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Stock Market Volatility Transmission in Malaysia: Islamic Versus Conventional Stock Market

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Abstract. This study attempts to explore the extent to which the conditional volatilities of both conventional and Islamic stock markets in Malaysia are related to the conditional volatility of monetary policy variables. Among the monetary policy variables tested in the study are the narrow money supply (M1), the broad money supply (M2), interest rates (TBR), exchange rate (MYR), and Industrial Production Index (IPI), while the Kuala Lumpur Composite Index (KLCI) and Rashid Hussain Berhad Islamic Index (RHBII) are used as measures for conventional and Islamic stock markets, respectively. In order to capture the international influence on both stock markets, the volatility in the U.S. monetary policy variable measured by the Federal Funds Rate (FFR) is incorporated into the study. Unlike our earlier study (Mohd. Yusof and Abd. Majid, 2006) that employed the Generalized Autoregressive Conditional Heteroskedasticity (GARCH)-M, GARCH (1,1) framework together with Vector Autoregressive (VAR) analysis are employed for the monthly data starting from January 1992 to December 2000 in this study. The study finds that interest rate volatility affects the conventional stock market volatility but not the Islamic stock market volatility. This highlights the tenet of Islamic principles that the interest rate is not a significant variable in explaining stock market volatility. Our finding provides further support that stabilizing interest rate would have insignificant impact on the volatility of the Islamic stock markets.

1. Introduction

The interaction between stock market volatility and macroeconomic variables has been extensively researched in the financial economics literature. Among the most pertinent questions raised are: to what extent the explanatory power of monetary policy

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variables is able to explain the stock market volatility? And the extent to which the volatility in the international monetary policy transmitted across national stock markets? Officer (1973), for instance, examines the effects of volatility in business cycle variables. Black (1976) and Christie (1982) provide empirical evidences on the relationship between stock market volatility and financial leverage in the U.S. economy. Kock and Kock (1991), Malliaris and Urrutia (1991), Chan *et al.* (1992), Peel *et al.* (1993) and Rahman and Yung (1994) explore whether the world's financial and capital markets are now transmitting volatility more quickly. Studies on volatility of asset returns have also been documented in the recent years. Examples are Tarhan (1993), Calvet and Abdul Rahman (1995), Johnson and Jensen (1998) and Ibrahim and Jusoh (2001).

Several other studies have also examined the causes of stock market volatility particularly its macroeconomic causes. Schwert (1989) conducts an extensive array of tests on the macroeconomic causes of stock market volatility over long runs of monthly data for the United States. Liljeblom and Stenius (1997), Kearney and Daly (1998), Muradoglu *et al.* (1999) and Morelli (2002) provide further evidence on the macroeconomic causes of stock market volatility.

Nevertheless, less empirical evidences are documented on the presence of time-varying risk premiums in the stock returns. The examples include Stenius (1991) and Su and Fleisher (1998). By employing GARCH model, Stenius (1991) analyzes the volatility of stock prices and evaluates whether there exists a relationship between increased volatility and the risk premium, which investors require in order to maintain the stocks. Su and Fleisher (1998) also apply the GARCH model to estimate an empirical model which captures the effects of local and global information variables on the conditional mean of the stock market excess returns. They also find that the government's market intervention policies have significant effect on stock market volatility in China.

The experience of the stock market volatility in Malaysia has extensively been highlighted in the recent years. Tang and Garnon (1998) assess the adequacy of the Exponentially Weighted Moving Average (EWMA) and various GARCH –class models in predicting volatility in both the Malaysian stock market and individual stocks and at the same time identify which of these models is most preferred. Ibrahim and Jusoh (2001) investigate the causes of stock market volatility by employing the Generalized Least Squares (GLS) estimation together with the Hendry's general-to-specific based on the Davidian and Caroll (1987). The finding suggests that among the most important determinants of the KLCI conditional volatility are the volatilities, lagged money supply, industrial index and inflation rate. Ibrahim (2002) compares two approaches namely the moving average standard deviation and ARCH models to examine relationship between stock market volatility and macroeconomic volatility. He finds that the presence of unidirectional causality is running from exchange rate volatility and reserve volatility to stock market volatility. From the above studies, we can conclude that inconsistent results are obtained with regards to which variables significantly affects the Malaysian stock market volatility.

While the studies on conventional stock market are proliferating in the recent decades, less attention is being given to its Islamic counterpart, particularly with regards to the volatility transmission. For instance, Hakim and Rashidian (2005) explore the risk and return of the Dow Jones Islamic Market Index (DIJMI) and its parallel conventional counterpart, Wilshire 5000 Index (W5000). Their findings suggest that the DIJMI presents unique risk-returns characteristics compared to the risk profile of W5000. In the Malaysian context, Muhammad (2002) investigates the performances of the KLSE Composite index, KLSE Syariah index and the RHBI index during the period of 1992-2000. The study finds that the movements of both the conventional and Islamic indices are somewhat parallel. By using GARCH-M approach, Mohd. Yusof and Abd. Majid (2006) compare the risks and returns of the Islamic and conventional stock market volatilities in Malaysia for the 1992 to 2000. They find that risk as measured by the conditional standard deviation does not affect stock returns during the period of analysis. There is no evidence of significant time varying risk premium for both conventional and Islamic stock returns.

