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Stylized Facts and Impact of Oil Price Shocks on International Shariah Stock Markets

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ABSTRACT

This paper is undertaken to study the stylized facts of three international Shariah stock markets (i.e., FTSE China Shariah, FTSE Bursa Malaysia Emas Shariah and S&P Pan Asia Shariah) and its responses to the oil price shocks. Results denote the presence of volatility clustering and long memory volatility in the three international Shariah stock markets examined. Besides that, FTSE China Shariah and S&P Pan Asia Shariah stock markets illustrate the existence of leverage effect whereby bad news influences the volatility greatly as compared to good news. In contrast, there is no leverage effect captured in the FTSE Bursa Malaysia Emas Shariah stock market. Meanwhile, the effect of shocks to the conditional volatility displays a hyperbolic rather than an exponential decaying rate. In terms of impact of oil price shocks to the three international Shariah stock markets examined, Brent and WTI crude oil returns demonstrate significant responsive to the three international Shariah stock returns investigated. However, return volatility of Brent and WTI crude oil show insignificant responsive to three international Shariah stock returns and its volatility. Last but not least, the risk-return tradeoff parameter in overall is statistically

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insignificant for the three international Shariah stock markets examined.

Key words: stylized facts, oil prices shocks, Shariah stock markets

INTRODUCTION

The past few years have seen a surge into research pertaining to stylized facts as well as the interaction of oil price shocks and stock market performance. These issues have become the attention of investors and market analysts due to the fact that oil commodities play an important character in the global economy. Stylized facts are defined as some consistent observations that have been debated in many contexts; from a widespread of mechanisms to various financial segments and time spans. Generally, stylized facts are widely understood to be empirical true, to which theories must fit. (Cont, 2001; 2008, Mukherjee et. al. 2011). Some common stylized facts in the studies of asset returns are volatility clustering, leverage effect, long memory volatility and risk-return tradeoff. Coolen (2004), Ding et al., (1993) and Mukherjee et al., (2011) indicated that stylized facts tend to be quantitative. Since stylized facts are universal regularities, it therefore can be thought to have some common origin. However, stylized facts are not accurate enough to argue among different parametric models due to its generality. A numbers of recent researches concerning about stylized facts are Creti et al., (2012), Dellate and Lopez (2012), and He and Zheng (2008). Though, none of the studies investigated the returns and volatility movements of Shariah stock markets or Islamic stock markets.

The conventional and Shariah stock markets are two important financial markets in nowadays. Shariah stock markets or Islamic stock markets are recognized as a platform for investors to evade the inflation threats, besides acting as an indicator to enhance the economic development (Mohd Hussin and Borhan, 2009). In the middle of 1990s, the international financial market had seen a drastic growth of Islamic funds globally as Islamic funds play a crucial character in promoting investment in equity shares, create liquidity, reduce frauds, manipulations, insider trading, short-selling and under arbitrage in the market. Theoretically, the Islamic equity markets are prominently differing from the conventional counterparts due to the role of Shariah (Islamic law) screening. The contemporary Shariah scholars have come out with the general rules to assess whether a firm is halal (lawful) or haram (unlawful) to invest (Derigs and Marzban, 2008). According to Shariah rules, businesses related to immoral activities such as liquor and gambling are prohibited and the most distinct characteristic of Islamic firms would be the limit of leverage using interest-based debts. Consequently, the filtering criteria will take out the large non-compliant firms from the pool of investable equities, leaving

the remaining Shariah compliant firms available to become smaller and portray more volatile returns (Hussien and Omran, 2005). In other words, the small size of firms, lower leverage and under-diversification of the market will be the main distinctive feature of Islamic equity market. Moreover, the Islamic stock markets prefer growth and are small cap oriented while conventional stock markets favour more value and are mid cap focused.

Another important factor that drives the global economic growth is the movements of crude oil prices. Due to the importance of oil in the worldwide economy, an upsurge in oil prices may affect the economy in different ways, especially the rise in the production cost for goods and services, which will indirectly affect the inflation rate, consumer confidence and particularly, the financial markets. Hence, studies have been conducted to investigate the impact of oil price shocks on stock market performance, such as Ratti and Hasan (2013), Yang et al. (2013), Babatunde et al. (2012) and Kilian and Park (2009). In United States, journalists and stock market commentators believed that oil price shocks will have direct effect on stock markets. In fact, the effect might be depends on the historical crude oil price behaviour; which suggested that the relationship between oil price shocks and stock returns might be nonlinear (Alsalman and Herrera, 2015).

