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Real Exchange Rate Return and Real Stock Price Returns: An Investigation on the Stock Market of Malaysia

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ABSTRACT

This study examines the relationships between real exchange rate return and real stock price returns in the stock market of Malaysia, namely overall real stock price return and individual stocks of Shariah-compliant securities using a multivariate framework of the constant conditional correlation (CCC)-multivariate generalized autoregressive conditional heteroskedasticity (MGARCH) model. The results of the CCC-MGARCH model show that real exchange rate return and overall real stock price return are negatively and significantly correlated. Moreover, real exchange rate return and about half of individual real stock price returns examined are respectively to be negatively and significantly correlated. However, there is no evidence of Granger causality between the conditional variances of real exchange rate return and overall real stock price return but there is some evidence of Granger causality between the conditional variances of real exchange rate return and individual real stock price returns. There is some evidence of link between the exchange rate market and the stock market in Malaysia.

JEL Classification: F31, G10

Keywords: Constant conditional correlation (CCC)-multivariate generalized autoregressive conditional heteroskedasticity (MGARCH) model; Granger causality; Real exchange rate return; Real stock price return

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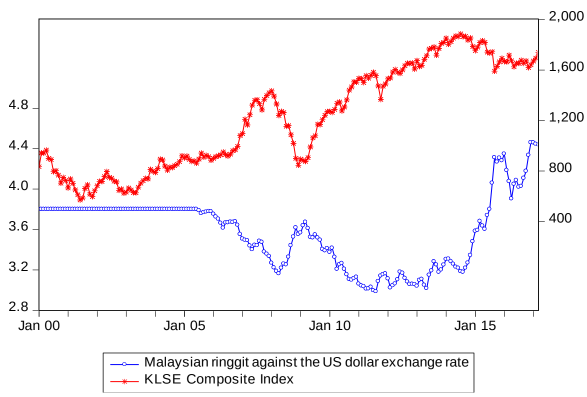
INTRODUCTION

Exchange rate and stock price shall be linked (Reboredo et al., 2016). There are two main explanations on the relationship between exchange rate and stock price (Caporale et al., 2014). The good market approach states that with the Marshall-Lerner condition, depreciation of real exchange rate can increase international competitiveness of domestic firms and make domestic firms to export more and therefore make more profits. This improves trade balance and stimulates real economy through profitability of domestic firms and increases stock market prices. On the other hand, depreciation of real exchange rate increases importing cost of domestic firms and this reduces sales and profits of domestic firms. This will reduce stock prices of domestic firms. Thus, the impact of exchange rate on stock price can be either positive or negative (Dornbusch and Fischer, 1980; Pan et al., 2007; Ülkü and Demirci, 2012; Caporale et al., 2014). The portfolio balance approach states that exchange rate reacts to increase in demand for financial assets. A bullish in the domestic stock market will induce capital inflows to invest in the domestic stock market and this will increase stock prices and the net-worth of domestic firms, which will expand their production and sale. This will increase aggregate demand in the economy, which will increase interest rate and attract more capital inflows from abroad. Capital inflows can lead to appreciation of exchange rate (Branson, 1983; Frankel, 1983; Ülkü and Demirci, 2012; Tsagkanos and Siriopoulos, 2013; Moore and Wang, 2014). The good market approach and the portfolio balance approach are both empirically relevant, a bidirectional relation between exchange rate and stock price can lead to correlation (Caporale et al., 2014). There is no consensus on the relationship between exchange rate return and stock price return (Lin, 2012; Tsai, 2012; Sui and Sun, 2016).

The Malaysian ringgit against the US dollar (RM/USD) exchange rate and Kuala Lumpur Composite Index fluctuated over the period from October 2000 to March 2017 (Figure 1). The averages of the RM/USD exchange rate and Kuala Lumpur Composite Index were RM3.6/USD and 1263.2, respectively. The coefficient of correlation between the RM/USD exchange rate and Kuala Lumpur Composite Index for the same period was negatively and significantly correlated at -0.3883. The negative correlation between the RM/USD exchange rate and Kuala Lumpur Composite Index tended to increase after 2010s. This study examines the relationships between real exchange rate return and real stock price returns in the stock market of Malaysia, namely overall real stock price return and individual stocks of the technology/infrastructure/finance sectors, consumer products sector, industrial products sector, construction sector, trading/services sectors, properties sector and plantation sector using the monthly data over the period from October 2000 to March 2017. All the stocks selected are from the list of Shariah-compliant securities (Securities Commission Malaysia, 2017), which stocks do not involve in non-Shariah complaint business activity such as alcohol, gambling, pork, tobacco, dangerous drugs, pornography, prostitution, interest-based lending and conventional insurance and stock brokering. Thus, this study provides some evidence of the link between real exchange rate return and real stock price returns of Shariah-compliant securities, which there are not many studies examined for the case of Malaysia. This can help portfolio managers to diversify their portfolios across different stocks under Shariah-compliant securities to maximize their risks and returns (Lean and Badeeb, 2017).



	RM/USD	KLSE
Mean	3.5775	1217.214
Median	3.6659	1239.650
Maximum	4.4615	1886.840
Minimum	2.9853	571.2600
SD	0.3490	409.6988
Skewness	0.1625	0.0776
Kurtosis	2.5011	1.5206
Jarque-Bera	3.0578	19.0834***

Notes: RM/USD is the RM/USD exchange rate. KLSE denotes KLSE composite index. SD denotes standard deviation. *** denotes significance at 10 per cent level.
Sources: KLSE was obtained from Thomson Reuters Datastream. RM/USD was obtained from the website of Bank Negara Malaysia.

Figure 1 The RM/USD Exchange Rate and Kuala Lumpur Stock Exchange (KLSE) Composite Index, October 2000 - March 2017

The constant conditional correlation (CCC)-multivariate generalized autoregressive conditional heteroskedasticity (MGARCH) model is used. The other variables included in the multivariate framework are the lag of real exchange rate return, the lag of real stock price return, the real United States (US) stock price return or the lag of the real US stock price return, real interest rate differential, relative demand or the lag of relative demand, positive real oil price return, negative real oil price return and the dummy variables for the fixed exchange rate of Malaysian ringgit against the US dollar (RM/USD) at RM3.80/USD for the period from October, 2000 to April 2005 and the global financial crisis, 2008. This study provides some evidence of the impact of asymmetric real oil price return on the relationship between real exchange rate return and real stock price return (Huang et al., 2017). The use of the multivariate framework would provide a more realistic framework than a bivariate framework for the relationship between real exchange rate return and real stock price return. The influence of real oil price, either positive real oil price or negative real oil price on economy, exchange rate or real stock price is well documented in the literature (Lean and Badeeb, 2017; Mensah et al., 2017; Tiwari et al., 2018). Moreover, the causality of the conditional variances of real exchange rate return and real stock price returns is examined using the Granger causality test. This enables to identify the directional of volatility or risk spillover across the exchange rate and stock market.

LITERATURE REVIEW

There is a huge literature review on the relationship between real exchange rate return and real stock price return. Caporale, et al., (2014) examine the linkages between stock market prices and exchange rates in the United States (US), the United Kingdom (UK), Canada, Japan, the euro area and Switzerland during the banking crisis between 2007 and 2010. The data are weekly from August 2003 to December 2011. The results show unidirectional Granger causality from stock price returns to exchange rate return in the US and the UK, unidirectional Granger causality from exchange rate return to stock price return in Canada and bidirectional Granger causality between exchange rate return and stock price return in the euro area and Switzerland. Causality in variance from stock price return to exchange rate return is found in the US and causality in variances from exchange rate returns to stock price returns are found in the euro area and Japan. There is evidence of bidirectional Granger causality between causality in variances of exchange rate returns and stock price returns in Switzerland and Canada. The results of the time varying correlations show that the dependence between the two variances has increased during the financial crisis. These findings imply limited opportunities for investors to diversify their assets during this period. Sui and Sun (2016) investigate the dynamic relationships among stock price returns, exchange rate returns, interest differentials and the US S&P 500 returns in Brazil, Russia, India, China and South Africa. These countries adopt a managed floating exchange rate regime. The results show the significant spillover effects from exchange rate returns to stock price returns in the short run and not vice versa. Moreover, the spillover effects are stronger between exchange rate returns and stock price returns during the global financial crisis.

Speculative demand in the exchange rate market can destabilise real economy. Tule, Dogo and Uzonwanne (2018) analyse the return spillover and the conditional correlations between the stock market and the exchange rate market in Nigeria using the Vector Autoregressive Moving Average - Asymmetric Generalized Autoregressive Conditional Heteroscedasticity (VARMA-AGARCH) model. An advantage of the VARMA-AGARCH model is the ability to capture the transmission of the asymmetric effect in a market and also across markets. The results show a stronger unidirectional transmission of spillovers from the stock market to the exchange rate market when no breakpoints are considered. However, a bi-directional spillovers observed across both markets when breakpoints were considered. Short term capital flows into the stock market would distort the long-run equilibrium of the exchange rate market.

Reboredo et al. (2016) study co-movement between the stock and exchange rate markets using static and dynamic copula functions for currency-equity pairs for emerging economies, namely Brazil, Chile, Colombia, India, Mexico, Russia, South Africa and Turkey over the period from April 2001 to November 2014. Conditional value-at-risk (CoVaR) captures spillover effects between markets by providing the value-at-risk (VaR) of one market conditional on the fact that the other market is under financial distress as measured by its VaR. The results shows that emerging economy currencies appreciated (depreciated) as stock market prices rose (fell), consistent with the fact that bullish (bearish) stock markets attract capital inflows as foreign investor demand for local assets increases (decreases) and hence increasing (reducing) the value of the home currency. There is evidence of downside and upside risk spillover effects from exchange rates to stock prices and vice versa. Also, there is evidence of asymmetric downside and upside spillovers, with the downside effects greater than the upside effects. Spillovers from and to the US dollar (USD) were greater than for the euro, which is due to that the USD plays a more crucial role in trade and finance in emerging economies. The downside risk is consistent with flight to quality and the implication of the results is that the management of downside and upside risk in international investor portfolios shall include emerging market assets.

