Sukuk Investment: Efficiency of Global Sukuk Indices (Based on Tenures) following the 2008 Global Financial Crisis

Syazwani Abd Rahim[1], Nursilah Ahmad[2]

[1]Akademi Pengajian Islam dan Kontemporari (ACIS), Universiti Teknologi MARA Johor (Kampus Segamat)
[2]Universiti Sains Islam Malaysia

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ABSTRACT

The sukuk market in the Islamic capital market has undergone significant evolution and development. During the 2008 global financial crisis, the deteriorating economic condition of countries, especially Malaysia as the biggest sukuk market in the world, adversely affected the value of sukuk investments. The decrease of 33 per cent in total global sukuk issuance after the 2008 crisis generated a complicated situation among sukuk investors (classified sukuk as a risky investment), then increased the number of sukuk defaults. The high volatility affected long-term efficiency. The daily data of all indices are collected from Dow Jones Sukuk Indices (1-3years, 3-5 years, 5-7 years, and 7-10 years). This research investigates the types of sukuk market efficiency before, during and after the 2008 global financial crisis utilising the GARCH-in-Mean (GARCH-M) model. The analyses are based on the Efficient Market Hypothesis (EMH) and the Random Walk model. The results conclude that the sukuk index with a long-term tenure (DJSUK10TR) is the best market performance analysis. Overall, the sukuk market record as an inefficient market. In short, the findings will provide valuable information, guidelines and give confidence to issuers, policymakers, regulatory bodies, and investors to invest in and issue sukuk. The empirical contributions in this study show the importance of sukuk to encourage investors to invest in sukuk to increase economic growth and investment.

Keywords: sukuk, market efficiency, sukuk indices, tenures, GARCH-M

[1]Correspondence: syazwani160989@gmail.com

Introduction

In 2016, the global sukuk market witnessed a rebound after three consecutive years of decline following its peak in 2012. The Malaysian government sukuk market has exhibited impressive growth over the years. The primary sukuk market is expected to gain momentum in 2017, with issuances coming predominantly from corporate issuances in Malaysia as well as GCC and MENA sovereigns (IIFM Sukuk Report, 2016; MIFC Sukuk Report, 2017). The expected issuance numbers will stay solid for the rest of 2017, then consider it unlikely that some of the large transactions seen in the first half of the year will be repeated in 2018 (S&P Global, 2018). Kamso and Ng (2013) pointed out that the 2008 global financial crisis and the 2009 Dubai debt crisis erroneously gave the global investment community a poor impression of sukuk investment. Investing in sukuk not only enhances potential returns relative to conventional fixed income investing but also reduces portfolio volatility.

Alam and Rizvi (2016) described that for a Muslim investor to decide whether to pay for the delegated asset management cost and engage in frequent trading or to have a simple buy-and-hold strategy, the characterisation of the form of market efficiency is vital. Fama (1965) defines market efficiency as: "In an efficient market, competition among the many intelligent participants leads to a situation where, at any point in time, actual prices of individual securities already reflect the effects of information based both on events that have already occurred and on events which, as of now, the market expects to take place in the future". This research goes beyond informational efficiency to explore the relationship between risk and return by examining the volatility, again focusing specifically on the impact of the 2008 global financial crisis. Most studies have investigated the efficiency of the stock market with little focus and limited evidence on the sukuk market efficiency. Thus, this study will concentrate on the effectiveness of the sukuk market.

Price fluctuation and uncertainty influence the performance of the financial sector, especially in terms of the returns of sukuk. During the 2007/2008 global financial crisis, records indicate that the return of the sukuk market encountered a decline from USD46.65 billion in 2007 to only USD15.8 billion in 2008 (Ahmad & Radzi, 2011). The decrease in total global sukuk issuance after the 2008 global financial crisis generated a complicated situation among sukuk investors (Rahim & Ahmad, 2016).

The global financial crisis affected Malaysia's markets (as the leader of the global sukuk market) in both the short - and long-term, supposedly due to the exposures undertaken by global portfolio managers in these capital markets (Ab Hamid, Zakaria & Ab Aziz, 2014). However, a multi-

horizon analysis showed an interesting observation where there is an increase in inefficiency for long-term investors. This situation may contribute to the increasing number of retail and short horizon investors. On the other hand, while a surge in short horizon investors is likely to increase the efficiency in the short-term, it may adversely affect long-term efficiency (Rizvi & Arshad, 2015). The investigation of the sukuk market's efficiency in the sample period of study is important since volatility will impact the market efficiency in the long term.