Meanwhile, study of Degiannakis et al. (2013) suggested that oil price returns and volatility possess the power to forecast the state of stock market returns and volatility. On the other hand, Driesprong et al. (2008) indicated that oil price change predicts stock prices in many economics while Papapetrou (2001) showed, in fact, that oil price forms an important component in explaining stock price movements, and the increases in oil price shocks induce serious depressions in real stock returns. Yet, as compared to the extensive literature on the impact of oil price shocks on the conventional stock markets, the Shariah stock market impact and its related issues have remained largely unexplored (Mohd Hussin et al., 2012) due to many have claimed that Islamic stock markets tend to be relatively safer market, particularly during the financial turmoil.

The recent 2008 global financial crisis had significantly impacted the aforementioned Shariah and crude oil markets. Truthfully, Islamic stock markets are not spared from the global financial crisis as all the Islamic stock markets were adversely affected by the crisis (Kassim, 2010). This can be reflected by the lower returns and more volatile nature of the Islamic stock markets in the crisis period than the non-crisis period. Even though no convincing performance differences can be detected between Islamic and conventional stock markets up until year, 2007, changes in performance of stock indices are attributed mainly to the 2008 global financial crisis, where preliminary evidence tends to support the stability of Islamic indices during that period (R. Rizvi and Arshad, 2014). Thus, research

in this area is still needed as an Islamic stock index measures the performance of a certain basket of securities and these securities are permissible for the Muslim to invest. Besides, it is the best alternative types of investment for conventional stock indices that are either ethical or have potential to hedge against risk.

Therefore, this paper aims to identify the stylized facts of international Shariah stock markets and thereafter filling the gap by exploring the relation between oil price shocks and international Shariah stock markets performance. To the best knowledge of the authors, this is the first paper that combines the study of stylized facts and interaction of oil price shocks to stock markets. Therefore, it is worth the authors' effort to study the impact of oil prices shocks on Shariah stock markets as this will facilitate the portfolio managers and investors in considering and deciding their investments in the Shariah stock markets. The paper continues as follows. Section 2 states the data and methodology applied in order to determine the behavioural market movements and investigate the interaction between oil price shocks and international Shariah stock returns, volatility, and return volatility. Section 3 interprets and discusses the results obtained from the analysis. Last but not least, concluding remarks and recommendations are provided in Section 4.

DATA AND METHODOLOGY

Sample Data

Sample data for this study consists of crude oil markets and international Shariah stock markets (Table 1). In this study, the authors consider the Brent and WTI crude oil as oil plays a vital character in the global economy and thus become the key driven for modernization and industrialization. In terms of stock indices, three international Shariah stock markets from the seven major international stock markets in East Asia studied by Saiti and Masih (2014) are considered as these are the only three Shariah stock markets among the seven major international stock markets in East Asia. The spot prices of crude oil markets and international Shariah stock markets are gathered from the Energy Information Administration (EIA) webpage and Datastream database respectively. The Shariah stock markets are deserved to be separately tested is not to forecast the movements of stock markets. Rather,

Table 1 Sample data

Crude Oil	International Shariah Stock
1. Brent	1. FTSE Shariah China
2. West Texas Intermediate (WTI)	2. FTSE Bursa Malaysia Emas Shariah
	3. S&P Pan Asia Shariah

the authors seek to generate the return and volatility series using GARCH-class models to so that the objective of examining the interaction between oil price shocks and international Shariah stock returns, volatility, and return volatility can be appropriately accomplished.

In fact, Kabir, Bacha and Masih (2013) found that both the returns and volatility in Islamic equity markets are affected by the financial turmoil (i.e., volatility of Islamic equity indices decrease dramatically). Therefore, the sample period for this study is from 01 January 2010 to 31 March 2014 to avoid any possible effect from the 2008 global financial crisis that had erupted on the 15 September of year 2008, the day whereby Chapter 11 protection was filed by Lehman Brothers (Wen *et al.,* 2012).

The return series that have been applied regularly in the conditional mean are well-determined as

$$r_t = 100 \times \ln (P_{t,close} / P_{t-1,close}) \tag{1}$$

whereby $P_{t,close}$ and r_t in the above specification are refer to the close-to-close prices and the returns for $t = 1, 2, \ldots T$ respectively. Figure 1 demonstrates the plot of return series for the sample data.

