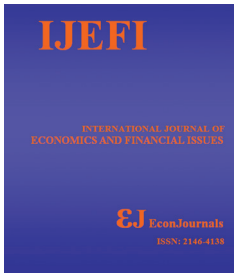

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Is there any Causality between the Islamic Banks' Deposit Returns and the Conventional Banks' Interest Rates? Evidence from Malaysian Commercial Banking

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ABSTRACT

This paper examined and compared the Islamic banks' time series rates of return to depositors, 1-month, 3-month, 6-monht, 9-month, and 12-month as well as the rate of return on Islamic Bank Muderabah saving and with the conventional banks' similar time series deposit interest rates during 2001–2015. Non-cointegration of monthly and quarterly series of deposit interest rates, established by Johansen Cointegration test, led to the VAR Granger causality test which showed unidirectional causality running from the conventional banks' deposit interest rates to the Islamic banks' rate of returns. The establishment of cointegration for the conventional bank and the Islamic bank series of 6-monht, 9-month, and 12-month as well as saving deposit rates series by Johansen Cointegration test led to the Vector Error correction (VEC) model which establishes the short term dynamics and the stability of long run equilibrium between the rates of return of Islamic banks and interest rates of the conventional banks. The VEC results showed the speed of convergence varied from 18% to 24%. The results of the VEC Granger causality/Wald test (F-test) found unidirectional causality i.e. the direction causality running from conventional banks' interest rate to the Islamic bank's rate of return in all series, 6-month, 9-month, 12-month, and the saving deposit.

Keywords: Malaysia, Conventional Bank Deposit Interest Rate, Islamic Bank Deposit Return, Commercial Banks, Granger Causality
JEL Classifications: G21; F311.

INTRODUCTION

Mobilizing deposits is an important function of the commercial banks. The amount of deposit mobilization is positively related to financial incentives provided to depositors. The conventional banks' financial incentive to depositors is known as interest rate on deposits and it is a fixed percentage of deposit. Islamic banks also mobilize deposits from the customers. The financial incentives are a key factor for increasing deposits of a bank. The financial incentive provided to the depositors of Islamic banks is not called interest and it is neither a fixed percentage. This is because of the fundamental differences in the mode of operation. Islamic bank is new breed of banking with unique mode of operation and product features that are different from those of the conventional banks. The striking feature that distinguished Islamic banking from the conventional banking is the avoidance of "Riba," now called interest. Islamic banks do not pay and do not charge fixed interest rate. This is because interest is prohibited in Islam. God said in the divine book of Islam, the Quran, without defining what riba is: "Allah hath permitted trade And forbidden usury." The avoidance of interest in bank transaction gave rise to innovative mode of production called profit and loss sharing (PLS).

The deposit interest rates of the conventional banks and the return on deposits of the Islamic banks from the banking industry of Malaysia during 2001–2015 were presented in Graphs 1-4 for examining their changing patterns.

The examination of the above graphs shows similar patterns of fluctuation ie. both moved positively. The Examination of Table 1

shows significantly positive correlation between the Islamic banks' rates return on deposits and the conventional banks' deposit interest rates.

Since the two rates (Islamic banks' return on deposits and conventional banks' deposit rate) are positively correlated and significant, the critiques of the Islamic bank call the rate of return of Islamic banks a "back door for interest-based financing (Chong and Liu 2009). According to others, the rates of return of the Islamic bank are simply conventional banks" interest rate, in disguise, and they follow conventional banks' interest rates in the market. This common criticism, the Islamic banks' rates of return are "back door" of conventional banks' interest rates and they follow the conventional banks' deposit or financing interest rates, has not been empirically examined and evidenced. Banking literature demands empirical evidences.

This paper is motivated to empirically test whether there are causalities between the rates of return of the Islamic banks to depositors and the deposit interest rates of the conventional banks and the direction. The empirical exploration of the causality and the direction of causality, if any, between the rates of return of the Islamic banks to depositors and the conventional banks' deposit interest rates is the important contribution of this paper in the banking literature.

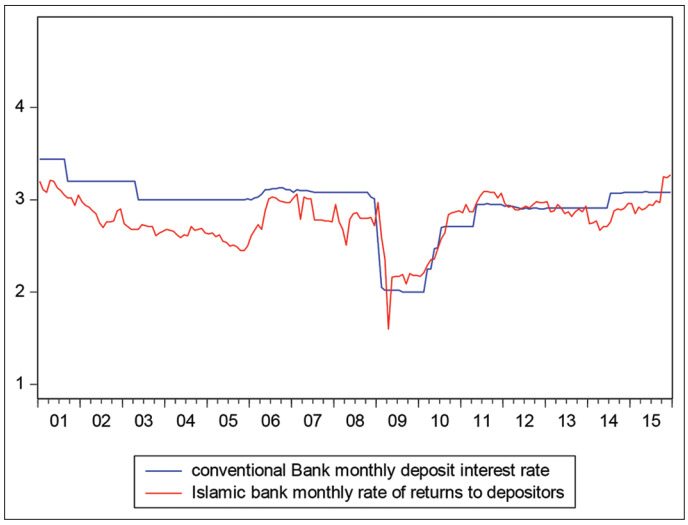
This paper is organized as: Features and the mode of operation of Islamic banks are discussed in Section 2. Section 3 provides the justifications for studying Malaysia. The survey of literature of literature is provided in Section 3. Section 4 explained the methodology and data. Empirical results and conclusions are presented in Section 5.

2. ISLAMIC BANK PRODUCTS AND CHARACTERISTICS

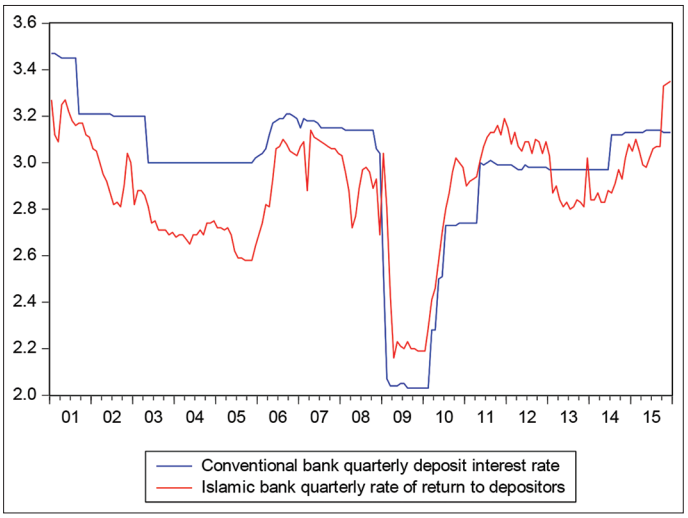
First, all activities of the Islamic banks, financing and deposit mobilizations, are guided by the Islamic principles called the Shariah. Unlike conventional banks, Islamic banks are not free finance activities which are repugnant to human welfare, even if such financing is profitable. Since the Sharia law prohibits harmful activities such as the production and consumption of alcohol, gambling, prostitution, pork, and war material destructive to humanity, Islamic banks are prohibited by the Sharia board in financing these activities. Islamic banks do not engage in financing these activities even they are highly profitable. This is an important constraint and characteristics of the Islamic bank.

