Dynamic Linkages between Newly Developed Islamic Equity Style Indices

Shahrin Saaid Shaharuddin [1*], Wee-Yeap Lau [2] and Rubi Ahmad [3]

[1] Institute of Graduate Studies, University of Malaya, 50603 Kuala Lumpur, Malaysia
[2] Faculty of Economics and Administration, University of Malaya, 50603 Kuala Lumpur, Malaysia
[3] Faculty of Business and Accountancy, University of Malaya, 50603 Kuala Lumpur, Malaysia

*Abstract***:** *This study examines the dynamic linkages among six newly developed Islamic equity style indices based on the FTSE EMAS Shariah Index in Malaysia. By using the Vector Autoregression (VAR) model, the results indicate that there are short-run dynamics between the Islamic equity style indices. The results indicate that the Large Value (LV) index has Granger causes Large Growth (LG) and Small Value (SV) indices. This study is useful to both researchers as well as investors for purposes of benchmarking and portfolio construction. Also, the results also add to the existing body of knowledge as to the idiosyncratic nature of Islamic equity style stocks.*

Keywords: *Islamic equity style indices, Vector Autoregression model, Fama and French three-factor model.*

1. Introduction

The Fama and French (1992) three-factor model stands to be one of the most important theoretical developments in the area of asset pricing and portfolio management. Despite the arguments and criticisms against the three-factor model, academics and practitioners successfully utilized the newly developed Fama and French factors, which classifies stocks based on value and growth characteristics as well as market capitalization, in order to develop stock market indices which are better known as equity style indices.

The information transmission capabilities of equity style indices have been commended by authors such as Liew and Vassalou (1999), Tan and Lau (2013) and Lau and Lee (2015). The results of their studies have indicated that conventional equity style indices have predictive properties which precedes macroeconomic indicators. These tests were proven to be useful in the setting of both developed and developing markets. Nevertheless, the information transmission capabilities of style indices have not been tested based on Shariah compliant stocks. Furthermore, for purposes of portfolio management, there is a scarcity in the literature when it comes to testing equity style indices and their information transmission properties between each other.

The main research objective of this paper is to test the cointegration and information transmission capabilities of newly created Islamic equity style indices based on the FTSE EMAS Shariah indices of and emerging economy such as Malaysia. The information transmission capabilities of the newly created Islamic equity style indices will be tested using the Vector Autoregression (VAR) model by Sims (1980).

Based on this objective, the first hypothesis that can be formulated is that Islamic Fama and French indices does have information content. The second hypothesis argues that if the Islamic Fama and French indices do in fact have information content, how then does the newly developed Islamic equity style indices then relates to one another for purposes of forecasting and portfolio construction. For purposes of this study, it is assumed that the Vector Autoregression methodology proposed by Sims (1980) will be sufficient to inform prospective researchers and investors as to the efficacy of the newly developed Islamic Fama and French indices.

By reviewing the state of the current literature on the information transmission capabilities of the Fama and French factors, the evidence seems to suggest that the equity style indices have information transmission content that can be used to predict future economic performance. However, there is a shortage in terms of studies performed on the information transmission capabilities of the Fama and French factors when it comes to Islamic stocks and emerging economies. A gulf in the area of research can also be found when it comes to the study of the relationship between the Fama and French factors and their information transmission capabilities as they relate to each other. A study of the information transmission capabilities of the Fama and French factors and their relationship to each other is important as a guide to researchers and investors in the financial markets.

The remainder of this paper will be presented as follows. Section 2 will outline relevant empirical methods which have been applied in this study. Section 3 discusses the data and variables which were utilized. Section 4 discusses results of the study and finally Section 5 will conclude the paper by presenting conclusions and recommendations.

2. Methodology

2.1. VAR Model

The Vector Autogregression (VAR) model based on Sims's (1980) model which takes the form of multiple simultaneous equations, and the endogenous variables in each equation form a regression with the lagged values of all endogenous variables, is used to test the long-run and short-run relationships between the variables. This is done in order to estimate the dynamic relationships between all endogenous variables. As a result, the VAR model can be used to describe the impact of factors influencing dependant variables based on the indices chosen for this study.

The mathematical representation of a VAR(p) model are (Equation 1):-

$$Y_t = C + \emptyset_1 Y_{t-1} + \emptyset_2 \Delta Y_{t-2} + \ldots + \emptyset_p Y_{t-p} + \mu_{t,} \tag{1}$$

where Y_t is a K x 1 vector of variables, Φ_i is a K x K coefficient matrices, and u_t is a K x 1 vector of stochastic disturbances, which is assumed to be white noise processes.

A unit root test is used to examine whether a time series is stationary or non-stationary using the autoregressive model. It is essential that the economic time series is stationary in a VAR framework. A differencing method is commonly used in order to eliminate non-stationary trend for time series data which has a non-stationary sequence. In order to establish sequence stationarity, standard unit root rests will be performed. The tests which shall be employed include the Augmented Dickey-Fuller (ADF) test, Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test and the Dickey-Fuller GLS test in order to improve the credibility of the empirical findings. These tests are further explained below.