Generalized Autoregressive Conditional Heteroscedasticity (GARCH) Model

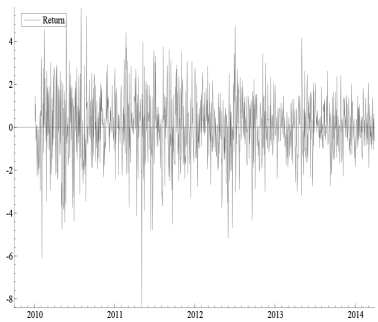
Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model was first introduced by Bollerslev (1986). This model is then implemented by Elyasiani (2011) and Sadorsky (2006) with the objective of estimating the conditional variance; which can also be used to approximate the oil return volatility. The estimated oil return volatility via GARCH (1,1) was realized to be well fitted in exploring the impact of oil price shocks on stock returns (Ratti and Hasan, 2013; Sardosky, 1999). Mathematically, the GARCH (1,1) specification is represented by

$$r_{o,t} = \gamma_0 + \sum_{i=1}^{i=p} \gamma_i r_{o,t-1} + \varepsilon_i$$

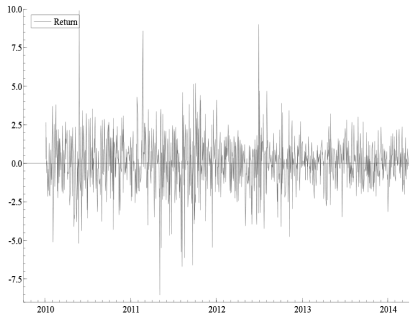
$$\varepsilon_i \Big| I_{t-1} \sim N\left(0, \sigma_{o,t}^2\right), t = 1,2,\ldots T \tag{2}$$

whereby ε_i is the error term, a random variable. The mean and variance of the error term are 0 and $\sigma_{o,t}^2$ respectively. Besides that, the variance term, $\sigma_{o,t}^2$ is depends on the information set of I_{t-1}.

Crude Oil Markets

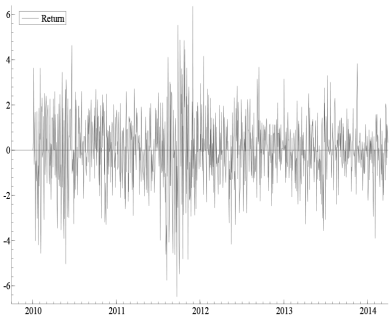


Brent

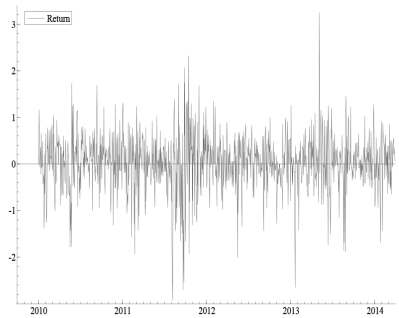


WTI

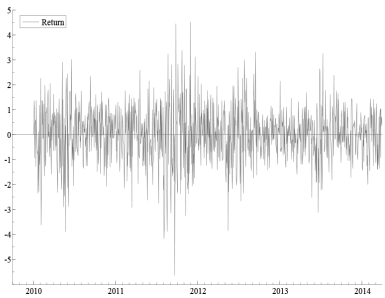
International Shariah Stock Markets



FTSE China Shariah



FTSE Bursa Malaysia Shariah Emas



S&P Pan Asia Shariah

Figure 1 Plot of return series for the sample data

Meanwhile, the conditional volatility of oil returns at time period, t is the specification of autoregressive term and squared of past residuals. The specification is therefore denoted as

$$\sigma_{o,t}^2 = \omega_0 + \omega_1 \varepsilon_{t-1}^2 + \omega_2 \sigma_{o,t-1}^2 \tag{3}$$

whereby $\sigma_{o,t}^2$ is the conditional oil return volatility at the time span of t–1 and I_{t-1} is the squared of past residuals.

Fractionally Integrated Asymmetric Power Autoregressive Conditional Heteroscedasticity (FIAGARCH) Model

The Fractionally Integrated Asymmetric Power Autoregressive Conditional Heteroscedasticity (FIAPARCH) model is introduced by Tse (1999). This model is able to increase the flexibility of conditional volatility specifications via allowing for long memory volatility, asymmetric response of volatility to both the positive and/or negative shocks as well as the power of returns. For FIAPARCH model, the predictable structure in the volatility pattern is the strongest (Conrad et al., 2008). Besides that, FIAPARCH model is also considered the stable model under special cases, whereby it able to nest the formulation without power effects. The specification for FIAPARCH (1,d,1) model is specified as:

$$\sigma_t^{\delta} = \omega(1-\beta)^{-1} + \left[1 - (1-\beta L)^{-1}(1-\phi L)(1-L)^d\right]\left(|\varepsilon_t| \gamma\varepsilon_t\right)^{\delta} \tag{4}$$

restricted to $\omega > 0$, $\phi < 1$, $\delta > 0$, $\beta < 1$, $-1 < \gamma < 1$ and $0 \leq d \leq 1$. The process of FIAPARCH will reduce to FIGARCH 1 as when $\gamma = 0$ and $\delta = 0$.