Second, the most unique feature of Islamic banking is the avoidance of riba (usury) in all financial transactions. This is because, the Quran, the Divine book of Islam strongly prohibits riba in business transactions. The Quran says: "…whereas Allah permitted trading and forbidden riba" (Quran: 2: 275). However, neither the Quran nor the Prophet of Islamic did define what riba is[1]. At present, riba is interpreted as interest. The present scholars

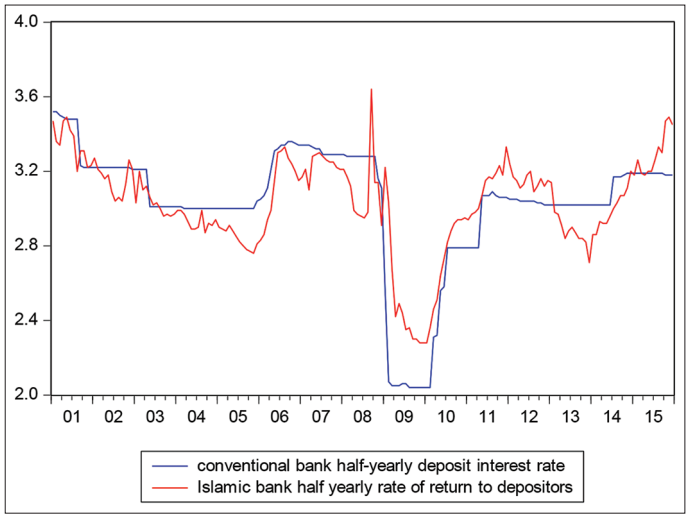
Graph 1: Monthly deposit interest rate of conventional banks and monthly rate of return on the deposit of Islamic banks



Graph 2: Quarterly deposit interest rate of conventional banks and quarterly rate of return on the deposit of Islamic banks



Graph 3: Half-yearly deposit interest rate of conventional banks and half-yearly rate of return on the deposit of Islamic banks



1 Umar b. al-Khattab said, "There are three things: If God's Messenger had explained them clearly, it would have been dearer to me than the world and what it contains: (These are) *kalalah*, *riba*, and *khilafah*." (*Sunan Ibn Majah*, Book of Inheritance, Vol. 4, #2727;

of Shariah agreed that the predetermined fixed rate of return, called interest, is not permitted in Islamic banking business transactions.

The prohibition of interest in business gives rise to the development of unique financial products by the Islamic banks. Like any bank's balance sheet, the balance sheet of Islamic banks, assets and liabilities, is an x-ray of Islamic banking. The major assets of Islamic banks consist of the following:

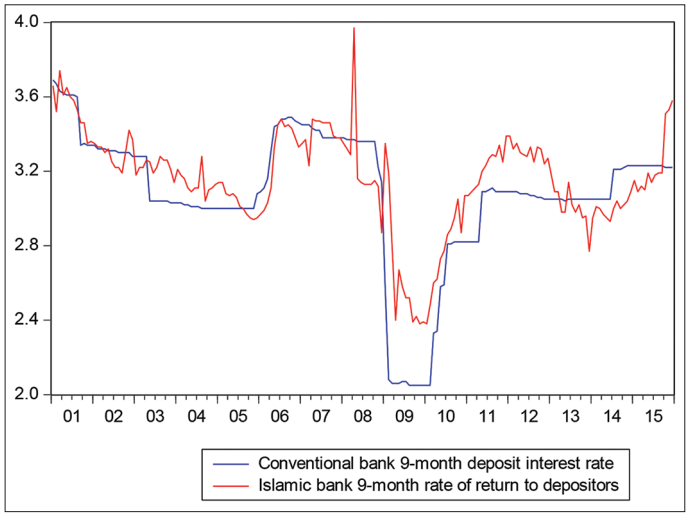
(i) Musharakah (ii) Muderabah (iii) Murabahah (iv) Bai Baithaman Ajil' (v) bai al-salam (vi) Ijarah (vii) Istisna.

There are two types of the financing contracts of Islamic banks. They are equity type and debt type contracts. "Musharakah" (partnership) and "Mudarabah" (trust financing) are equity type contracts (Hamwi and Aylward (1999).

2.1. Musharakah

Musharakah is a partnership and joint venture contract between the Islamic bank and the investor where both parties provide capital and manage funds and projects. Profits or losses accruing from the venture are distributed based on the proportion of capital and pre-determined agreement. The key features of this contract are: (i) PLS. Both parties share profits or loss. Unlike conventional bank equity contracts where banks do not bear the risk of financing investments, Islamic banks share the risk of investment. (ii) Unlike conventional banks' equity contracts where banks enjoy the fixed rate of return from investments, even when there are losses for the project, there is no predetermined rate of returns on investments for Islamic banks. Thus, PLS, avoiding of fixed interest, is a key feature of Islamic financing. Justice requires that both share the risk of business.

Graph 4: Nine-month deposit interest rate of conventional banks and 9-month rate of return on the deposit of Islamic banks



2.2. Mudarabah

Mudarabah is a trust financing contract between Islamic banks and investors where Islamic banks provide all funds for a project and investors provide physical labor, intellectual, and management skills. Profits from the projects are distributed based on a pre-agreed (ratio) arrangement. However, in cases of losses, banks, the provider of fund (called rab al maal), will bear the losses of fund and investor will bear the loss of his labor. The key feature of this contract is that there is no predetermined fixed rate of returns for bank; and both parties share the risk of investment.

The key features of the Musharakha and Muderaba contract are: (i) PLS. Both parties share profits or losses. Unlike conventional bank equity contracts where banks do not bear the risk of financing investments, Islamic banks share the risk of investment. (ii) Unlike conventional banks' equity contracts where banks enjoy the fixed rate of return from investments, even when there are losses for the project, there is no predetermined rate of returns on investments for Islamic banks. Thus, PLS, avoiding of fixed interest, is a key feature of Islamic financing. Justice requires that both share the risk of business.

