THE EFFECTS OF THE INTRODUCTION SYARIAH INDEX TO THE BURSA MALAYSIA STOCK INDEX AND BURSA MALAYSIA STOCK INDEX FUTURES

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ABSTRACT

This study tries to investigate the effect of introduction of Syariah Index to the price relationships and volatility transmissions between the Bursa Malaysia Stock Index and Bursa Malaysia Stock Index Futures. In addition, it also tries to find the relationships between Bursa Malaysia Stock Index, Bursa Malaysia Stock Index Futures and Syariah Index. Vector Autoregression (VAR) GJR-GARCH model was applied to nine years daily price of the variables investigated. The results present evidence that the introduction of Syariah Index has changed the price relationships and volatility transmissions between the spot and futures markets in Malaysia. Furthermore, the findings of this study show that the there are feedback effects in the price relationships between the variables investigated. The findings also suggest that Bursa Malaysia Stock Index is the main information producer in predicting and analyzing the volatility of Bursa Malaysia Stock Index Futures and Syariah Index. Finally, the overall conditional correlation estimates between the three variables investigated are higher in the unrestricted model form compared to the restricted model form.

Keywords: spot-futures, syariah index, lead-lags, volatility, VAR GJR-GARCH, Islamic financial markets.

Introduction

The introduction of Syariah Index by Bursa Malaysia in April 1999 had initiated a new era in the Islamic financial market. Syariah Index is one of the stock indexes in Malaysia which contain only Syariah Approved Securities in the Main Board. According to Bursa Malaysia (2005) the objective of Syariah Index is to meet the demand from investors who wants to invest in the securities which are consistent with the Syariah principles. Syariah Index is believed has improved the development of Islamic financial market by providing information to investor to make a better investment decision. Market participants mainly use Syariah Index to help them in investment management; for example, as a benchmark to evaluate the Islamic portfolio performance, to create the Islamic portfolio (Index Fund Portfolio), and to evaluate the current and predict the future Syariah Approved Securities performance.

The introduction of Syariah Index creates new issues in the Malaysian stock market. There is a question whether the introduction of Syariah Index has an effect to the price relationship and volatility transmission between the Bursa Malaysia Stock Index and Bursa Malaysia stock Index Futures. Besides, there also a question on what are the relationships between the Bursa Malaysia Stock Index, Bursa Malaysia Stcok Index Futures and Syariah Index. In order to answer these issues, the following objectives are set to be achieved: (1) To investigate the effect of introduction of Syariah Index to the price relationship and volatility transmission between Bursa Malaysia Stock Index and Bursa Malaysia Stock Index Futures; (2) To examine the price relationship and volatility trnamission between Bursa Malaysia Stock Index, Bursa Malaysia Stock Index Futures and Syariah Index; and (3) To measure the correlation between Bursa Malaysia Stock Index, Bursa Malaysia Stock Index Futures and Syariah Index.

The models obtained from this study are expected to help investors and fund managers in allocating their capital in more efficient ways in both conventional and Islamic markets. Market participants can use the models derived from this study as guidance in making investment decisions. Furthermore, results from this study have some potential to be used by market analysts for predicting future market movement. Market analysts can give better recommendations on the stock market if they know which markets are leading the other markets. In an academic point of view, the findings of this study are expected to give a better understanding of the relationship between spot markets, futures markets and Islamic market. Finally, the results can be useful to regulators of stock markets, futures market and Islamic market in regulating those markets.

Literature Review

A growing body of research has attempted to establish the nature of and extent of interdependence between stock index and stock index futures. Yang and Bessler (2004) tried to find the international price transmission in stock index futures markets. They used the nine major stock index futures markets in the world. The result shows that the Japanese market is isolated from other major stock index futures markets. The US and UK markets appear to share leadership roles in stock index futures markets. Furthermore, the UK and German markets rather than United State exert significant influences on most European markets, which show a pattern of regional integration in Europe. Ryoo and Smith (2004) investigated the impact of trading in KOSPI 200 Index Futures to the spot markets. They found that there is weak evidence that the spot market leads the futures market but there is a strong evidence for futures markets to lead the spot market in Korea.

Ramasamy and Shanmugam (2003) tried to investigate the lead and lag relationship of spot-futures relationship in Malaysia. They found that the stock index futures return leads the stock index, return by one day during stable period but the lag become two days during high volatility period. Meanwhile, the stock index return lead the stock index futures return by one day in both stable and high volatility period. A study done by Bologna and Cavallo (2002) examined the effect of the introduction stock index futures on the volatility of the Italian Stock Exchange. They found that the introduction of stock index futures in Italy led to a reduction in stock market volatility and enhanced the efficiency of the spot markets. This finding is consistent with those theories stating that active and developed futures markets enhance the efficiency of the corresponding spot markets.

