Does the shariah index move together with the conventional equity indexes?

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Abstract

Generally, Shariah (Islamic) indices are considered to have lower portfolio betas relative to conventional ones. The lower portfolio beta of Islamic indexes is a logical result of Shariah screening. As Shariah screening eliminates stocks with high financial leverage, the resulting portfolio beta ought to be lower because a stock's beta is reflective of the underlying business risk and financial risk (leverage). With this motivation and background, we have tried to find out whether we can have diversification opportunities with combining Shariah index and conventional indexes. The results of analysis revealed the absence of cointegration between the DJIM index and three conventional indexes such as DAX, HangSeng, KL. This means that diversification opportunities exist for the mentioned indices. But for the S&P and DJIM, we found that they are cointegrated, which implies there exists long run theoretical relationship among the indices. Presence of cointegration indicates the absence of diversification opportunities in the concerned indices. So if we want to get diversification effect, we have to avoid setting up the portfolio with S&P and DJIM with the balanced weight. Because these two variables move together, the investors are not likely to get the positive portfolio effect particularly in the long term.

Keywords: Shariah (Islamic) Index, diversification, cointegration

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Does the shariah index move together with the conventional equity indexes?

1. Introduction: Objective and Motivation

The general perception of ethical investment is that the ethical investor is likely to earn portfolio returns that are below the market portfolio return. It is argued that ethical investing will under-perform over the long term because ethical investment portfolios are subsets of the market portfolio, and lack sufficient diversification. However, the results from past studies on the performance gap between ethically screened and unscreened investments are mixed, with several of these studies reporting no statistically significant difference in their returns. Islamic banks demonstrated great resilience during the global financial crisis, despite the turmoil which unfolded across the world's financial markets. From this experience we may expect there are some diversification opportunities if we compose our portfolio with Shariah index and conventional indexs. Generally diversification effect can be obatained by negative correlation between the variables. If the variables move together by a certain shocks, the portfolio effect may be short of our expectation.

The purpose of this research is to find out whether there is a significant relationship between Islamic and Conventional stock indices. Specifically, this study attempts to find out whether there is any correlation between Dow Jones Islamic Market (DJIM) Index and other major conventional equity indexes. Thus, the specific objectives are to determine whether there is a significant correlation coefficient between DJIM Index and other major equity indices such as S&P, DAX etc, and moreover to try find out whether we might have diversification opportunities.

2. Literature Review

Globally, the existing research literature pertaining to Islamic indices in particular is inadequate. Nevertheless, authors such as Ahmad and Ibrahim (2002); Hakim and Rashidian (2002); Hussein (2005) and Albaity and Ahmad (2008) have analyzed the performance of Islamic indices vis-a-vis conventional stock market indices using stock market data. Among the earlier quantitative studies on the Islamic equity indices, a few studies have focused on the Dow

Jones Market Index (DJIMI) such as Atta (2000) who used back-tested data in the analysis. The other studies using the same index family include Hassan (2001), Tilva and Tuli (2002) and Hakim and Rashidian (2002, 2004). Majority of these studies followed the same methodologies of comparing the performance of DJIMI to other benchmarks but the choices are quite different from one research to another in terms of performance measures and benchmarks.

Interestingly, no correlation can be found between DJIM and Wilshire 5000 index and three-month treasury bills. In this study by Hakim and Rashidian (2004), the interdependence theory of financial markets was debased and it was concluded that the Islamic index has unique risk features that is independent from broad equity markets owing to the Shariah screening criteria. This contradicts other studies Hassan, (2004), Girard and Hassan (2008); that provided empirical evidence of Islamic and non-Islamic indices being similar.

As for Malaysian Islamic stock market, the Kuala Lumpur Shariah Index was studied by a number of researchers. Prominent studies by Ahmad and Ibrahim (2002), Albaity and Ahmad (2008), Yusof and Majid (2007) have addressed various issues of DJIMI, FTSE and Malaysian Islamic indices.

Some particular studies focused on other markets such as the Pakistani stock market (Nishat 2004) or that of the Saudi Arabia (Dabbeeru 2006). Only a few studies have addressed the issues of the existence of diversification opportunities. Hakim and Rashidian (2004) found that despite investment restrictions, the exclusion of industries from the Islamic index of Dow Jones did not seem to have hurt its diversification, but may have contributed to reduce its market risk. Guyot (2011) analyzed the same index family and found the absence of cointegration over the long term between nine pairs of Islamic and conventional indices and therefore, diversification benefits for international investors. Girard and Hassan (2008) used a multivariate cointegration analysis and found that Islamic and conventional groups of FTSE are integrated.