Stock Return Model

GARCH-M model by Ratti and Hasan (2013) is implemented in this study to formulate the returns as well as the conditional volatility of international Shariah stock markets. Essentially, GARCH-M model estimates the conditional return volatility as in the variance specification and concurrently, it lets the volatility to influence the stock returns in the mean specification. In other words, GARCM-M model has the capability to determine the impact of oil price returns to the

international Shariah stock returns and its return volatility concurrently. The function for GARCH-M model is represented as

$$r_{i,t} = c_i + \delta_{i1} r_{i,t-1} + \delta_{i2} r_{0,t-1} + \delta_{i3} \sigma^2_{o,t} + \lambda \ln(h^2_{i,t}) + \varepsilon_{i,t} \quad (5)$$

where

$r_{i,t}$ is the excess returns of international Shariah stock market at time span of t

$r_{i,t-1}$ is the excess returns of international Shariah stock market at time span of t -1

$r_{0,t-1}$ is the oil price returns at time span of t-1

$\sigma^2_{o,t}$ is the conditional oil return volatility at times pan of t-1

$h^2_{i,t}$ is the conditional variance

$\varepsilon_{i,t}$ is the residuals term

Meanwhile, the volatility of international Shariah stock returns at the time t is defined by

$$h^2_{i,t} = \omega + \alpha_i \varepsilon^2_{i,t} + \beta h^2_{i,t-1} + \rho_i \sigma^2_{o,t} \quad (6)$$

where

$h^2_{i,t}$ is the conditional variance of international Shariah stock markets

is the past residuals

$\varepsilon^2_{i,t-1}$ is the autoregressive term

$\sigma^2_{o,t}$ is the conditional oil return volatility at time span of t–1

restricted to $\alpha > 0$, $\beta \geq 0$ and $(\alpha_i + \beta_i) < 1$, i = 1, 2,....., J. $\varepsilon_{i,t}$ is a random variable. The mean of the error term, $\varepsilon_{i,t}$ is 0. Besides that, both the $\varepsilon_{i,t}$ and $h^2_{i,t}$ is dependent to the information set of ψ_{t-1}.

The parameter of $r_{0,t-1}$, δ_2 in the Equation (5) detects the influence of oil price returns to the international Shariah stock markets. Meanwhile, the parameter δ_3 in the Equation (5) and parameter ρ in the Equation (6) respectively explain the impact of oil price return volatility to the international Shariah stock returns and return volatility.

EMPIRICAL RESULTS

Descriptive Statistics

Table 2 illustrates the descriptive statistics of the three international Shariah stock markets return series examined over the time span from 01 January 2010 to 31 March 2014.

Table 2 Descriptive statistics of international shariah stock markets return series

	FTSE China Shariah	FTSE Bursa Malaysia Emas Shariah	S&P Pan Asia Shariah
Mean	–0.0087356	0.03929	0.02677
Std. Dev.	1.4667	0.58656	1.0868
Minimum	–6.481	–2.9242	–5.6377
Maximum	6.3621	3.2472	4.5295
Skewness	–0.20013**	–0.46689**	–0.24633**
Excess Kurtosis	1.6813**	2.2961**	1.7578**
Jarque–Bera	137.78**	541.33**	153.71**
No. of Obs.	1107	1107	1107

Note: ** denotes 1% level of significance

The sample mean of the three international Shariah stock markets examined show a mixture of positive and negative coefficient and the values are close to zero. Comparatively, sample mean of FTSE China Shariah is relatively smaller than the sample mean of FTSE Bursa Malaysia Emas Shariah and S&P Pan Asia Shariah. Besides that, the standard deviation of FTSE China Shariah and S&P Pan Asia Shariah denote a higher value as compared to FTSE Bursa Malaysia Emas Shariah, implying that prices for FTSE China Shariah and S&P Pan Asia Shariah are more volatile than the prices of FTSE Bursa Malaysia Emas Shariah. Meanwhile, FTSE Bursa Malaysia Emas Shariah signifies higher kurtosis and heavier tails as compared to the FTSE China Shariah and S&P Pan Asia Shariah. Finally, Jarque-Bera statistic of the three international Shariah stock markets examined suggests that the hypothesis for normality is to be rejected at 1% significance level.