There are some studies reporting the significant relationship between exchange rate and stock price. Pan et al. (2007) report a significant causal relationship from exchange rate to stock price for Hong Kong, Japan, Malaysia and Thailand before the Asian financial crisis, 1997-1998. A causal relation is found from the stock market to the exchange rate market for Hong Kong, Korea and Singapore. On the other hand, there are some studies documented no long-run relationship between exchange rate and stock price. Lean et al., (2011) find that for individual country analysis, exchange rate and stock price is only found to be cointegrated over the whole period and a long-run unidirectional Granger causality is found from exchange rate to stock price. For panel data analysis, exchange rates and stock prices are found not cointegrated. Overall, the results suggest little evidence of a long-run relationship between exchange rate and stock price for individual country analysis and no evidence of cointegration for panel data analysis. Wong and Li (2010) show that relative stock return differential and real exchange rate are negatively correlated. An appreciation of the domestic currency could lead to an increase in the domestic stock price relative to the US. Besides, the dynamic conditional correlation is reported to be high during the two financial crises, namely the Asian financial crisis, 1997-1998 and the global financial crisis, 2008.

There are many studies examine the relationship between exchange rate and stock price with different method and different sets of data (Pan et al., 2007; Lin 2012; Caporale et al., 2014; Lean et al., 2011; Liang et al., 2013). Generally, there is no consensus on the relationship between exchange rate and stock price. Furthermore, there is not many studies investigate individual stocks of Shariah-compliant securities in Bursa Malaysia using the CCC-MGARCH model.

DATA AND METHODOLOGY

Real exchange rate (RER_t) is expressed as $RER_t = ER_t \times \frac{CPI_{us,t}}{CPI_{d,t}}$, where ER_t is the RM/USD exchange rate, $CPI_{d,t}$ is domestic consumer price index (CPI, 2010 = 100) and $CPI_{us,t}$ is the US CPI (2010 = 100). Real exchange rate is a measurement of the competitiveness of a country in terms of prices and costs in international markets. Nevertheless, real exchange rate does not reflect all the competitiveness of a firm such as product quality, innovation and reputation. Real stock price (RSP_t) is expressed as as $RSP_t = ER_t \times \frac{sp_{D,t}}{CPI_{d,t}}$, where $SP_{d,t}$ is the Malaysian stock price index (BURSA, 2010 = 100) or domestic stock price. Relative demand (RD_t) is expressed as as $RD_t = \left(\frac{D_{d,t}}{D_{us,t}}\right)$, where $D_{d,t}$ and $D_{us,t}$ are domestic industrial production index (IPI_t, 2010 = 100) and the US IPI_t (2010 = 100), respectively. Real US stock price ($RSP_{us,t}$) is expressed as as $RSP_t = \frac{SP_{us,t}}{CPI_{us,t}}$, where $SP_{us,t}$ is the US stock price index (2010 = 100). Real interest rate differential (ID_t) is expressed as as $ID_t = i_{d,t} - i_{us,t}$, where $i_{d,t}$ is real domestic treasury bills rate and $i_{us,t}$ is real the US treasury bills rate. Real treasury bills rate is nominal treasury bills rate minus inflation rate (π_t), $\pi_t = \frac{CPI_t - CPI_{t-1}}{CPI_{t-1}} \times 100$. Real oil price (OP_t) is expressed as average crude oil price (3 spot price index, 2010 = 100). Positive real oil price (OP_t^+), $OP_t^+ = \sum_{j=1}^{t} \Delta\, OP_j^+$, $\Delta OP_t^+ = \max\,(\Delta OP_t, 0)$ and $OP_t^- = \sum_{j=1}^{t} \Delta\, OP_j^-$, $\Delta OP_t^- = \min\,(\Delta OP_t, 0)$ are partial sum process of positive and negative changes in OP_t, respectively (Shin, Yu and Greenwood-Nimmo, 2014). A dummy variable ($D_{1,t}$) is used to capture the fixed exchange rate of RM/USD at RM3.80/USD, that is, from January 2000 to April 2005 is 1 and the rest is 0, is used. Moreover, a dummy variable ($D_{2,t}$) is used to capture the influence of the global financial crisis, 2008, that is, from January to December 2008 is 1 and the rest is 0, is used. All the data were seasonal adjusted using the census X13 multiplicative method, which is a standard method used by the US Bureau of Census to seasonally adjusted the data. All data were transformed into the natural logarithms before estimation, except real interest rate. The sample is monthly over the period from October 2000 to March 2017. The sample period is selected from October 2000 and therefore there is no influence of the Asian financial crisis, 1997-1998 in the estimation. The use of monthly data provides more informative information than quarterly data and less noisy information than daily data (Lean and Badeeb, 2017).

The Malaysian stock price index, the US stock price index, industrial production indexes, treasury bills rates, consumer price indexes and real oil price were obtained from *International Financial Statistics*, International Monetary Fund. The RM/USD exchange rate was obtained from the website of Bank Negara Malaysia. Domestic stock prices in the stock market of Malaysia were obtained from Thomson Reuters Datastream. The stock price returns in the stock market of Malaysia or Bursa Malaysia are selected from seven sectors, namely the technology/infrastructure/finance sectors, consumer products sector, industrial products sector, construction sector, trading/services sectors, properties sector and plantation sector. For each sector, five individual stock price returns are selected randomly based on the available of the data, except for the technology/infrastructure/finance sectors, which only four individual stock price returns are selected randomly due to the limited stock price returns available under the list of Shariah-compliant securities issued by the Shariah Advisory Council of the Securities Commission Malaysia (2017). This study also examines overall real stock price return. Therefore, all together 35 real stock price returns, that is, overall real stock price return and 34 individual real stock price returns are selected and examined. More specifically, the stock price returns from the technology/infrastructure/finance sectors are Amtel Holdings Berhad (AMTEL), Malaysian Pacific Industries Berhad (MALAY), DiGi.Com Berhad (DIGI) and BIMB Holdings Berhad (BIMB). The stock price returns from the consumer products sector are Hwa Tai Industries Berhad (HWA), Fraser & Neave Holdings Berhad (FRAS), Hong Leong Industries Berhad (HONG), Nestle (Malaysia) Berhad (NEST) and UMW Holdings Berhad (UMW). The stock price returns from the industrial products sector are Lafarge Malaysia Berhad (LAFAR), Petron Malaysia Refining & Marketing Berhad (PETRON), Petronas Gas Berhad (PETRO), Sapura Industrial Berhad (SAPUR) and Lion Industries Corporation Berhad (LION). The stock price returns from the construction sector are Gamuda Berhad (GAMU), Hock Seng Lee Berhad (HOCK), IJM Corporation Berhad (IJM), Puncak Niaga Holdings Bhd (PUNCA) and Econpile Holdings Berhad (EKO). The stock price returns from the trading/services sectors are Amway (Malaysia) Holdings Berhad (AMW), Star Media Group Berhad (STAR), Sime Darby Berhad (SIME), Suria Capital Holdings Berhad (SURIA) and Telekom Malaysia Berhad (TELE). The stock price returns from the properties sector are Damansara Realty Berhad (DAMAN), Mah Sing Group Berhad (MAH), Tropicana Corporation Berhad (TROPI), S P Setia Berhad (SP) and Talam Transform Berhad (TALAM). The stock price returns from the Plantation sector are Genting Plantations Berhad (GENT), IOI Corporation Bhd (IOI), Kuala Lumpur Kepong Berhad (KUALA), United Plantations Berhad (UNIT) and Dutaland Berhad (DUTA).

The Dickey and Fuller unit root test statistic is used to examine the stationary of the data and the conditional variances of real exchange rate returns and real stock price returns. The CCC-MGARCH models are used to estimate constant conditional correlation between real exchange rate return and real stock price returns. The CCC-MGARCH model assumes the conditional correlation to be time invariant and the covariance matrix ($\boldsymbol{H_t}$) can be decomposed into conditional standard deviations ($\boldsymbol{D_t}$) and correlation matrix ($\boldsymbol{R}$) (Engle, 2002). The CCC-MGARCH model can be written as:

$$y_t = Cx_t + \varepsilon_t \quad (1)$$

$$\varepsilon_t = H_t^{1/2} \nu_t \quad (2)$$

$$H_t = D_t^{1/2} R D_t^{1/2} \quad (3)$$

where y_t is an $m \times 1$ vector of dependent variables, namely real exchange rate return and real stock price return C is an $m \times k$ vector of parameters, x_t is a $k \times 1$ vector of independent variables, which might contain lags of y_t, namely the lag of real exchange rate return, the lag of real stock price return, the real US stock price return or the lag of the real US stock price return, real interest rate differential, relative demand or the lag of relative demand, positive real oil price return, negative real oil price return and the dummy variables to capture the fixed exchange rate of RM/USD at RM3.80/USD and the influence of the global financial crisis, 2008, ε_t is an $m \times 1$ vector of residuals, $H_t^{1/2}$ is the cholesky factor of the time varying conditional covariance matrix H_t, ν_t is an $m \times 1$ vector of normal, independent and identically distributed innovations, D_t is a diagonal matrix of conditional variances:

$$D_t = \begin{bmatrix} \sigma_{1,t}^2 & 0 & \cdots & 0 \\ 0 & \sigma_{2,t}^2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \sigma_{m,t}^2 \end{bmatrix}$$

where $\sigma_{i,t}^2 = \exp(\gamma_i z_{i,t}) + \sum_{j=1}^{p_i} \alpha_j \varepsilon_{i,t-j}^2 + \sum_{j=1}^{q_i} \beta_j \sigma_{i,t-j}^2$, $i = 1, \ldots, m$, γ_i is a $1 \times p$ vector of parameters and $z_{i,t}$ is a $p \times 1$ vector of independent variables including a constant term, α_j is the autoregressive conditional heteroskedasticity (ARCH) parameter and β_j is the generalized autoregressive conditional heteroskedasticity (GARCH) parameter. R is an $m \times m$ matrix of the time invariant unconditional correlations of the standardised residuals $D_t^{-1/2}\varepsilon_t$:

$$R = \begin{bmatrix} 1 & \rho_{12} & \cdots & \rho_{1m} \\ \rho_{12} & 1 & \cdots & \rho_{2m} \\ \vdots & \vdots & \ddots & \vdots \\ \rho_{1m} & \rho_{2m} & \cdots & 1 \end{bmatrix}$$

This model is called the CCC-MGARCH model because the matrix R is time invariant. This model is restrictive compared with the dynamic conditional correlation (DCC)-multivariate generalized autoregressive conditional heteroskedasticity (MGARCH) model or the varying conditional correlation (VCC)-MGARCH model. However, the CCC-MGARCH model is found to be the best for data examined in this study in terms of the log-likelihood statistic. Sui and Sun (2016) propose a multivariate framework to examine the dynamic relationships among stock price returns, exchange rate returns, interest differentials and the US S&P 500 returns in Brazil, Russia, India, China and South Africa. Generally, there is no consensus on the relationship between exchange rate and stock price (Pan, Fok and Liu, 2007; Wong and Li, 2010; Lean, Narayan and Smyth, 2011; Liang, Lin and Hsu, 2013; Caporale, Hunter and Ali, 2014). Mensah, Obib and Bokpina (2017) report an inverse relationship between oil price and exchange rate especially after the financial crisis period. The influence of real oil price or asymmetric real oil price, namely positive real oil price or negative real oil price on real stock price returns is also examined (Huang, et al., 2017; Lean and Badeeb, 2017; Wei and Guo, 2017; Tiwari et al., 2018). The influence of asymmetric real oil price on real exchange rate can be asymmetric, that is an increase in real oil price on real exchange rate is not the same as a decrease in real oil price on real exchange rate (Mensah, Obib and Bokpina, 2017). Habib, Mileva and Stracca (2017) find that a real appreciation (depreciation) decreases (increases) significantly annual real growth domestic product (GDP) growth.