2.3. Murabaha

Murabaha financing is a debt type contract. Murabaha mode of financing is based on a "mark-up" arrangement in which goods or assets are purchased by the bank on behalf of a client, and are sold to the client at a price equal to the cost of the item(s) plus a profit margin. Under the Murabaha financing contract, a client wishing to buy goods or assets approaches an Islamic bank to buy them on their behalf. The Islamic bank then buys the product at the current market price and adds a profit margin to it, and then re-sells the product to the client. The key feature is that there is no fixed interest involved, although the critiques of Islamic banks do not admit it. They call it a "back door for interest-based financing" (Chong and Liu, 2009).

2.4. Bai Baithaman Ajil

Bai Baithaman Ajil' is a variant of the Murabah (cost plus) financing contract. The difference is that the delivery of goods is immediate but the payment of goods is deferred. The payment may be made at installment. However, the price of the product

Table 1: Descriptive statistics of Islamic banks' and conventional banks' deposits rates

Islamic Banks					Conventional Banks					$P_{Y, X}$
Descriptive Statistics Islamic Banks' Rate of Return to Depositors					Descriptive Statistics of Conventional Banks' Deposit Interest Rate					
Variable	Mean	Median	Maxi	Mini	Variable	Mean	Median	Maxi	Mini	
Y1	2.784	2.850	3.270	1.600	X1	2.944	3.000	3.440	2.000	0.72*
Y3	2.879	2.915	3.350	2.160	X3	2.98	3.000	3.470	2.030	0.75*
Y6	3.028	3.050	3.640	2.280	X6	3.033	3.050	3.520	2.040	0.83*
Y9	3.156	3.180	3.970	2.380	X9	3.083	3.090	3.690	2.050	0.83*
Y12	3.306	3.310	4.240	2.300	X12	3.457	3.700	4.240	2.500	0.74*
Y-Deposit	1.335	1.145	2.480	0.670	X-Deposit	1.422	1.410	2.690	0.800	0.95*

$P_{Y, X}$=correlation between two series, Y and X. *Significant at 1% level

is agreed to by both parties at the time of the sale but should not include charges for the deferred payment.

2.5. Bai Al-salaam

Bai al-salaam is a forward sale contract where an entrepreneur sells some specific goods to the Islamic bank at a price agreed upon and paid at the time of contract but the delivery of goods is deferred for the future.

2.6. Al-Ijera

Al-Ijera is a lease financing contract and is similar to a conventional bank lease contract. Under this contract, the Islamic bank purchases an asset for a customer and then leases it out to him for a fixed period at a fixed rental charge agreed upon at the time of purchase. A key difference with conventional bank leases is that the lessor i.e. Islamic bank retains the risk of property ownership. Note that Shariah permits fixed rental charges for the use of asset/property services.

2.7. Istisna

Istisna is a financing contract under which a manufacturer or a producer produces specific goods for future delivery at a predetermined price.

The key feature of Bai Baithaman Ajil', bai al-salam, Ijarah, and Istisna[2] is that financing is fully securitized and asset based. Unlike conventional banks, Islamic banks own the ownership of the goods until full payment is made.

On the liability side, deposit accounts of Islamic banks are classified into three major categories. They are: (i) Current Account called Al Amana/wadiah deposits (ii) Saving Deposits alled Mudarabah saving deposits (iii) Muderabah investment deposits.

2.8. Current Account Deposits

It is similar to demand deposits of the conventional banks. In Islamic banks, Current Account deposits are based on two principles: al Amanah and al Wadiah. In Amana deposits, interest-free deposits are held by the banks in trust (Amanah. Under Amanah arrangement, the Islamic bank treats the funds as a trust and cannot use these funds for its operations; it does not guarantee the refund of the deposit in case of any damage or loss to the Amanah resulting from circumstances beyond its control. The Wadiah deposits are the safe-keeping (Wadiah) deposits. In Wadiah, the bank is considered as a keeper and trustee of funds and has the depositors' permission to use the funds for its operations in a Shari´ah compliant manner. Deposits under Wadiah take the form of loans from depositors to Islamic banks and the bank guarantees refund of the entire amount of the deposit. While these deposits can be withdrawn at any time, the depositors have no right to any return/profit on such deposits. However, depositors, at the bank's discretion, may be rewarded with a profits

2.9. Mudarabah Saving Deposit

Savings deposit accounts of the Islamic banks operate in a different way. The depositors allow the banks to use their money invested in profitable business ventures which are legal and Shari´ah compliant. Generally, deposits in savings accounts are accepted by Islamic banks on the basis of Mudarabah where the depositor is rabb-ul-mal (investor) and the bank is the Mudarib (fund manager). The profit will be shared as per a pre-determined ratio upon, while loss will be borne by the rabb-ul-mal. Profit distribution amongst the depositors and the shareholders will be made according to the prearranged contract made at the beginning of each month to their investments. Savings deposits are generally paced in a joint investment pool with other deposits mobilised by the Islamic banks.

2.10. Muderabah Investment Deposits

Deposits are accepted for a fixed period of time or term and are governed by the Mudarabah contract with the bank. It is similar to fixed deposits of the conventional banks. When deposits are agreed for the fixed term no withdrawal is normally allowed until the end of the deposit term. However, some banks are allowing early withdrawals in an agreed notice period. Term deposits are arrangement where depositors seek some return on their investments; they are taken on a Mudarabah basis. These deposits are allocated to a number of investment pools and the Islamic banks invest the pooled amount in Shari´ah-compliant businesses. The profits from the assets are shared between the depositors and the bank according to a pre-determined ratio agreed upon at the beginning of contract. The profit sharing weightages are assigned based on the various tenures and the amount invested under the arrangement. And as required under Mudarabah, depositors have to be informed in advance of the formula used for sharing the net earnings of the investment pool with the bank. In case of the unlikely event of loss, the depositors have to bear the loss on a pro-rata basis while bank goes un-rewarded for all its efforts. If a bank contributes its equity capital in a pool at the time of setting up an investment pool, the relationship will be a combination of Musharakah and Mudarabah, and the bank would be entitled to a proportionate profit on its own investment in relation to the total Mudarabah investment pool. Islamic banks can also open may announce Murabaha and leasing funds in which the risk-averse investors may purchase units and be treated as rabbul-mal and get the quasi fixed-return from profits or rentals earned by the respective funds from the trading and leasing activities[3].

