-0.003	-0.090	0.929
KLCIR_02	0.026	0.880	0.381
$\alpha_{,o}$	0.000	1.240	0.213
δ	-0.120	-2.500	0.012
	0.104	2.200	0.027
	0.278	3.810	0.000
	1.448	6.510	0.000
ω	-0.120	-1.700	0.089

Source: Data Analysis

Table 6: VECM- EGARCH Estimates (KLCI to HSI)

KLCIR	Coef.	z	P>z
KLCIR_01	-0.018	-0.630	0.530
KLCIR_02	-0.027	-1.040	0.300
HR	0.852	98.350	0.000
HR_01	0.038	1.420	0.157
HR_02	0.007	0.290	0.771
$\alpha_{,0}$	0.000	-2.010	0.045
δ	-0.017	-0.360	0.717
	0.008	0.170	0.867
	0.222	3.660	0.000
	1.229	5.470	0.000
ω	-0.094	-2.240	0.025

Source: Data Analysis

Table 7: VECM- EGARCH Estimates (KLCI to EMAS)

KLCIR	Coef.	z	P>z
KLCIR_01	0.000	-0.010	0.990
KLCIR_02	-0.012	-0.510	0.613
ER	0.864	110.450	0.000
ER_01	0.013	0.520	0.605
ER_02	-0.014	-0.600	0.546
α,0	0.000	-0.670	0.503
δ	0.090	1.940	0.052
	-0.059	-1.300	0.195
	0.286	5.050	0.000
Θ	0.639	3.130	0.002
ω	-0.270	-2.900	0.004

Source: Data Analysis