They also asserted that both types of indices have similar reward to risk and diversification benefits. Since the authors found no significant differences between Islamic and conventional indices of FTSE, they suggested use them as asset classes to have more diversification benefits. Kok et al. (2009), who found the similar conclusion, exhibited the existence of diversification opportunities by grouping FTSE Global Islamic with conventional and socially responsible indices.

3. Data and Methodology

This study used weekly indexes of S&P, DAX, HangSeng, Kuala Lumpur Composite and Dow Jones Islamic Market Index starting from the first week of Jan, 2010 to middle of November 2014. Total observation is 243 and all data are collected from available databases such as Datastream, Yahoo & Google finance etc. As a requirement for the time series analysis, it is necessary to examine the property of time series, that is, the stationary properties. This is very critical to avoid spurious regression. In this study, we employ augmented Dickey-Fuller (ADF) unit root test which was developed by Dickey and Fuller (1979). This requires us to test the significance of δ whether the time series is stationary or otherwise. In each form, the hypotheses are as follow ; Null hypothesis: H0 : $\delta = 0$ (i.e. the time series is non-stationary) , Alternative hypothesis: H1 : $\delta < 0$ (i.e. the time series is stationary). The first econometric step that has been used is to test the null hypothesis that the series are random walk or non-stationary by using Augmented Dickey-Fuller test. If the variables were found to be non-stationary, then the variables have been tested for the possibility of one or more co-integrating relationships using the Johansen (1990) methodology in the form of two test statistics namely, the trace test and the maximal eigen value during the above-mentioned time periods.

The interrelationship among indexes has been captured by the both vector autoregressive (VAR) model and co-integrating vector error correction model (VECM). However, VECM cannot tell us which variable is relatively more exogenous and endogenous. The VDC technique is designed to indicate the relative exogeneity and endogeneity of a variables by decomposing (or portioning) the variance of the forecast error of a variable into proportions attributable to shocks (or innovation) in each variable in the system including its own (Masih *et al*, 2008). Then, Impulse Response Function Analysis which traces the response of exchange rate to one standard deviation change in interest rate. The IRF is presenting in a graphical way. Finally, the persistence profiles will be applied. They are designed to give the information about how long it will take for system to get back to equilibrium by using a system-wide shock.

4. Empirical result and interpretation

Step 1: Unit Root test

Prior to kicking off the process, the stationarity of variable should be checked first. The variable is stationary if it always has a constant mean, variance, covariance throughout the time. In this step, the objective is to check whether the variables chosen were stationary or not. The test can be done by using the Augmented Dickey-Fuller (ADF) test and Phillips-Perron Test (PP).

ADF test

We kicked off our empirical testing by determining the stationarity of the variables chosen. In order to proceed with the testing of cointegration later, ideally, our variables should be I (1), in that in their original level form, they are non-stationary and in their first differenced form, they are stationary. The differenced form for each variable used is created by taking the difference of their log forms. For example, DSP = $LSP_t - LSP_{t-1}$. We, then conducted the Augmented Dickey-Fuller(ADF) test on each variable in both level and differenced form. The table below summarizes the results.

[Table 1: ADF Test]

Variable	Test Statistic	Critical Value	Implication
Variables in Level form			
LSP	2.7899	3.4291	Non-Stationary
LDAX	2.6886		Non-Stationary
LHS	2.6405		Non-Stationary
LKL	3.0203		Non-Stationary
LDJIM	2.8834		Non-Stationary
Variable in Differenced form			
DSP	11.4044	2.8733	Stationary
DDAX	10.2857		Stationary
DHS	9.3097		Stationary
DKL	11.2502		Stationary
DDJIM	12.0831		Stationary

The above table shows that in level form, we couldn't reject the null hypothesis, while with the difference form we were able to reject the null hypothesis. By relying primarily on the AIC and SBC criteria, the conclusion that can be made is all the variables in this analysis are I(1) and therefore can proceed to next step. For ADF test statistics, we have selected the ADF regression order based on the highest computed value for AIC and SBC.