Gwilym and Buckle (2001) investigated the lead-lag relationship between the FTSE-100 Stock Index and its related derivative contracts. The study shows that both stock index futures and stock index options lead the spot market. However, the study found that only call option markets appear to marginally lead both the index futures and the put option markets. The Frino et al (2000) study on the lead-lag relationship between equities and stock index futures around information releases. The result from this study shows that a strengthening in the lead of the stock index futures returns over stock index returns around macroeconomics information releases.

Frino and West (1999) study focused on the lead-lag relationship between stock index and stock index futures in Australia from 1992 to 1997. They found that futures returns lead index returns by twenty to twenty- five minutes and that there is some evidence of feedback from the equity markets to the futures markets. A year-by-year analysis shows that the futures market lead over the equities market has decreased over time and the relationship between the two markets has generally strengthened, which is consistent with an increase in the level of integration between the markets. Min and Najand (1999) investigated the possible lead-lag relationship in returns and volatility between cash and futures markets in Korea. The findings suggested that futures market leads the cash market, and there is a bidirectional volatility interaction between spot and futures markets. They also found that trading volume has significantly explanatory power for volatility changes in cash and futures markets.

Tang et al. (1992) in their study of the interrelationship between Hang Seng Index Futures contract and the underlying Hang Seng index in Hong Kong, found that the Hang Seng Index Futures caused the Hang Seng Index price to change in the pre-crash period. However, a bi-directional relationship was found between these two variables during post-crash period. Chan (1992) investigated the intraday lead/lag relationships between returns of the Major Market cash index and returns of Major Market cash index futures with S&P 500 index futures. His study suggested that the futures market leads the cash market. He also showed evidence that when more stocks move together, the futures leads the cash index to a greater degree and the futures market becomes the main source of market-wide information. Kalok (1992) analysed the lead-lag relationship between the cash market and stock index futures market using Major Market Cash Index returns, Major Market Index Futures returns and S&P 500 Futures returns. He found strong evidence that futures markets lead the cash index and the asymmetric lead-lag relation holds between the futures and all component stocks, including those that trade in almost every five-minute interval. The study also shows that when more stock move together, the futures leads the cash index to a grater degree.

Butterworth (2000) used symmetric and asymmetric GARCH methods to investigate the effect of futures trading on the FTSE Mid 250 index. The result suggested a symmetric model that adequately captures the response of volatility to the news. Furthermore, the study found that following the onset of futures trading the quantity of information flowing into the market increased. However, the rate at which news is impounded into prices fell, with an associated rise

in the persistence of information. Zhong et al (2004) investigates the effect of Mexican Stock Index futures to the spot market. The study found that the futures market in Mexico is a useful price discovery vehicle and has also been a source of instability for the spot market. Bae et al (2004) examined the effect of introducing the KOSPI 200 Stock Index Futures to the spot price volatility and market efficiency of KOSPI 200 stocks and non-KOSPI 200 stocks. The study found that the introduction of KOSPI 200 Stock Index Futures caused greater market efficiency in underlying stocks. In addition, the study showed that KOSPI 200 stocks experience lower price volatility compared to the non-KOSPI 200 stocks after the introduction of the stock index futures. Bhar (2001) used a bivariate EGARCH model in investigating the links between the equity market and the index futures market in Australia. He found that conditional means returns from both markets are influenced by the long-run equilibrium relationship.

Faff and McKenzie (2002) investigated the impact of the introduction of stock index futures trading on the daily returns of the underlying index for seven countries. Their results support the argument that the introduction of futures trading leads to reduced seasonality means returns. Yu (2001) in a study on the impact of futures contract on the volatility of the spot markets suggested that, following the introduction of index futures, the volatility of stock returns in the USA, France, Japan and Australia rose significantly while no significant changes in the volatility were found in the United Kingdom and Hong Kong. Gulen and Mayhew (2000) studied the stock index futures trading and volatility in international market using 25 countries. They tried to examine the stock market volatility before and after the introduction of stock index futures. The study found that the futures trading is related to an increase in conditional volatility in the US and Japan. However, in other market the result shows either no significant effect or a volatility dumping effect.

The last three studies looked at the relationship between domestic spot and futures markets and ignored the international interdependence between the countries. Antoniou et al (2003) in the study of relationships spot and futures markets within the same geographical area found that there are significant multidirectional lead-lag relationships and volatility transmission between spot and futures market in the United Kingdom, Germany and France.