If there is no evidence of cointegration, the Granger causality test between the conditional variances of real exchange rate return and real stock price return is expressed as follows:

$$x_t = \beta_{10} + \sum_{i=1}^{p} \beta_{11i} x_{t-i} + \sum_{i=1}^{p} \beta_{12i} y_{t-i} + u_{1,t} \tag{4}$$

$$y_t = \beta_{20} + \sum_{i=1}^{p} \beta_{21i} x_{t-i} + \sum_{i=1}^{p} \beta_{22} y_{t-i} + u_{2,t} \tag{5}$$

where x_t is the conditional variance of real exchange rate return, y_t is the conditional variance of real stock price return and $u_{i,t}$ (i = 1, 2) is a residual. The null hypothesis of no Granger-causality from y_t to x_t is tested by the F test statistic on $\beta_{121} = \cdot\cdot\cdot = \beta_{12p} = 0$ in model (4). Similarly, no Granger-causality from x_t to y_t is tested by the F test statistic on $\beta_{211} = \cdot\cdot\cdot = \beta_{21p} = 0$ in model (5).

EMPIRICAL RESULTS AND DISCUSSIONS

The results of the Dickey and Fuller unit root test statistic for data used in the estimation are reported in Table 1. The lag length used to compute the Dickey and Fuller unit root statistics are based on the Akaike information criterion (AIC). On the whole, the Dickey and Fuller unit root test statistic shows that all the variables are non-stationary in their levels but become stationary after taking the first differences.

Table 1 The Results of the Dickey and Fuller Unit Root Test Statistic

$\Delta \log E_t$	-9.2834***(2)	∆ UMW	-4.2890***(4)	∆ SURIA	-5.1387***(4)
$\Delta \log P_{us,t}$	-4.9495***(5)	∆ LAFAR	-13.5683***(0)	∆ TELE	-15.2822***(0)
ΔID_t	-8.6413***(5)	∆ PETRON	-12.2818***(0)	∆ DAMAN	-13.3599***(0)
$\Delta \log RD_t$	-9.0156***(3)	∆ PETRO	-13.0213***(0)	∆ MAH	-12.3820***(0)
$\Delta \log OP_t$	-11.3601***(0)	∆ SAPUR	-7.6999***(3)	∆ TROPI	-7.5202***(0)
∆ BURSA	-10.3895***(0)	∆ LION	-13.3475***(0)	∆ SP	-14.2462***(0)
∆ AMTEL	-13.9905***(0)	∆ GAMU	-5.4029***(3)	∆ TALAM	-13.8580***(0)
∆ MALAY	-12.9531***(0)	∆ HOCK	-6.0578***(2)	∆ GENT	-12.3588***(0)
∆ DIGI	-12.4190***(0)	∆ IJM	-12.2329***(0)	∆ IOI	-7.9826***(1)
∆ BIMB	-7.1588***(2)	∆ PUNCA	-4.1093***(6)	∆ KUALA	-6.4039***(2)
∆ HWA	-15.2265***(0)	∆ EKO	-4.8650***(4)	∆ UNIT	-14.8377***(0)
∆ FRAS	-14.5360***(0)	∆ AMW	-5.1913***(5)	∆ DUTA	-17.1377***(0)
∆ HONG	-8.2309***(1)	∆ STAR	-9.2582***(2)		
∆ NEST	-10.8167***(1)	∆ SIME	-11.7565***(0)		

Notes: The Dickey and Fuller unit root statistic is estimated based on the model including an intercept. Values in the parentheses are the lags used in the estimation of the Dickey and Fuller unit root statistic. *** denotes significance at the 1% level.

The results of the CCC-MGARCH models are reported in Table 2. The log-likelihood statistics are found to be high, that is from 757.4753 to 1108.729. The lags of real exchange rate return and real interest rate differential are mostly found to have positive impact on real exchange rate return for all stocks examined. For BURSA, the lag of real exchange rate return, the lag of real BURSA return, the real US stock price return and real interest rate differential are found to have positive impact on real BURSA return. The global financial crisis is found to have negative impact on real BURSA return. Real BURSA return and real exchange rate return are found to be negative and significantly correlated. For stocks in the consumer products sector, the real US stock price return or the lag of the real US stock price return is found to have positive impact on real stock price returns. Real interest rate differential is found to have positive impact on real stock price returns. Positive real oil price return is found to have positive impact on real stock price returns. Negative real oil price return is found to have negative impact on real NEST return. Some real stock price returns are sensitive to positive real oil price return whilst some real stock price returns are sensitive to negative real oil price return. Relative demand and the global financial crisis are found to have negative impact on real UMW return.

For stocks in the industrial products sector, the real US stock price return and positive real oil price return are mostly found to have positive impact on real stock price returns. The global financial crisis is found to have negative impact on real LION return. The fixed exchange rate of RM/USD is found to have negative impact on real LAFAR return. Real interest rate differential is found to have positive impact on real SAPUR return and real PETRO return. Negative real oil price return is found to have positive impact on real SAPUR return. The lag of real PETRO return is found to have positive impact on real PETRO return. Real PETRO return and real exchange rate return and real LION return and real exchange rate return are respectively found to be negative and significantly correlated.

For stocks in the construction sector, the fixed exchange rate of RM/USD is found to have positive impact on real exchange rate return for the case of real HOCK return. The real US stock price return and real interest rate differential are mostly found to have positive impact on real stock price returns. Relative demand is found to have positive impact on real HOCK return. The global financial crisis is mostly found to have negative impact on real stock price returns. The fixed exchange rate of RM/USD is found to have negative impact on real EKO return. Real stock price return and real exchange rate return are found to be negative and significantly correlated for real stocks of GAMU, HOCK, IJM and PUNCA.

For stocks in the trading/services sectors, the fixed exchange rate of RM/USD is found to have positive impact on real exchange rate return for the case of real SURIA return. The real US stock price return is found to have negative impact on real exchange rate return for the case of real STAR return. The real US stock price return is mostly found to have positive impact on real stock price returns. The lag of real exchange rate return is found to have positive impact on real STAR return. Real interest rate differential is mostly found to have positive impact on real stock price returns. Positive real oil price return is found to have negative impact on real STAR return. Negative real oil price return is found to have positive impact on real AMW return. The global financial crisis is found to have positive impact on real AMW return whilst is found to have negative impact on real SIME return and real SURIA return. Real stock price return and real exchange rate return are found to be negative and significantly correlated for real stocks of SIME and SURIA.

For stocks in the properties sector, the lag of real DAMAN return, the lag of real MAH return, the lag of real SP return, the lag of real exchange rate return and real interest rate differential are found to have positive impact on real exchange rate return. The real US stock price return is found to have negative impact on real exchange rate return for the case of real DAMAN return and real MAH return. The lag of the real US stock price return is found to have negative impact on real exchange rate return for the case of real SP return. The fixed exchange rate of RM/USD is found to have positive impact on real exchange rate return for the case of real TALAM return. The real US stock price return is found to have positive impact on real DAMAN return and real TALAM return. The lag of the real US stock price return is found to have positive impact on real SP return. Real interest rate differential and positive real oil price return are mostly found to have positive impact on real stock price returns. Relative demand, negative real oil price return and the global financial crisis are found to have positive impact on real TALAM return. Real stock price return and real exchange rate return are found to be negative and significantly correlated for real stocks of DAMAN, MAH, TROPI and SP.

For stocks in the plantation sector, the real US stock price return is found to have negative impact on real exchange rate return for the case of real UNIT return. The lag of GENT return is found to have positive impact on real GENT return. The US real stock price return, real interest rate differential, relative demand and positive real oil price return are mostly found to have positive impact on real stock price returns. The global financial crisis is mostly found to have negative impact on real stock price returns. The lag of real IOI return and the fixed exchange rate of RM/USD are respectively found to have positive impact on real IOI return. Real stock price return and real exchange rate return are found to be negative and significantly correlated for real stocks of GENT, IOI and KUALA.

For stocks in the technology/infrastructure/finance sectors, the lag of real AMTEL and real interest rate differential are found to have positive impact on real AMTEL return. The global financial crisis is found to have negative impact on real AMTEL return. The lag of real exchange rate return and real interest rate differential are found to have positive impact on real MALAY return and real DIGI return. The lag of real MALAY return and the real US stock price return are found to have positive impact on real MALAY return. The lag of real DIGI return is found to have positive impact on real DIGI return and real DIGI return. The lag of real BIMB return, the real US stock price return and relative demand are found to have positive impact on real BIMB return. Positive real oil price return is mostly found to have positive impact on real stock price returns. The global financial crisis is found to have negative impact on real BIMB return. Real DIGI return and real exchange rate return are found to be negative significantly correlated.

