Monetary Policy Shocks and Islamic Banks' Deposits in a Dual Banking System: Empirical Evidence from Malaysia and Bahrain

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The objective of this paper is to empirically explore the dynamic inter-relationships between deposits of Islamic banks with monetary policy variables in Bahrain and Malaysia covering the period from January 2001 to June 2006. Both these countries are being dubbed as the worlds' largest International Islamic Financial Hubs (Qorchi, 2005). A comparative analysis between these two countries highlights the differences and similarities of the impact of monetary policy shocks on the Islamic banks' deposits. The analysis comprises of two major testing approaches. First, the auto-regressive distributed lag (ARDL) model is used to examine the long-run relationship among the variables. Second, the vector error-correction model (VECM) is adopted to explore the short- and long-run dynamics among the variables. Compared to the Malaysian Islamic banks' deposits, the study finds that the Islamic banks' deposits in Bahrain are sensitive to monetary policy changes. This implies that the Bahraini Islamic banks are less capable to offset the de-stabilizing impact of monetary policy as compared to its Malaysian counterpart.

1. Introduction

Studies supporting the merits of an interest-free monetary and banking system have been extensive. In general, these studies propose that the

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relative monetary stability accorded by an interest-free monetary system is due to its asset-linked nature as compared to the interest-based system, which is subjected to the fluctuations in the interest rate levels. A monetary system which is relying on interest-free assets eliminates the element of speculation. Due to this, it is proposed to be more predictable and has reliable link to the policy objectives, thus can be effectively controlled by the monetary authority. Consequently, there is a general belief that the Islamic banking system is somewhat shielded from the risks associated with the interest rate fluctuations and is more stable when compared to the conventional banking system. Khan (1985) further suggests that the Islamic financial market is able to weather economic and financial crisis better. In line with this, current research efforts in this area are mainly focused towards developing and evaluating the demand for Islamic monetary instruments and demonstrating the validity and effectiveness of these instruments for monetary policy purposes.

In the last decade, the empirical literature in the area of Islamic banking has been focused on product and development as well as the viability of Islamic banking in the current financial intermediation process. We find that there is a lack of research interest in the area of monetary policy from the Islamic perspective in general, and monetary transmission mechanism, in particular. With the increasing role that the Islamic banks are playing in both Malaysian and Bahrain economies, it is, therefore, timely to assess the transmission of monetary policy through Islamic banks' deposits. Currently, both Malaysia and Bahrain are being dubbed as the two biggest International Islamic Financial Hubs of the world (Qorchi, 2005). Given that both these countries have conventional and Islamic banking working in parallel; this study hopes to cast some light on the similarities and differences of effects of the monetary policy shocks on the Islamic banks deposits in these two countries. This study also hopes to contribute towards enriching the empirical studies on the validity and viability of Islamic monetary instruments for monetary policy implementation purposes (see, for example, Kaleem, 2000; Samad and Hassan, 2000; Samad, 1999). Another aspect of novelty of this paper is in terms of its methodology. This study adopts the auto-regressive distributed lag (ARDL) approach and the vector error-correction model (VECM), which has never been adopted in this area.

In finance literature, interest rate risk can be broadly defined as the impact of interest rate changes on a bank's profitability, cash flows as well as net worth (Bacha, 2005). Financial intermediaries such as commercial banks (both Islamic and conventional) are inherently exposed to interest rate risk particularly due to the fact that they have little control over the deposit structure of the banks. An increase in interest rate signals a higher cost of funds and banks may have to pay higher interest rates to attract new deposits. This may be made worse if the bank is an Islamic bank because there is always possibility of depositors (both non Muslims and perhaps Muslims) switching accounts or withdrawing funds.