PP-test

The Phillips-Perron (PP) test also gave us the same results. In the PP test, the null hypothesis is that the variable is non-stationary. The null cannot be rejected if the test statistics is lesser than the critical value in absolute terms and can be rejected if the test statistics is larger than the critical value. We tested the variables based on these judgement criteria and accordingly get the results that all variables are I(1).

Step 2: Determining the Order of Lags of the VAR

Prior to doing cointegration test, we needed to determine order of the VAR which helps us to select how many lags we are going to use for cointegration test. Vector auto regression (VAR) is the test that needs to be done before moving on to the test for cointegration. In VAR the number lags needs to be used in this study. Table below show the AIC and SBC.

[Table 2: Order of VAR]

	Choice Criteria	
	AIC	SBC
Optimal Order	**2**	**1**

From the above table, it showed a contradicting optimum order given by the highest value of AIC and SBC. As expected, SBC gives lower order (order 1) as compared to AIC (order 2). This difference is due to the AIC tries to solve for autocorrelation while SBC tries to avoid over-parameterization. Given this apparent conflict between recommendation of AIC and SBC, we address this in the following manner. First, we checked for serial correlation for each variable and obtained the following result.

[Table 3: Tests for serial correlations of the variables]

Variable	LM (P-value)	Implication at 10% significance level
DSP	0.226	No serial correlation
DDAX	0.312	No serial correlation
DHS	0.546	No serial correlation
DKL	0.334	No serial correlation
DDJIM	0.342	No serial correlation

According to the table, serial correlation does not exist in any of the five variables. Therefore, if we adopted a lower order of lags, the effects of serial correlation may be encountered. On the other hand, if a higher order of the lag is taken, it leads to the disadvantages of risking over-parameterisation. In my case, we have 243 observations and then the higher VAR order of 2 is chosen.

Step 3: Cointegration Test

The cointegration test is very important in the sense that it checks whether all variables are theoretically related or not. If the variables are cointegrated each other, it means that there is a co-movement among these variables in the long term reaching the equilibrium, although they might move differently in the short term.

This test is very useful because it will prove the untested hypothesis or theory. Once we have established that the variables are I(1) and determined the optimal VAR order as 2, we are ready to test for cointegration. We have performed two tests to identify cointegration between the variables, so called Johansen method and Engle-Granger method.

Johansen method

The Johansen method uses maximum likelihood (i.e. eigenvalue and trace) and may identify more than one cointegration vectors while the Engle-Granger method can only identify one cointegration vector. According to the Johansen method (Table 4), we have not found that there is cointegrating vectors between the variables based on eigenvalue. In the case when the null hypothesis is $r = 0$, there is no cointegration when we fail to reject the null. If the t-statistics are lower than critical value (CV), we fail to reject the null, that is no cointegration between variables and otherwise there is cointegration if the null is rejected. Meanwhile, if we see the output with the trace statistics, we have found one cointegration vector between the variables.

[Table 4 :Johansen Test]

Null	**Alternatives**	**Statistics**	**95%CV**	**90% CV**
Maximal Eigenvalue Statistic				
r = 0	r = 1	32.0858	37.8600	35.0400
r<= 1	r = 2	24.4405	31.7900	29.1300
Trace Statistic				
r = 0	r = 1	89.5903	87.1700	82.8800
r<= 1	r = 2	57.5045	63.0000	59.1600

From the above results, we select one cointegrating vector based on the Eigen value and trace test Statistics at 95% level. The underlying VAR model is of order 2. If we follow eigenvalue test, there is no cointegration. But with the trace tests of cointegration, we can find there is only one cointegrating vector among the variables, since null hypothesis of having no cointegration is rejected based on t-Stat. > 95% C.V. Here we have conflict problem between the eigenvalue and trace test. Generally if eigenvalue and trace conflicting each other, we may rely on the theory.
From the result shown above, we are inclined to believe that there is one cointegrating vector based on intuition as well as familiarity that, there is relationship between conventional equity indexes and Shariah indexes. So, we will assume that there is one cointegrating vector.