Table 2 The CCC–MGARCH Models

Bursa/Others					
	BURSA	AMTEL	MALAY	DIGI	BIMB
The Mean Equation - $\Delta \log E_t$					
$\Delta \log P_{t-1}$	0.0004	0.0003	0.0019	0.0012	-0.0004
	(0.07)	(0.18)	(0.80)	(0.45)	(-0.08)
$\Delta \log E_{t-1}$	0.5268***	0.5332***	0.5318***	0.5265***	0.5259***
	(8.55)	(8.42)	(8.76)	(8.56)	(8.27)
$\Delta \log P_{us,t}$	-0.0085	-0.0117	-0.0086	-0.0093	-
	(-1.20)	(-1.54)	(-1.14)	(-1.29)	
$\Delta \log P_{us,t-1}$	-	-	-	-	-0.0046
					(-0.57)
ΔID_t	0.0071***	0.0071***	0.0071***	0.0071***	0.0073***
	(15.18)	(14.88)	(14.88)	(15.15)	(15.14)
$\Delta \log RD_t$	0.0016	0.0005	-0.0007	-0.0011	-
	(0.19)	(0.05)	(-0.08)	(-0.13)	
$\Delta \log RD_{t-1}$	-	-	-	-	0.0051
					(0.53)
$\Delta \log OP_t^+$	-0.0047	-0.0052	-0.0057	-0.0046	-0.0053
	(-1.04)	(-1.19)	(-1.36)	(-1.07)	(-1.05)
$\Delta \log OP_t^-$	0.0023	0.0004	0.0004	-0.0001	0.0060
	(0.39)	(0.06)	(0.06)	(-0.01)	(0.92)
$D_{1,t}$	0.0004	0.0004	0.0005	0.0004	0.0004
	(0.98)	(1.01)	(1.23)	(1.09)	(1.00)
$D_{2,t}$	-0.0024	-0.0034	-0.0033	-0.0029	-0.0028
	(-0.72)	(-1.04)	(-1.01)	(-0.90)	(-0.83)
The GARCH Model					
μ_1	8.50e-08	8.00e-08	5.81e-08	3.84e-08	1.17e-07
	(0.50)	(0.52)	(0.36)	(0.25)	(0.60)
α_1	0.4057***	0.3834***	0.4156***	0.3832***	0.4166***
	(4.15)	(4.20)	(3.84)	(4.24)	(3.76)
β_1	0.7119***	0.7259***	0.7086***	0.7285***	0.7008***
	(14.46)	(15.50)	(13.10)	(15.97)	(12.16)
The Mean Equation - $\Delta \log P_t$					
$\Delta \log E_{t-1}$	0.2722***	0.3208	0.5761*	0.5254***	-0.0967
	(2.84)	(1.37)	(1.88)	(2.86)	(-0.36)
$\Delta \log P_{t-1}$	0.3231***	0.3609***	0.2473***	0.2346***	-0.1735**
	(4.89)	(4.36)	(3.25)	(2.78)	(-2.07)
$\Delta \log P_{us,t}$	0.3832***	0.0157	0.6565***	0.2964*	-
	(6.60)	(0.09)	(3.13)	(1.94)	
$\Delta \log P_{us,t-1}$	-	-	-	-	0.2340*
					(1.79)
ΔID_t	0.0085***	0.0146***	0.0262***	0.0093***	-0.0009
	(7.26)	(4.27)	(7.95)	(4.61)	(-0.24)
$\Delta \log RD_t$	0.1284**	-0.0799	0.1366	-0.0094	-
	(2.14)	(-0.42)	(0.81)	(-0.06)	
$\Delta \log RD_{t-1}$	-	-	-	-	0.6632***
					(4.61)

Table 2. Cont.

$\Delta \log OP_t^+$	-0.0013	-0.0059	-0.1924*	0.1449*	0.1306*
	(-0.04)	(-0.08)	(-1.82)	(1.86)	(1.84)
$\Delta \log OP_t^-$	0.0026	0.1348	-0.0643	-0.0397	-0.0754
	(0.09)	(1.44)	(-0.73)	(-0.66)	(-1.23)
$D_{1,t}$	0.0067	-0.0222	-0.0028	0.0015	-0.0084
	(1.24)	(-1.52)	(-0.28)	(0.10)	(-1.04)
$D_{2,t}$	-0.0231**	-0.0475**	-0.0175	-0.0147	-0.0569***
	(-2.37)	(-2.03)	(-0.96)	(-0.80)	(-4.23)
The GARCH Model					
μ_1	0.00004	0.0015***	0.0006	0.00005	0.0013**
	(1.64)	(3.85)	(1.12)	(1.11)	(2.50)
α_1	0.2127***	1.0351***	0.2859*	0.1713**	0.4731**
	(2.74)	(4.07)	(1.75)	(2.01)	(2.33)
β_1	0.7556***	0.1860***	0.6185***	0.8289***	0.2449
	(11.05)	(3.22)	(2.78)	(12.36)	(1.22)
Diagnostic Tests					
CCC	-0.2704***	0.0230	-0.1355*	-0.1716**	-0.0471
	(-3.78)	(0.29)	(-1.75)	(-2.27)	(-0.63)
LL	1108.729	863.9616	902.1016	938.5	939.5062
Consumer Product					
	HWA	FRAS	HONG	NEST	UMW
The Mean Equation - $\Delta \log E_t$					
$\Delta \log P_{t-1}$	0.0025	0.0006	0.0012	0.0330**	-0.0014
	(1.08)	(0.11)	(0.50)	(2.16)	(-0.35)
$\Delta \log E_{t-1}$	0.5448***	0.5343***	0.5302***	-	0.5294***
	(8.94)	(8.49)	(8.33)		(8.48)
$\Delta \log P_{us,t}$	-0.0082	-0.0114	-	-0.0216**	-0.0111
	(-1.10)	(-1.54)		(-2.19)	(-1.49)
$\Delta \log P_{us,t-1}$	-	-	-0.0065	-	-
			(-0.88)		
ΔID_t	0.0071***	0.0071***	0.0072***	0.0056***	0.0071***
	(15.34)	(14.84)	(15.48)	(11.61)	(15.25)
$\Delta \log RD_t$	-0.0006	0.0005	0.0044	-0.0091	0.0014
	(-0.07)	(0.05)	(0.52)	(-1.02)	(0.16)
$\Delta \log OP_t^+$	-0.0050	-0.0051	-0.0045	-0.0032	-0.0050
	(-1.22)	(-1.14)	(-1.00)	(-0.47)	(-1.15)
$\Delta \log OP_t^-$	-0.0002	0.0004	0.0033	-0.0136**	0.0008
	(-0.03)	(0.06)	(0.52)	(-2.00)	(0.13)
$D_{1,t}$	0.0004	0.0004	0.0004	0.0004	0.0004
	(1.26)	(0.97)	(0.96)	(0.86)	(1.06)
$D_{2,t}$	-0.0035	-0.0035	-0.0030	-0.0030	-0.0034
	(-1.02)	(-1.05)	(-0.88)	(-0.73)	(-1.02)
The GARCH Model					
μ_1	5.92e-08	8.58e-08	4.91e-08	6.15e-08	8.82e-08
	(0.39)	(0.54)	(0.29)	(0.23)	(0.55)
α_1	0.4031***	0.3836***	0.4376***	0.3753***	0.3937***
	(4.07)	(4.17)	(3.84)	(4.17)	(4.10)
β_1	0.7158***	0.7254***	0.6950***	0.7294***	0.7198***
	(14.46)	(15.38)	(12.44)	(15.91)	(14.69)
The Mean Equation - $\Delta \log P_t$					
$\Delta \log E_{t-1}$	-0.1292***	0.1508	0.7585***	0.1630	-0.4040
	(-0.26)	(0.73)	(2.75)	(1.15)	(-1.50)
$\Delta \log P_{t-1}$	-0.1117	0.0574	0.0367	-	0.0329
	(-1.45)	(0.64)	(0.42)		(0.44)
$\Delta \log P_{us,t}$	0.6256**	0.3003***	-	0.1249**	0.2609**
	(2.34)	(3.42)		(2.33)	(2.04)
$\Delta \log P_{us,t-1}$	-	-	0.4581***	-	-
			(2.90)		

Table 2. Cont.

ΔID_t	-0.0007	0.0062***	0.0086***	0.0082***	0.0022
	(0.934)	(2.41)	(3.19)	(8.14)	(0.90)
$\Delta \log RD_t$	-0.0800	0.0142	-0.0351	-0.0037	-0.2933**
	(-0.22)	(0.12)	(-0.24)	(-0.04)	(-2.10)
$\Delta \log OP_t^+$	-0.0039	0.0773	0.1442*	0.0657*	0.2047**
	(-0.02)	(1.35)	(1.65)	(1.94)	(2.53)
$\Delta \log OP_t^-$	0.0701	-0.0470	-0.0299	-0.0565**	-0.0736
	(0.53)	(-0.92)	(-0.41)	(-2.06)	(-0.95)
$D_{1,t}$	-0.0179	0.0058	-0.0152	-0.0001**	-0.0026
	(-1.14)	(1.04)	(-1.21)	(-0.03)	(-0.32)
$D_{2,t}$	-0.0175	0.0111	-0.0206	0.0007	-0.0346*
	(-0.36)	(0.84)	(-1.38)	(0.10)	(-1.75)
The GARCH Model					
μ_1	0.0005	0.0014***	0.0017***	0.0005***	0.0003*
	(1.42)	(3.89)	(2.54)	(4.52)	(1.95)
α_1	0.0840***	0.2228*	0.5187***	0.5493**	0.1269**
	(2.82)	(1.70)	(2.87)	(2.03)	(2.42)
β_1	0.8851***	-0.0698	0.2715*	-0.0538*	0.8076***
	(25.16)	(-0.41)	(1.86)	(-1.76)	(14.04)
Diagnostic Tests					
CCC	-0.0903	0.0110	-0.1563**	0.1052	-0.0734
	(-1.20)	(0.15)	(-2.11)	(1.32)	(-0.97)
LL	807.9486	1010.837	898.7224	1069.591	942.7823
			Industrial Product		
	LAFAR	PETRON	PETRO	SAPUR	LION
The Mean Equation - $\Delta \log E_t$					
$\Delta \log P_{t-1}$	0.0046**	-0.0035	0.0013	0.0012	0.0052***
	(1.99)	(-0.96)	(0.20)	(0.51)	(3.25)
$\Delta \log E_{t-1}$	0.5611***	0.5348***	0.5216***	0.5337***	0.5442***
	(9.15)	(8.32)	(8.24)	(8.51)	(8.91)
$\Delta \log P_{us,t}$	-	-0.0081	-	-0.0113	-
		(-1.11)		(-1.56)	
$\Delta \log P_{us,t-1}$	-0.0057	-	-0.0066	-	-0.0117*
	(-1.07)		(-0.98)		(-1.70)
ΔID_t	0.0073***	0.0070***	0.0072***	0.0071***	0.0075***
	(17.34)	(14.56)	(16.00)	(15.15)	(16.97)
$\Delta \log RD_t$	0.0055	0.0010	0.0046	-0.0007	0.0073
	(0.66)	(0.12)	(0.49)	(-0.08)	(0.98)
$\Delta \log OP_t^+$	-0.0021	-0.0042	-0.0053	-0.0047	-0.0024
	(-0.45)	(-0.92)	(-1.14)	(-1.07)	(-0.44)
$\Delta \log OP_t^-$	0.0042	0.0019	0.0046	-0.0005	0.0024
	(0.88)	(0.31)	(0.72)	(-0.07)	(0.39)
$D_{1,t}$	0.0002	0.0003	0.0004	0.0004	0.00002
	(0.68)	(0.70)	(1.05)	(0.96)	(0.04)
$D_{2,t}$	-0.0029	-0.0032	-0.0025	-0.0034	-0.0025
	(-0.71)	(-0.96)	(-0.75)	(-1.05)	(-0.79)
The GARCH Model					
μ_1	9.80e-09	7.29e-08	1.09e-07	7.44e-08	1.81e-07
	(0.06)	(0.52)	(0.61)	(0.48)	(1.15)
α_1	0.5331***	0.4100***	0.4203***	0.3903***	0.4571***
	(3.77)	(3.95)	(3.94)	(4.15)	(3.69)
β_1	0.6508***	0.7112***	0.7000***	0.7220***	0.6763***
	(10.62)	(13.53)	(12.86)	(15.04)	(11.15)
The Mean Equation - $\Delta \log P_t$					
$\Delta \log E_{t-1}$	-0.0095	-0.5543	0.2391	0.4461	0.2467
	(-0.03)	(-1.55)	(1.54)	(1.47)	(0.34)
$\Delta \log P_{t-1}$	-0.0559	0.1383	0.1959**	-0.0024	0.0074
	(-0.76)	(1.38)	(2.05)	(-0.03)	(0.08)
$\Delta \log P_{us,t}$	-	0.6690***	-	0.8163***	-
		(4.26)		(4.06)	
$\Delta \log P_{us,t-1}$	0.3196**	-	0.0326	-	0.2269
	(2.05)		(0.47)		(0.66)

Table 2. Cont.