The role of financial intermediaries, such as banks, emanates from the balance sheet items; both assets and liabilities. Money channel highlights the importance of banks in generating liabilities such as deposits. Banks create money through the deposits and other placement earnings from customers, banks and other financial institutions. For instance, a contraction in money supply reduces the banks' reserves due to reserve requirements. This in turn, reduces the banks' ability to increase deposits. As a result, fewer deposits are placed by the banks customers (Ford et al., 2003). Ramlogan (2004) asserts that in the money channel there are two classes of assets; money and all other assets. A reduction in the level of reserves prompts a fall in the level of deposits. Therefore, if money demand is related to interest, an open market interest rates need to rise to restore equilibrium.

Although theoretically, Islamic banks and conventional banks in a dual banking system are governed by different philosophical foundations, it is inevitable that these two systems may interact given that they operate in a common macroeconomic environment. For instance, although the Islamic banks operate within the interest-free framework, the macroeconomic environment in a dual banking system exposes them to problem associated with interest rate risks faced by conventional banks. This paper, therefore, seeks to investigate the proposition that Islamic banks, as compared to their conventional counterparts, are not susceptible to interest rate changes given their asset-linked nature.

The rest of this paper is organized as follows: the next section provides some theoretical underpinnings and literature review. Section 3

highlights an overview of the banking systems both in Malaysia and Bahrain. Section 4 discusses the data and empirical framework. Section 5 presents the empirical findings and analysis of the results. Lastly, Section 6 provides the conclusion reached to

2. Literature Review

Empirical assessment on the merits of the interest-free banking system has been initiated by Darrat (1988) who showed that the banking system in Tunisia becomes more stable without interest-bearing assets than if these assets were to exist. More recent studies such as Darrat (2000) and Kia (2001) provide further empirical evidences on the advantages of the interest-free monetary and banking system by focusing on the case of Iran, which has a long history in implementing a full-fledged interest-free monetary and banking system since 1984. These studies find that both short- and long-run interest-free money demand functions are stable and their coefficients are invariant with respect to policy and other exogenous shocks. Kia and Darrat (2003) compare the demand equations for money and profit-sharing deposits and find that the demand for profit-sharing deposits possesses the most stable and policy invariant function, suggesting that profit-sharing banking scheme insulates the monetary system from interest rate fluctuations and minimizes the possibility of financial instability. Consequently, it is further suggested that the profit-sharing deposits could represent a credible instrument for monetary policy-making in Iran.

Kaleem (2000), Samad and Hassan (2000) and Samad (1999) are among the many studies which provide empirical supports on the stability of the Islamic monetary instruments in a dual banking system in Malaysia. For instance, Kaleem (2000) analyzes the Malaysian data over the period from January 1994 to December 1999 and finds that Islamic banking is more crises-proof due to its asset-linked in nature. In view of this, the interest-free monetary instruments are proposed to be valid and effective instruments that are useful, if not, better than the interest-based monetary instruments, for monetary policy implementation purposes.

Despite the numerous studies supporting the superiority of the interest-free banking system over the interest-based system, further research on more detailed aspects of the relationships between the interest-free

banking and various aspects of financial risks reveal some concerns. Baldwin (2002) finds that there is a general lack of awareness in adopting the best risk management practices in the Islamic countries due to an erroneous belief that an Islamic bank, by virtue of its interest-free nature, is not subjected to the interest rate fluctuations. Rosly (1999) finds that Islamic banks in Malaysia are at disadvantage compared to the conventional banks when there is an increase in market interest rates. While the conventional banks could reap higher profit due to the increase in interest rates, Islamic banks face negative funds gap since interest-free financing is based on fixed rate, while liabilities (deposits) are benchmarked against the prevailing interest rates. However, How *et al*. (2004) examine whether interest-free banking institutions in Malaysia are subject to the three types of bank risks, namely, credit risk, interest-rate risk and liquidity risk. The study finds that while the commercial banks with interest-free financing have significantly lower credit and liquidity risks, they have significantly higher interest-rate risk than the banks without Islamic financing (Bacha, 2005).