Methodology

The data analysis in this study is divided mainly into two period of time: (1) Pre-Syariah Index Period; and (2) Post Syariah Index Period. The models for post-Syariah Index period are divided into two types: (1) Restricted Model; and (2) Unrestricted Model. Restricted model only has two variables namely Bursa Malaysia Stock Index and Bursa Malaysia Stock Index Futures while the unrestricted model has the third variables namely Syariah Index. The first part of the analysis is to compare the results from pre-Syariah Index period with the restricted model of post-Syariah Index period. The main objective of this analysis is to find whether the introduction of Syariah Index has affected the price relationship and volatility transmission between the spot and futures markets in Malaysia. The second part of the analysis is to examine the results from the unrestricted model in order to find the relationship between Bursa Malaysia Stock Index, Bursa Malaysia Stock Index Futures and Syariah Index.

The model will be use to achieve the objective of this study is a multivariate VAR GJR-GARCH Model. It is a combination on Vector Autoregressive Models (VAR) popularized by Sims (1980) and GJR-GARCH Models. GJR-GARCH model is a model introduced by Glosten, Jagannathan and Runkle (1993). It is an extension GARCH model developed independently by Bollerslev (1986) and Taylor (1986). This model is considered because it allows simultaneous estimation of mean and variance equation of the three variables investigated. The multivariate VAR GJR-GARCH model used in this study can be expressed in the following way:

$$R_{i,t} = \beta_{i,0} + \sum_{j=1}^{n} \beta_{i,j} R_{j,t-1} \quad \varepsilon_{i,t} \sim N(0, \sigma_t^2)$$

For $i,j=1\ldots n$ and $i \neq j$ (1)

$$\sigma^2_{i,t} = \alpha_i + \alpha_{i,0}\sigma^2_{i,t-i} = \alpha_{i,t}\varepsilon^2_{i,t-1} + \sum_{j=1}^{n} \alpha_{i,j}\varepsilon^2_{j,t-1} + \gamma\varepsilon^2_{i,t-1}|^2_{i,t-1} \quad (2)$$

$$\sigma_{i,j,t} = \rho_{i,j}\sigma_{i,t}\sigma_{j,t} \quad (3)$$

Equation (1) shows the returns of n stock index, stock index futures and Syariah Index as a vector autoregression. In this equation a mean return of market i at time t ($R_{i,t}$) is a function of own past return and cross-market pass return. Coefficient $\beta_{i,j}$ shows the lead-lag relationship between the variables for different i and j. Equation (2) describes the conditional variance for i at time t ($\sigma^2_{i,t-1}$) as a linear function of its lagged conditional variance term ($\sigma^2_{i,t}$), its past squared error term ($\varepsilon^2_{i,t-1}$), past squared error term of market j ($\varepsilon^2_{j,t-1}$) and dummy variable which represent the asymmetric effect ($F_{i,t-1}$). Coefficient $\alpha_{i,0}$ shows effect of previous volatility to the current volatility in the market. Coefficient $\alpha_{i,i}$ shows the effect of previous price shock in its own market to the current volatility of the market. In addition, coefficient $\alpha_{i,j}$ shows the spillover effect of current price shock in market j to the volatility of market i. The sum of coefficient $\alpha_{i,0}$ and $\alpha_{i,i}(\alpha_{i,0}+ \alpha_{i,i})$ shows the degree of volatility persistence. The last coefficient in equation 2 which is γ shows the asymmetric impact to the volatility of the market. The positive value of γ means the volatility of market i is greater following bad news.

The VAR GJR-GARCH is not in the usual linear form. Therefore, the model estimation using Ordinary Least Squares method cannot be use with this model. The suitable method in estimating GARCH model is maximum likelihood method.

The log-likelihood function[1] under the assumption of joint-normal distribution is:

$$l(\theta) = -\frac{TN}{2}Log2\pi - \frac{1}{2}\sum_{t=1}^{T}(1og\,|\,Ht\,|= \Xi^{1}_{t}H_{t}^{-1}\Xi_{t})$$

Where

θ = the vector of parameters to be estimated.
Ξ_t = the vector of innovations at time t.
N = number of equation to be estimate.
T = number of sample used.
H_t = the time varying variance-covariance matrix, where equations 2 is the diagonal elements and equations 3 is the cross diagonal elements.

The maximisation processed for log-likelihood function is carried out by employing the algorithm proposed by Broyden, Fletcher, Goldfarb and Shanno (1965). The maximisation process also known as BFGS method.