ΔID_t	0.0032	0.0014	0.0068***	0.0141***	0.0086
	(0.91)	(0.41)	(4.76)	(2.90)	(1.14)
$\Delta \log RD_t$	-0.0276	0.1548	-0.1169	-0.1618	0.1221
	(-0.15)	(0.87)	(-1.28)	(-0.64)	(0.30)
$\Delta \log OP_t^+$	0.1792*	-0.0955	0.0674	-0.0456	0.3724*
	(1.86)	(-0.97)	(1.49)	(-0.49)	(1.76)
$\Delta \log OP_t^-$	-0.0189	-0.1276	-0.0441	0.2016**	0.2730
	(-0.24)	(-1.39)	(-1.12)	(2.24)	(1.39)
$D_{1,t}$	-0.0193**	0.0041	-0.0043	-0.0030	0.0186
	(-2.06)	(0.45)	(-1.00)	(-0.21)	(0.91)
$D_{2,t}$	-0.0355	0.0116	-0.0181	0.0209	-0.0720*
	(-1.13)	(0.60)	(-1.58)	(0.71)	(-1.80)
The GARCH Model					
μ_1	0.0002	0.0016**	0.0007***	-0.0001*	0.0197***
	(1.50)	(2.19)	(4.98)	(-1.75)	(4.24)
α_1	0.1243***	0.3642	0.3479***	0.0430***	0.2252*
	(2.70)	(1.50)	(2.64)	(2.65)	(1.77)
β_1	0.8526***	0.4228**	0.0227	0.9680***	-0.1774
	(18.28)	(2.30)	(0.21)	(50.22)	(-0.98)
Diagnostic Tests					
CCC	-0.3229***	-0.0013	-0.1313*	-0.0440	-0.1864**
	(-4.71)	(-0.02)	(-1.80)	(-0.59)	(-2.53)
LL	917.126	896.2877	1056.132	868.6258	770.8438
			Construction		
	GAMU	HOCK	IJM	PUNCA	EKO
The Mean Equation - $\Delta \log E_t$					
$\Delta \log P_{t-1}$	0.0025	0.0040*	0.0041	0.0049**	0.0030
	(1.06)	(1.85)	(1.33)	(1.99)	(1.21)
$\Delta \log E_{t-1}$	0.5402***	0.4106***	0.5393***	0.5320***	0.5406***
	(9.12)	(7.61)	(7.62)	(8.72)	(8.77)
$\Delta \log P_{us,t}$	-0.0047	-	-0.0045	-0.0105	-0.0130*
	(-0.63)		(-0.59)	(-1.44)	(-1.74)
$\Delta \log P_{us,t-1}$	-	-0.0072	-	-	-
		(-1.16)			
ΔID_t	0.0071***	0.0064***	0.0072***	0.0071***	0.0072***
	(14.91)	(13.84)	(14.64)	(15.19)	(15.36)
$\Delta \log RD_t$	-0.0004	-0.0052	-0.0012	0.0015	-0.0011
	(-0.05)	(-0.73)	(-0.14)	(0.20)	(-0.14)
$\Delta \log OP_t^+$	-0.0052	-0.0033	-0.0056	-0.0054	-0.0047
	(-1.30)	(-0.56)	(-1.14)	(-1.32)	(-1.10)
$\Delta \log OP_t^-$	0.0006	0.0029	0.0043	-0.0003	-0.0013
	(0.09)	(0.77)	(0.68)	(-0.04)	(-0.22)
$D_{1,t}$	0.0004	0.0008**	0.0004	0.0004	0.0004
	(1.12)	(2.10)	(0.86)	(1.03)	(1.07)
$D_{2,t}$	-0.0024	-0.0024	-0.0010	-0.0032	-0.0038
	(-0.71)	(-0.65)	(-0.31)	(-1.00)	(-1.19)
The GARCH Model					
μ_1	4.73e-08	-9.37e-08	4.61e-08	2.58e-08	6.63e-08
	(0.31)	(-0.25)	(0.28)	(0.17)	(0.46)
α_1	0.4283***	0.8613***	0.4435***	0.4238***	0.3929***
	(3.89)	(4.28)	(3.50)	(3.91)	(4.16)
β_1	0.7013***	-	0.6929***	0.7041***	0.7203***
	(12.87)		(11.35)	(13.05)	(15.21)
β_2	-	0.5076***	-	-	-
		(7.81)			
The Mean Equation - $\Delta \log P_t$					
$\Delta \log E_{t-1}$	0.0891	0.2781	0.1189	0.6710	-0.0013
	(0.43)	(0.79)	(0.61)	(1.30)	(-0.00)
$\Delta \log P_{t-1}$	-0.0460	0.0516	0.0649	-0.0351	0.2000**
	(-0.61)	(0.57)	(0.83)	(-0.43)	(2.41)

Table 2. Cont.

$\Delta \log P_{us,t}$	0.5778**	-	0.3962**	0.6567**	0.4710**
	(4.26)		(2.56)	(2.09)	(1.98)
$\Delta \log P_{us,t-1}$	-	0.2112	-	-	-
		(1.14)			
ΔID_t	0.0082**	0.0115***	0.0062***	0.0068***	0.0046
	(2.54)	(2.86)	(2.64)	(1.26)	(0.98)
$\Delta \log RD_t$	0.3222*	0.4796***	0.1542	0.3786	-0.0790
	(1.73)	(2.62)	(0.81)	(1.34)	(-0.28)
$\Delta \log OP_t^+$	0.0747	0.0605	0.1180	0.1763	0.3648**
	(1.08)	(0.60)	(1.45)	(1.21)	(2.25)
$\Delta \log OP_t^-$	-0.0514	-0.0327	-0.0253	0.0316	-0.0988
	(-0.85)	(-0.38)	(-0.43)	(0.23)	(-0.76)
$D_{1,t}$	-0.0068	-0.0045	-0.0001	-0.0014	-0.0246*
	(-0.60)	(-0.43)	(-0.01)	(-0.10)	(-1.67)
$D_{2,t}$	-0.0869**	-0.0665***	-0.1332***	-0.0541	-0.0372
	(-2.59)	(-2.87)	(-6.22)	(-1.21)	(-1.00)
The GARCH Model					
μ_1	0.00004	0.0017***	0.0003*	0.0028	0.0020*
	(0.61)	(2.91)	(1.95)	(0.94)	(1.96)
α_1	0.2390***	0.4989***	0.2848***	0.0663	0.2218**
	(3.37)	(2.79)	(2.66)	(0.74)	(2.27)
β_1	0.7889***	-	0.6800***	0.6213	0.6527***
	(17.96)		(7.73)	(1.63)	(5.74)
β_2	-	0.2941**	-	-	-
		(2.53)			
Diagnostic Tests					
CCC	-0.2771***	-0.1801**	-0.2302***	-0.1366*	-0.0660
	(-3.88)	(-2.44)	(-2.88)	(-1.76)	(-0.88)
LL	910.0233	884.7144	943.3853	845.1821	816.3428

Trading/Services					
	AMW	STAR	SIME	SURIA	TELE
The Mean Equation - $\Delta \log E_t$					
$\Delta \log P_{t-1}$	0.0028	0.0048	0.0010	0.0034	0.0055
	(0.39)	(1.15)	(0.17)	(1.49)	(1.23)
$\Delta \log E_{t-1}$	0.5373***	0.5372***	0.5419***	0.3987***	0.5510***
	(8.70)	(8.87)	(8.37)	(7.02)	(8.69)
$\Delta \log P_{us,t}$	-0.0117	-0.0121*	-0.0112	-0.0068	-0.0088
	(-1.60)	(-1.69)	(-1.54)	(-1.12)	(-1.19)
ΔID_t	0.0071***	0.0072***	0.0071***	0.0067***	0.0072***
	(14.87)	(15.03)	(14.70)	(10.77)	(15.18)
$\Delta \log RD_t$	0.0004	-0.0015	0.0002	-0.0134	-0.0001
	(0.04)	(-0.19)	(0.03)	(-1.38)	(-0.01)
$\Delta \log OP_t^+$	-0.0058	-0.0058	-0.0045	-0.0070	-0.0055
	(-1.32)	(-1.44)	(-1.03)	(-1.19)	(-1.26)
$\Delta \log OP_t^-$	-0.0007	-0.0004	0.0002	-0.0008	0.0011
	(-0.12)	(-0.06)	(0.04)	(-0.14)	(0.18)
$D_{1,t}$	0.0004	0.0004	0.0003	0.0009**	0.0005
	(1.13)	(1.15)	(0.78)	(2.28)	(1.23)
$D_{2,t}$	-0.0035	-0.0037	-0.0037	-0.0029	-0.0033
	(-1.07)	(-1.12)	(-1.10)	(-0.83)	(-1.00)
The GARCH Model					
μ_1	7.51e-08	7.38e-08	1.04e-07	4.18e-08	7.72e-08
	(0.46)	(0.51)	(0.66)	(0.09)	(0.47)
α_1	0.3927***	0.3891***	0.3903***	0.8099***	0.3930***
	(4.14)	(3.96)	(4.18)	(3.55)	(4.07)
β_1	0.7206***	0.7232***	0.7205***	-	0.7191***
	(15.05)	(14.49)	(15.04)		(14.37)
β_2	-	-	-	0.5123***	-
				(6.74)	
The Mean Equation - $\Delta \log P_t$					

Table 2. Cont.