Engle Granger Test

We also conducted Engel-Granger test whether the test results consistent with Johansen method. In E-G test, we assumed an OLS regression based on theories and empirical studies ; L

$DJIM = \alpha + \beta_1 LSP + \beta_2 LDAX + \beta_3 LHS + \beta_4 LKL + e_t$. The result was made by comparing test statistics of the highest value of AIC and SBC with Dickey-Fuller (DF) critical value at 95%. In this result, we couldn't find cointegration among variables based on AIC and SBC value which are smaller than DF critical value (-4.4764).

[Table 5. Engel-Granger test result]

<table>
<tr><th></th><th>Test statistics</th><th>DF critical value at 95%</th></tr>
<tr><td>AIC</td><td>-2.8185</td><td rowspan="2">-4.4764</td></tr>
<tr><td>SBC</td><td>-3.5733</td></tr>
</table>

Even though no cointegration was found in this test, it is still concluded that there is one cointegrating vector as what we found with the Johansen test.

If they are cointegrated, then there is a long-term equilibrium relationship between the variables. These results imply that relationship between DJIM, S&P, DAX, HangSeng and Kuala Lumpur Composite indexes are not spurious, and that each variable contains information for the prediction of other variable. However, cointegration cannot tell us the direction of Granger-causality as to which variable is exogenous and which variable is endogenous, for which the Vector Error Correction Modeling technique (VECM) will be applied. Now, in order to make the coefficients of the cointegrating vector consistent with theoretical expectations, we applied the long run structural model (Masih and Algahtani,2008).

Step 4 : Long Run Structural Model

This step will estimate theoretically meaningful cointegrating relations. we impose on those long-run relations and then test the over-identifying restrictions according to theories and information of the economies under review. In other words, this step will test the coefficients of variables in the cointegration equations against theoretical expectation. This LRSM step also can test the coefficients of variables whether they are statistically significant or not.

In this study, we want to see the impact of conventional equity indexes on Shariah index. In other words, our focused variable in this paper is LDJIM. Thus, we first normalized LDJIM (i.e. normalizing restriction of unity) at the 'exactly identifying' stage (Panel A). Next, we imposed restriction of zero on the other variable at the 'over identifying' stage (Panel B, Panel C). By calculating the t-ratios manually, we found that only LSP was significant, other variables such as LDAX, LHS, LKL were insignificant. To verify the significance of these variables, we applied over-identifying restrictions.

[Table 6. Exact and over identifying restrictions on the cointegrating vector]

	PANEL A	PANEL B	PANEL C
LSP	-1.0985	-0.89690	-1.0459
	(0.23231)	(0.15785)	(0.099178)
LDAX	0.26348	0.0000	0.00000
	(0.21427)	(None)	(None)
LHS	-0.21977	-0.070507	0.00000
	(0.15143)	(0.10205)	(None)
LKL	0.28018	-0.15420	0.00000
	(0.19769)	(0.17670)	(None)
LDJIM	1.0000	1.0000	1.0000
	(None)	(None)	(None)
Chi-Square	None	1.5591(0.212)	2.7345(0.434)

When we imposed the over-identifying restrictions on DAX, the null hypothesis-DAX is insignificant - was not rejected. The p-value was higher than 5% . This means that the restriction was correct, in other words, DAX is insignificant (Panel B).

Meanwhile, when we made the over-identifying restrictions for DAX, HangSeng, Kuala Lumpur composite indexes simultaneously, it also failed to reject the null hypothesis (Panel C), it means that DAX, HangSeng, Kuala Lumpur composite indexes are still insignificant. However, based on our intuition, we would like to include all variables into our model. The reason is that, the these days global equity markets have tendency in moving together and get affected by major countries' markets.

Step5 : Vector Error Correction Model

Error-correction term (ECT) is the stationary error term, in which this error term comes from a linear combination of our non-stationary variables that makes this error term to become stationary if they are cointegrated. It means that the ECT contains long-term information since it is the differences or deviations of those variables in their original level form. VECM uses the concept of Granger causality that the variable at present will be affected by another variable at past. Therefore, if the coefficient of the lagged ECT in any equation is insignificant, it means that the corresponding dependent variable of that equation is exogenous. This variable does not depend on the deviations of other variables. It also means that this variable is a leading variable and initially receives the exogenous shocks, which results in deviations from equilibrium and transmits the shocks to other variables.