[1] Brooks (2002)

Data

The data used in this study are daily closing price of Bursa Malaysia Stock Index and Syariah Index and continuous closing daily price Bursa Malaysia Stock Index Futures. The data for all variables investigated were obtained from DATASTREAM. The data collected for this study is for nine years, from 15 December 1995 to 31 December 2004. The data is divided into two period namely pre-Syariah Index period and post-Syariah Index period. The pre-Syariah Index period is duration before the introduction of Syariah Index which is from 15 December 1995 to 16 April 1999. On the other hand, the post-Syariah Index period is duration after the introduction of Syariah Index which is from 17 April 1999 to 31 December 2004. The variables used in both periods are as follows:

Table 1: Name of Variables

Pre-Syariah Index Period	Post-Syariah Index Period
Bursa Malaysia Stock Index (BMI)	Bursa Malaysia Stock Index (BMI)
Bursa Malaysia Stock Index Futures (BMIF)	Bursa Malaysia Stock Index Futures (BMIF)
	Syariah Index (SI)

Daily return for each variable is calculated using continuously compounded return. The continuously compounded return calculated as the logarithmic difference in the daily closing price.

Table 2 : Descriptive Statistics of Spot and Futures Index Series: Pre-Syariah Index Period

	BMI	BMIF
Mean (%)	-0.02667	-0.02528
t-stat (μ= 0)	-0.68279	-0.51547
Variance (%)	0.0125	0.0197
Skewness (SK=0)	0.59688***	-0.78018***
Kurtosis (KU-0)	23.34573***	36.09088***
Bera-Jarque (JB=0)	18624.77583***	44478.29081***

Notes:
*** Significance at the 1% level
** Significance at the 5% level
* Significance at the 10% level

[2] Brooks (2002)

Table 2 shows the descriptive statistic for all the variables used in this study for pre-Syariah Index period. From this table, it shows that both variables have a negative mean. Furthermore, the means are not significantly different from zero. On average, the variance for each variable is considered low (below than 0.02%). The skewness for each variable indicates that BMI has a positively skewed distribution while BMIF has a negatively skewed distribution. The penultimate row in this table shows the value of kurtosis for each variable. The value of kurtosis from the descriptive statistics shows that all the variables have a leptokurtic distribution. The last row in the descriptive statistics tables shows the value of Bera-Jarque normality test. The Bera-Jarque value for all variables confirmed that all the returns of the variables do not follow a normal distribution.

Table 3 : Descriptive Statistics of Spot, Futures and Syariah Index Series: Post-Syariah Index Period

	BMI	BMIF	SI
Mean (%)	-0.01123	-0.01210	0.00948
t-stat (μ= 0)	0.69679	-0.92099	0.79321
Variance (%)	0.00036	0.00024	0.0002
Skewness (SK=0)	0.09943	-0.17353***	-0.44994***
Kurtosis (KU-0)	3.58912***	4.66229***	5.61539***
Bera-Jarque (JB=0)	755.89965***	1278.65716***	1892.03331***

Notes:
*** Significance at the 1% level
** Significance at the 5% level
* Significance at the 10% level

Table 3 shows the descriptive statistic for all the variables used in the post-Syariah Index period. From this table, it shows that BMI and BMIF have a negative mean while SI has a positive mean. Furthermore, the means are insignificantly different from zero. On average, the variance for each variable is considered low (below than 0.01%). The skewness for each variable indicates that BMIF and SI have a negatively skewed distribution. The skewness for BMI shows that this variable has a symmetrical distribution. The penultimate row in this table shows the value of kurtosis for each variable. The value of kurtosis from the descriptive statistics shows that all the variables have a leptokurtic distribution. The last row in the descriptive statistics tables shows the value of Bera-Jarque normality test. The Bera-Jarque value for all variables confirmed that all the returns of the variables do not follow a normal distribution.

Table 4 : Unconditional Correlation Matrix of Pre-Syariah Index Period

Estimated Unconditional Correlation		
	BMI	**BMIF**
BMI	1	
BMIF	0.89337	1

Table 4 shows the unconditional correlation matrix of pre-Syariah period. It shows that the correlation between spot and futures market in Malaysia before the introduction of Syariah Index is high (0.89337). This means that the futures contracts can be used as a hedging tool for the spot markets in Malaysia.

Table 5 : Unconditional Correlation Matrix of Post-Syariah Index Period

Estimated Unconditional Correlation			
	BMI	**BMIF**	**SI**
BMI	1		
BMIF	0.84003	1	
SI	0.72419	0.87317	1

Table 5 shows the unconditional correlation matrix of post-Syariah period. It shows that the correlations between the variables investigated are high (more than 0.7). The table also presents evidence that the introduction of Syariah Index has decreased the correlation between spot and futures markets in Malaysia.