Stylized Facts

The result of estimation process for the three international Shariah stock markets in East Asia from 01 January 2010 to 31 March 2014 using GARCH model and FIAPARCH model respectively are illustrated in Table 3 and Table 4. From the results obtained, some common stylized facts were detected.

All the three international Shariah stock markets investigated display a positively insignificant of first-order of autocorrelation AR (1), which might be considered a specific form of "persistent" but uncorrelated. According to Cont (2005), even though the returns were uncorrelated, its absolute returns or return squares displayed a persistent, positively significant as well as slowly decayed

of autocorrelation function, which was recognized as a main sign for presence of volatility clustering.

Besides, the GARCH and FIAPARCH models with generalized error distribution (GED) also show heavy-tail, which is represented by the degree of freedom, *v*. The three international Shariah stock markets examined exhibit positively significant degree of freedom; varies from 1.10876 to 1.61411 and 1.151016 to 1.747233 for the GARCH model and FIAPARCH model respectively.

The responses of market volatility to price movements are captured by the asymmetric news impact parameter, γ. From Table 4, FTSE China Shariah and S&P Pan Asia Shariah denote a positive of γ at 1% significance level, implying that there is leverage effect in FTSE China Shariah and S&P Pan Asia Shariah stock markets whereby bad news influences the volatility greatly than the good news. Meanwhile, FTSE Bursa Malaysia Emas Shariah demonstrates insignificant asymmetric news impact parameter, γ, which suggests no presence of leverage effect in the FTSE Bursa Malaysia Emas Shariah stock market.

The parameter of power transformation, δ, for FTSE China Shariah and S&P Pan Asia Shariah stock markets as indicated in Table 4 are significantly vary from either unity (Taylors or Schwert model) or two (Bollerslev GARCH model) at 1% level of significance. However, power parameter for FTSE Bursa Malaysia Emas Shariah stock market is insignificantly different from unity. Based on the test of $\left(\frac{\delta-1}{SE}\right)$ and $\left(\frac{\delta-2}{SE}\right)$, FTSE China Shariah and S&P Pan Asia Shariah stock markets are more favourable to conditional variance rather than conditional standard deviation. In contrast, for FTSE Bursa Malaysia Emas Shariah stock market, it cannot be determined between neither the Taylor's nor the Bollerslev's representation.

In addition, the estimated fractional difference coefficient, *d*, as established in Table 4 in overall are statistically significant at either 1% or 5% level of significance. The coefficient of *d* signifies that the effect of shocks to the conditional volatility displays a hyperbolic rather than an exponential decaying rate. Moreover, the result also suggested that long memory will directly affect the markets which are informationally efficient. This will pose a critical challenge on the proponents of random walk behaviour in the stock markets (Bhattacharya and Bhattacharya, 2012).

The second part of Table 3 and Table 4 demonstrates the outcome of diagnostic test and residual test. The parameters such as Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC) and Log-Likelihood (Log(L)) are focused in order to determine the fitted model. In general, the coefficient of AIC and SIC as stated in Table 3 and Table 4 are very close to each other; which is parallel to

Table 3 Estimation result using GARCH model with GED distribution

	FTSE China Shariah	FTSE Bursa Malaysia Emas Shariah	S&P Pan Asia Shariah
Conditional Mean			
α_0	0.005949 (0.025714)	0.043823 (0.039375)	0.057251 (0.029734)
α_1	0.040338 (0.027035)	0.044305 (0.057046)	0.055630 (0.029711)
Conditional Variance			
α_0	0.033569 * (0.015767)	0.019106 * (0.0076569)	0.019631 * (0.0085065)
α_1	0.052269 ** (0.010663)	0.092359 ** (0.026668)	0.060360 ** (0.011942)
β_1	0.931038 ** (0.013742)	0.851418 ** (0.041500)	0.922422 ** (0.014035)
v	1.379336 ** (0.106080)	1.10876 ** (0.105750)	1.614111 ** (0.113670)
Model Selection			
Log (L)	-1902.333	-855.895	-1586.518
AIC	3.447756	1.557172	2.877177
SIC	3.474907	1.584324	2.904328
Diagnostic			
Q(10)	7.28392 [0.6075856]	15.2929 [0.0831993]	11.0573 [0.2718029]
$Q^2(10)$	17.8136 * [0.0226685]	6.21969 [0.6226379]	10.6915 [0.2198019]
ARCH (10)	1.6315 [0.0926000]	0.60429 [0.8112000]	1.0746 [0.3788000]