In summary, there is no fixed rate of return to any types of deposit accounts of the Islamic banks. As the depositors undertake risk of their deposits under the Muderabah saving deposits and the Muderabah investment deposits, they earn money on their deposits as per prearranged contract. The key feature of this liability contract is that Islamic banks neither guarantee the safety of depositors' capital nor any fixed return on deposits. In this sense, Islamic banks,' Muderabah investment deposits are more risky than those of conventional banks' fixed deposits and as such deserve more earnings. Second, the profits and losses sharing under this contract (Muderabah investment deposit) are not symmetric. Under this contract, banks share profits but share no losses. Depositors bear all losses (Chong and Liu, 2009).

2 see Samad,Gardner,and Cook (2005) and (Chong and Liu, 2009) for definition and features.

3 www.financislam.com/depositw.html

3. JUSTIFICATION FOR STUDYING MALAYSIA

Malaysia was the first country in the South-East Asia that established a Shaiah based Islamic banking. Bank Islam Malaysia Berhad was established in 1983. Established in 1983, the bank has been playing pivotal and leadership role in the development in the Islamic banking industry in the region. The bank has provided technical support in setting up Islamic financial institutions to Thailand, Indonesia, and Sri Lanka. Along with technical support, the Malaysian Islamic banking is providing Islamic finance expertize through the ASEAN and Far Eastern countries. In this way, it is supporting the development of Islamic financial institutions and Islamic products and services in Asia. Being a pioneer bank, it has innovated "over 70 innovative and sophisticated Islamic banking products and services" (Corporate profile, 2016) and became the world's first Sukuk insurance. Malaysia has become the world's largest Sukuk, consisting of 67% of the global Sukuk.

Malaysia is a Muslim country. Islamic sharia which governs the Islamic banks, is strictly followed by Malaysian Muslims in their way of life. The origin of Bank Islam Malaysia Berhad was the development of financial institution called Tabung Hajji which was established in response to the Sharia need that money deposited for performing "Hajj" (Pilgrim to Mecca) must be clean and untainted from riba (interest) (Samad 2005).

Malaysia is the hub of Islamic finance in the South East Asia by its leadership role and has becomes the key Islamic finance gateway and partner for the Middle East and central Asia.

The growth of Islamic banking in Malaysia is phenomenal. According to Zawya (2016), the banking is expected to grow at an average of 18% and in the next 5 years the Islamic banking sector will be more than double to $296.29 billion in 2019 compared to $141.77 in 2013.

Malaysia is of the few countries that has incorporated both the conventional banks and the Islamic banks. Currently, there twenty one Islamic banks in Malaysia operating side by side with the conventional banks.

3.1. Survey of Literature

The scholarly and the pioneer researches on the Islamic banks' theoretical development, institutional issues, concepts, and principles owe to Khan (1986), Mannan (1968), Iqbal and Mirakhor (1987), Chapra (1982), Siddiqi (1983), and Ahmad (1984).

Khan (1986) provided an important theoretical model of Islamic banking and compared the model with conventional banking. He argued that Islamic banks "treat deposits as shares and accordingly does not guarantee their nominal value" (p. 19). Banks, according to Khan, are investment companies and depositors are treated like shareholders of a bank and, therefore, "no official reserve requirement would be necessary for these investment deposits" (p. 20-21).

Chapra (1982) and Siddiqi (1983) argued for Islamic banking as the primary alternative of interest based conventional banking. They also argued that Islamic banks were efficient to generate economic growth without getting involved interest.

The extant of Islamic banks' empirical literature is more than the theoretical foundation. Kazarian (1993) compared two Egyptian Islamic banks with Egypt conventional banks taking ratio of long term financing and found that the two Islamic banks occupied a third position in Egypt during 1979–1990.

Qorchi (2005) provided a detail development of Islamic banking and finance.

Samad's pioneering research (1999) found that the managerial efficiency of the Islamic Bank, Bank Islam Malaysia BHD, was higher than that of the conventional banks of Malaysia during 1992–1996.

Aggarwal and Yousef (2000) examined Islamic banks mode of operations and found that the PLS mode of Islamic banks was minimum and the agency problem of Islamic banks was more severe. Samad et al., (2005) studied the Bahrain and Malaysia Islamic banking finances and found that the Muderabah and Musharak, the distinct mode of Islamic banks that distinguished Islamic banks from the conventional banks are <4% of total financings. Debt type financing such as Murabah and Ijarah appeared to be most popular and dominant of all other modes of financing.

Samad (2004) compared the performance of Islamic banks and conventional commercial banks of Bahrain with respect to (a) profitability (b) liquidity (c) capital management. Eleven financial ratios were compared for the period 1991–2001 and found that there is no difference in profitability and liquidity performance between Islamic and conventional banks. Fayed (2013) compared the profitability, liquidity, credit risk, and solvency performance of three Egyptian Islamic banks with six conventional banks during 2008–2010 and found superiority of conventional banks' performance over Islamic banks.

Chong and Liu (2009) examined Malaysian Islamic banks and found that the PLS mode of finance was minimum. The growth of Islamic banking was largely driven by the Islamic resurgence rather than by advantage of the PLS mode of production.

Cevik and Charap (2011) examined the empirical behavior of conventional bank deposit rates and the rate of return on retail Islamic PLS investment accounts in Malaysia and Turkey, using monthly data from January 1997 to August 2010 and found long-run and the pairwise and multivariate causality tests showed that conventional bank deposit rates Granger cause returns on PLS accounts.

Samad (2013) investigated whether the global financial crisis (GFC) has had its impact on the efficiency of Islamic banks estimated by using the time varying Stochastic Frontier function on the Islamic banks of 16 countries. The efficiencies of Islamic

banks were estimated using Cobb-Douglas production function and found that the GFC had had no impact on banks' efficiency. Mean efficiencies between the pre GFC and the post global crisis were estimated 39% and 38% respectively and the difference was not statistically significant.

3.2. Difference with Previous Studies

The current study is different from Cevik and Charap (2011) and Chong and Liu (2009) in terms of data set and time frame. Whereas Cevik and Charap (2011) used the average interest rates on 1 year deposits during 1997–2010, this study used monthly, quarterly, half-yearly, 9-monthly, yearly interest rate as well as the saving deposit interest rates of the conventional banks and the Islamic banks of Malaysia. Whereas Chong and Liu (2009) study used pre-2009 data, this study covered the extended periods during 2001-2015. The time series data requires structural break for stationarity test which was absent in both Cevik and Charap (2011) and Chong and Liu (2009). This paper incorporates the structural break test as well as Phillips-Parron (PP) test. In addition, the paper presented the Granger Causality/Block Exogeneity Wald Test.

4. METHODOLOGY AND DATA

4.1. Methodology

4.1.1. Unrestricted VAR and vector error correction (VEC)

The paper applies unrestricted VAR and restricted (VAR) for causal relation as well as for examining the long run relation and the short run dynamics between the Islamic banks' rate of return to depositors (Y) and the conventional bank's interest rate deposits (X).