In the light of the above studies, inconsistent results prevail with regards to which variables significantly affects the Malaysian stock market volatility. Most of the above reviewed studies contribute to our understanding of the econometric characteristics of volatility. However, very few provide economic explanation of volatility of stock returns and underlying causes of the observed volatility in stock returns. Based on our literature review, there has been no study conducted on the effect of monetary policy volatility on Islamic stock market volatility in Malaysia using GARCH (1,1) framework. This study is an extension of our previous paper, Mohd. Yusof and Abd. Majid (2006). It attempts to fill this gap by exploring the effectiveness of the monetary policy variables in regulating both conventional and Islamic stock markets in Malaysia. Successful estimation of the volatility of the underlying stocks in the Malaysian market will enable investors to make decisions when engaging in dynamic trading strategies.

Therefore, the main objectives of this present study are: (i) to explore the predictive power of the volatility in each of the monetary policy variable on both conventional and Islamic stock market volatilities; and (ii) to estimate the relationships between both conventional and Islamic stock market volatilities and the volatilities of the monetary policy variables.

The rest of the study is organized in the following manner. In the next section, we shall highlight the theoretical framework pertaining to the issue of the stock market volatility. Section 3 provides an overview on the Malaysian stock markets. The empirical framework in Section 4 highlights the volatility dependencies as captured by GARCH (1,1) model. Section 5 provides empirical results and discusses the findings and implications. Finally, the conclusion is presented in the last section.

2. Theoretical Framework

Theories explaining the relationships between stock market volatility and economic volatility include Simple Discounted Present Value Model (SDPVM), Capital Asset Pricing Model (CAPM), and Arbitrage Pricing Theory (APT). According to SDPVM, the stock prices are determined by the future cash flow to the firms and the discounted

rates. The volatilities in these two factors could be affected by volatility in macroeconomic variables and in turn, will affect the stock market volatility (Liljeblom and Stenius, 1997; Ibrahim, 2002; Ibrahim and Jusoh, 2001; and Md. Isa, 1989). This implies that a change in the level of uncertainty about future macroeconomic conditions would produce, perhaps a proportional change in stock return volatility assuming that the discount rate is constant.

The impact of monetary policy can be further analyzed in the following manner:

The price of equity at any point in time is equal to the present value of expected future cash flows (including capital gains and dividends) to shareholders:

$$E_{t-1}Q_t^i = E_{t-1}\sum_{k=1}^{\infty}\frac{C_{t+k}^i\left(X_{t+k}\right)}{\left(1+R_{t+k}\right)^k} \qquad (2.1)$$

Where Q^i_t is the price of asset i at time t, C^i denotes the cash flows associated with asset i, R denotes the interest rate and E_{t-1} is the expectations operator. In a open economy and financial system such as in Malaysia, corporate cash flows C^i are influenced by the development of monetary policy changes, X. Examples of X are level of M1 and/ or M2 money supply, interest rate (TBR), exchange rate (MYR), real output (IPI) and foreign monetary policy changes as proxied by the U.S Federal Funds Rate (FFR), etc.

In moving from equity prices to returns, we can then let the conditional expected return of the asset on the available information at time $t-1$ be denoted by $\hat{q}^i{}_t = E_t = \left[q^i{}_t \middle| I_{t-1}\right]$q. Accordingly, we also denote $\sigma^{qi}{}_t$, be the unconditional standard deviation of return on asset i. While, the conditional standard deviation can be expressed as $\hat{\sigma}^{qi}{}_t = E_t\left[\sigma^{qi}{}_t \middle| I_{t-1}\right]$. From equation (2.1), the conditional expected return on asset i is a function, f of the conditionally expected determinants of the discounted cash flows:

$$\hat{q}^i{}_t = E_t\left[q^i{}_t \middle| I_{t-1}\right] = f\left\{E_t\left[C_t^i(X)\right] I_{t-1}\right\} \qquad (2.2)$$

and the conditional standard deviation of returns is a function, of the conditional standard deviations of the determination of the cash flows

$$E_t\left[\sigma_t{}^{q^i} \middle| I_{t-1}\right] = g\{E_t\left[\sigma_t{}^X, \sigma_t{}^R\right] I_{t-1}\} \qquad (2.3)$$

In addition, CAPM is also a useful theory in explaining the magnitude of an asset's risk premium, the difference between the asset's expected return and the risk-free interest rate (Mishkin and Eakins, 1997). Accordingly, Rose (2000) defines the expected return on a financial asset as:

$$E(R_i) = r_F + \beta_i\left[E(R_M) - r_F\right] \qquad (2.4)$$

Where $E(R_i)$ measures the expected return on the i th asset; $E(R_M)$ is the expected return on the market's entire collection of financial assets or the whole portfolio; β_i is a measure of an individual asset's or portfolio of asset's risk exposure compared to the risk exposure of the whole market portfolio; and r_F is the risk-free interest rate (often approximated by the return on government bonds). The risk-free interest rate element can be influenced by the changes in money supply and thus affecting the expected return of a financial asset. Therefore, volatilities in monetary policy variables, may also affect the volatility in the expected return of a financial asset.