An examination of the impacts of the conventional money market rates on the Islamic financial instruments in Malaysia by Kaleem and Isa (2006) reveals another weakness of the interest-free monetary system, particularly in a dual banking system such as that in Malaysia. The study finds that the current financial market setup is not in favour of the interest-free banking system because it enables the conventional banks to take advantage of the arbitrage opportunities provided by the dual banking system. The conventional banks have the flexibility of investing in both the interest-free and the interest-based financial markets, thus making profit from the interest rate differentials between the two markets. On the other hand, the Islamic banks are only limited to raise financing in the Islamic money market.

Malaysia currently practises dual banking system where the conventional banks operate hand – in - hand with the Islamic banks. Despite the different philosophical foundations governing the two systems, they are both subject to the same macroeconomic conditions. Bacha (2005) reiterates that nevertheless, the differences may lie in the profile of the customers that subscribe to both banking systems. The non-Muslim customers constitute of a larger group of customers for both these systems. There is always a possibility of switching between the

two systems. Theoretically, the non- Muslim depositors can take advantage of the arbitrage that arises from the rate differentials between the two systems. Although some studies have found that even the Muslim depositors in Malaysia switch between the two systems to take advantage in terms of the rate differentials (Sukmana and Mohd. Yusof, 2005)

3.   Islamic Banking System In Malaysia and Bahrain: An Overview

3.1. Islamic Banking in Malaysia

Islamic banking industry in Malaysia has undergone remarkable growth in the last two decades due largely to the supportive policy environment provided by the government through the central bank, Bank Negara Malaysia. Since the establishment of the first full-fledged Islamic bank in 1983 and the introduction of the Islamic banking window scheme by the conventional banks in 1993, the Islamic banking industry continued to stage an impressive performance. In the period from 1993 to 2006, the total assets of the Islamic banks surged to RM73.8 billion in 2006 from RM2.4 billion in 1993, registering an impressive compounded annual growth rate of 30.2 percent per year over the thirteen-year period. In the same period, total Islamic deposits mobilised by the banking system increased to RM50.5 billion at end-2006 from a mere RM2.2 billion in 1993. Meanwhile, the growth of total financing was also impressive at RM78.5 billion at end-2006 compared to RM1.1 billion in 1993. The encouraging performance of the Islamic banking in Malaysia can be attributed to the wide office network that enabled easy access by customers throughout the country. By end-2006, there were 10 full-fledged Islamic banks (another Islamic bank commenced operation in early 2007), having a branch network of 1,167 comprising of Islamic banking branches and counters made available by the full-fledge Islamic banks and the conventional banks which offered the Islamic banking windows scheme.

Despite the impressive growth, the share of Islamic banking of the total financing extended by the banking system is still small. Of the total deposits mobilised by the banking system in 2006, Islamic banks contributed about 12.4 percent, a small improvement from 5 percent

recorded in 2000. Likewise, Islamic banks contribute only 13.3 percent of total financing extended by the banking system.

The Islamic banking industry continues to grow supported by the conducive environment provided by the BNM. To accelerate development of the industry and create positive competitive pressure to take advantage of positive spill-over effects, BNM grants banking licence to full-fledge domestic and foreign Islamic banks, particularly from the MiddleEast to operate in the country. By the end of 2006 and early 2007, several full-fledged Islamic banks commence operations resulting in eleven full-fledge Islamic banks in Malaysia. These are Asian Financial Bank (M) Berhad, Bank Islam Malaysia Berhad, Bank Muamalat Malaysia Berhad, Hong Leong Islamic Banking Berhad, CIMB Islamic Bank Berhad, RHB Islamic Bank Berhad, AmIslamic Bank Berhad, Affin Islamic Bank Berhad, Al-Rajhi Banking and Investment Corporation (Malaysia) Berhad, EONCAP Islamic Bank Berhad, and Kuwait Finance House (Malaysia) Berhad. With the continuous supportive banking policy provided by the BNM, Islamic banking industry has a bright prospect for growth in the country.