The objective of this study is to investigate the types of sukuk market efficiency following the 2007/2008 global financial crisis (pre, during and after the crisis) using selected sukuk indices for the period under study. This research considers only one Islamic capital market instrument, namely sukuk as it covers almost 90 per cent of the global Islamic capital market (Haider & Azhar, 2010). The findings of the study may provide information on how sukuk investors behave under different economic conditions based on the performance of these sukuk indices. It is essential to decrease uncertainty and increase the confidence among investors and issuers (Muslim or non-Muslim) in sukuk investment. More importantly, the results of the study would record the consistency and sustainability of Islamic financial instruments during an economic downturn. Furthermore, an analysis of the market reactions either in the weak form, semi-strong form, or strong form efficiency (Ojo & Azeez 2012; Abdalla, 2012; Sheefeni, 2015) of the selected sukuk indices before, during and after the global 2008 financial crisis is important and reflects the total global sukuk issuances.

Theoretical Framework

Efficient Market Hypothesis (EMH)

In an efficient market, the Efficient Market Hypothesis (EMH) affirms that at all times, the prices comprehensively reflect the available information that is relevant to their valuations. The ability of a particular stock exchange to integrate information into prices demonstrates its competency level. The EMH could be more accurately defined in the information items. Taken from the information on price, Fama (1965) categorised the information items into three levels, subject to how quick the information is, namely: (1) weak form EMH (2) semi-strong form EMH, and (3) strong form EMH.

In strong form efficiency, the EMH postulates that a market is perceived as efficient and resourceful if all information is relevant to the value of a share, notwithstanding its availability to existing or potential investors, as well as whether it is accurate and quick in displaying the market price. The prices displayed should reflect the information retrieved from both public and private

sectors, which are more concerned with the disclosure of efficiency of the information in the market rather than the pricing efficiency of the securities (Fama, 1970). Second, in the semi-strong form efficiency, a market, according to the EMH, is efficient if all applicable, valid, and publicly available information reflects the market price for a quick period. In this case, no investors could earn excess returns from the trading rules based on the publicly available information. The fast reaction shown in the movement of stock price proves that no investors can earn an above-normal return (Fama, 1970). Third, in weak form efficiency, EMH is restricted to past data or historical information regarding the share prices. There should be no established relationship between the current and previous prices resulting from the new data. The movement in the share prices in response to new information is not distinguishable from the last price (Fama, 1970).

According to the market efficiency theory, sukuk investors are aware of their intrinsic risks and price to incorporate their risks. Therefore, researchers can track the common market risk of an individual sukuk from its sensitivity to movements in the sukuk market. It is assuming that the market knows more about the behaviour of a sukuk if its price moves closely in step with the market, compared to those that do not correlate. Thus, it is easier to value a sukuk with a beta closer to one (sukuk market beta) than those with significantly higher or lower values, because the returns of the former are driven predominantly by market movements.

Random Walk Theory

Random walk theory states that variables contain random series of actions that differ from previous values. They are independently and identically distributed (i.i.d) in size. It anticipates that all future values would match the last observed values. A random walk defined by the price changes is independent of one another (Brealey et al., 2005). A random walk model, which is assumed to be independent, is valid as long as knowledge of the changes in price behaviour in the past could not be used to increase the expected gains. Specifically, no problem is incurred from the perspective of the timing of the purchases and sales of that security should the price changes for given securities be independent.

The random walk assumption imposes the real degree of dependency in a series of price changes that is inadequate to make the expected profits under a simple buy-and-hold policy. The efficient market implies that successive price changes in individual securities will be independent. Thus, a random walk market is defined as a market where successive price changes in individual securities are independent. The theory of random walk translates into a series of stock price changes and

has no memory of its past prices. This means that the history of the series cannot be used to forecast the future. The future path of the price level of a security is as predictable as a series of cumulated random numbers. Moreover, the market price of a security in a random walk efficient market reflects the presently available information on the prospects of that security. The premise is that investors react spontaneously to any informational resources gathered, consequently reducing profit opportunities.

Therefore, prices wholly reflect the information at all times, and no profit can be gained from information-based trading (Lo and MacKinley, 1999). This assumption leads to a random walk postulate; the more efficient the market, the more random the progression of price changes. Nevertheless, it should be noted that EMH and random walk theory do not evaluate the same issue. This is demonstrated by the fact that a random walk does not presume that the stock market is efficient and filled with rational investors.