$\Delta \log E_{t-1}$	0.2099	0.3593**	0.2473	-0.1157	0.3837**
	(1.51)	(2.28)	(1.40)	(-0.34)	(1.97)
$\Delta \log P_{t-1}$	0.1520	-0.0213	-0.0165	0.0380	-0.0142
	(1.39)	(-0.24)	(-0.22)	(0.51)	(-0.19)
$\Delta \log P_{us,t}$	0.3097***	0.3529***	0.3306***	1.0857***	0.3034***
	(4.32)	(4.71)	(3.40)	(4.75)	(2.61)
ΔID_t	0.0075***	0.0076***	0.0064***	0.0148***	0.0051**
	(6.57)	(5.68)	(3.05)	(3.43)	(2.26)
$\Delta \log RD_t$	0.0355	0.0349	0.1512	0.4034*	-0.0616
	(0.52)	(0.40)	(1.45)	(1.84)	(-0.44)
$\Delta \log OP_t^+$	-0.0221	-0.1248***	0.0720	0.0479	0.0162
	(-0.63)	(-2.91)	(1.32)	(0.38)	(0.21)
$\Delta \log OP_t^-$	0.1097***	0.0564	0.0226	0.0910	0.0120
	(3.63)	(1.11)	(0.43)	(0.84)	(0.20)
$D_{1,t}$	-0.0014	0.0033	0.0040	-0.0093	-0.0072
	(-0.29)	(0.77)	(0.76)	(-0.68)	(-0.90)
$D_{2,t}$	0.0175*	0.0019	-0.0411**	-0.0593*	0.0015
	(1.86)	(0.16)	(-2.02)	(-1.84)	(0.07)
The GARCH Model					
μ_1	0.0002*	0.0002*	0.0002**	0.0008	0.0002
	(1.70)	(1.84)	(2.15)	(1.65)	(1.53)
α_1	0.7364***	0.5325***	0.2512***	0.2019***	0.1103**
	(3.14)	(3.12)	(2.83)	(3.07)	(1.98)
β_1	0.2799	0.5172***	0.6903***	-	0.7953***
	(1.35)	(4.92)	(8.97)		(9.13)
β_2	-	0.2941**	-	0.7026***	-
		(2.53)		(8.45)	
Diagnostic Tests					
CCC	-0.0744	0.0481	-0.2337***	-0.1531**	-0.0341
	(-0.97)	(0.63)	(-3.30)	(-2.00)	(-0.45)
LL	1067.395	1006.68	1002.653	847.7086	977.2704
			Properties		
	DAMAN	MAH	TROPI	SP	TALAM
The Mean Equation - $\Delta \log E_t$					
$\Delta \log P_{t-1}$	0.0025**	0.0055***	0.0019	0.0067***	0.0020
	(2.03)	(2.87)	(0.81)	(2.93)	(1.09)
$\Delta \log E_{t-1}$	0.5587***	0.5274***	0.4074***	0.5779***	0.4104***
	(9.31)	(8.46)	(7.21)	(8.31)	(7.13)
$\Delta \log P_{us,t}$	-0.0103*	-	-	-	-0.0111
	(-1.82)				(-1.64)
$\Delta \log P_{us,t-1}$	-	-0.0148**	-0.0046	-0.0115*	-
		(-2.02)	(-0.78)	(-1.86)	
ΔID_t	0.0071***	0.0071***	0.0061***	0.0074***	0.0065***
	(16.75)	(15.90)	(11.69)	(15.48)	(11.41)
$\Delta \log RD_t$	-0.0009	0.0049	-0.0032	0.0034	-0.0099
	(-0.13)	(0.63)	(-0.59)	(0.47)	(-1.24)
$\Delta \log OP_t^+$	-0.0030	-0.0006	-0.0003	-0.0022	-0.0068
	(-0.75)	(-0.13)	(-0.03)	(-0.49)	(-1.28)
$\Delta \log OP_t^-$	-0.0034	0.0015	0.0001	0.0004	0.0009
	(-0.73)	(0.26)	(0.02)	(0.08)	(0.19)
$D_{1,t}$	0.0003	0.0001	0.0007*	0.00004	0.0009**
	(0.86)	(0.38)	(1.95)	(0.11)	(2.40)
$D_{2,t}$	-0.0038	-0.0040	-0.0035	-0.0033	-0.0037
	(-1.22)	(-1.11)	(-1.06)	(-0.88)	(-1.12)
The GARCH Model					
μ_1	5.44e-08	9.76e-08	-2.77e-07	3.71e-08	-9.72e-08
	(0.42)	(0.72)	(-0.63)	(0.33)	(-0.20)
α_1	0.4530***	0.4493***	0.9829***	0.4688***	0.8128***
	(3.87)	(3.99)	(3.34)	(4.11)	(3.28)

Table 2. Cont.

β_1	0.6898***	0.6854***	-	0.6793***	-
	(12.59)	(12.19)		(12.80)	
β_2	-	-	0.4754***	-	0.5235***
			(6.00)		(6.47)
The Mean Equation - $\Delta \log P_t$					
$\Delta \log E_{t-1}$	0.1664	-0.1650	0.2894	0.1758	0.6690
	(0.37)	(-0.44)	(0.64)	(0.60)	(1.48)
$\Delta \log P_{t-1}$	0.0720	0.0917	-0.0257	-0.1109	0.0860
	(0.84)	(1.14)	(-0.28)	(-1.49)	(1.24)
$\Delta \log P_{us,t}$	1.6948***	-	-	-	0.8502***
	(5.39)				(4.03)
$\Delta \log P_{us,t-1}$	-	0.2558	-0.0263	0.5490***	-
		(1.46)	(-0.12)	(3.25)	
ΔID_t	0.0046	0.0099***	0.0080	0.0079**	0.0116***
	(0.84)	(2.85)	(1.45)	(1.98)	(2.87)
$\Delta \log RD_t$	-0.1378	-0.0957	-0.1421	-0.1264	1.3027***
	(-0.39)	(-0.48)	(-0.41)	(-0.59)	(6.44)
$\Delta \log OP_t^+$	-0.1277	0.1687*	0.2226*	0.2179**	-0.0690
	(-0.61)	(1.69)	(1.87)	(2.29)	(-0.57)
$\Delta \log OP_t^-$	0.1682***	0.0025	0.0471	0.0313	0.2625**
	(0.86)	(0.02)	(0.43)	(0.37)	(2.06)
$D_{1,t}$	-0.0100	0.0161	-0.0212	0.0077	0.0116
	(-0.55)	(1.34)	(-1.64)	(0.69)	(0.96)
$D_{2,t}$	-0.0066	0.0083	-0.0365	-0.0294	0.0563*
	(-0.18)	(0.32)	(-1.48)	(-1.06)	(1.86)
The GARCH Model					
μ_1	0.0114***	0.0044***	0.0055***	0.0001	0.0047***
	(3.27)	(4.96)	(4.81)	(0.84)	(3.45)
α_1	0.7728**	0.6028***	0.1998	0.0724*	0.9593***
	(2.41)	(3.36)	(1.01)	(1.93)	(4.11)
β_1	0.0009	-0.0361	-	0.9003***	-
	(0.01)	(-0.51)		(16.12)	
β_2	-	-	0.1249	-	0.1010
			(0.79)		(1.35)
Diagnostic Tests					
CCC	-0.1399*	-0.1568**	-	-0.1713**	-0.0262
	(-1.85)	(-2.13)	0.2118***	(-2.34)	(-0.35)
			(-2.79)		
LL	757.4753	869.0951	849.6889	909.5833	786.9095
			Plantation		
	GENT	IOI	KUALA	UNIT	DUTA
The Mean Equation - $\Delta \log E_t$					
$\Delta \log P_{t-1}$	0.00003	0.0025	-0.0004	-0.0078	0.0009
	(00.01)	(0.94)	(-00.08)	(-1.46)	(0.75)
$\Delta \log E_{t-1}$	0.5329***	0.5447***	0.5356***	0.5265***	0.5462***
	(8.43)	(8.77)	(8.54)	(8.62)	(8.58)
$\Delta \log P_{us,t}$	-0.0097	-	-0.0097	-0.0116*	-0.0108
	(-1.30)		(-1.26)	(-1.73)	(-1.50)
$\Delta \log P_{us,t-1}$	-	-0.0056	-	-	-
		(-0.89)			
ΔID_t	0.0071***	0.0072***	0.0071***	0.0071***	0.0072***
	(14.93)	(15.88)	(14.96)	(15.64)	(15.14)
$\Delta \log RD_t$	0.0009	0.0056	0.0007	-0.0009	0.0030
	(0.10)	(0.67)	(0.08)	(-0.11)	(0.33)
$\Delta \log OP_t^+$	-0.0044	-0.0057	-0.0047	-0.0061	-0.0046
	(-0.98)	(-1.28)	(-1.01)	(-1.50)	(-1.06)
$\Delta \log OP_t^-$	0.0015	0.0045	0.0023	0.0014	0.00007
	(0.22)	(0.77)	(0.36)	(0.26)	(00.01)
$D_{1,t}$	0.0004	0.0003	0.0004	0.0005	0.0004
	(0.89)	(0.96)	(0.96)	(1.43)	(1.05)
$D_{2,t}$	-0.0028	-0.0022	-0.0026	-0.0034	-0.0035
	(-0.85)	(-0.67)	(-0.81)	(-1.02)	(-1.08)

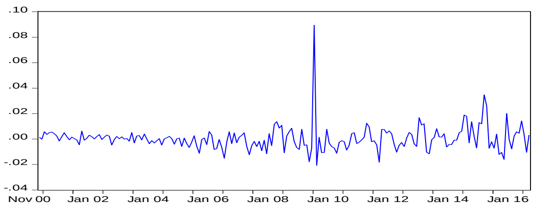
Table 2. Cont.