The VAR is the most appropriate technique when we do not know which variables—Y or X—are endogenous and which variables are exogenous. Secondly, VAR (unrestricted) is appropriate when the variables in the VAR are integrated of order I(1) but not cointegrated (Asterioius and Hall, 2007). Cointegration results of this paper find that two series, monthly and three monthly interest of conventional banks and the Islamic banks' rate of return to depositors, are not cointegrated even though they are integrated of order I(1). In this case, bivariate VAR can be written as:

$$Y_t = \alpha_0 + \sum_{i=1}^{n} \beta_i X_{t-I} + \sum_{j=1}^{m} \gamma_j Y_{t-j} + \theta_t \quad (1)$$

$$X_t = {}_1 + \sum_{i=1}^{n} \theta_i X_{t-1} + \sum_{j=1}^{m} \delta_j Y_{t-j} + \varphi_t \quad (2)$$

Where we assume that both series, ISDR and DEPI, are stationary, θ_t and φ_t are uncorrelated white-noise error term. It follows from (1) and (2) that conventional banks' interest rate, X_t, has contemporaneous impact on Islamic banks' rate of return, Y_t given by β, and Islamic banks' rate of return, Y, has contemporaneous impact on conventional banks' interest rate, X, given by δ.

Once we estimate the VAR model given by (1) and (2), we can apply the VAR Granger causality test for the variables which are integrated order of I(1) but not cointegrated to find the causality by looking at the significance of the coefficients using variable deletion test or at the significance of F-statistics of the pairwise Granger causality test.

VEC, called restricted VAR, is applied in determining the long run relation and the short run dynamics between the Islamic banks' rate of return to depositors (Y) and the conventional bank's interest rate deposits (X) as well as their causal direction. This paper estimated the following VEC model.

$$\Delta Y_t = \beta 1 \sum_{i=1}^{n} \Delta Xt - i + \alpha_1 \sum_{i=1}^{n} \Delta Yt - i + \Phi \vartheta t - 1 + \varepsilon_t \quad (3)$$

$$\Delta X_t = \beta 2 \sum_{i=1}^{n} \Delta Yt - i + \alpha_2 \sum_{i=1}^{n} \Delta Xt - i + \Psi \vartheta t - 1 + \varepsilon_t \quad (4)$$

Where $\vartheta_{t-1} = (Y_{t-1} - \alpha_o - \beta X_{t-1})$ is called the residual cointegration equation or Error Correction Term (ECT), ε_t is white noise error term.

4.1.2. Short run impact

When ϑ_{t-1} is omitted, ΔY_t, in equation (3), does not, for sure, provide about long term relation/behavior. In (3) β_i is the short run impact multiplier that measures the immediate impact of changes in conventional banks' deposit interest, X (DEPI) on Y, the changes on Islamic banks' rate of return to depositors (ISRD). It, thus, provides the short effect.

4.1.3. Long term relation and Granger causality test

Since ΔY_t in (3) does not, for sure, provide about long term relation/behavior, the incorporation of $\square_{t-1}$ the ECT resolves this problem and, thus, provides the existence of long term relation. The coefficient (Φ) of the ECT, $\square_{t-1,}$ on the other hand, is the short term adjustment effect. It provides the speed/rate of adjustment when rates are out of equilibrium. The sign of Φ is expected to be negative in the mean reverting case. Based on Henry (1995), the mean adjustment lag is calculate by the following equation:

$$MAL = (1-\beta)/\Phi \quad (5)$$

The equation (3) provides two sources of causation, first, ΔX_t and second, the cointegrating equation, ϑ_{t-1}. In the conventional Granger causality test, null hypothesis: ΔX_t does not Granger Y_t is rejected if β≠0 (i.e. β is not significantly zero). With the incorporation of cointegrating eqauation, ϑ_{t-1}, additional source of causation is established. The null hypothesis: ΔX_t does not Granger Y_t is rejected not only if β, the lagged values of Y are not jointly significant i.e. β=0 but also if the coefficient of the ECT, Φ is significant, according to Miller and Russek (1990) and Granger (1988). In other words, the ECT opens up an additional channel for Granger causality. The Granger causality is established either through the significance of (i) Φ, the ECT by t-test; or (ii) joint test applied to the significance of the sum of lagged of each explanatory variables ($\sum_{i=1}^{n} \Delta Xt - i$ and $\alpha_1 \sum_{i=1}^{n} \Delta Yt - i$ by a joint F or Wald χ^2 test.

The causality in the long term exists only when Φ, the coefficient of ECT is statistically significant and different from zero (Φ≠0).

The application of the VEC requires that the variables X and Y must integrated of order I(1) i.e. X ~(1) and Y ~(1). They are nonstationary at level but stationary at first difference. This requirements sets the stage for unit test and cointegration test.

4.1.4. Determining lag

Since the cointegration analysis, is very sensitive to lag length, the determination of optimum lag is very import. The two most commonly used criteria are the Akaike Information and the Schwarz Bayesian Criterion (SBC). If they contradict, usually SBC is preferable because SBC provides the smallest negative number. So, this paper used SBC to determine the lag length or K. The result of lag selection is presented below in Table A.

4.1.5. Unit root tests

Since the publication of Nelson and Plosser (1982), it is widely recognized that most time series macroeconomic variables contain unit root i.e. variable $X_t \sim I(1)$. So, this paper, first, examines the existence of unit root in Y indices and X indices by using the ADF. In the following equation, the null hypothesis, $\alpha=0$ is tested against the alternative hypothesis, $\alpha<0$:

$$\Delta y_t = \alpha_0 + \beta t + \gamma y_{t-1} + \sum_i^k \lambda i \Delta y_{t-1} + \varepsilon_t \quad (6)$$

4.1.6. Structural break test

The issue of testing the presence of unit root gained further momentum when Parron (1989) emphasized the importance of structural break while testing the unit root test. The structural break test is needed because the most macroeconomic series suffers some kind of shock i.e. structural break. So, the unit root test is not enough. Parron (1989) argued that conventional unit root tests have low power to reject the null hypothesis of nonstationarity when there is a structural break in the series. To overcome this problem, Perron (1989) modified the ADF test by adding dummy variables to account for structural breaks at known points in time. Zivot and Andrews (1992) suggested that structural breaks in the series may be endogenous and they extended Perron's methodology to allow for the endogenous estimation of the break date. We employ the following two alternative models proposed by Zivot and Andrews (hereafter ZA) to examine the presence of unit root with structural break in the stock market price series:

$$\text{Model C: } \Delta Y_t = \mu + \varnothing DU_t(\lambda) + \beta t + \gamma DT(\lambda) + \alpha X_{t-1} + \varepsilon_t \quad (7)$$

where ΔY is 26 slamic banks' rate of return to depositors, DU_t and DT_t are indicator variables for mean shift and trend shift for the possible structural break-date (TB) and they are described as following:

$$DT_t = \begin{cases} t - TB & if\ t > TB \\ 0 & otherwise \end{cases}$$

The null hypothesis of unit root ($\alpha = 0$) can be tested against stationary with structural breaks ($\alpha < 0$) in Equations 1 and 2. Every time points are considered as a potential structural break date in the ZA unit root test and the break date is determined according to minimum one-sided t-statistic. Results of Zivot-Andrew test are provided in Table 2.