Literature Review

'Sukuk' is a classical Arabic word and the plural form is 'sakk'. Sakk means a legal document or an instrument that represents obligations in compliance with Islamic law or Shari'ah (Haider & Azhar, 2010). From the Islamic perspective, the emergence of sukuk is suitably based on a hadith that explains historical facts with regard to this concept. The Al-Muwatta by Imam Malik records a reference mentioning the term sukuk: 'Yahya narrated to me from Malik that he had heard that sukuk was given to people in the time of Marwan ibn al-Hakam for the produce of the market at al-Jar. People had bought and sold the sukuk among them before they delivered the goods. Zayd bin Thabit and one of the Companions of Rasulullah (pbuh) went to Marwan and said, "Marwan! Do you make usury permissible?" He said: "I seek refuge with Allah! What is that?" He said, "These sukuk, which people buy and sell before they take delivery of the goods." Marwan, therefore, sent a guard to follow them and to take them from people's hand and return to their owners.' (ISRA, 2011; Bank Islam Malaysia Berhad, 2012; Shahida & Sapiyi, 2013).

Definition of Sukuk

There are several international standard setters in Islamic finance and capital markets. The most notable among them are the Accounting and Auditing Organisation for Islamic Financial Institutions (AAOIFI) and the Islamic Financial Services Board (IFSB). In Malaysia, the Securities Commission Malaysia (SC) provides guidelines on sukuk issuances. In this study, sukuk is defined based on the Securities Commission Malaysia for two reasons. Firstly, according to the literature, SC's definition is considered the broadest

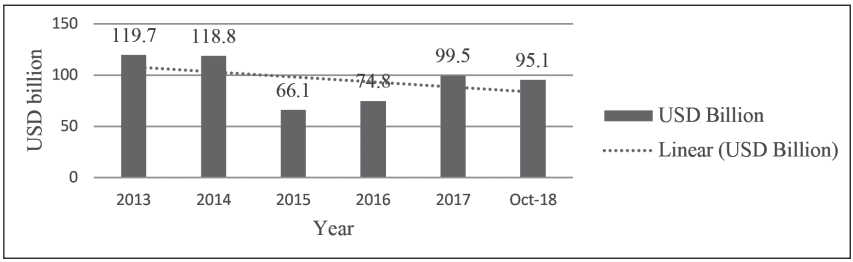

Figure 1. Global Sukuk Issuance
Source: Malaysia International Islamic Financial Centre (MIFC)

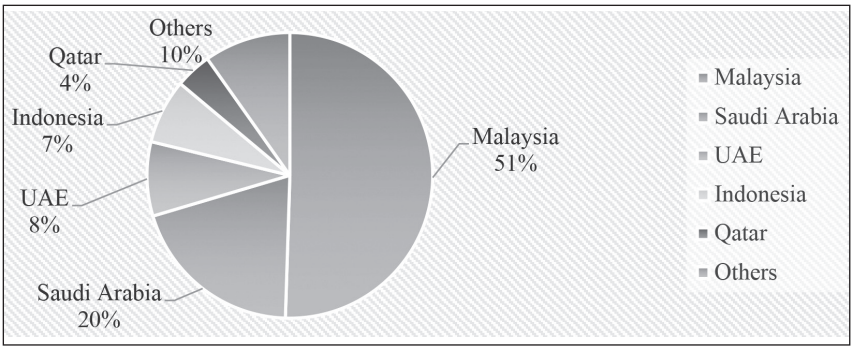

Figure 2. Global Sukuk Outstanding by Domicile
Source: Malaysia International Islamic Financial Centre (MIFC)

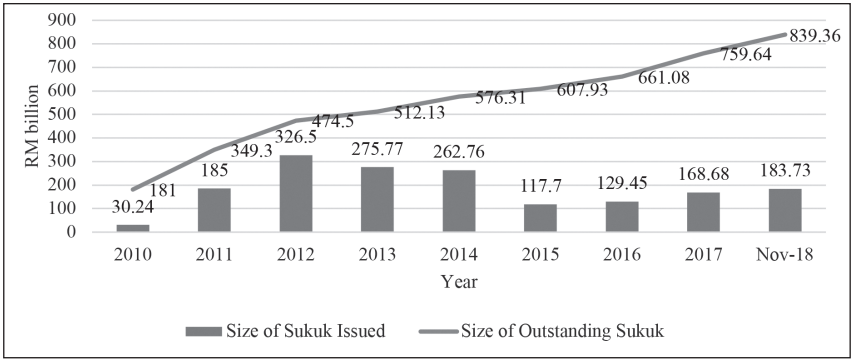

Figure 3. Total Sukuk Issued and Total Sukuk Outstanding
Source: Malaysian ICM bulletin

and all-encompassing relative to other definitions. Secondly, Malaysia is the main driver of sukuk issuance historically, and the trend continues.