Notes: * and ** denote 5% and 1% significance level respectively. Jarque-Bera statistics tests for the null hypothesis of normality in the sample return distribution. The numbers in parentheses are standard error of the estimation. Log (L) is the logarithm maximum likelihood function value. AIC is the average Akaike information criterion and SIC is the average Schwarz information criterion. Q (10) and Q^2 (10) are the Ljung-Box Q-statistics of order 10 computed on the standardized residuals and squared standardized residuals respectively. ARCH (10) is the non-heteroscedasticity statistic of order 10. P-values of the statistics are reported in square brackets. The ARCH-in Mean coefficient is excluded from the estimation models.

Table 4 Estimation result FIAPARCH model with GED distribution

	FTSE China Shariah	FTSE Bursa Malaysia Emas Shariah	S&P Pan Asia Shariah
Conditional Mean			
α_0	-0.017300 (0.024663)	0.040228 (0.032253)	0.015491 (0.032366)
α_1	0.030973 (0.020407)	0.048694 (0.070418)	0.055279 (0.028600)
Conditional Variance			
α_0	-0.088913 (0.243280)	0.174559 (0.182590)	0.042414 (0.043123)
α_1	0.110506 (0.225590)	-0.135469 (0.199060)	0.372109 ** (0.066490)
β_1	0.255152 (0.270730)	-0.027992 (0.220820)	0.619072 ** (0.117350)
γ	0.832115 ** (0.250630)	0.720747 (0.407630)	0.999404 ** (0.0040115)
d	0.146172* (0.071452)	0.219393 ** (0.057210)	0.302866 ** (0.110160)
δ	1.967488 ** (0.399120)	1.214269 (0.817630)	1.343199 ** (0.216340)
v	1.403798 ** (0.111300)	1.151016 ** (0.111470)	1.747233 ** (0.126080)
$\delta = 1$	2.424053	0.262061	1.586387
$\delta = 2$	-0.081459	-0.960987	-3.035967
Model Selection			
Log (L)	-1891.149	-848.581	-1570.854
AIC	3.432970	1.549379	2.854298
SIC	3.473697	1.590106	2.895024

Table 4 (Cont.)

Diagnostic			
Q(10)	6.86976 [0.6506773]	12.6260 [0.1802715]	10.7194 [0.2954359]
$Q^2(10)$	18.5769 * [0.0172938]	10.0267 [0.2631601]	13.1754 [0.1059545]
ARCH (10)	1.4239 [0.1641000]	0.97680 [0.4618000]	1.4238 [0.1642000]

Notes: * and ** denote 5% and 1% significance level respectively. Jarque-Bera statistics tests for the null hypothesis of normality in the sample return distribution. The numbers in parentheses are standard error of the estimation. Log (L) is the logarithm maximum likelihood function value. AIC is the average Akaike information criterion and SIC is the average Schwarz information criterion. Q (10) and Q^2 (10) are the Ljung-Box Q-statistics of order 10 computed on the standardized residuals and squared standardized residuals respectively. ARCH (10) is the non-heteroscedasticity statistic of order 10. P-values of the statistics are reported in square brackets. The ARCH-in Mean coefficient is excluded from the estimation models.

the results reported in the study of Wei, Wang and Huang (2010). Nevertheless, models with GED distributed are preferred in this study rather than the one with normal or student-t distribution as models with GED distribution tend to provide a better results (i.e., minimum values of AIC, SIC and Log(L)). More specifically, the ARCH-class models with GED distribution are fitted well than the ARCH-class models with normal or student-t distribution.

Nevertheless, Ljung-Box Q ARCH test demonstrates mixed outcomes. Generally, the Ljung-Box test designates no presence of autocorrelation in the standardized residuals and squared standardized residuals for all the three international Shariah stock markets examined. However, squared standardized residuals with tenth lag for FTSE China Shariah stock market suggests that there is still presence of conditional volatility for 5% level of significance. Lastly, the three international Shariah stock markets investigated show no ARCH effects under the lagged of tenth.

Impact of Oil Price Shocks

Table 5 and Table 6 illustrate the result of GARCH-M estimation for the three international Shariah stock markets examined over the period of 01 January 2010 to 31 March 2014.