Lastly, capital asset pricing model has also proved to be useful theory in terms of explaining the source of systematic risk, though it only focuses on the source of risk available in the market portfolio. In APT models, macroeconomic variables constitute an important set of information in determining stock prices. Macroeconomic volatilities are therefore modeled assuming that they influence stock prices *via* their effects on future cash flows and the discount rates as evident in the SDPVM.

3. The Malaysian Stock Market

As it is today, the Malaysian stock market is one of the most prominent emerging markets in the region.[1] The Malaysian Stock Exchange was initially set up in March 1960, and public trading of stocks and shares commenced in May 1960 in the clearing house of Bank Negara Malaysia. The Capital Issues Committee (CIC) was established in 1968, to supervise the issue of shares and other securities by companies applying for listing or already listed on the Exchange. Following the termination of the interchangeability with Singapore and the floating of the Malaysian dollar, the Malaysian Stock Exchange was separated into Kuala Lumpur Stock Exchange (KLSE) and Stock Exchange of Singapore (SES) in 1973.

In 1992, the Islamic Capital Market (ICM)[2] was introduced in the Malaysian economy. Its existence is reflected by the presence of Islamic stock-broking operations which include Islamic indices, Islamic unit trusts, and a list of permissible counters in the KLSE as issued by the Securities Commission (SC). The main feature of ICM is its activities are guided by *Shari'ah* injunctions. Precisely, ICM represents an assertion of religious law in the capital market transactions where the market should be free from the elements such as usury (*riba*), gambling (*maisir)* and uncertainties (*gharar*).

The Islamic corporate securities market comprises of Islamic debt securities (IDS) market and the Islamic equity market. Currently, there are two Islamic Indices; the RHB Islamic Index (RHBII) introduced in 1992 and the KLSE Syariah Index (KLSI) launched in 1999. Our paper emphasizes on RHBII. When it was first launched, the RHBII was based on 179 Kuala Lumpur Stock Exchange Main Board counters which approved by the *Shari'ah* council of Bank Islam Malaysia Berhad and the *Shari'ah* Panel of Rashid Hussain Berhad (RHB). However, as of 1st January 1998, the counter

(1) In comparison with other markets, Malaysia was ranked twenty-third in the world in 2004, being the largest market in ASEAN and is currently ranked eighth in Asia. If 1996 was used as yardstick, the KLSE would be one of the largest markets in the world (*Bank Negara Malaysia*, 2005, pp: 307-310).

(2) See *http:// islamic-world.net/Islamic-state/malay_islamcap market.htm.*

for RHBII is based on the companies approved by the *Shari'ah* Advisory Council of the Securities Commission and those deemed permissible by the *Shari'ah* Panel of RHB. As of October 2000, the total counters listed under RHBII are 316.

On June 23, 2005, the Dow Jones-RHB Islamic Malaysia Index was launched. This new index was jointly developed by Dow Jones Indexes and RHB Research Institute Sdn Bhd and replaces the RHB Islamic Index that has been in use since May 1996. The Index is part of the Dow Jones Islamic Market Index series and follows the methodology of the *Shari'ah* compliant index family. The index has been developed specifically to meet the growing demand for *Shari'ah* compliant in the Malaysian stock market. The index is based on internationally acknowledged Islamic finance standards. A committee consisting of international *Shari'ah* scholars, the Dow Jones *Shari'ah* Supervisory Board, are formed to observe the execution of those standards used by Dow Jones Indexes.

4. Methodology and Data

4.1. Methodology

This section discusses the statistical tools for analyzing volatility focusing on the extended GARCH model and VAR analysis. In most empirical works, the GARCH (p,q) models adopt low orders for the lag lengths *p* and *q,* e.g., GARCH (1,1),[3] GARCH (1,2) or GARCH (2,1). Such small numbers of parameters are sufficient to model the variance dynamics over very long sample periods. This study, therefore, adopts the GARCH (1,1) model to estimate the relationship between stock market volatility and the monetary policy volatility. Based on diagnostic tests such as ARCH-LM, Correlogram-Q Statistics and Durbin-Watson,[4] there are no remaining serial correlation and misspecification in the mean equation specified by GARCH (1,1).

In this model, both the conditional mean and the conditional variance equations incorporate monetary policy variables namely M1 and M2 money supply, interest rate (TBR), exchange rate (MYR), real output (IPI) and federal funds rate (FFR) to measure foreign monetary policy changes. We can further assess the predictive power of monetary policy volatility on stock market volatility and vice-versa using the VAR model. This procedure is conducted firstly for conventional stock market and then repeated for the Islamic stock market.

4.1.1. GARCH (1,1)

In this analysis we generate the volatility estimates for stock returns and monetary policy variables growth rates based on the following standard GARCH (1,1) specifications:

$$R_t = \sum_{i=1}^{m} \alpha_1 R_{t-1} + \delta_1 d_{i,t} + \varepsilon_t \qquad (4.1)$$

$$h_t^2 = \beta_0 + \beta_1 \varepsilon^2_{t-1} + \beta_2 h^2_{t-1} \qquad (4.2)$$

(3) **Liljeblom** and **Stenius** (1997) states that several empirical studies indicate that GARCH (1,1) model adequately fits many economic time series, especially the stock return series. See also **Bollerslev** (1987), **Akgiray** (1989) and **Bollerslev** *et al.* (1992).