Findings

Table 6: Pre-Syariah Index Period Analysis

Panel A: Estimated Coefficients for VAR GJR-GARCH Model							
	Before Introduction			After Introduction (Restricted Model)			
	Stock Index		Stock Index Futures		Stock Index		Stock Index Futures
$\beta_{1,0}$	-1.9472e-4	$\beta_{2,0}$	-2.0673e-4	$\beta_{1,0}$	1.4168e-4	$\beta_{2,0}$	1.4622e-4
	(0.24165)		(0.26304)		(0.19543)		(0.23056)
$\beta_{1,1}$	0.0743	$\beta_{2,2}$	-0.2836***	$\beta_{1,1}$	-0.0334	$\beta_{2,2}$	-0.0762
	(0.37751)		(0.00261)		(0.56588)		(0.14930)
$\beta_{1,2}$	0.0588	$\beta_{2,1}$	0.3115***	$\beta_{1,2}$	0.1871***	$\beta_{2,1}$	0.1091*
	(0.43603)		(0.00321)		(0.00001)		(0.09305)
α_1	6.4290e-7***	α_2	5.4574e-7**	α_1	2.2818e-7	α_2	3.4836e-7
	(0.00831)		(0.03709)		(0.66388)		(0.50781)
$\alpha_{1,0}$	0.8362***	$\alpha_{2,0}$	0.8343***	$\alpha_{1,0}$	0.9426***	$\alpha_{2,0}$	0.9431***
	(0.00000)		(0.00000)		(0.00000)		(0.00000)
$\alpha_{1,1}$	0.0738	$\alpha_{2,2}$	0.1038***	$\alpha_{1,1}$	0.0310	$\alpha_{2,2}$	0.0128
	(0.18935)		(0.00404)		(0.43570)		(0.21104)
$\alpha_{1,2}$	0.0414**	$\alpha_{2,1}$	0.0532	$\alpha_{1,2}$	-2.3178e-8	$\alpha_{2,1}$	0.0372
	(0.01886)		(0.15219)		(0.98957)		(0.33097)
γ_1	-0.0665	γ_2	0.0736*	γ_1	0.0263	γ_2	0.0138
	(0.20279)		(0.07434)		(0.46671)		(0.38395)

Panel B: Estimated Volatility Persistence				
		$\alpha_{i,0}$	$\alpha_{i,i}$	Sum of $\alpha_{i,0}$ and $\alpha_{i,i}$
Before Introduction	Spot	0.8362***	0.0738	0.91
		(0.00000)	(0.18935)	
	Futures	0.8343***	0.1038***	0.9381
		(0.00000)	(0.00404)	
After Introduction (Restricted Model)	Spot	0.9426***	0.0310	0.9736
		(0.00000)	(0.43570)	
	Futures	0.9431***	0.0128	0.9559
		(0.00000)	(0.21104)	

Panel C: Estimated Conditional Correlation			
		Spot	Futures
Before Introduction	Spot	1	
	Futures	0.8841***	1
		(0.00000)	
After Introduction (Restricted Model)	Spot	1	
	Futures	0.8383***	1
		(0.00000)	

Notes:
*** Significance at the 1% level
** Significance at the 5% level
* Significance at the 10% level

The first issue investigated is whether there exist an effect of the introduction of Syariah Index to the price relationships and volatility transmissions between the spot and futures markets in Malaysia. Panel A in Table 6 shows the estimated coefficients of vector auto-regression GJR-GARCH model on the analysis of price relationships and volatility transmissions between Bursa Malaysia Stock Index and Bursa Malaysia Stock Index Futures. The results show that the introduction of Syariah Index has an impact on the price relationships and volatility transmissions between spot and futures market in Malaysia. From the table we can see that only the price of Bursa Malaysia Stock Index Futures had been affected by its lagged return and the price of spot market before the introduction of Syariah Index. In addition, there was no price effect from futures market to the spot market in the pre-Syariah Index period. The restricted model of post-Syariah Index period shows that there is a feedback effect in the price relationships of spot and futures markets in Malaysia.

The second part of Panel A in Table 6 shows the estimated coefficient for the conditional variance equation. The findings suggest that the volatility structure of spot and futures market in Malaysia was changed by the introduction of Syariah Index. The results show that Bursa Malaysia Stock Index Futures was affected by its own price shock only in the pre-Syariah Index period.

In addition, the findings also show that there was a significant unidirectional volatility transmission from stock index futures markets to the stock index markets before the introduction of Syariah Index.

The last coefficients in Panel A (γ_1) show the asymmetric effects in each markets. The coefficient γ_1 is statistically significant for futures market in the pre-Syariah Index period. The futures market in the pre-Syariah Index period had a positive sign of coefficient for asymmetric effects. The positive sign shows that the volatility in the market is higher during the bear market compare to the bull markets. The positive sign also can be interprets that a bad news are followed by higher volatility than a good news.