2.2. Granger Causality Test

The Granger causality test is used to determine whether one of chosen Islamic indices helps in forecasting the other. This test will be performed based on Granger's (1969) bivariate framework, where if variable *x* Granger causes variable *y*, the mean square error (MSE) of a forecast of *y* based on prior values of both variable *x* and *y* should be lower that the MSE of the forecast which only uses past value of *y*. The Granger causality is further explained in Equation 2 below:-

$$\Delta y_t = \alpha + \sum_{i=1}^{p} \beta_i \Delta y_{t-1+} \sum_{i=1}^{p} \beta_i \Delta x_{t-1} + \varepsilon_t \tag{2}$$

and testing the joint hypothesis

$H_0 : \gamma_1 = \gamma_2 = \ldots.. = \gamma_p = 0$
$H_1 :$ At least one of the γ_1 is not equal to zero

The asymptotic chi-square test will then determine the Granger causality between variable x and y. If the asymptotic chi-square test rejects H_0, therefore short-run dynamics exist from variable x to variable y. Furthermore, if the test statistic is significant, therefore it could be argued that variable x has predictive value for forecasting movement in variable y.

3. Data

The data for this study is taken from various sources including Bank Negara Malaysia (Central Bank of Malaysia), Securities Commission of Malaysia (SC), Department of Statistics of Malaysia as well as from Reuters Datastream. Data for the construction of the indices were collected from data retrieved on a daily basis. The Cubic Spline[1] method was employed to determine monthly data points for macroeconomic data which was reported on a quarterly basis. The data period selected was from May 2006 to April 2011 to coincide with the Shariah Listing of Shariah compliant stocks from the Securities Commission of Malaysia.

The Fama and French factors are developed by using Islamic Equity style indices as derived from the Malaysian Shariah stock market, which is then used to construct the Fama and French 'SMB' and 'HML' factors. The universe of Islamic stocks chosen are determined by the Shariah Listing of Shariah Compliant Securities[2] from the Securities Commission of Malaysia.

The newly created Islamic equity style indices can be observed from Figure 1 below.
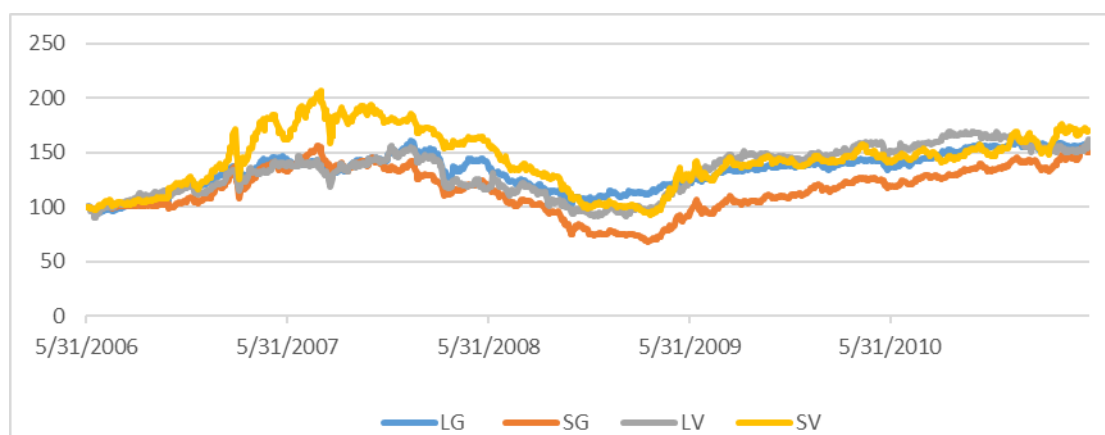

Fig. 1: Large Growth (LG), Large Value (LV), Small Growth (SG) and Small Value (SV) Islamic Equity style indices

Figure 1 above illustrates the newly developed LG, LV, SG and SV Islamic equity style indices from May 2006 to April 2011 and evidence of correlation between the indices during the period.

4. Empirical Results

4.1. Unit Root Tests

The unit root rest results seem to indicate that all six variables are stationary after taking a first difference. As such, this would indicate that the LLG, LLV, LMG, LMV, LSG and LMV are integrated of order one.

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[1] The Cubic Spline method is used for purposes of interpolating quarterly economic data to produce monthly data which is relevant to this analysis. This method also enables the development of a smooth curve which interpolates values of monthly data. The Cubic Spline output was produced using MS Excel. The application of the Cubic Spline method in capital markets through the mathematical application of a piecewise polynomial function is explained by de la Granville (2001).

[2] Shariah Compliant Securities are stocks listed on the Kuala Lumpur Stock Exchange (KLSE) which are approved by the Shariah Advisory Council (SAC) of the Securities Commission of Malaysia (SC) (refer to Securities Commission of Malaysia website). These stocks are classified as Shariah Compliant based on the SAC's methodology in screening companies to be included in their list of Islamic Shariah Compliant securities. The list of Shariah Compliant securities is produced twice a year.