The null hypothesis of unit root ($\alpha = 0$) can be tested against stationary with structural breaks ($\alpha < 0$) in Equations 1 and 2. Every time points are considered as a potential structural break date in the ZA unit root test and the break date is determined according to minimum one-sided t-statistic (Table 3).

4.1.7. Cointegration test

Having established that the variables are non-stationary i.e. I(1), there raises the possibility that they are co-integrated. Consequently, the co-integration properties of the variables are examined. That is, it is necessary to determine whether there is at least one linear combination of these variables that is I(0). To investigate multivariate cointegration, this paper applies Johansen (1991 and 1995a) VAR based Trace and Maximum Eigenvalue tests. Johansen (1991 and 1995b) cointegration is a VAR test and written in general form as:

$$\Delta Y_t = \pi Y_t - 1 + \sum_{i-1}^{p-1} \tau i \Delta Y_t - i\beta X_t + \varepsilon_t \quad (8)$$

Where $\Pi = \sum_{i-1}^{p} \beta i - I$ and $\tau = -\sum_{j-1+1}^{p} \beta j$

Based on Granger's theorem, if the coefficient matrix Π has reduced rank $r < k$, then there exists $k \times r$ matrices α and β each rank r such that $\Pi = \alpha\beta'$ and $\beta' yt$ is I(0). R is the number of cointegrating relations (the cointegrating rank) and each column of β is the cointegrating vector. The null hypothesis is that number of cointegration:

H_0: r = 0
H_a: r = 1

4.1.8. Data

Monthly data during 2001–2015 are obtained from the Bank Negara, the central bank of Malaysia. The Islamic banks' variables/ series (Y) are:

Y1 = Islamic Banks' monthly rate of return to depositors on investment account
Y3 = Islamic Banks' three monthly rate of return to depositors on investment account
Y6 = Islamic Banks' six monthly rate of return to depositors on investment account
Y9 = Islamic Banks' nine monthly rate of return to depositors on investment account
Y12 = Islamic Banks' twelve monthly rate of return to depositors on investment account

Y-Deposit = Islamic Banks' rate of return to depositors on saving deposits
Conventional banks' variables(X) are:
X1 = Conventional banks' monthly deposit interest rate
X3 = Conventional banks' three monthly deposit interest rate
X6 = Conventional banks' six monthly deposit interest rate
X9 = Conventional banks' nine monthly deposit interest rate
X12 = Conventional banks' twelve monthly deposit interest rate
X-Deposit = Conventional banks' fixed deposit interest rate

The descriptive statistics of these variables is provided in Table 1.

Table 2: Augmented Dicky-Fuller, Phillip-Parron and Zivot-Andrew unit root with structural break for Islamic bank variables

Augmented Dicky-Fuller Test: $\Delta y_t = \alpha_0 + \beta t + \gamma y_{t-1} \sum_i^k \lambda i \Delta y_{t-1} + \varepsilon_t$			Phillips-Parron Test		Zivot-Andrew Unit Root test with a structural Break in both the intercept and trend Chosen Lag length: 1 (Max lag=4)	
Variable	Level Statistics	1st difference Statistics	Level Statistics	1st difference Statistics	t-Statistics	Break point
Y1	−2.97	−15.95*	−2.84	−16.06*	−3.50	2009M02
Y3	−2.20	−13.23*	−2.44	−13.29*	−3.28	2009M02
Y6	−2.51	−15.88*	−2.59	−15.71*	−4.50	2008M10
Y9	−2.08	−18.13*	−2.92	−18.74*	−3.57	2008M05
Y12	−2.78	−11.35*	−4.50*	−22.85*	−2.76	2008M03
Y-Deposit	−2.41	−13.86*	−3.91**	−33.30*	−5.08**	2007M04

*Significant at 1% level, **Significant at 5% level, and ***Significant at 10% level

Table 3: Augmented Dicky-Fuller, Phillip-Parron and Zivot-Andrew unit root with structural break for conventional bank variables

Augmented Dicky-Fuller Test			Phillips-Parron Test		Zivot-Andrew Unit Root test with a structural Break Chosen Lag length: 1 (Max lag=4)	
Variable	Level Statistics	1st difference Statistics	Level Statistics	1st difference Statistics	t-Statistics	Break point
Y1	−2.09	−9.59*	−2.13	−9.54*	−5.93*	2009M01
Y3	−2.12	−9.72*	−2.13	−9.59*	−5.76*	2009M01
Y6	−2.23	9.28*	−2.26	−9.14*	−5.42**	2009M01
Y9	−2.15	−9.22*	−2.58	−9.07*	−5.26**	2008M11
Y12	−1.90	−8.90*	−2.03	−8.94*	−6.80*	2009M01
Y-Deposit	−1.81	−10.97*	−2.09	−6.87*	4.02	2009M01

*Significant at 1% level, **Significant at 5% level, and ***Significant at 10% level

It is evident from Table 1 the mean deposit interest rates of conventional banks are consistently and significantly higher than the Islamic banks' mean rate of return to depositors in all series, monthly, 3-monthly, 6-monthly, and yearly, except 9-month series. The trend of paying higher mean interest rate on saving deposit of the conventional banks was also evident. The mean rate of return to the depositors of saving deposit called Muderabah saving of the Islamic bank was lower than that of conventional banks.

The correlation column of Table 1, showed that there were significant correlation between all series of Islamic banks' rate of return to depositors and the conventional banks' interest rate on deposits.

Both ADF test and the PP test, in Table 2, show that all series of the Islamic banks, namely, monthly rate of return to depositors (Y1), quarterly rate of return to depositors (Y3), half-yearly rate of return to depositors (Y6), 9 month rate of return to depositors (Y9), and yearly rate of return to depositors (Y12) were non-stationary at the level but stationary at the first difference. Similarly, the rate of return to depositors on Muderabah saving deposit were non-stationary at the level. However, it is stationary at the first difference. The Zivot-Andrew Unit Root test showed that all series of had structural break. The break points were mentioned.