The Securities Commission Malaysia (2011) defines sukuk as "certificates of equal value which evidence exclusive ownership or investment in the property using Shari'ah principles and concepts approved by the Shari'ah Advisory Council (SAC)." Meanwhile, the AAOIFI defines sukuk as "a certificate of equal value, representing undivided interests in the ownership of the underlying assets (applicable to both tangible and intangible assets), usufruct, services, or investment, particularly ventures or some special investments" (AAOIFI, 2008). According to IFSB, sukuk refers to "a certificate that represents the holder's proportionate ownership in an entire part of an underlying asset where the owner assumes all rights and obligations to such asset."

Sukuk Market Developments in Malaysia

Malaysia maintained its dominance in the global sukuk market, constituting 50.5 per cent of the global sukuk issuance, followed by Saudi Arabia (19.9 per cent) as at end October 2018. For the first half of 2018, Malaysia retained its position as the world's leading issuer with a 41% share, an increase from 33 per cent a year ago. It issued USD 22.4 billion worth of sukuk during the period, an increase of 9 per cent from 1H17. The increase reflected a surge in corporate issuance across a broad range of sectors as well as an increase in the volume of short-term Islamic Treasury bills issued by the Central Bank of Malaysia.

The domestic sukuk market in Malaysia continues to serve as an important and attractive platform for government and corporate entities to raise long-term funds for various economic, business and infrastructure development needs. In the first half of 2018, sukuk issuances by Government and corporates amounted to RM99.36 billion, representing 52.02 per cent of total bond issuances, compared with RM79.01 billion in 1H2017. Total sukuk outstanding amounted to RM818.41 billion or 59.59 per cent of total bonds outstanding, compared with RM718.41 billion in 1H2017. Corporate sukuk issuances represented 75.22 per cent of total corporate bonds and sukuk issuances while corporate sukuk outstanding accounted for 75.53 per cent of total corporate bonds and sukuk outstanding. As at end of November 2018, corporate sukuk outstanding reached RM499.89 billion compared to that of conventional bonds at RM158.36 billion, constituting 75.94 per cent of total outstanding bonds. The total issuance of corporate sukuk amounted to RM68.44 billion compared to that of conventional bonds at RM31.18

billion. As at end of November 2018, total sukuk outstanding amounted to RM839.36 billion or 59.59 per cent of total bonds outstanding while total sukuk issuances by Government and corporates amounted to RM183.73 billion (IIFM Sukuk Report, 2019).

In Malaysia, the sukuk market provides customised solutions to sovereign and corporate issuers through a variety of sukuk structures using different Islamic contracts such as Ijarah, Murabahah, Musharakah, Wakalah or hybrid structures based on combinations of Shari'ah contracts. To be Shari'ah-compliant, sukuk holders must have an ownership in the underlying asset, and their cash flows ideally must come from the earnings of an asset employed in a particular business project approved by Islamic law. The sukuk structures are backed by real economic activity and have the ability to tap a wider investor base from both Islamic and conventional spectrums, including foreign investors. An increasing number of corporations, including foreign corporates, also leverage on the strength of Malaysia's Islamic capital market to issue regular short-term commercial papers to meet their on-going financing needs.

Market Efficiency

Black and McMillan (2006) used an asymmetric GARCH-M model to examine whether returns exhibit a positive (negative) risk premium resulting from a negative (positive) shock and the relative size of any premium. They suggest that following a shock, volatility and expected future volatility are heightened, leading to a rise in required rates of return, which depresses current prices. Squalli (2006) tested for market efficiency in the represented sectors of the Dubai Financial Market (DFM) and the Abu Dhabi Securities Market (ADSM). He employed variance ratio tests and run test. The variance ratio tests rejected the random walk hypothesis in all sectors, and run tests suggested that ADSM is the only weak form efficient sector. Cooray and Wickremasinghe (2007) examined the efficiency in the stock markets of India, Sri Lanka, Pakistan and Bangladesh. They employed unit root test and concluded the presence of weak form efficiency in these markets. Verma and Rao (2007) examined the weak form efficiency of the Bombay Stock Exchange (BSE100) Index companies for three years. The serial correlation and run test exhibited that for the first two years, the market was not weak form efficient, but the results of the third year indicated that the market was weak form efficient. Mishra and Paul (2008) examined the integration and efficiency of the Indian stock and foreign exchange market. They concluded that the Indian stock and foreign exchange market are weak form efficient. Then, from the year 1990 to 2000, Asiri (2008) measured the behaviour of stock prices in the BSE and weak form efficiency of 40 listed companies. These authors

concluded that the stock markets and stock exchanges for India, Sri Lanka, Pakistan and Bangladesh are recorded as weak form efficient.