(4) Please refer to Section 5 for results.

whereas for the monetary policy variables induced model, the specification is as follows:

$$R_{xt} = \sum_{i=1}^{m} \phi Rx_{t-i} + \delta_1 d_i + \varepsilon_t \qquad (4.3)$$

$$h_{xt2} = \beta_0 + \beta_1 \varepsilon^2 x_{t-1} + \beta_2 h x^2_{t-1} \qquad (4.4)$$

The (1,1) in GARCH (1,1) refers to the presence of a first order ARCH term (the first term in the parentheses) and a first order GARCH term (the second term in parentheses). An ordinary ARCH model is typically a special case of a GARCH specification in which there are no lagged forecast variances in the conditional variance equation.

Having generated the volatility estimates for stock returns and monetary policy variables growth rates; we next proceed to VAR to test the predictive power of monetary policy volatility on stock market volatility and vice-versa. Consistent with the works of Morelli (2002) and Liljeblom and Stenius (1997), a two-variable twelfth-order VAR model is adopted in our study, as follows:

$$h^2_t = \beta_0 + \sum_{i=1}^{12} \varphi_i h^2_{t-i} + \sum_{i=1}^{12} \theta_i h^2 x_{jt-i} + \varepsilon_t \qquad (4.5)$$

$$h^2 x_{jt} = \beta_0 + \sum_{i=1}^{12} \theta_i h^2 x_{jt-i} + \sum_{i=1}^{12} \varphi_i h^2_{t-i} + + \varepsilon_t \qquad (4.6)$$

where h_t^2 is the conditional stock market volatility at time t, $h^2 x_{jt-i}$ is the conditional volatility in the monetary policy variable j at time t - i, where i = 1, …,2. This enables us to determine whether conditional stock market volatility can be predicted by conditional monetary policy volatility or vice-versa.[5]

4.1.2.Regression Analysis

To further assess the relationship between stock market volatility and monetary policy volatility, we conduct regression analysis for both conventional and Islamic stock markets based on the following empirical models:

Conventional Stock Market:

Model 1: $$Ln\ KLCI_t = \alpha_0 + \alpha_1 Ln\ M1_t + \alpha_2 Ln\ IPI_t + \alpha_3 MYR_t + \alpha_4 Ln\ TBR_t + \alpha_5 FFR_t + \pi_t \qquad (4.7)$$

Model 2: $$Ln\ KLCI_t = \delta_0 + \delta_1 Ln\ M2_t + \delta_2 Ln\ IPI_t + \delta_3 MYR_t + \delta_4 Ln\ TBR_t + \delta_5 FFR_t + \tau_t \qquad (4.8)$$

(5) According to Morelli (2002), this two-variable VAR model allows us to capture historical patterns of each variable and its relationship to the other; generally used to forecast values of two or more variables.

Islamic Stock Market:

$$\text{Model 1:} \quad Ln\ RHBII_t = \beta_0 + \beta_1 Ln\ M1_t + \beta_2 Ln\ IPI_t + \beta_3 MYR_t + \beta_4 Ln\ TBR_t + \beta_5 FFR_t + \varepsilon_t \qquad (4.9)$$

$$\text{Model 2:} \quad Ln\ RHBII_t = \lambda_0 + \lambda_1 Ln\ M2_t + \lambda_2 Ln\ IPI_t + \lambda_3 MYR_t + \lambda_4 Ln\ TBR_t + \lambda_5 FFR_t + \mu_t \qquad (4.10)$$

As highlighted in the above models, in Model 1, narrow money supply (M1) is used as the monetary policy variable, while Model 2 uses broad money supply (M2). Accordingly, the rest of the monetary policy variables remain unchanged. The choice of monetary policy variables above are motivated by the relevance and importance for the Malaysian economy during the period of analysis (Mohd. Yusof, 2003).

In this study, we hypothesize that there will not be significant differences in the reaction of stock returns volatility to macroeconomic volatility as compared to the conventional stock returns volatility. Accordingly, we postulate that variables such as narrow money supply (M1), broad money supply (M2) and Industrial Production Index (IPI) will have similar effects in terms of direction on both Islamic and conventional stock markets. However, as highlighted in the *Shari'ah* principles, the Islamic stock market volatility is not influenced by interest rate volatility as interest rate is deemed not permissible.

4.2. Data

The study utilizes monthly data covering the period 1992 to 2000. The data is gathered from Bank Negara (the Central Bank of Malaysia) reports and *Bloomberg Database*. Kuala Lumpur Composite Index (KLCI) and Rashid Hussain Berhad Islamic Index (RHBII) are used as measures for conventional and Islamic stock markets, respectively. Both measures of money, that is the narrow measure of money (M1) and broad measure of money (M2), Treasury Bill Rate (TBR), exchange rate (MYR) represent monetary policy variables used in this study. Industrial Product Index (IPI) is used as a proxy for real output.[6] Finally to test for the international influence on the volatility of stock returns, we also include the variable Federal Funds Rate (FFR). Except for TBR and FFR, logarithmic differences are taken of the monetary policy variables in order to measure growth rates in M1, M2, MYR and IPI.