The GARCH Model					
μ_1	9.00e-08	3.52e-08	9.21e-08	6.46e-08	8.49e-08
	(0.56)	(0.21)	(0.57)	(0.43)	(0.54)
α_1	0.3895***	0.4306***	0.3960***	0.4102***	0.3893***
	(4.18)	(4.04)	(4.06)	(3.97)	(4.11)
β_1	0.7218***	0.6988***	0.7178***	0.7122***	0.7227***
	(15.18)	(13.60)	(14.43)	(13.86)	(15.11)
The Mean Equation - $\Delta \log P_t$					
$\Delta \log E_{t-1}$	0.2816	0.2949	0.2015	0.0127	-0.1981
	(0.94)	(1.34)	(0.93)	(0.07)	(-0.46)
$\Delta \log P_{t-1}$	0.1456*	0.2325***	-0.0592	0.0090	-0.0996
	(1.65)	(4.24)	(-0.74)	(0.13)	(-1.24)
$\Delta \log P_{us,t}$	0.5408***	-	0.3106**	0.4554***	1.0541***
	(3.32)		(2.47)	(4.47)	(6.05)
$\Delta \log P_{us,t-1}$	-	0.0950	-	-	-
		(0.86)			
ΔID_t	0.0066*	0.0054**	0.0062**	0.0043**	0.0064
	(1.83)	(2.39)	(2.21)	(2.05)	(1.16)
$\Delta \log RD_t$	0.3498*	0.6736***	0.2115	-0.0090	0.6190***
	(1.84)	(5.77)	(1.37)	(-0.07)	(2.64)
$\Delta \log OP_t^+$	0.2722***	0.2246***	0.1333	0.1419**	-0.1448
	(2.72)	(3.25)	(1.62)	(2.39)	(-1.27)
$\Delta \log OP_t^-$	-0.0289	0.0741	0.0054	-0.0216	0.0032
	(-0.35)	(1.24)	(0.07)	(-0.42)	(0.03)
$D_{1,t}$	0.0039	0.0189***	0.0013	0.0032	0.0107
	(0.34)	(2.71)	(0.16)	(0.54)	(0.70)
$D_{2,t}$	-0.0539**	-	-0.0529**	-0.0079	-
	(-2.48)	0.0442***	(-2.18)	(-0.51)	0.0679***
		(-3.66)			(-2.89)
The GARCH Model					
μ_1	0.0030***	0.0020***	0.0002*	0.0001	0.0041***
	(2.67)	(4.48)	(1.71)	(1.27)	(4.25)
α_1	0.1676	0.9775***	0.1141**	0.1161*	1.1121***
	(1.15)	(4.16)	(2.51)	(1.84)	(4.68)
β_1	0.1768	-0.0408	0.8147***	0.8123***	0.0217
	(0.57)	(-1.57)	(13.05)	(8.36)	(0.46)
Diagnostic Tests					
CCC	-0.1331*	-0.1425*	-0.1575**	-0.0382	0.0291
	(-1.78)	(-1.85)	(-2.16)	(-0.51)	(0.39)
LL	913.2593	919.819	953.8629	1000.222	818.358

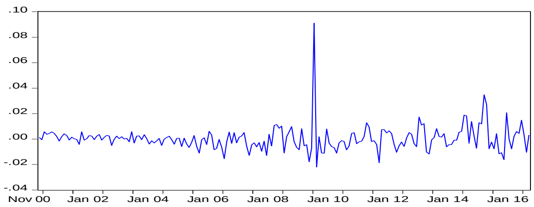
Notes: E_t is real exchange rate. P_t is real stock price. $P_{us,t}$ is real US real stock price. ID_t is real interest differential. RD_t is relative demand. OP_t^+ is positive real oil price. OP_t^+ is negative real oil price. $D_{1,t}$ is the dummy variable to capture the fixed exchange rate of RM/USD at RM3.80/USD, that is, from January 2000 to April 2005 is 1 and the rest is 0, is used. $D_{2,t}$ is the dummy variable to capture the influence of the global financial crisis, 2008, that is, from January to December 2008 is 1 and the rest is 0, is used. Others refer to stocks from technology, infrastructure and finance sectors. μ_1 is constant. α_1 and β_1 are coefficient of the GARCH model. CCC is constant conditional correlation. LL is the log-likelihood statistics. Values in the parentheses are the z statistics. *** (**, *) denotes significance at the 1% (5%, 10%) level.

Figure 2 shows the evolution of the conditional correlations of real exchange rate returns and real stock price returns. In all cases, the plot shows that the conditional correlations fall within the range of -0.04 to 0.1, which implies that the conditional correlations fluctuate from negatively to positively in a small range. Generally, real exchange rate return and real stock price return fluctuates throughout the sample period with the conditional correlations are found to be high in the period of about the global financial crisis, 2008.

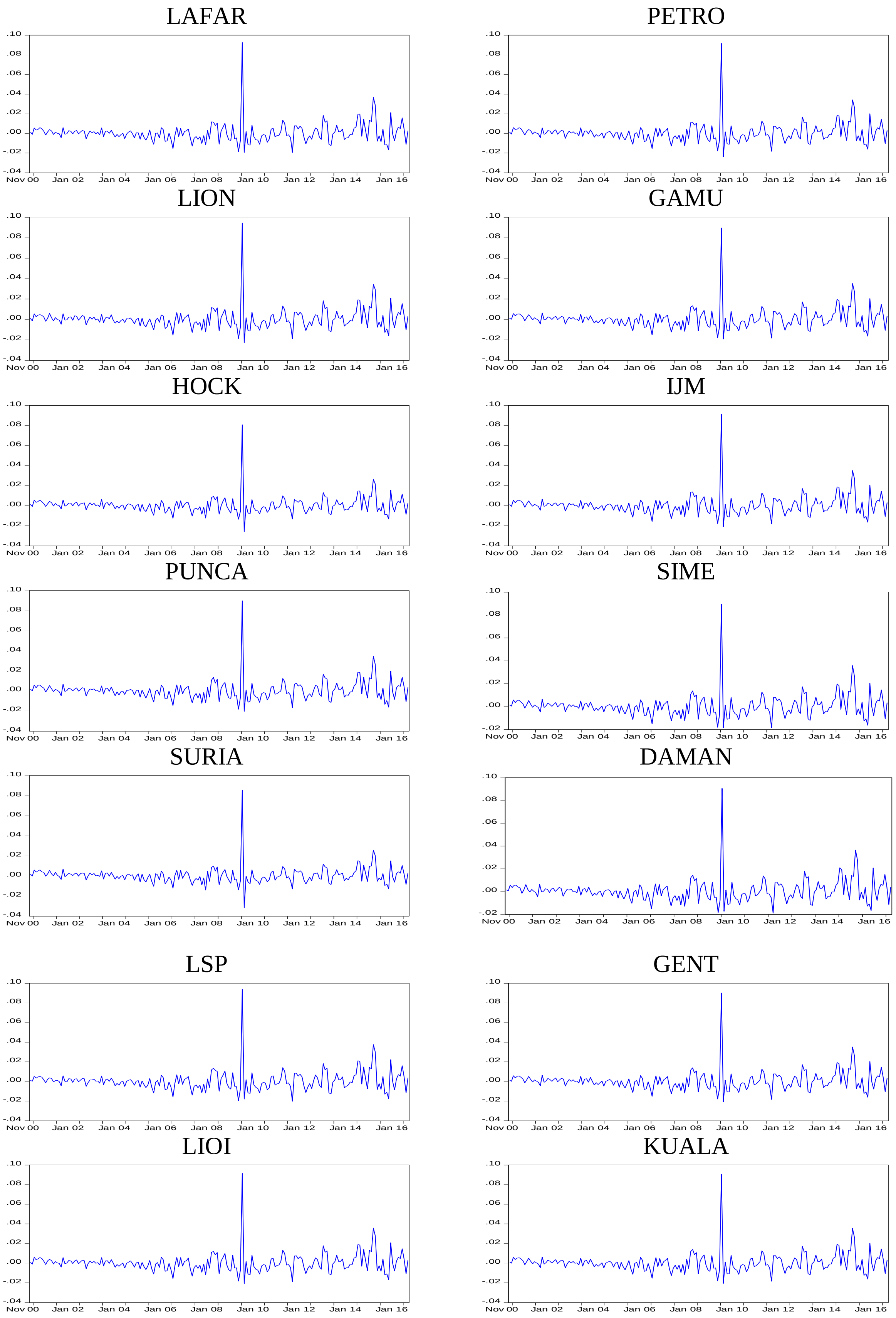
BURSA



HONG



Real Exchange Rate Return and Real Stock Price Returns



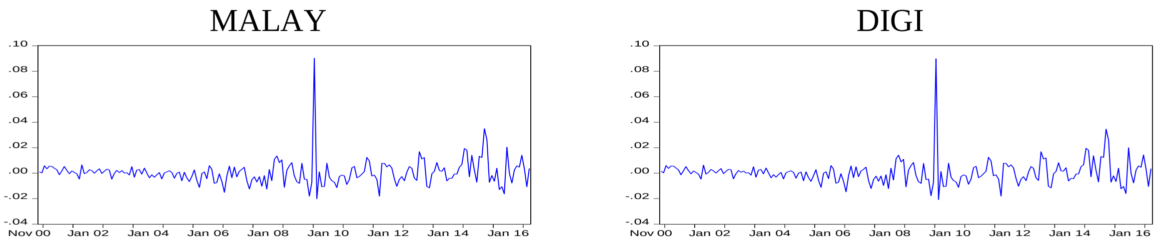


Figure 2 The Conditional Correlations between Real Exchange Rate Return and Real Stock Price Returns

The results of the Dickey and Fuller unit root test statistic for the conditional variances of real exchange rate returns and real stock price returns are reported in Table 3. The lag length used to compute the Dickey and Fuller unit root statistics are based on the AIC. On the whole, the Dickey and Fuller unit root test statistic shows that all the conditional variances are said to be stationary, except the conditional variances of real stock price of HWA and SP and the conditional variance of real exchange rate for the case of IJM. For the variables which are found to be non-stationary, the estimation of Granger causality will be in the first difference.