Chander, Mehta and Sharma (2008) studied empirical evidence on weak form stock market efficiency for the Indian scenario. Both parametric and nonparametric tests conclude the weak form stock market efficiency and their results signal that trading strategies which are based on historical prices cannot rely on abnormal gains consistently, except when these coincide with underlying drifts in the stock price movements. Lazar (2009) examined the weak form efficiency of the Indian capital market. The results of ADF and Phillips-Perron (PP) tests show that the Indian capital market is weak form efficient. A study by Mittal and Jain (2009) dealt with the testing of a weak form of efficiency and the EMH on Indian stock market in the form of a random walk. They examined the existence of seasonal anomalies in the Indian stock market. The result highlights that the anomalies did not exist in the market and this market could be considered informational efficient. As a result, these researchers support that India is a weak form of market efficiency.

Besides, Awad and Daraghma (2009) examined the weak form market efficiency of the Palestine Security Exchange (PSE) for 35 stocks included in the PSE market indices. The returns of the 35 sample stocks did not follow the normal distribution, so the study utilised parametric and nonparametric tests to check for randomness. The runs tests conclude that the PSE at the weak form is inefficient. The unit root tests also suggest the weak form of inefficiency in the return series. Then, it was different to Abedini (2009) who studied the weak form efficiency of the stock market in the Gulf Cooperation Council (GCC) countries that include Bahrain, Kuwait, and Dubai. The autocorrelation function test and Augmented Dickey-Fuller (ADF) test concluded that the stock market in GCC was efficient. Although these studies suggest the weak form, they are different in terms of efficiency.

Hamid et al., (2010) conducted research in the stock markets of Pakistan, India, Sri Lanka, China, Korea, Hong Kong, Indonesia, and Malaysia from 2004 until 2009. It was derived from the autocorrelation, runs test, unit root test, and variance ratio in the study that all markets were in weak form efficiency during the test time frame. Abdmoulah (2010) showed that all 11 Arab stock markets for periods ending in March 2009 gave high sensitivity to the past, collapsed and were affirmed to be weak form inefficient. The results show the Asian market as weak form efficiency but the Arab stock markets weak form inefficient after the 2007/2008 global financial crisis. Ntim et al., (2011) tested the weak form efficiency of 24 African continent-wide stock price indices from 1986 to 1989. Based on ranks

and signs, the 32 stock price indices were examined. The returns from the majority of African continent stock price indices presented weak form efficiency. Meanwhile, Haroon (2012) tested the weak form efficiency of Karachi Stock Exchange (KSE) covering the period from the year 1991 to 2011 and found that it was not weak form efficient. Both descriptive statistics and nonparametric tests show the absence of weak form efficiency. It proves that the Karachi Stock Market was not weak (Omar et al., 2013) when using the same method as Haroon (2012). Tweneboah et al., (2013) examined the efficiency of the Ghanaian foreign exchange market. They found that the behaviour of the U.S. Dollar was inconsistent with the random walk process and the weak form of efficiency. They argue that the Variance Ratio (VR) technique is a better methodology to test for the random walk.

Mabakeng and Sheefeni (2014) tested the weak form of efficiency in the Namibian foreign exchange market using three bilateral exchange rates. They found that past values cannot be used to predict current values, hence it was efficient in the weak form. Hasan (2015) argues that the Dhaka Stock Exchange is inefficient in weak form as historical stock prices cannot be used to achieve superior gains. In addition, if the connection between stock prices and economic variables exist, the stock market of Bangladesh will lose its informational efficiency in semi-strong form and become more volatile. However, Bhuiyan et al., (2017) investigated whether sukuk can offer any advantage in terms of global diversification. They examined the volatilities and correlations of bond indices of emerging counties such as South Korea, Singapore, China, India, Indonesia, and Malaysia with the Thomson Reuters BPA Malaysia Sukuk Index by applying wavelet coherence and Multivariate GARCH analyses. They conclude that the sukuk market offers effective portfolio diversification opportunities for fixed income investors in the mentioned sample countries.

Table 1
Sukuk Indices

No.	List of Sukuk Indices	Launch Date	N
1	Dow Jones Sukuk 1-3 Year Total Return Index	28th April 2006	2,424
2	Dow Jones Sukuk 3-5 Year Total Return Index	28th April 2006	2,424
3	Dow Jones Sukuk 5-7 Year Total Return Index	30th April 2010	1,436
4	Dow Jones Sukuk 7-10 Year Total Return Index	31st July 2007	2,126

Source: Bloomberg Database (2015)

This section does not focus solely on the literature review of sukuk market efficiency because of the limited research in this area. The authors also examined other types of markets in countries that are not issuing sukuk. These include studies of the foreign exchange market, exchange rates, stock markets, and countries that have not expressed interest in Islamic financial instruments yet represent a non-Muslim investor base.