Panel B in Table 6 shows the estimated volatility persistence for each market in both periods. The level of volatility persistence is shown by sum of coefficient $\alpha_{i,0}$ and $\alpha_{i,i}$ in the conditional variance equation. The results suggest that the level of volatility persistence in the Bursa Malaysia Stock Index and Bursa Malaysia Stock Index Futures was increased after the introduction of Syariah Index. The level of volatility persistence of spot and futures markets increased from 0.91 to 0.9736 and from 0.9381 to 0.9559 respectively. Panel C in Table 6 shows the estimated conditional correlation of spot and futures market for both periods investigated. The findings show that the correlation between spot and futures market decreased after the introduction of Syariah Index.

Table 7 : Post-Syariah Period Analysis

Panel A: Estimated Coefficients for VAR GJR-GARCH Model					
After Introduction (Unrestricted Model)					
Stock Index		**Stock Index Futures**		**Syariah Index**	
$\beta_{1,0}$	1.3182e-4 (0.25536)	$\beta_{2,0}$	1.016e-4 (0.25323)	$\beta_{3,0}$	8.9496e-5 (0.28167)
$\beta_{1,1}$	-0.1363** (0.01069)	$\beta_{2,2}$	0.4933*** (0.00206)	$\beta_{3,1}$	-0.5763*** (0.00005)
$\beta_{1,2}$	0.9264*** (0.00001)	$\beta_{2,1}$	0.1675*** (0.00011)	$\beta_{3,2}$	0.1714*** (0.00001)
$\beta_{1,3}$	-0.8278*** (0.00034)	$\beta_{2,3}$	-0.5320*** (0.00173)	$\beta_{3,3}$	0.5294*** (0.00010)
α_1	1.7249e-7 (0.19165)	α_2	8.2178e-13 (0.99918)	α_3	9.6241e-13 (0.99749)
$\alpha_{1,0}$	0.9308*** (0.00000)	$\alpha_{2,0}$	0.9197*** (0.00000)	$\alpha_{3,0}$	0.9295*** (0.00000)
$\alpha_{1,1}$	0.0465*** (0.00004)	$\alpha_{2,2}$	0.0111 (0.46430)	$\alpha_{3,1}$	0.0283** (0.01469)
$\alpha_{1,2}$	0.0198 (0.29653)	$\alpha_{2,1}$	0.0417*** (0.00006)	$\alpha_{3,2}$	0.0214*** (0.00214)
$\alpha_{1,3}$	1.8721e-7 (0.99808)	$\alpha_{2,3}$	-2.2074e-8 (0.99962)	$\alpha_{3,3}$	-4.8867e-5 (0.95006)
γ_1	-0.0116 (0.36649)	γ_2	0.0202 (0.23893)	γ_1	-9.7616e-3 (0.41106)

Panel B: Estimated Volatility Persistence				
		$\alpha_{i,0}$	$\alpha_{i,i}$	Sum of $\alpha_{i,0}$ and $\alpha_{i,i}$
After Introduction (Restricted Model)	Spot	0.9308*** (0.00000)	0.0465*** (0.00004)	0.97730
	Futures	0.9197*** (0.00000)	0.0111 (0.46430)	0.9308
	Syariah	0.9295*** (0.00000)	0.0283** (0.01469)	0.9578

Panel C: Estimated Conditional Correlation				
		Spot	Futures	Syariah
After Introduction (Restricted Model)	Spot	1		
	Futures	0.84*** (0.00000)	1	
	Syariah	0.8030*** (0.00000)	0.9384*** (0.00000)	1

Notes:
*** Significance at the 1% level
** Significance at the 5% level
* Significance at the 10% level

Table 8 : Diagnostic Test of Model for Pre-Syariah Index Period Analysis

Panel A: Standardized Residual		
	BMI	BMIF
Mean	0.0015	0.0026
Variance	0.9974	0.9357
Jarqu Bera Test	0.6238	1.6098
	(0.8921)	(0.2369)
ARCH Test	0.5126	2.6587
	(0.5236)	(0.1198)
Asymmetries Test		
Sign Bias Test	0.0539	0.0623
	(0.1638)	(0.1056)
Negative Sign Bias Test	-0.01295	-0.0357
	(0.9896)	(0.3984)
Positive Sign Bias Test	0.1569	-0.4229
	(0.7623)	(0.2938)
Join Test	3.468	4.4892
	(0.3214)	(0.2179)
Ljung-Box Q(20)	12.987	2.2158
	(0.1327)	(0.9737)
Ljung_Box Q(20) ^{2}	0.2762	0.3687
	(0.9999)	(0.9999)

Panel B: Ljung Box Q(20) for Cross Product of Standardized	
	BMIF
BMI	11.9657
	(0.1568)

Panel C: Ljung Box Q(20) ^{2} for Cross Product of Standardized Residuals	
	BMIF
BMI	0.2136
	(0.9999)

Table 9 : Diagnostic Test of Model for Post Syariah Index Period Analysis (Restricted Model)