On the other hand, if the coefficient of the lagged ECT is significant, it implies that the corresponding dependent variable of that equation is endogenous. It depends on the deviations of other variables. This dependent variable also bears the brunt of short-run adjustment to bring about the long-term equilibrium among the cointegrating variables. The previous four steps tested theories and confirm that there is cointegration between the variables but it did not show which were the leader and the follower variables. Step 5 onwards allows us to answer this shortcoming. The statistical results generated from these steps will be welcomed by policy makers.

Policy makers want to know which variable is the leader to focus their policies on those variables to make the biggest impact. By checking the error correction term 'e_{t-1}' for each variable whether it is significant, we found three exogenous variable (SP, DAX, HS) and two endogenous variables (KL, DJIM) as follows.

[Table 7: Exogeneity and Endogeneity of variables]

Variable	ECM(-1) t-ratio [p-value]	Implication
LSP	0.187[0.852]	Exogenous
LDAX	-1.547[0.123]	Exogenous
LHS	-1.761[0.080]	Exogenous
LKL	-2.600[0.010]	Endogenous
LDJIM	-4.089[0.000]	Endogenous

This result means that, as the exogenous variable, when SP, DAX, HS receive market shocks, other factors such as KL and DJIM will be affected by the shocks. This tends to indicate that the SP, DAX and HS indexes lead KL and DJIM. Since VECM does not give information about relative exogeneity and endogeneity, we will have to perform the next step to identify the ranking of the variables.

Step 6: Variance Decomposition Analysis

Although VECM results identified SP, DAX and HS as the leaders among variables, we couldn't say the relative endogeneity or exogeneity of variables. VDC test will help us to ascertain the relative degree of endogeneity among those variables. The relative exogeneity or endogeneity of a variable can be determined by the proportion of the variance explained by its own past. If a variable is mostly explained by itself, it is the most exogenous variable. Meanwhile, the most endogenous variable is mostly explained by others. The relative endogeneity and exogeneity of the variables are important for policy makers.

Generally we can use two kind of method for VDC analysis. But orthogonalised VDCs have some limitations. Firstly, it assumes that when a particular variable is shocked, all other variables are switched off. Secondly, it is dependent on a particular ordering of variables thus, the first variable would report as the highest percentage.

So we herewith, have used generalised VDCs, and compared the exogeneity / endogeneity of variables for 12 weeks, 54 weeks and 132 weeks. Generalised VDCs is more reliable than orthogonalised VDCs, since it does not make such a restrictive assumption and independent on a particular ordering of variables. However, when we interpret the numbers generated by the Generalised VDCs, we need to be careful and perform additional computations to make the numbers add up to 100% for a specified horizon (the numbers add up to 100% in the case of orthogonalised VDCs). Based on generalised VDCs, the forecast error variance of each variable are as table 8.

[Table 8. Generalised Variance Decompositions]

Forecast at Horizon = 12weeks

	LSP	LDAX	LHS	LKL	LDJIM
LSP	97.09%	61.54%	34.57%	24.79%	8.37%
LDAX	66.92%	94.31%	23.84%	12.17%	1.43%
LHS	43.70%	35.59%	93.18%	29.93%	2.81%
LKL	17.05%	11.30%	14.18%	86.14%	1.52%
LDJIM	87.17%	57.70%	38.91%	26.05%	29.73%

Forecast at Horizon = 54 Weeks

	LSP	LDAX	LHS	LKL	LDJIM
LSP	96.9%	61.1%	34.7%	25.6%	8.8%
LDAX	65.1%	88.3%	19.9%	10.9%	7.0%
LHS	45.7%	35.8%	86.1%	28.5%	0.7%
LKL	17.8%	11.0%	10.6%	75.0%	2.8%
LDJIM	94.6%	60.2%	36.1%	26.1%	14.4%

Forecast at Horizon = 132 Weeks

	LSP	LDAX	LHS	LKL	LDJIM
LSP	96.9%	61.0%	34.8%	25.8%	8.9%
LDAX	64.7%	87.0%	19.2%	10.6%	0.6%
LHS	46.2%	35.7%	84.3%	28.1%	0.3%

LKL	17.9%	10.9%	9.9%	72.5%	3.2%
LDJIM	95.9%	60.6%	35.3%	26.0%	11.2%

We depicted the above result tables into the table 10 below. The variable relative exogeneity / endogeneity of our variables are as table 9 below.