Methodology

Data Collection

The daily data of historical prices from the years 2005 to 2015 for all indices were collected from the Bloomberg database (Saturdays and Sundays excluded). This study used four sukuk indices which were separated by different tenures:

Dow Jones Sukuk 1-3 Year Total Return Index (DJSUK3TR)

The Dow Jones Sukuk 1-3 Year Total Return is designed to track the performance of global Islamic fixed income securities, also known as sukuk. The index includes U.S. dollar-denominated, investment-grade sukuk with maturities of 1-3 years that have been screened for Shari'ah compliance (Bloomberg, 2018).

Dow Jones Sukuk 3-5 Year Total Return Index (DJSUK5TR)

The Dow Jones Sukuk 3-5 Year Total Return is designed to track the performance of global Islamic fixed income securities, also known as sukuk. The index includes U.S. dollar-denominated, investment-grade sukuk with maturities of 3-5 years that have been screened for Shari'ah compliance (Bloomberg, 2018).

Dow Jones Sukuk 5-7 Year Total Return Index (DJSUK7TR)

The Dow Jones Sukuk 5-7 Year Total Return is designed to track the performance of global Islamic fixed income securities, also known as sukuk. The index includes U.S. dollar-denominated, investment-grade sukuk with maturities of 5-7 years that have been screened for Shari'ah compliance (Bloomberg, 2018).

Dow Jones Sukuk 7-10 Year Total Return Index (DJSUK10TR)

The Dow Jones Sukuk 7-10 Year Total Return is designed to track the performance of global Islamic fixed income securities, also known as sukuk. The index includes U.S. dollar-denominated, investment-grade sukuk with maturities of 7-10 years that have been screened for Shari'ah compliance (Bloomberg, 2018).

Method: Measuring Sukuk Market Efficiency

The objective of the study is to investigate the types of sukuk market efficiency pre, during and post 2008 global financial crisis based on the selected sukuk indices. For that purpose, the

GARCH-in-Mean (GARCH-M) model was implemented to identify types of sukuk market efficiency as listed in Table 1. The *Generalised Autoregressive Conditionally Heteroscedasticity* in Mean model (GARCH-M (1,1) model) allows the variance of the error term to vary over time, in contrast with the classical regressions that assume constant variance. Also, the GARCH-M model allows the testing for the presence of risk premium in the markets. The GARCH-M (1,1) model is stated as follows:

$$r_t = \beta_0 + \beta_1 r_{t-1} + \delta h_t + e_t$$
$$e_t \sim N(0, h_t)$$
$$h_t = \alpha_0 + \alpha_1 h_{t-1} + \alpha_2 e_{t-1}^2$$

The β_0 is the intercept and the β_1 is the slope. Both β_0 and β_1 represent an AR (1) model. The δ represents the risk premium parameter in the conditional model when trade-off between volatility and return prevails. Returns volatility is measured by conditional variance h_t, which is described as a function of a squared value of past residuals, e_{t-1}^2 presenting the ARCH factor, and an autoregressive term (h_{t-1}) reflecting the GARCH character of the model. The sum of $\alpha_0 + \alpha_1$ represents the degree of volatility persistence in the model. If the sum of $\alpha_0 + \alpha_1$ is very close to 1, it indicates a volatility cluster and the effect of volatility clustering will become more important (Eagle, Ito, and Lin, 1990).

Bollerslev, Chou, and Kroner (1992) stated that volatility clustering indicates that the market is volatile for a week or two before calming gradually for several subsequent weeks. The estimation process is to identify the selected sukuk indices as the proxy to analyse the types of the efficiency of the sukuk market. In the case of overshooting, this can be seen as the presence of an outrageous level of volatility. Table 2 shows the classification of sukuk market efficiency. Instability here is indicated by summing up the root of the autoregressive model of $\alpha + \beta$; the rule of the thumb, in this sense if:

Table 2
Classification of Sukuk Market Efficiency

NO.	ARCH term (α) + GARCH term (β)	Types of Sukuk Market Efficiency
1	$\alpha + \beta < 0.5$	Strong form efficiency
2	$0.5 \leq \alpha + \beta < 0.75$	Semi-strong form efficiency
3	$0.75 \geq \alpha + \beta < 1$	Weak form efficiency
4	$\alpha + \beta > 1$	No efficiency or inefficient market

Source: Ojo and Azeez (2012) and Sheefeni (2015)

Table 3
Summary of Results for GARCH-M (1,1) Model (During the Crisis)

GARCH-M(1,1) Model for the During-Crisis (2007-2008)