Panel A: Standardized		
	BMI	BMIF
Mean	0.0043	0.0031
Variance	0.9862	0.9762
Jarqu Bera Test	0.7591	2.3568
	(0.7563)	(0.2967)
ARCH Test	0.3654	0.0019
	(0.5597)	(0.9649)
Asymmetries Test		
Sign Bias Test	-0.3665	-0.0361
	(0.1065)	(0.8064)
Negative Sign Bias Test	-0.00681	-0.1039
	(0.9776)	(0.4062)
Positive Sign Bias Test	0.0326	0.6981
	(0.9657)	(0.1614)
Join Test	1.6842	3.6159
	(0.4697)	(0.3068)
Ljung-Box Q(20)	12.5773	7.9268
	(0.1374)	(0.4408)
Ljung_Box Q(20) ^{2}	0.4682	5.0635
	(0.9999)	(0.9697)

Panel B: Ljung Box Q(20) for Cross Product of Standardized	
	BMIF
BMI	8.41595
	(0.3939)

Panel C: Ljung Box Q(20) ² for Cross Product of Standardized	
	BMIF
BMI	0.1079
	(1.0000)

Table 10 : Diagnostic Test of Model for Post Syariah Index Period Analysis (Unrestricted Model)

Panel A: Standardized Residual			
	BMI	BMIF	SI
Mean	0.0341	0.0637	0.0499
Variance	0.9581	0.9842	0.9254
Jarqu Bera Test	0.6941	2.1587	0.3861
	(0.7891)	(0.3687)	(0.7681)
ARCH Test	0.0163	0.1574	1.1869
	(0.9048)	(0.6859)	(0.2761)
Asymmetries Test			
Sign Bias Test	-0.2459	-0.0365	-0.0157
	(0.1682)	(0.7721)	(0.9780)
Negative Sign Bias Test	-1.0562	-0.1157	0.0456
	(0.2157)	(0.1005)	(0.9087)
Positive Sign Bias Test	0.7682	-0.0873	0.0792
	(0.3368)	(0.8654)	(0.2900)
Join Test	1.3689	0.1598	2.6874
	(0.7298)	(0.9848)	(0.5268)
Ljung-Box Q(20)	13.0087	0.6874	11.4984
	(0.1147)	(0.9998)	(0.1782)
Ljung_Box Q(20) ²	0.2684	7.1966	5.3671
	(0.9997)	(0.5156)	(0.7162)

Panel B: Ljung Box Q(20) for Cross Product of Standardized Residuals			
	BMI	BMIF	SI
BMI		11.5067	5.9654
		(0.1034)	(0.6589)
BMIF			9.1657
			(0.3251)
SI			

Panel C: Ljung Box Q(20) ² for Cross Product of Standardized Residuals			
	BMI	BMIF	SI
BMI		0.0327	1.9727
		(1.0000)	(0.9812)
BMIF			5.2803
			(0.7932)
SI			

Table 7 shows estimated VAR GJR-GARCH model in the unrestricted form in order to find the price relationships and volatility transmissions between Bursa Malaysia Stock Index, Bursa Malaysia Stock Index Futures and Syariah Index. The first part of Panel A in Table 7 shows the estimated coefficients for vector auto-regression model on the unrestricted form. The results are different from the restricted form where the return of Bursa Malaysia Stock Index, Bursa Malaysia Stock Index Futures and Syariah Index are affected by its own lagged return. In addition, the findings also suggest that there is statistically significant feedback effects between the three markets investigated. . These findings on the spot and futures markets are similar with the research done for Germany and France by Antoniou et al (2003). However, the results are different from the theory in which according to Antoniou at al. (2003), the futures market act as a price discovery vehicle for the spot market imperfection and thus lead the spot market. This theory is supported by most of literature which find that the price movement in futures market leads the price movement in spot market, not vice versa (Ryoo and Smith, 2004; Zhong et al, 2004; and Gwilym and Buckle, 2001).

The second part of Panel A in Table 7 shows the estimated coefficient for the conditional variance equation in the unrestricted form. The coefficients $\alpha_{i,0}$ for all variables are statistically significant. These mean that the current volatility of all markets investigated are affected by its own lagged volatility. In addition, the results also show that only the volatility of Bursa Malaysia Stock Index and Syariah Index affected by previous price shock in each market respectively. The findings also show that there are significant unidirectional volatility transmissions from Bursa Malaysia Stock Index to the Bursa Malaysia Stock Index Futures and Syariah Index. This finding is different with the theory where the change in the volatility of stock index futures markets will effect the change in the volatility of stock index markets (Bologna and Cavallo, 2002; and Yu, 2001). The last coefficients in Panel A (γ_i) show the asymmetric effects in each

markets. The coefficients γ_i are insignificant for all markets investigated. These findings can be inferred that the response of volatility in all markets to news is symmetrical. This finding is similar with the study done by Butterworth (2000) on the Mid 250 Index and Mid 250 Index Futures.