Both ADF test and the PP test, in Table 3, show that all series of the conventional banks, namely, monthly interest rate on deposit (X1), quarterly interest rate on deposit (X3), half-yearly interest rate on deposit (X6), 9 month interest rate on deposit (X9), and yearly interest rate on deposit (X12) were non-stationary at the level but stationary at the first difference. Similarly, the interest rate on saving deposit of the conventional banks were non-stationary at the level. However, it was stationary at the first difference. The Zivot-Andrew Unit Root test showed that all series of had structural break. The break points were mentioned.

The results of cointegration test, in Table 4, showed that the monthly and quarterly series of the conventional banks and the Islamic banks were not found to be cointegrated. The null hypothesis of no cointegration cannot be rejected. The Islamic banks monthly and quarterly rate of return to depositors (Y1 and Y3) and the conventional banks' monthly interest rate on deposit (X1), quarterly interest rate on deposit (X3) were not cointegrated. The establishment of non-conintegration of Y1 and X1 and Y3 and X3 series justifies the application of VAR and VAR Granger causality test for the causal direction.

The results of cointegration test for all series, namely, Islamic banks' half-yearly rate of return to depositors (Y6) and the conventional banks' half-yearly interest rate on deposit (X6), Islamic banks' 9 month rate of return to depositors (Y9) and conventional banks' 9 month interest rate on deposit (X9), Islamic banks' yearly rate of return to depositors (Y12) and conventional banks' yearly interest rate on deposit (X12), and Islamic banks' rate of return of saving deposit (Y-saving) and conventional banks' interest rate on saving deposit (X-saving) showed that the null hypothesis of no cointegration between them was rejected i.e. the series were found to be cointegrated. The establishment

of cointegration justifies the application of the VEC model and VEC Granger causality test for the long run equilibrium relation, short term dynamics, and the causality direction.

The VAR Granger causality/Wald test for the Islamic banks' monthly rate of return to depositors (Y1) and the conventional banks' monthly interest rate on deposits, in Table 5, showed unidirectional causality. The causality run from the conventional banks' monthly interest on deposits to the Islamic banks monthly rate of return to depositors and not the other way. That is, the Islamic banks' monthly rate of return to depositors did not Granger cause the conventional banks' monthly interest rate on deposits.

The result of VAR Granger causality/Wald test for the Islamic banks' quarterly rate of return to depositors (Y3) and the conventional banks' quarterly interest rates on deposits, in Table 6, showed unidirectional causality. The causality run from the conventional banks' quarterly interest rates on deposits to the Islamic banks quarterly rates of return to depositors and not the other way. That is, the Islamic banks' quarterly rates of return to depositors did not Granger Cause the conventional banks' quarterly interest rates on deposits.

Table 4: Johansen Cointegration test results

Trend assumption: Linear deterministic trend Lags interval (1st differences)				
Variables	**Hypothesized No. of CE (s)**	**Eigen value**	**Trace statistics**	**Max-Eigen Statistics**
Y1 and X1:	(r=0)	0.05	11.34	8.12
Lag interval1-4	(r≤1)	0.03	3.21	3.21
Y3 and X3	(r=0)	0.04	12.08	8.25
Lag interval 1-3	(r≤1)	0.02	3.83	3.83
Y6 and X6	(r=0)	0.06	20.31*	12.49
Lag interval 1-2	(r≤1)	0.04	7.81*	7.81*
Y9 and X9	(r=0)	0.09	24.25*	17/88*
Lag interval 1-2	(r≤1)	0.03	6.36	6.36
Y12 and X12	(r=0)	0.06	16.81**	12.29
Lag interval 1-1	(r≤1)	0.02	4.51**	4.51**
Y-Deposit and	(r=0)	0.04	16.20*	9.03
X-Deposit	(r≤1)	0.03	7.17**	7.17**
Lag interval 1-1				

Table 5: VAR Granger Causality/Block Exogeneity Wald test between Islamic banks' rate of return (Y) and Conventional banks' deposit interest (X)

Excluded	Chi-sq	df	Prob.
Dependent variable: Y1			
X1	26.60753	2	0.0000
All	26.60753	2	0.0000
Dependent variable: X1			
Y1	0.488801	2	0.7832
All	0.488801	2	0.7832

Table 6: VAR Granger Causality/Block Exogeneity Wald test for Y3 and X3

Excluded	Chi-sq	df	Prob.
Dependent variable: Y3			
X3	40.45670	2	0.0000
All	40.45670	2	0.0000
Dependent variable: X3			
Y3	1.113985	2	0.5729
All	1.113985	2	0.5729

The results of long run equilibrium relation, the short term dynamic and the mean adjustment lags are reported in Table 7. First, the sing of the coefficient of the ECT, Φ, is negative and significant at 1% for all series of the explanatory variables of conventional banks' deposit interest rates on Islamic banks' rate of return to depositors for Eq 1, Eq 3, and Eq 5. The significance of Φ established long term equilibrium relation between conventional banks' deposit interest rates(X) and the Islamic banks' rate of returns to depositors(Y) for all series such as the 6-month deposit rates (Y6 and X6), 9-month deposit rates(Y9and X9), yearly deposit rates Y12 and X12), and saving deposits (Y-Saving and X-Saving).

The significance of the coefficient of ECT for the explanatory variable of conventional banks' deposit interest rates on the Islamic banks' rate of returns to depositors suggests Grander Causal relation running from the conventional banks' interest rates on deposits to the Islamic banks' rate of return to depositors for all series except for the saving deposits.

The negative sign and the significance of the coefficient of the ECT, Φ, indicates the speed of convergence (mean reverting) to equilibrium. This means when the Islamic banks' rate of return to depositors is above the long run equilibrium level, it will adjust downward and the vice versa. The speed of convergence/ adjustment for the Islamic banks' 6-month rate of return to depositors was 18% in Eq 1. The speed of convergence for the Islamic banks' 9-month rate of return to depositors was 24% in Eq 3. The speed of convergence for the Islamic banks' 12-month rate of return to depositors was 22% in Eq 5.

The mean adjustment lag (MAL) results showed that that the short term adjustment process, for Islamic banks' 6-month rate of return to depositors took about 4.2 months to complete. The MAL for Islamic banks' 9-month rate of return to depositors and the 12-month rate of return to depositors took about 3.2 months and 2.45 months respectively to complete the adjustment. For saving deposits, the MAL was about 48 months.