Parameter	ø (Constant)	λ (Risk premium)	ω (Constant)	α (ARCH effect)	β (GARCH effect)	$\alpha + \beta$	Types of Sukuk Market Efficiency
DJSUK3TR	0.0010	-337.1769	-0.0000	0.1497	0.6877	0.8374	Weak-form
DJSUK5TR	0.0011 (0.0195)	-17.7736 (-0.0192)	-0.0000 (0.7100)	-0.0025 (-2.2419)***	0.5605 (0.9053)	0.5579	Semi-strong form
DJSUK10TR	0.0004 (0.9264)	1.7166 (0.3137)	-0.0000 (-1.0690)	-0.0088 (-26.1713)***	1.0195 (1.0195)***	1.0108	Inefficient market

Note: ***, **, and * respectively represent significant at the 1%, 5% and 10% *α and β are significant for only DJSUK10TR.

Source: Authors' calculation **Note:** DJSUK7TR had yet to be launched during the crisis.

Note: The z-statistics for DJSUK3TR was not available for during the crisis

Hypothesis:

Efficient Market Hypotheses (EMH) categorise market efficiency into three types viz. weak, semi-strong, or strong form efficiency. Sukuk data are analysed in pre, during, and post-2007/2008 global financial crisis period to test the second hypothesis as follows:

i. Null Hypothesis (H_0):

Sukuk market is inefficient based on EMH classification, and it does not follow a random walk theory for pre, during, and after the 2007/2008 global financial crisis.

ii. Alternative Hypothesis (H_1):

There is a different type of sukuk market efficiency (inefficient, weak-form, semi-strong form, and strong form) as categorised by Efficient Market Hypothesis (EMH) and the market follows random walk theory for pre, during, and after the 2007/2008 global financial crisis.

H_{1a}: Sukuk indices show a weak form efficient market before the crisis.

H_{1b}: Sukuk indices show an inefficient market during the crisis.

H_{1c}: Sukuk indices show a weak form efficient market after the crisis.

Results

The second objective of the study is to investigate the state of sukuk market efficiency pre, during and post-2008 crisis on sukuk indices utilising the GARCH-M (1,1) model. The market efficiency was categorised based on the value of the ARCH term (α) and GARCH term (β). The market categorisation follows EMH's viz. strong form, semi-strong form, weak form, and inefficient market.

The difference between the GARCH-M model from the other GARCH-family is the risk premium parameter, λ , which is the coefficient of standard deviation. A positive

risk premium indicates the return is positively related to its volatility. In other words, a rise in mean return or performance is caused by an increase in the conditional variance as a proxy for greater risk. Furthermore, the higher conditional variance of returns requires larger compensation to convince the agent to hold the long-term asset. Based on this theoretical premise, an identification of two undiversifiable common risks that determine the risk premium for sukuk that is market risk and information asymmetry risk is very important. In addition, by identifying sukuk risk premium, it will provide an opportunity for further development in the Islamic sukuk pricing criteria.

In establishing the relationship between risk and return for the GARCH-M model, λ was employed as the coefficient for estimating this relationship. The risk-return coefficient of the GARCH-M (1,1) model had most of the models showcasing a positive and significant relationship (positive risk premium). If λ is positive or negative and statistically significant, an increased risk given by an increase in conditional variance will lead to a rise or fall in the mean return. In this sense, λ can be said to be a time-varying risk premium. A statistically positive relationship indicates that investors are compensated for consuming greater risk. However, a negative relationship signifies investors' reaction to factors other than the standard deviation of equities from their historical mean. The DJSUK7TR index was launched after the 2008 global financial crisis, and the DJSUK10TR index was launched during the 2008 global crisis. These four sukuk indices also show the same trend, with higher volatility during and after the crisis. The DJSUK7TR index indicates the recovery effect of the crisis, which started in 2010.

There was no significant result of the risk premium, meaning no positive and significant relationship between risk and return during the crisis (higher risk does not promise a higher return). There was only one sukuk index with significance α and β which was DJSUK10TR. This sukuk index showed inefficient markets during the crisis that follows $\alpha+\beta>1$, DJSUK10TR with $\alpha + \beta = 1.0108$. Efficient Market Hypothesis (EMH) asserts that inefficient market means a market in which prices do not always adequately reflect the available information (Fama, 1965, 1970). This index shows no efficiency during the crisis, even though it was launched during the crisis and did not adequately reflect the bad news of the global crisis.