In this study, volatility is defined as the variance of stock returns. The stock returns are calculated as the log of the price relative:[7]

$$R_t = \ln\left(P_t \Big/ P_{t-1}\right) \qquad (4.11)$$

Where P_t is the index value of stock at the end of month t and P_{t-1} is the index value of stock for previous month-end, *t - 1*.

(6) This is not uncommon as several studies on the Malaysian stock market volatility also include Industrial Production Index as a determinant (**Ibrahim** and **Jusoh**, 2001; **Tang** and **Garnon** 1998; and **Ibrahim**, 2002).

(7) Note that the return is not adjusted for dividend yield. This is not uncommon despite the fact that the dividend is a component of stock returns (**Ibrahim**, 1997).

5. Empirical Results

In this section, the summary statistics for stock returns, growth rates for the monetary policy variables and the conditional volatility estimates are presented. The study, then discusses the empirical results based on GARCH (1,1) specification. Here, we highlight various relationships between the growth rates of the monetary policy variables and the stock returns behaviour. Finally, study highlights the results for our VAR analysis where the relationship between monetary policy variable volatility and stock market volatility is discussed.

5.1. Summary Statistics

Table 1 provides summary or descriptive statistics for our main variables namely RHBII, KLCI, M1, M2, TBR, MYR and FFR. The first column reports the name of the variable, while the rest of the columns report the test statistics including the mean, standard deviation, skewness, kurtosis, Ljung–Box Q Statistics test for autocorrelation, and Jarque-Bera (1980) test for normality.

As observed in Table 1, the RHBII yields a higher average monthly return (0.4%) than the KLCI (0.2%). Except for TBR that has negative average growth (4.4%), the other variables have a positive average growth rates ranging from 0.3% to 2.2% per month. The FFR monthly growth rate is recorded as the highest (2.2%). It is interesting to note that both the RHBII and KLCI have similar volatility as indicated by their similar standard deviation of 0.097. At this juncture, this suggests that investing in Islamic stocks provides higher returns although it has almost similar risk to the conventional stock market.

Except for growth rates of stock indices (RHBII and KLCI) and M2 money supply, all variables are negatively skewed. In terms of kurtosis value, except for IPI, all the variables are found to have excess kurtosis (greater than 3). This is expected for most financial time series distributions. Results from the autocorrelation tests up to 12 lags indicate that autocorrelation exists. In addition, the Jarque-Bera (JB) normality test indicates that we can reject the null hypothesis that the residuals are normally distributed. Finally, the significances of r_1, r_2, r_3, r_6, r_{12} and Ljung-Box Q statistics tests, indicate the presence of autocorrelation (error terms are not white noise).

Table (1)

5.2. Analysis for GARCH (1,1)

The GARCH (1,1) approach is employed to generate the volatility estimates for stock returns and other monetary policy variables. Table 2 reports the GARCH (1,1) specification described in equations 4.1 and 4.2 for conventional and Islamic stock markets, respectively. For the lags considered, the Ljung-Box Q-statistics indicate that we cannot reject the null hypothesis of the presence of no autocorrelation at 5% significance level. This implies that the mean equation is not misspecified for both conventional and Islamic stock returns. Further, we found both past returns and the 1997 financial crisis have no effect on the stock returns (as described in the mean equation). This could possibly be attributed to the government's fixed exchange rate policy in cushioning off the effect of the 1997 financial crisis. However, the lagged value of the conditional variance in the variance equation is found to be positive and statistically significant for both markets. The sum of the coefficients is 0.987 for conventional stock market and is 0.926 for Islamic stock market (which is less than unity) and therefore satisfies the non-explosiveness of the conditional variances.

Table (2). GARCH (1,1) Model Estimates for Stock Returns.

	Conventional Stock Return	**Islamic Stock Return**
α_1	0.012 (0.923)	-0.036 (0.777)
δ_1	-0.0004 (0.986)	0.008 (0.685)
β_0	0.0004 (0.123)	0.0008 (0.221)
β_1	0.245 (0.053)	0.219 (0.154)
β_2	0.742 (0.000)	0.707 (0.000)
Skewness	0.007	-0.272
Kurtosis	4.259	3.950
Normality	7.007	5.296
Ljung-Box Q(12)	16.605 (0.165)	13.572 (0.329)
Q(24)	31.835 (0.131)	25.394 (0.385)
Q(36)	41.909 (0.230)	34.033 (0.562)
$(\beta_1 + \beta_2)$	0.987	0.926
Durbin-Watson	1.973	1.977
ARCH LM	**F-Stats:** 0.766 (0.599)	**F-Stats:** 1.134 (0.349)
	Observed-R^2: 4.707 (0.582)	**Observed-R^2:** 6.816 (0.338)

Next, Table 3 reports the GARCH (1,1) specifications based on equations 4.3 and 4.4. As noted, except for M2 and IPI, for all the monetary policy variables, both the lagged values of the squared residuals and lagged values of the conditional variances in the variance equations are found to be statistically significant. The sum of the coefficients for the lagged values of the squared residuals and the lagged values of the

conditional variances are 0.971, 0.376, 0.508, 1.068, 1.016 and 0.970 for M1, M2, IPI, TBR, MYR and FFR respectively. In general, volatilities in all the monetary policy variables indicate the non-explosiveness of the monetary policy variances.

Table (3). GARCH (1,1) Model Estimates for Stock Returns (With Monetary Policy Variables Specifications).