The test results indicate that the VAR (5) model is the optimal model to be applied to the indices which have been selected. Following from this, further diagnostics checks will be performed. In order to ensure that the chosen model it well-specified, it is necessary to conduct the stability test of the VAR model. This is done in order to test whether the estimated parameters change over time. Model misspecification or non-constant parameters may adversely affect statistical inferences. Therefore, in order to test the stability of the model, the VAR roots of characteristics polynomial test is performed. The results of this test indicate that all the characteristic roots are less than 1 and lies inside the unit circle. This would imply that the VAR (5) model which was chosen satisfies the stability condition.

A number of diagnostics tests have been selected to confirm the validity of the results. The tests are performed in order to check the following: (i) violation of normality; (ii) autocorrelation and (iii) heteroscedasticity. Taken together, the results of the diagnostics tests seem to indicate that the selected model is robust, and allows for inferences to be made.

4.2. Short-Run Dynamics of VAR Model

The short-run causal relationship between the indices are analysed in Table 1 below through the Granger causality approach. The Granger causality allows for causal relationships to be identified in all equations. It further suggests that causal relationships exist when contemporary or past realizations helps to predict future values of another variable.

TABLE 1: Granger Causality Tests

Dependent Variables	Independent Variables					
	ΔLnLG	**ΔLnLV**	**ΔLnMG**	**ΔLnMV**	**ΔLnSG**	**ΔLnSV**
ΔLnLG		9.5577	2.3758	6.8747	1.9406	7.1848
		(0.0888)**	(0.7951)	(0.2301)	(0.8573)	(0.2073)
ΔLnLV	8.0626		2.9648	4.2586	6.7488	6.4842
	(0.1528)		(0.7054)	(0.5128)	(0.2400)	(0.2619)
ΔLnMG	7.237	5.6946		4.4431	0.9531	5.8278
	(0.2036)	(0.3371)		(0.4875)	(0.9663)	(0.3233)
ΔLnMV	4.7915	7.8629	0.8325		1.6837	0.2643
	(0.4419)	(0.1640)	(0.9749)		(0.8909)	(0.9983)
ΔLnSG	5.8595	8.982	1.5104	4.2769		3.0134
	(0.3201)	(0.1098)	(0.9119)	(0.5103)		(0.6979)
ΔLnSV	6.7466	10.1148	3.0371	8.7252	3.4936	
	(0.2402)	(0.0720)*	(0.6943)	(0.1205)	(0.6243)	

*, ** and *** denote statistical significance at 1%, 5% and 10% level respectively
All estimates are asymptotic Granger Chi-squared F-statistics. Values in parentheses are p-values.

The results from Table 4 indicates that for all significance levels, the Granger Chi-squared statistics are statistically significant at for the LV index to Granger cause LG and SV. The short-run dynamics of the LV index and its relationship with the LG and SV index which was identified in Table 1 can be explained in Figure 2 below.
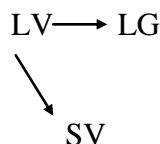
LV⟶ LG

SV

Fig. 2: Short-run Causal Relationship between LV and LG

It should be noted that the nature of the causality was determined within the time span under analysis and it should be cautioned that it cannot be claimed that similar causality exists outside this time frame.

In summary, the results of the Granger causality test indicates that there is uni-directional causality between the LV to LG and LV to SV indices. There are no short-run dynamics between all the other indices. However, the LV index appears to be better in predicting the economic performance of the LG and SV indices.

5. Conclusion and Recommendations

This paper empirically investigates the relationship and degree of cointegration between the newly developed Islamic equity style indices based on the FTSE EMAS Shariah index in Malaysia. The six Islamic equity style indices were found to be non-stationary in variable form, but were found to become stationary after first differencing and there is no long-run relationship between the indices. By applying the Vector Autoregression method in order to test the short-run dynamics between the six Islamic equity style indices, the evidences indicate that the LV index has information content that precedes the LG as well as the SV indices.

These results are useful to investors as well as researchers studying the forecasting abilities of equity style indices specifically from the point of view of Islamic stocks in emerging economies. The study in fact corroborates previous results from Liew and Vassalou (1999), Tan and Lau (2013) as well as Lau and Lee (2015) on the information transmission capabilities of the equity style indices. Furthermore, the results would suggest that the newly developed Islamic equity style indices are useful to investors for purposes of predicting the performance of Islamic equity style stocks. In particular, the results of Granger causality tests imply that the predictive qualities of the LV index would be useful for investors and fund managers for purposes of making investment decisions. Future studies could be extended to include studies of the information transmission capabilities of Islamic equity style indices between stock markets in different countries. Analyst and investors would then be able to gain more insights as to the idiosyncratic nature of Islamic equity style stocks and its potential for purposes of diversification.

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