Table 3 The Results of the Dickey and Fuller Unit Root Test Statistic for the Conditional Variances of Real Exchange Rate Returns and Real Stock Price Returns

			Bursa/Others		
	BURSA	AMTEL	MALAY	DIGI	BIMB
Δ log RER_t	-3.0275**(1)	-2.9316**(1)	-3.0465**(1)	-2.9171**(1)	-3.0759**(1)
Δ log RSP_t	-5.2134***(8)	-6.0668***(3)	-3.8648***(4)	-3.4033**(1)	-7.2583***(0)
			Consumer Product		
	HWA	FRAS	HONG	NEST	UMW
Δ log RER_t	-2.9826**(2)	-2.9340**(1)	-3.1083**(1)	-3.7913***(2)	-2.9759**(1)
Δ log RSP_t	-2.0518(1)	-13.3992***(0)	-8.0040***(0)	-13.1179***(0)	-3.1143**(0)
			Industrial Product		
	LAFAR	PETRON	PETRO	SAPUR	LION
Δ log RER_t	-3.3515**(1)	-3.0319**(1)	-3.0905**(1)	-2.9603**(1)	-3.1722**(1)
Δ log RSP_t	-2.8755*(1)	-6.9948***(1)	-10.5286***(0)	-0.3905(0)	-5.7761***(4)
			Construction		
	GAMU	HOCK	IJM	PUNCA	EKO
Δ log RER_t	-3.0805**(1)	-3.3991**(1)	-3.1226(1)	-3.0813**(1)	-2.9647**(1)
Δ log RSP_t	-2.7140*(9)	-6.7984***(0)	-2.8817**(4)	-6.0890***(0)	-4.5714***(0)
			Trading/Services		
	AMW	STAR	SIME	SURIA	TELE
Δ log RER_t	-4.0744***(2)	-2.9447**(1)	-2.9591**(1)	-3.3659**(1)	-3.0891**(1)
Δ log RSP_t	-4.6159***(4)	-5.7357***(0)	-2.8359*(1)	-3.2885**(2)	-3.2581**(4)
			Properties		
	DAMAN	MAH	TROPI	SP	TALAM
Δ log RER_t	-2.3330**(1)	-3.1611**(1)	-3.6444***(1)	-3.1622***(1)	-3.3397**(1)
Δ log RSP_t	-3.1418**(4)	-11.3849***(0)	-5.2615***(1)	-1.7484(3)	-11.5694***(0)
			Plantation		
	GENT	IOI	KUALA	UNIT	DUTA
Δ log RER_t	-2.9558**(1)	-3.0725**(1)	-2.9803**(1)	-3.0387**(1)	-2.9398**(1)
Δ log RSP_t	-10.1864***(1)	-12.2582***(0)	-2.8663*(0)	-2.8457*(4)	-10.7263***(1)

Notes: RER_t is real exchange rate. RSP_t is real stock price. The Dickey and Fuller unit root test statistic is estimated with the model included a constant only. Values in the parentheses are the lags used in the estimation of the Dickey and Fuller unit root test statistic. *** (**, *) denotes significance at the 1% (5%, 10%) level.

The Granger causality tests for the conditional variances of real exchange rate returns and real stock price returns are reported in Table 4. The lag length used to compute the Granger causality test statistic is based on the AIC. The results show that there is no evidence of Granger causality between the conditional variance of real exchange rate return and the conditional variance of BURSA. However, the conditional variance of real exchange return is found to Granger cause the conditional variances of some real stock price returns, namely PETRO and PUNCA. Conversely, the conditional variances of real stock price returns of HWA, HONG, PUNCA, MAH, IOI and DUTA are found to Granger cause the conditional variance of real exchange rate return. The conditional variance of real stock price return in the stock market of Malaysia has relatively more predictive powers to the conditional variance of real exchange rate than the conditional variance of real exchange rate on the conditional variance of real stock price return.

Table 4 The Granger Causality Tests of the Conditional Variances of Real Exchange Rate Returns and Real Stock Price Returns

			Bursa/Others		
	BURSA	AMTEL	MALAY	DIGI	BIMB
Δ log RSP_t $\rightarrow$ Δ log RER_t	1.1774(1)	0.4011(2)	0.0002(1)	2.5080(2)	2.1198(2)
Δ log RER_t $\rightarrow$ Δ log RSP_t	2.6896(1)	2.4574(2)	0.0290(1)	2.3091(2)	0.8336(2)
			Consumer Product		
	HWA	FRAS	HONG	NEST	UMW
Δ log RSP_t $\rightarrow$ Δ log RER_t	0.1762(1)	0.1577(1)	1.7547(1)	0.6371(2)	1.4050(1)
Δ log RER_t $\rightarrow$ Δ log RSP_t	0.0061(1)	0.2688(1)	6.6482**(1)	0.5969(2)	0.9149(1)
			Industrial Product		
	LAFAR	PETRON	PETRO	SAPUR	LION
Δ log RSP_t $\rightarrow$ Δ log RER_t	0.1766(2)	2.7815(2)	4.6377**(1)	0.7824(1)	2.1742(2)
Δ log RER_t $\rightarrow$ Δ log RSP_t	0.8654(2)	3.5952(2)	2.0260(1)	1.1393(1)	1.0576(2)
			Construction		
	GAMU	HOCK	IJM	PUNCA	EKO
Δ log RSP_t $\rightarrow$ Δ log RER_t	0.7264(2)	2.0608(2)	0.2664(1)	3.0170*(1)	0.4833(1)
Δ log RER_t Δ log RSP_t	2.8768(2)	0.7594(2)	0.2774(1)	4.8737**(1)	0.7456(1)
			Trading/Services		
	AMW	STAR	SIME	SURIA	TELE
Δ log RSP_t $\rightarrow$ Δ log RER_t	0.8216(3)	0.3258(1)	0.8969(2)	0.5499(2)	0.1292(2)
Δ log RER_t $\rightarrow$ Δ log RSP_t	0.8816(3)	0.4207(1)	0.1235(2)	1.1503(2)	1.9297(2)
			Properties		
	DAMAN	MAH	TROPI	SP	TALAM
Δ log RSP_t $\rightarrow$ Δ log RER_t	0.4246(2)	0.1119(1)	0.0047(2)	0.8874(2)	1.2134(2)
Δ log RER_t $\rightarrow$ Δ log RSP_t	0.1863(2)	5.0738**(1)	1.5003(2)	1.4938(2)	0.0627(2)
			Plantation		
	GENT	IOI	KUALA	UNIT	DUTA
Δ log RSP_t $\rightarrow$ Δ log RER_t	0.2287(1)	0.0921(1)	0.0079(1)	0.4732(1)	0.1078(1)
Δ log RER_t $\rightarrow$ Δ log RSP_t	2.2507(1)	3.4577*(1)	1.4395(1)	1.7732(1)	2.8652*(1)

Notes: RER_t is real exchange rate. RSP_t is real stock price. The arrow "→" denotes no Granger causality. Values in the table are the Wald test statistics. Values in the parentheses are the lags used in the estimation of the F test statistic. ** (*) denotes significance at the 5% (10%) level.

The results of the CCC-MGARCH models show that real exchange rate return and overall real stock price return in the stock market of Malaysia as well as real exchange rate return and about half of individual real stock price returns examined are respectively to be negatively and significantly correlated. Thus, real exchange rate return and real stock price return are mostly negatively linked. The conditional variances of real exchange rate return and real stock price returns are mostly found to be stationary and thus there is no long-run relationship between the conditional variances of real exchange rate return and real stock price returns. The transmission of risk between the exchange rate market and the stock market shall be limited in the short run. Conversely, Yau and Nieh (2009) and Wu et al. (2012), amongst others, report that there is long-run relationship between exchange rates and stock prices. Ibrahim (2000), Nieh and Lee (2001), Zhao (2010) and Lean et al., (2011), amongst others, find the relationship between exchange rate and stock price is in the short run. In the global financial crisis, the conditional correlations of real exchange rate return and real stock price return were found to be high. Wong and Li (2010), Caporale et al.,(2014) and Sui and Sun (2016), amongst others also report that the relationship between exchange rate return and stock price return are high in the financial crisis period. Lin (2012) finds that the comovement between exchange rates and stock prices becomes stronger during the crisis periods when compared with the tranquil periods.

There is no evidence of Granger causality between the conditional variances of real exchange rate return and real stock price returns for the stock market of Malaysia, except several stocks there are evidence of Granger causality. Wu et al. (2012) reveal that there is no evidence of Granger causality between the US dollar exchange rate and stock price in the Philippines. Real exchange rate and real stock price could be influenced by other factors (Pan, et al. 2007). Ülkü and Demirci (2012) demonstrate that the instantaneous movement of exchange rate and stock price depends on the depth of the stock market. For real stock price returns of PETRO and PUNCA, the evidence of Granger causality between the conditional variances of real exchange rate return and real stock price returns support for the good market approach. Pan et al. (2007), Yau and Nieh (2009) and Lean et al., (2011), amongst others, show that the good market approach is more important in explaining the relationship between the exchange rate market and the stock market. Contrarily, Lin (2012), Tsai (2012) and Liang et al., (2013), amongst others, demonstrate that the portfolio balance approach is more important in explaining the relationship between the exchange rate market and the stock market. For real stock price returns of HWA, HONG, PUNCA, MAH, IOI and DUTA, the evidence of Granger causality between the conditional variances of real exchange rate return and real stock price returns support for the portfolio balance approach. Hence, the good market approach and the portfolio balance approach are both found to be important in Malaysia. However, the portfolio balance approach is marginally found to be more importance than the good market approach. The government can use the exchange rate market to influence the stock market and the stock market performance can influence the exchange rate market. Economic growth implies firm growth which can appreciate exchange rate. Conversely, depreciation of exchange rate might lead to economic growth of an economy. The growth and development of the exchange rate market and the stock market are both important for economic growth (Zhao, 2010; Lin, 2012). Tule et al. (2018) report the long run uni-directional Granger causality from the stock market to the foreign exchange market without breakpoints but a bi-directional Granger causality across both markets is found with breakpoints. The short run uni-directional Granger causality from stock market to the foreign exchange market is found without breakpoints but no Granger causality across markets is found with breakpoints. A suitable foreign exchange management framework shall be proposed to reduce the stock market volatility.

CONCLUDING REMARKS

This study investigates the relationships between real exchange rate return and real stock price returns in the stock market of Malaysia, namely overall real stock price return and individual stocks of Shariah-compliant securities using a multivariate framework of the CCC-MGARCH model. The CCC-MGARCH model is estimated included additional variables, namely the lag of real exchange rate return, the lag of real stock price return, the real US stock price return or the lag of the real US stock price return, real interest rate differential, relative demand, a dummy variable to capture the influence of the fixed RM against the US dollar exchange rate and a dummy variable to capture the influence of the global financial crisis. There is significant constant conditional correlation between real exchange rate return and real stock price returns of BURSA and about half of individual real stock price returns. Real exchange rate return and real stock price return are mostly negatively linked. The good market approach is much more important in explaining the relationship between real exchange rate return and real stock price return. The conditional correlations are found to be high in the global financial crisis period. There are no long-run relationships between the conditional variances of real exchange rate return and real stock price returns. This implies that volatility or risk spillover across the exchange rate and stock markets would not happen in the long run. Moreover, there is no evidence of Granger causality between the conditional variances of real exchange rate return and real stock price return of BURSA but some evidence of Granger causality between the conditional variances of real exchange rate return and real stock price returns of individual stocks. There is some evidence of the good market approach and the portfolio market approach in explaining the relationships between the conditional variances of real exchange rate return and real stock price returns. Nonetheless, the portfolio balance approach is marginally found to be more importance than the good market approach. The diversity of the relationships between real exchange rate return and real stock price returns in the list of Shariah-compliant securities could be an indication for investors to diversify their portfolio investment among Shariah-compliant securities in the stock market of Malaysia. The information from the exchange rate market is useful to predict the behavior of Shariah-compliant securities and vice versa.

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