	M1	M2	IPI	TBR	MYR	FFR
δ_1	0.054 (0.219)	0.265 (0.026)	-0.419 (0.000)	0.298 (0.006)	0.296 (0.003)	0.254 (0.000)
Φ	0.014 (0.017)	0.007 (0.223)	0.012 (0.179)	-0.021 (0.856)	-0.000 (0.993)	0.018 (0.473)
β_0	0.000 (0.000)	0.000 (0.344)	0.001 (0.329)	0.009 (0.002)	0.000 (0.000)	0.000 (0.149)
β_1	-0.088 (0.000)	0.149 (0.304)	0.203 (0.226)	0.392 (0.000)	0.556 (0.000)	-0.087 (0.003)
β_2	1.059 (0.000)	0.227 (0.751)	0.305 (0.539)	0.676 (0.000)	0.460 (0.000)	1.057 (0.000)
Skewness	-0.425	0.167	-0.448	-1.053	1.285	-0.018
Kurtosis	3.526	3.472	3.260	7.426	10.559	3.469
Normality	4.416	1.480	3.847	106.103	281.506	0.977
Ljung-Box Q(12)	30.081 (0.003)	20.506 (0.058)	61.963 (0.000)	12.882 (0.378)	8.5838 (0.738)	14.899 (0.247)
Q(24)	46.197 (0.004)	32.681 (0.111)	95.752 (0.000)	21.526 (0.608)	21.764 (0.593)	31.007 (0.154)
Q(36)	67.708 (0.001)	44.944 (0.146)	113.60 (0.000)	36.859 (0.429)	33.866 (0.570)	43.280 (0.188)
$(\beta_1 + \beta_2)$	0.971	0.376	0.508	1.068	1.016	0.970
Durbin-Watson	1.965	2.027	1.998	2.001	2.003	1.999
ARCH LM	**F-Stats:** 0.565 (0.757)	**F-Stats:** 0.934 (0.475)	**F-Stats:** 0.652 (0.688)	**F-Stats:** 1.407 (0.220)	**F-Stats:** 0.253 (0.957)	**F-Stats:** 0.540 (0.776)
	Obs*R^2: 3.515827 (0.742)	**Obs*R^2:** 5.681 (0.460)	**Obs*R^2:** 4.039 (0.671)	**Obs*R^2:** 8.322 (0.215)	**Obs*R^2:** 1.608 (0.952)	**Obs*R^2:** 3.367 (0.762)

Note: Obs*R^2 represents observed R^2

5.3. VAR Analysis

By using VAR framework, we then proceed with the analysis to assess the predictive power of the volatility in each of the monetary policy variable on stock market volatility and at the same time, enable us to estimate the predictive power of stock market volatility in explaining the volatility of each of the monetary policy variable. In this analysis, we start by determining the stationarity of the variance series generated based on the GARCH (1,1) specifications. Vector Autoregressive Analysis (VAR) requires that the data is stationary in order to avoid spurious regression. Therefore, we conduct the ADF unit root tests on the specified variance series. Our ADF unit root tests indicate that three variables; RHBII, KLCI and M1 are not stationary at levels while the other variables are found to be stationary at levels (See Appendix I). However, all variables are found to be stationary at first difference. Based on these results, we therefore choose the first differenced variables in our following analysis.

The VAR allows us to examine the effects of monetary policy volatility on stock returns volatility. Here, the predictive power of monetary policy volatility is obtained by

regressing the stock returns with monetary policy variable (one by one based on 12th order VAR Model) with stock returns volatility as the dependent variable. Whereas, to assess the predictive power of stock market volatility in predicting monetary policy volatility, the same procedure is employed with monetary policy variable volatility as the dependent variable as in equations 4.5 and 4.6.

Table (4). F-Tests from Vector Autoregressive Models for Stock Returns Volatility Including M1, M2, IP, TBR, MYR and FFR Volatility, 1992-2000.

	M1	M2	IPI	TBR	MYR	FFR	
Conventional Stock Market							
Predictive power of monetary policy volatility		3.707 (0.000)	2.887 (0.000)	1.707 (0.045)	2.175 (0.007)	2.036 (0.012)	0.886 (0.618)
Predictive power of stock market volatility		1.462 (0.113)	1.792 (0.032)	2.674 (0.000)	1.839 (0.026)	1.687 (0.048)	0.978 (0.504)
Islamic Stock Market							
Predictive power of monetary policy volatility	3.556 (0.000)	3.510 (0.000)	2.746 (0.001)	2.819 (0.000)	3.510 (0.000)	1.159 (0.310)	
Predictive power of Islamic stock market volatility	1.504 (0.097)	2.059 (0.011)	2.536 (0.001)	2.247 (0.005)	2.103 (0.009)	1.184 (0.288)	

Note: figures in parentheses represent the probabilities (p-values)

From Table (4), except for FFR, we find that the volatilities of all the monetary policy variables chosen have an influence on the stock market volatility for both the conventional and Islamic markets in Malaysia during the period 1992-2000. However, it is interesting to note that the predictive power of monetary policy variables volatility appear to better explain the volatility in Islamic stock market. This could perhaps be due partly to the number of listed companies under Islamic stock market is smaller as compared to the conventional stock market.