Hence, the DJSUK3TR showed the weak form efficiency during the crisis. It recorded positive value of α and β, but insignificant results. These results indicate that these sukuk indices were affected by the 2008 global financial crisis because the market efficiency changed when the crisis took place. DJSUK3TR changed from semi-strong efficient before the crisis to the weak

Table 4
Summary of Results for GARCH-M (1,1) Model (Post-Crisis)

GARCH-M(1,1) Model for the Post-Crisis (2009-2015)

Parameter	ø (Constant)	λ (Risk premium)	ω (Constant)	α (ARCH effect)	β (GARCH effect)	$\alpha + \beta$	Types of Sukuk Market Efficiency
DJSUK3TR	0.0002 (0.0224)	3.3768 (0.0094)	-0.0000 (0.9947)	-0.0019 (-6.5797) ***	0.5875 (1.4168)	0.5856	Semi-strong form
DJSUK5TR	-0.0001 (-1.9351) **	0.1383 (0.0561)	-0.0000 (100.9564) ***	2.0307 (15.7318) ***	0.0212 (5.1079) ***	2.0518	Inefficient market
DJSU7TR	0.0009 (0.0601)	-19.0271 (-0.0461)	-0.0000 (0.5757)	-0.0015 (-4.0687) ***	0.5542 (0.7157)	0.5528	Semi-strong form
DJSUK10TR	**0.0000 (-4.1789) *** **	**4.6637 (188.7842) *** **	**-0.0000 (94.6529) *** **	**0.3473 (187.5621) *** **	**0.8838 (3,0740.90) *** **	**1.2310**	**Inefficient market**

Note: ***, **, and * respectively represent significant at the 1%, 5% and 10%
* α and β are significant for DJSUK5TR and DJSUK10TR.
Source: Authors' calculation

form efficient during the crisis. Efficient Market Hypothesis (EMH) shows there was no stable relationship between the current and previous rates based on the new information. DJSUK5TR remained stable with semi-strong form efficiency and did not change during the crisis. However, the only DJSUK10TR recorded as significant results during the crisis.

Table 4 shows the results of the GARCH-M (1,1) model after the crisis.

There were two sukuk indices with semi-strong form efficiency after the crisis. They were DJSUK3TR and DJSUK7TR with $0.5 \leq \alpha+\beta<0.75$, which were $\alpha + \beta = 0.5856$, and 0.5528, respectively. These results indicate that the DJSUK3TR showcases early reactions and quickly recovers from the bad news of the crisis. It reacts to semi-strong form efficiency after the crisis, although it was highly affected as a weak form efficient market during the crisis.

Higher volatility leads to significant variations of return, hence higher risk. In a positive risk-return relationship, if an investor is a risk lover, an increase in risk will lead to an increase in return and demand for sukuk. For the summary, only sukuk indices with significant α, β and λ coefficients were considered. Positive and significant results of risk premium (λ coefficient) indicate a positive relationship between risk and returns. In short, the higher the risk, the higher the returns. The inefficient

Table 5
Summary of Results for Objective Two: Market Efficiency

Classification of Sukun Market Efficiency

Sukuk Indices	(α & β)	(Risk Premium), λ	Market Efficiency
DURING CRISIS (2007-2008)			
3 Sukuk Indices [DJSUK3TR, DJSUK5TR, DJSUK10TR]	DJSUK10TR (significant results of α & β)	No significant result of the risk premium	Inefficient market: [DJSUK10TR]
POST-CRISIS (2009-2015)			
4 Sukuk Indices [DJSUK3TR, DJSUK5TR, DJSUK7TR, DJSUK10TR]	Positive & significant α & β: [DJSUK5TR, DJSUK10TR]	Positive and significant risk premium [DJSUK10TR]	Inefficient market: [DJSUK10TR]

***Note: Market efficiency records only the significant results of α, β and λ coefficients.**
Source: Authors' calculation

market as being when investors might not have enough information about the securities in that market to make informed decisions about what to buy or the price to pay. Markets in emerging nations may be inefficient, since securities laws may not require issuing companies to disclose relevant information. In addition, few analysts follow the securities being traded there. Similarly, there can be inefficient markets for stocks in new companies, particularly for new companies in new industries that are not widely analysed. An inefficient market is the opposite of an efficient one where enormous amounts of information are available for investors who choose to use it.

Conclusion

The risk premium was not detected during the crisis period. It could also be deduced that when sukuk are in the inefficient market, risk premium behaviour is recognised. The Dow Jones Sukuk Indices are most likely the best leading market indicator based on market efficiency analysis. A statistically positive risk premium λ suggests that investors are compensated for assuming greater risk and support the positive relationship between risk and returns. From these results, the sukuk index with 10-year long-term tenures (DJSUK10TR) records the best leading market indicator based on the market efficiency analysis.

Based on the results, this research supports the hypothesis that there are different types of sukuk market efficiency as categorised by Efficient Market Hypothesis and markets follow Random Walk theory during the sample period. In addition, identifying sukuk risk premium will provide an opportunity for further development in the Islamic sukuk pricing criteria. ■

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