As far as the causality between the Islamic banks' 6-month rate of return to depositors (Y6) and conventional banks' 6-month interest on deposits(X6), the result of VEC Granger Causality/Wald test, in Table 8, showed unidirectional causality. The causality run from the conventional banks interest rates to the Islamic banks' rate of return to deposits at a probability of 0.0005. Islamic banks' rate of return (Y6) does not Granger Cause the conventional banks interest rate on deposits (X6).

The result of VEC Granger Causality/Wald test between the Islamic banks' 9-month rate of return to depositors (Y6) and conventional banks' 6-month interest on deposits (X9), in Table 8, showed unidirectional causality. The causality run from the conventional banks interest rates to the Islamic banks' rate of return to deposits at a probability of 0.007. Islamic banks' rate of return (Y9) does not Granger Cause the conventional banks interest rate on deposits (X9).

Table 7: Result of VEC estimate and short term dynamics

Dep Variable	Coefficient Sums Independent Variables[1]		ECT_{t-1}	Adj-R^2	Constant	MAL
	$\beta X6_{t-i}$	$\alpha Y6_{t-i}$	ΦECT_{t-1}			
Eq 1. ΔY6	−0.76		−0.18 (−3.38)*	0.27	0.001	4.2
Eq 2. ΔX6		−1.29	−0.05 (−1.25)	0.16	−0.0009	
	$\beta X9_{t-i}$	$\alpha Y9_{t-i}$				
Eq 3. ΔY9	−0.75		−0.24 (−3.73)*	0.30	0.0001	3.1
Eq 4. ΔX9		−1.32	−0.07 (−2.38)*	0.19	−0.0007	
	$\beta X12_{t-i}$	$\alpha Y12_{t-i}$				
Eq 5. ΔY12	−0.54		−0.22 (−3.45)*	0.27	5.19E-3	2.45
Eq 6. ΔX12		−1.82	−0.01 (−0.92)	0.16	−0.002	
	βX-Deposit	αY-Deposit				
Eq 7. ΔY-Deposit	−1.46		−0.03 (−1.03)	0.27	−0.01	48
Eq 8. ΔX-Deposis		−0.68	−0.03 (−2.68)*	0.15	-0.005	

[1]The coefficient reported for the independent variables are standardized coefficient. MAL is calculated: (1-β)/Φ

Table 8: VEC Granger Causality/Block Exogeneity Wald test for Islamic banks' rate of return to depositors (Y) and the Conventional banks' interest rate on deposits (X)

Excluded	Chi-sq	df	Prob.
Dependent variable: D (Y6)			
D (X6)	15.10109	2	0.0005
All	15.10109	2	0.0005
Dependent variable: D (X6)			
D (Y6)	1.325617	2	0.5154
All	1.325617	2	0.5154
Dependent variable: D (Y9)			
D (X9)	9.879830	2	0.0072
All	9.879830	2	0.0072
Dependent variable: D (X9)			
D (Y9)	4.069289	2	0.1307
All	4.069289	2	0.1307
Dependent variable: D (Y12)			
D (X12)	2.584051	2	0.2747
All	2.584051	2	0.2747
Dependent variable: D (X12)			
D (ISBKINVEST12)	3.631071	2	0.1628
All	3.631071	2	0.1628
Dependent variable: D (Y-Saving Deposit)			
D (X-Saving Deposit)	7.326303	2	0.0257
All	7.326303	2	0.0257
Dependent variable: D (X-Saving Deposit)			
D (Y-Saving Deposit)	1.826943	2	0.4011
All	1.826943	2	0.4011

The result of VEC Granger Causality/Wald test between the Islamic banks' rate of return on saving deposits (Mudarabah) to depositors (Y-Saving) and conventional banks' interest rates on saving deposits (X-Saving), in Table 8, showed unidirectional causality. The causality run from the conventional banks interest rates to the Islamic banks' rate of return to deposits at a probability of 0.02. Islamic banks' rate of return on Mudarabah savings (Y-Saving) does not Granger Cause the conventional banks interest rate on saving deposits(X-Saving).

Both VAR Granger Causality tests for the monthly and quarterly series of deposit interest rates and the VEC Granger Causality/Block Exogeneity Wald Test for the 6-month, 9-month, yearly series as well as the fixed deposit interest rate series confirmed the findings of Chong and Liu (2009) and Cevik and Charap (2011).

5. CONCLUSIONS

The examined and compared the conventional banks' deposit interest rate series with rates of return of the Islamic bank. The paper found strong, positive, and significant correlation between the Islamic banks' rates of return and the conventional banks' deposit interest rates for all series such as monthly, quarterly, half-yearly, 9-monthly, yearly as well as fixed deposit rate series.

The results of the Augmented Dicky-Fuller Test, PP Test, and the Zivot-Andrew Unit Root test with a structural Break found all series were non-stationary at level but stationary at the first difference.

The Johansen Cointegration test found cointegration between the half-yearly, 9-month, yearly series of the conventional banks' deposit interest rates and the Islamic banks' rates of return to depositors which led to the VEC for establishing the long run equilibrium relation, short term dynamics, and the causality direction.

The negative sign and the significance of the coefficient of the ECT, Φ, indicates the speed of convergence (mean reverting) to equilibrium. When the Islamic banks' rate of return to depositors was above the long run equilibrium level, it adjusted downward and the vice versa. The speed of convergence/adjustment varied between 18% and 24%.

VEC Granger Causality/Block Exogeneity Wald Test for Islamic banks' rates of return to depositors and the conventional banks' Interest Rates on Deposit in all cointegrated series found Granger causality and the causality run from the deposit interest rates of the conventional bank to the rates of return of the Islamic bank during 2001-2015. The VAR Granger Causality/Block Exogeneity Wald Test for the non-cointegrated series, monthly and quarterly series, showed Granger causality running from the conventional banks interest rates to Islamic banks' rates of return to depositors. The result of this paper confirmed the previous findings of Chong and Liu (2009) and Cevik and Charap (2011).

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APPENDIX

Table A : Criteria of Lag Selection

Variables	Selection Criteria	Lag 0	1	2	3	4	5	6
X1 and Y1	AIC					−4.57*		
	SC				−4.28*			
X3 and Y3	AIC				−5.08*			
	SC				−4.83*			
X6 and Y6	AIC							−4.61*
	SC			−4.30*				
X9 and Y9	AIC				−4.01*			
	SC			−3.76*				
X12 and Y12	AIC			−3.71*				
	SC			−3.53*				
XSaving Deposit and Y saving Deposit	AIC				−5.68*			
	SC			−5.44*				

*Indicates lag order selected by the criterion. AIC: Akaike Information Criterion, SC: Schwarz Information Criterion