These findings provide several important policy implications. Malaysia, being an emerging market is more susceptible to the increased volatilities in monetary policy variables. The bidirectional causation running from all the monetary policy variables volatility and both the conventional and Islamic stock markets underlines the importance of monetary stability. This could be explained by the 'substitution' between monetary assets and financial assets during periods of high volatility. This further implies that stabilizing the monetary aggregates and interest rate will reduce the volatility in the both conventional and Islamic stock markets.

Based on the above discussion, the findings also suggest that exchange rates together with interest rates and money supply M1 and M2 appear to be the appropriate targets for the government to affect both the conventional and Islamic stock markets in Malaysia during the period of analysis. Our results are in line with the finding of Ibrahim (2002) for exchange rate volatility and at the same time contradict the finding of Ibrahim and Jusoh (2001) who found no evidence for exchange rate and interest rate volatilities on conventional stock market volatility during the period October 1992 to December 1999. At this juncture, our findings support the government's policy to focus on exchange rate to stabilize the stock market during the period of the 1997 financial crisis.

5.4. Regression Analysis

In this section, we present the regression analysis results based on the empirical models, equations 4.7 to 4.10. Based on Table 5, for both models using M1 and M2, the volatilities in exchange rate and interest rate significantly affect the conventional stock market volatility during the period of analysis. This augurs well with the stock valuation model which views that stock prices represent the discounted present values of the firm's future cash flows. An increase in the interest rate, for example, reduces stock prices and eventually the returns. Investors who seek to maximize profits tend to be more sensitive towards changes in interest rates. Accordingly, instability caused in the conventional stock market during the period of analysis is mainly caused by the changes in the interest rates. Perhaps, the government should emphasize on controlling the interest rate to stabilize the conventional stock market. This finding is consistent with the study by Muradoglu *et al.* (1999) who found that for Turkish stock market, higher interest rate affect the stock market volatility for the period 1988-1995.

Interestingly, for the Islamic stock market, interest rate is found to be insignificant for both models. This highlights the tenet of Islamic principles that the interest rate is not a significant variable in explaining stock market volatility. It is found that 22-29% of the volatilities in the monetary policy variables can predict conventional stock market volatility. Whereas, for the Islamic stock market, the predictive power of the monetary policy volatility reduces from 15-26% with the volatility in exchange rate remain the most significant. For Muslim investors, they are not just concerned about maximizing profits but also whether the stocks are *Shari'ah* compliant. This concurs with Webley *et al.* (2001) and Etzioni (1988) who view that there has been a marked growth in the literature recently that investors seek to go beyond maximizing profits and that they are more concerned of the moral dimension of their investments. In the case of Malaysian investors who seek to invest in *Shari'ah* compliant stocks, interest rate is therefore not a determining factor. In addition, for Islamic stock market volatility, a different variable is found to be the important indicator of stock market instability, namely the exchange rate. As elaborated by Liljelblom and Stenius (1997), the stock returns volatility should depend on the health of the economy. Hence, it is plausible that a change in the level of uncertainty about future macroeconomic conditions like exchange rate would produce perhaps a change in stock return volatility. Accordingly, economic factor like exchange rate significantly affects the Malaysian stock market volatility rather than interest rate alone. For the government agencies, these variables should be noted in designing policies to stabilize both conventional and Islamic stock markets.

Table (5). Regression Analysis of Stock Market Volatility on Monetary Policy Volatility.

Constant	M1	M2	IPI	MYR	TBR	FFR	R^2
Conventional Stock Market							
0.000 (0.301)	-2.848*** (-3.221)	-	-1.267** (-2.003)	0.872*** (5.151)	0.003** (2.224)	0.091 (1.013)	0.287
0.000 (0.166)		-3.041 (-1.015)	-1.094 (-1.659)	0.819*** (4.597)	0.003* (1.788)	0.102 (1.078)	0.220
Islamic Stock Market							
0.000 (0.296)	-2.948*** (-3.882)	-	-1.121** (-2.063)	0.630*** (4.335)	0.001 (1.025)	0.090 (1.164)	0.259
0.000 (0.138)	-	-1.391 (-0.527)	-0.942 (-1.622)	0.589*** (3.754)	0.000 (0.439)	0.098 (1.178)	0.149

Note: ***, **, and * represent 1%, 5%, and 10% level of significances.
Figures in parentheses denote the t-statistics.

This finding reveals higher explanatory power than the studies on the U.S. and U.K. stock markets. Schwert (1989) for instance, by using U.S data, showed a weak evidence (an explanatory power of between 2.2% and 5%) that macroeconomic volatility namely inflation, industrial production and money can help predict stock return volatility. Morelli (2002) found that for UK data, only 4.4% of the variation of the stock market volatility is explained by macroeconomic volatility i.e., exchange rate, industrial production, inflation, real retail sales and money. A study by Liljeblom and Stenius (1997) based on Finnish data indicated higher explanatory power of the macroeconomic volatility. Lilijeblom and Stenius (1997) found that between one-sixth and more than two thirds of changes in the conditional stock market volatility are affected by macroeconomic volatility namely inflation, industrial production and money supply.