Table 5 GARCH-M Model Estimation Result for Brent Crude Oil Market

	FTSE China Shariah	FTSE Bursa Malaysia Emas Shariah	S&P Pan Asia Shariah
Mean Equation			
λ	0.033291 (0.130518)	0.037435 (0.039861)	0.005169 (0.101178)
c	-0.053384 (0.119471)	0.004475 (0.051921)	-0.014693 (0.070353)
δ_1	-0.487315 ** (0.026942)	-0.482240 ** (0.027450)	-0.500453 ** (0.028893)
δ_2	0.108514 ** (0.023588)	0.034483 ** (0.007676)	0.089057 ** (0.018409)
δ_3	0.011778 (0.025313)	0.007089 (0.007666)	0.006765 (0.022409)
Variance Equation			
ω	0.063031 (0.036366)	0.043142 ** (0.016398)	0.030221 (0.019785)
α	0.079673 ** (0.019359)	0.158656 ** (0.034283)	0.080703 ** (0.022445)
β	0.893157 ** (0.026006)	0.771248 ** (0.048816)	0.883351 ** (0.031446)
ρ	0.004830 (0.008329)	-0.002045 (0.002231)	0.008643 (0.006216)
$\alpha + \beta$	0.972830	0.929904	0.964054
GED	2.142373 ** (0.008329)	1.361686 ** (0.064303)	1.978311 ** (0.120352)
Model Selection			
Log Like	-2046.820	-1019.539	-1732.203
AIC	3.877135	1.940695	3.284078
SIC	3.923949	1.987509	3.330892

Notes: * and ** denote 5% and 1% significance level respectively. Jarque-Bera statistics tests for the null hypothesis of normality in the sample return distribution. The numbers in parentheses are standard error of the estimation. Log (L) is the logarithm maximum likelihood function value. AIC is the average Akaike information criterion and SIC is the average Schwarz information criterion. Q (10) and Q^2 (10) are the Ljung-Box Q-statistics of order 10 computed on the standardized residuals and squared standardized residuals respectively. ARCH (10) is the non-heteroscedasticity statistic of order 10. P-values of the statistics are reported in square brackets. The ARCH-in Mean coefficient is excluded from the estimation models.

Table 6 GARCH-M model estimation result for WTI crude oil market

	FTSE China Shariah	FTSE Bursa Malaysia Emas Shariah	S&P Pan Asia Shariah
Mean Equation			
λ	0.014837	0.029243	0.018403
	(0.126426)	(0.038607)	(0.092570)
c	-0.028894	-0.007040	-0.002370
	(0.107479)	(0.051840)	(0.056985)
δ_1	-0.492138 **	-0.486265 **	-0.501661 **
	(0.025581)	(0.026901)	(0.027271)
δ_2	0.168898 **	0.044382 **	0.127258 **
	(0.022024)	(0.006808)	(0.016689)
δ_3	0.005081	0.005720	0.001307
	(0.014904)	(0.004467)	(0.013274)
Variance Equation			
ω	0.057978	0.040980 **	0.023193
	(0.037628)	(0.015445)	(0.019965)
α	0.077925 **	0.178872 **	0.079796 **
	(0.020182)	(0.036004)	(0.021895)
β	0.889958 **	0.747079 **	0.877312 **
	(0.028488)	(0.049732)	(0.030780)
ρ	0.007246	-0.000559	0.010412
	(0.007670)	(0.001926)	(0.006499)
$\alpha + \beta$	0.967883	0.925951	0.957108
GED	1.950415 **	1.327798 **	1.977919 **
	(0.134756)	(0.063480)	(0.117175)
Model Selection			
Log Like	-2032.997	-1009.731	-1721.412
AIC	3.829422	1.911398	3.245383
SIC	3.876026	1.958002	3.291987

Notes: * and ** denote 5% and 1% significance level respectively. Jarque-Bera statistics tests for the null hypothesis of normality in the sample return distribution. The numbers in parentheses are standard error of the estimation. Log (L) is the logarithm maximum likelihood function value. AIC is the average Akaike information criterion and SIC is the average Schwarz information criterion. Q (10) and Q^2 (10) are the Ljung-Box Q-statistics of order 10 computed on the Standardized residuals and squared standardized residuals respectively. ARCH (10) is the non-heteroscedasticity statistic of order 10. P-values of the statistics are reported in square brackets. The ARCH-in Mean coefficient is excluded from the estimation models.