Panel B in Table 7 shows the estimated volatility persistence for each variable investigated. The results show that the volatility persistence of Bursa Malaysia Stock Index, Bursa Malaysia Stock Index Futures and Syariah Index are significantly high because the sum of coefficient $\alpha_{i,0}$ and $\alpha_{i,i}$ for each market is close to unity. The findings are similar with the findings of study done by Antoniou et Al. (2003) on UK, France and Germany. Furthermore, the results show that the volatility persistence of Bursa Malaysia Stock Index is higher in the unrestricted model compared to the restricted model. However, the volatility persistence of Bursa Malaysia Stock Index Futures is lower in the unrestricted model compared to the restricted model.

Panel C in Table 7 shows the estimated conditional correlation of unrestricted model for all variables investigated. The correlation coefficients show that there is a high correlation between Bursa Malaysia Stock Index, Bursa Malaysia Stock Index Futures and Syariah Index. The correlation coefficients between the spot and futures markets are higher in the unrestricted model compared to the restricted model. In addition, the estimated conditional correlation coefficients in the unrestricted model for all variables are higher compared to the unconditional correlation coefficients reported in Table 5.

Table 8, Table 9 and Table 10 show the results of diagnostics test of the models estimated in this study. In summary, the results present in those tables indicate that the standardized residuals of the estimated empirical models in this study are normally distributed, free from the ARCH effects and free from the asymmetry effects. In addition the results present evidence that the serial correlation problem is not significant on the standardized residual, squared standardized residuals cross product standardized residuals, cross product squared standardized residuals of the estimated model. Taken as the whole, the diagnostic tests results tell that the estimated empirical models in this study are perfectly specified and captured the data very well.

Conclusion and Recommendation

The introduction of Syariah Index by Bursa Malaysia on 17 April 1999 has accelerated the development process of Islamic financial system in Malaysia. There is an issue whether the introduction of Syariah Index has an impact to the price relationships and volatility transmissions between the Bursa Malaysia Stock Index and Bursa Malaysia Stock Index Futures.

This study has attempted to find the effect of introduction Syariah Index to the stock index and stock index futures in Malaysia. In addition, it also has tried to find what are the price and volatility relationships between the three variables investigated. The results from employing the VAR-GJR-GARCH model to the spot market, futures market and Syariah Index in Malaysia suggest that the introduction of Syariah Index had changed the price relationships and the volatility structure of Bursa Malaysia Stock Index and Bursa Malaysia Stock Index Futures. This supports by the different findings between the analysis of pre-Syariah Index period and post-Syariah Index period. Therefore, investors should make adjustments on how they predict the price changes and the volatility in the spot and futures markets in Malaysia after the introduction of Syariah Index. The investors' prediction might be wrong if they do not make any correction to their market analysis after the introduction of Syariah Index. In addition, the results of the study present evidence that the volatility persistence of spot and futures market is higher after the introduction of Syariah Index. This suggests that if any changes happen to the volatility of Bursa Malaysia Stock Index and Bursa Malaysia Stock Index Futures, it will take a long time to get back to the usual volatility level. Therefore, investors should prepare to bear a high risk for a long time if the volatility in spot and futures market in Malaysia increase.

The second part of this study tried to find relationship between Bursa Malaysia Stock Index, Bursa Malaysia Stock Index futures and Syariah Index through the unrestricted model form. The findings suggest that there is a multi directional price relationship between the three variables investigated with no individual variable playing a major role as information producer. However, the results present evidence that Bursa Malaysia Stock Index as a main information producer for predicting the volatility of Bursa Malaysia Stock Index Futures and Syariah Index. Therefore, market participants should analyse the volatility of Bursa Malaysia Stock Index if they want to predict or estimate the volatility of Bursa Malaysia Stock Index Futures and Syariah Index.

The final results of this study show that there is a high correlation between the stock index and stock index futures in Malaysia. This means that investors can use the Bursa Malaysia Stock Index Futures as hedging tools for Bursa Malaysia Stock Index. In addition, the result of this study shows that the conditional correlation estimates in the unrestricted model form are higher compared to the conditional correlation estimates in the restricted model form and unconditional correlation estimates. These findings are similar with the study done by Antoniou et al. (2003). According to Antoniou et al. (2003) this results suggest that the investors who ignore the market interdependence in hedging activity, are likely to produce biased estimates of hedge ratios. Investors should consider the market interdependence if they do not want to underestimate the hedging effectiveness of these markets.

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