6. Conclusion

This study attempts to establish the link between the monetary policy volatilities with the volatility of stock returns in both conventional and Islamic stock markets in Malaysia during the period January 1992 to December 2000. To capture the link between monetary policy variables and the Malaysian stock market volatility, the GARCH (1,1) model is employed. The study suggests that the predictive power of monetary policy variables volatility appear to better explain the volatility in Islamic stock market. This could perhaps be due partly to the number of listed companies under Islamic stock market is smaller as compared to the conventional stock market. As expected, the study finds that the interest rate volatility affects the conventional stock market volatility but not the Islamic stock market volatility. This highlights the tenet of Islamic principles that the interest rate is not a significant variable in explaining stock market volatility. These results suggest that interest rate volatility acts as an important indicator of economic instability and therefore increases the conventional stock market volatility during this period. However, for Islamic stock market volatility, a different variable is found to be the important indicator of economic instability, namely the exchange rate. This implies that the Islamic stock market is less susceptible to volatilities in monetary policy variables as compared to the conventional stock market. Additionally, based on the Malaysian experience, it is also important to note that interest rate volatility is much more difficult to control, given the competitive nature of the financial and banking systems as compared to volatilities in exchange rate.

The results of this study provide important policy implications for the domestic stock markets and international investors. Firstly, the fact that volatility persistence is high should be taken into consideration by the investors in the portfolio management with regards to asset returns predictability. For the policy makers, to curb the outflows of capital as a result of higher volatility or risk can be controlled by stabilizing the exchange rates as well as the interest rates. However, one should also caution that, combinations of other policies also be required to curb the outflows of capital due to higher volatility. This finding also supports the government's move to peg the exchange rate in order to curb the capital outflows during the 1997 financial crisis.

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APPENDIX (I)
Unit Root Test of Volatility Estimates Based on GARCH (1,1) Specifications

Variable:		Level		First Difference	
		ADF	PP	ADF	PP
KLCI	Intercept	-2.330	-2.125	-9.041***	-12.243***
	Trend & Intercept	-2.315	-2.132	-9.066***	-12.400***
RHBII	Intercept	-2.408	-2.327	-5.169***	-12.635***
	Trend & Intercept	-2.359	-2.258	-5.187***	-12.497***
M1	Intercept	-2.345	-2.363	-10.763***	-10.821***
	Trend & Intercept	-2.473	-2.335	-10.726***	-10.789***
M2	Intercept	-6.352***	-6.227***	-8.174***	-34.066***
	Trend & Intercept	-6.360***	-6.232***	-8.135***	-33.912***
IPI	Intercept	-6.906***	-6.902***	-6.493***	-21.508***
	Trend & Intercept	-6.912***	-6.912***	-6.496***	-21.213***
TBR	Intercept	-3.325**	-3.314**	-9.160***	-11.325***
	Trend & Intercept	-3.323*	-3.325*	-9.132***	-11.286***
MYR	Intercept	-4.618***	-4.591***	-7.438***	-36.632***
	Trend & Intercept	-4.652***	-4.632***	-7.407***	-38.872***
FFR	Intercept	-2.029	-1.985	-5.069***	-10.728***
	Trend & Intercept	-2.664	-2.440	-5.063***	-10.696***

Note: ***, **, and * represent 1%, 5%, and 10% levels of significances.

تأثير التقلبات في البورصة الماليزية: مقارنة سوق البورصة التقليدية بالإسلامية

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المستخلص. تسعى هذه الدراسة إلى كشف مدى ارتباط التقلبات المقيدة في كل من البورصتين التقليدية والإسلامية في ماليزيا بالتقلبات المماثلة في متغيرات النظام النقدي. ومن ضمن متغيرات النظام النقدي التي تم اختبارها: الاعتماد النقدي المحدود، الاعتماد النقدي الواسع، معدل الفائدة، سعر الصرف، ومؤشر الإنتاج الصناعي، في حين اعتُمد بهذا الخصوص مؤشر "كوالالمبور" التركيبي ومؤشر "رشيد حسين برحد الإسلامي" بوصفهما مثالين لقياس البورصتين التقليدية والإسلامية. ومن أجل تحديد التأثير العالمي على كلا النموذجين، ضمَّت الدراسة في جنباتها دراسة التقلبات في متغير النظام النقدي الأمريكي المقاس بمعدل الاعتمادات المالية الفدرالية. وبخلاف دراستنا السابقة (محمد يوسف وعبدالمجيد، 2006م) التي وظَّفت أسلوب اختلاف التباين المعمَّم المقيَّد المنحدر ذاتيًا GRACH-M (1،1)، اعتُمد هنا GRACH (1،1) مصحوباً بتحليل متجه الانحدار الذاتي (VAR) للبيانات الشهرية، وذلك بدءاً من يناير 1992م ولغاية ديسمبر 2000م. وقد توصلت الدراسة إلى أن تقلب نسبة الفائدة يؤثر في تقلبات البورصة التقليدية دون تقلبات البورصة الإسلامية. وهذا يُجلي صواب الاعتقاد – استناداً إلى الأسس الإسلامية– بأن نسبة الفائدة ليست متغيرًا خطيراً في تفسير تقلبات البورصة. إن ما توصلت إليه الدراسة يدعم الفكرة التي مفادها أن لتحديد نسبة ثابتة تأثيراً غيرَ هامّ على التقلبات التي تحدث في البورصة الإسلامية.