From the analysis, the parameter of oil price returns (δ_2) for Brent and WTI crude oil indicates significant response on the stock returns. This infers that a rise in the Brent and WTI crude oil returns will increase the stock returns for the three international Shariah stock markets examined.

Meanwhile, the impact of oil price returns volatility to the international Shariah stock returns is captured by the parameter of δ_3. As shown in Table 5 and Table 6, δ_3 in general is statistically insignificant to the returns of international Shariah stock markets. In other words, the three international Shariah stock returns are not responsive to the return volatility of Brent crude oil and WTI crude oil.

Similarly, the influence of oil return volatility to the international Shariah stock markets return volatility as can be detected via the coefficient of ρ in the variance equation of the GARCH-M model is statistically insignificant. This signifies that return volatility of Brent and WTI crude oil does not significantly influences the return volatility of three international Shariah stock markets investigated.

In overall, the analysis of oil price shocks on Shariah stock returns and volatility demonstrates contrary results. As designated in the studies of Hamilton (2009a, 2009b) and Kilian (2008a, 2008b), not all oil price changes originate from the same source and thus, they do not cause the same response from the financial markets. In other words, different shocks in the oil market have different effects on stock markets. More specifically, Bastianin and Manera (2014) signified that stock volatility only reacts to unexpected changes in aggregate demand, leaving no role to supply-side and oil-specific demand shocks.

In terms of risk premium, the coefficient of λ, as displayed in Table 5 and Table 6 demonstrates positively insignificant result. The positive but insignificant of risk premium suggests that that risk averse investors are satisfied with the fairly lower yields due to the investment had relatively lower expected risk (Suliman Abdalla, 2012).

CONCLUDING REMARKS

This study intends to: *first*, study the stylized facts of three international Shariah stock markets in East Asia and *second*, identify whether oil price shocks influence the three international Shariah stock markets examined. In this study, stylized facts of three international Shariah stock markets namely FTSE China Shariah, FTSE Bursa Malaysia Emas Shariah and S&P Pan Asia Shariah are examined via applying the ARCH-class models. The first-order of autocorrelation, AR (1) for the three Shariah stock markets examined establishes a positively insignificant of which might be considered a specific form of "persistent" but uncorrelated. Although the

returns are uncorrelated, the absolute returns or return squares illustrate a persistent, positively significant together with slowly decay of autocorrelation function, which is a sign for presence of volatility clustering. Besides, leverage effect is captured in the FTSE China Shariah and S&P Pan Asia Shariah stock markets in which bad information influence the volatility greatly than the good information. Furthermore, the effect of shocks on the conditional volatility demonstrates a hyperbolic rather than an exponential decaying rate.

In terms of response of the three international Shariah stock markets examined to the oil price shocks, returns of Brent and WTI crude oil illustrate significant responsive to the three international Shariah stock returns investigated. Meanwhile, return volatility of Brent and WTI crude oil show insignificant responsive to the three international Shariah stock returns and its volatility. Finally, the risk return tradeoff parameter in overall is statistically insignificant for the three international Shariah stock markets examined.

This study delivers significant implications especially in the decision making process of investment and portfolio management in the sense that it enables the investors, portfolio managers and traders to adjust or rebalance their stock portfolios after determining the responsive of international Shariah stock markets to the oil price shocks, particularly during the durations of oil price shocks or environment changes for oil prices. Clearing understand the interaction of oil price shocks on Shariah stock market is a key determinant of success for investors, fund managers and other market players who are pursuing diversification of their investment and make capital budgeting decisions in the markets. Since Islamic stock markets are as susceptible to the financial crisis, it is likewise important that the industry players to remain alert of the crisis impact on their investment in the Islamic stock markets. Besides, it is highly suggested that the market players should undertake continuous prudent risk management practices and select the suitable hedging instrument so that pre-emptive measures can be taken to safeguard the stability of the Islamic stock markets, especially during economic and financial uncertainties. Also, preventative steps should be taken by policy makers to reduce the crisis impact and ensure the stability of the Islamic stock markets.

This study can be further extended via adding in the conventional stock markets for the comparison purposes. This future study is expected to provide a clear picture on whether the oil price shocks influence the Shariah and conventional stock markets similarly or differently. Besides that, it is also possible for this study to examine the aftermath impact of 2008 global financial crisis. Evidence has shown that Islamic stock markets are adversely affected by financial crisis and there is stronger correlation and integration of the Islamic stock markets during the crisis

period as compared to the non-crisis period. This study is expected to shed some lights on the resilience of the Islamic stock market to financial shocks besides the oil price shocks.

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