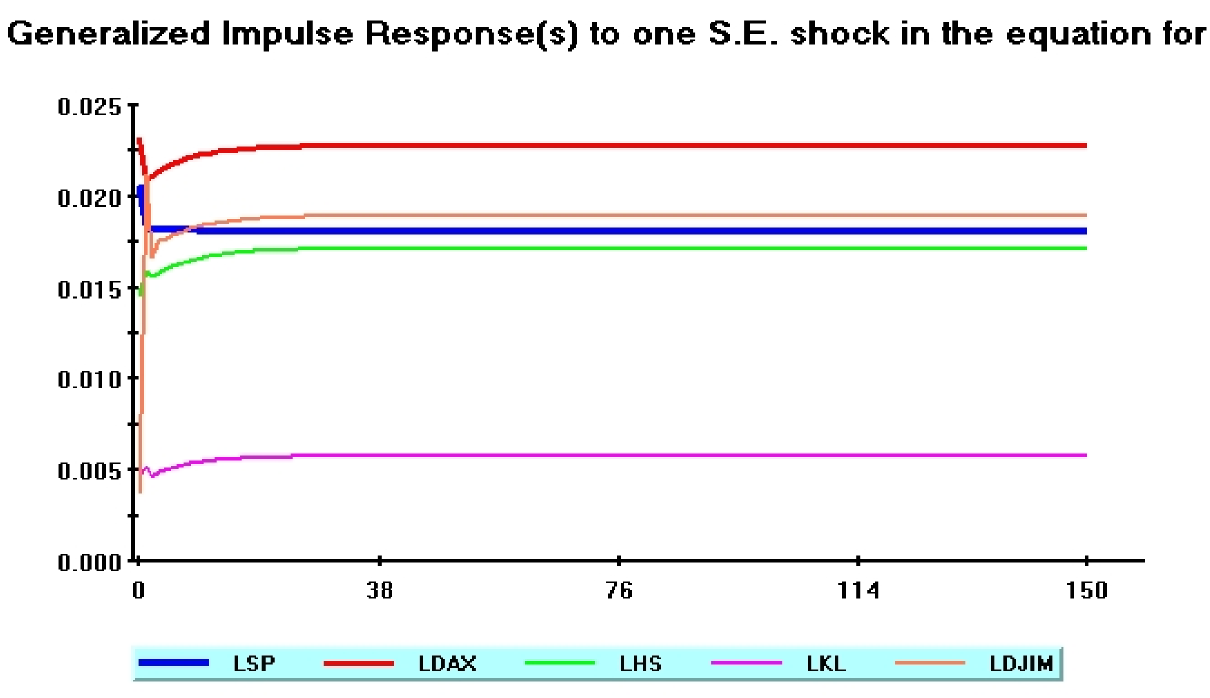
[Table 9. Variable relative exogeneity / endogeneity]

No.	Time-horizons		
	12 weeks	**54 weeks**	**132 weeks**
1	SP	SP	SP
2	DAX	DAX	DAX
3	HangSeng	HangSeng	HangSeng
4	KL	KL	KL
5	DJIM	DJIM	DJIM

From the above table, S&P index can be said to be the lead variable compared to the others and then followed by DAX, HangSeng, KL and DJIM index. Actually we have found this result is similar to our VECM result. Because we have found in VECM that the exogenous variables are S&P, DAX and HangSeng, and the rankings in VDC are consistent with our previous result. From the above result, we can conclude that, S&P index is most influential factor to the other major indexes.

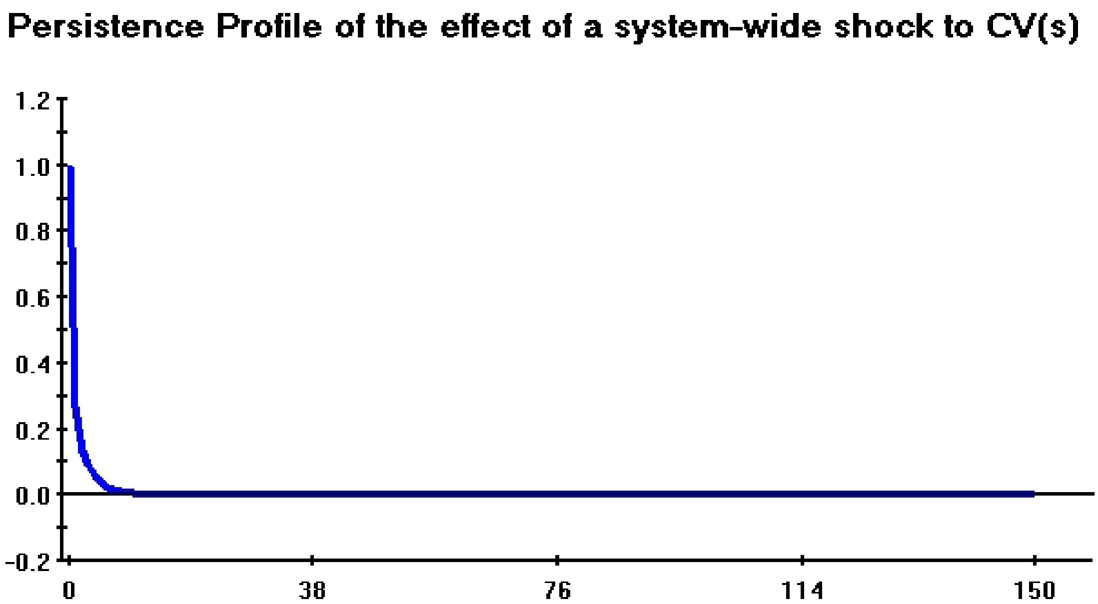
Step 7: Impulse Response Function

The information which is presented in the VDCs also can be equivalently represented by Impulse Response Functions (IRFs). IRFs will present the graphical explanations of the shocks of a variable on all other variables. In other words, IRFs map the dynamic response path of all variables owing to a shock to a particular variable. The IRFs trace out the effects of a variable-specific shock on the long-run relations. For the sake of comprehensiveness, we put various graphs of IRFs in the Appendix.



Step 8: Persistence Profile

The persistence profile illustrates the situation when the entire co-integrating equation is shocked, and indicates the time it would take for the relationship to get back to equilibrium. Here the effect of a system-wide shock on the long-run relations is the focus instead of variable-specific shocks as in the case of IRFs. The chart below shows the persistence profile for the co-integrating equation of this study, the chart indicates that it would take approximately 7 weeks for the co-integrating relationship to return to equilibrium following a system-wide shock. Refer appendix for detail.



6. Conclusions and Suggestions for future research

Islamic finance has shown resilience at a time when global recovery has slowed and conventional banking in western countries has remained under pressure. Generally, Shariah indices are considered to have lower portfolio betas relative to conventional ones. The lower portfolio beta of Islamic indexes is a logical result of Shariah screening. As Shariah screening eliminates stocks with high financial leverage, the resulting portfolio beta ought to be lower because a stock's beta is reflective of the underlying business risk and financial risk (leverage). The Islamic index, by virtue of the Shariah screening, only has stocks that have minimal financial leverage.

This study attempts to find out the relationship between Shariah equity index and conventional equity indexes by employing standard time series techniques including cointegration test, LRSM, VECM and VDCs etc. Through these techniques, we have tried to answer the question whether these indices offer an opportunity for portfolio diversification or not. In order to answer this question, we have analyzed four conventional indices (S&P, DAX, HnangSeng, KL) and one Shariah index(DJIM). Our results reveal the absence of cointegration between the DJIM index and three conventional indexes such as DAX, Hang Seng, KL. This means that diversification opportunities exist for the mentioned indexes. But for the S&P and

DJIM, we found that two indexes are moving together and DJIM was strongly affected by the shock of S&P index. This can be said that there exists theoretical relationship among the indices. Presence of cointegration indicates the absence of diversification opportunities in the concerned indices. So if we want to get diversification effect, we have to avoid setting up the portfolio with S&P and DJIM with the balanced weight. Because these two variables move together, the investors are not likely to get positive portfolio effect particularly in the long term.

The policy implication of our analysis is a little bit straight forward. The evidence of cointegration might have significant impact for portfolio diversification by the managers and investors. Indeed, the possibility of abnormal gain through portfolio diversification is limited in the long-run for cointegrated pairs of stock indices. In terms of academic research, it would be interesting to study more indices since our study is limited to just Dow Jones Islamic Market index. Future works should go for in-depth analysis to look into widely adopted Islamic indices.

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