The encouraging growth of the Islamic banking industry in Malaysia's financial landscape, in part, reflects the country's strong commitment to develop a comprehensive Islamic financial system. In working towards this objective, BNM is carefully taking steps to strengthen the foundation and put in place the pre-requisites of the system. In August 2006, BNM launched the Malaysia International Islamic Financial Center initiative to undertake Malaysia's liberalization strategies to a new level with the aim of positioning the country strategically in the area of Islamic Finance. Under this initiative, "…Islamic banking institutions are allowed to undertake a broader array of Islamic financial activities that include commercial banking, consumer banking, investment banking and international currency business" (Bank Negara Malaysia, 2007). In other words, financial institutions in Malaysia are allowed to strategically positioning themselves in order to take advantage of the encouraging growth of the Islamic banking and finance industry.

3.2. Islamic Banking in Bahrain

The Bahraini Islamic banking system is enjoying a robust and dynamic growth in a favourable financial environment in the last few years. Bahrain continues to be an attractive centre for financial institutions with the banking sector having the largest component of the financial system accounting for more than 85 percent of the total financial assets. Among the reasons for this significant momentum are its geographical location, a well regulated supervision of its monetary authority, serious efforts undertaken in promoting and enhancing Islamic banking industry together with well –qualified work force nationals and expatriates and reasonable operating costs (International Monetary Fund, 2006).

Currently, the conventional banking system comprises of 19 retail banks, 69 wholesale banks, 2 specialised banks and 36 representative offices of overseas bank. The Islamic banking system on the other hand, comprises of 6 retail banks and 18 wholesale banks offering a diversified *shari'ah*-compliant products and services. The banking system in Bahrain is also gaining significant role in the emergence of Bahrain as a leading International Islamic Financial hub. As at December 2006, the banking sector assets amount to over USD 180 billion, which is more than twelve times of the annual GDP (Central Bank of Bahrain, 2007).

The significant role of the banking industry in the emergence of Bahrain as a leading International Islamic Financial hub is further evidenced by the growth of its total assets. As at December 2006, the banking sector assets amounted to over USD 180 billion, which were more than twelve times of the annual GDP. The Islamic banking industry in particular witnessed phenomenal growth with its total assets jumping from US$1.9 billion in 2000 to US$ 10.3 billion by July 2006, an increase of over 400 percent. Correspondingly, the market share of Islamic banks is observed to increase from 1.8 percent of total banking assets in 2000 to 6.2 percent in 2006 (Central Bank of Bahrain, 2007).

Backed by the escalating fuel prices and a corresponding increase in liquidity within the GCC region, the Islamic banking and finance industry in Bahrain is expected to continue gaining a spectacular

momentum and a remarkable progress to further enhance its position as global leader in Islamic banking and finance.

Against the backdrop of this burgeoning growth of the two global leaders in Islamic banking and finance industry, Malaysia and Bahrain, it is imperative that we also assess the effects of monetary policy transmission mechanism on the deposits in these two systems. In view of the increasing role played by Islamic banking in the intermediation process in both countries, it is therefore important to conduct a deeper analysis on the role of Islamic bank deposits in the transmission process of monetary policy. The findings of this study would help to determine the relevance of Islamic banking industry in the countries' monetary policy implementation and the viability of developing a comprehensive Islamic financial system. At the same time, the similarities and differences of these two systems would help both countries to design relevant monetary policies to further strengthen their positions as two largest international hubs in Islamic banking and finance.

4. Data and Empirical Framework

4.1. Data

The study uses monthly data covering the period from January 2001 to June 2006. Due to unavailability of data for comparative analysis, we employ data that are most appropriate to represent each objective and macroeconomic variable. The data description is summarised in the table below.

Table 1: Data Description and Sources

Variable	Description	Measurement	Source
MID	Malaysian Islamic Banks' Deposits	Total deposits in the Islamic banking system	BNM
BID	Bahraini Islamic Banks' Deposits	Domestic Liabilities of Islamic banks to private non-banks	CCB
M2	Broad-Money Supply (M2)	Money Supply M2 for Malaysia Money + Quasi Money for Bahrain	IFS
IR	Interest Rate	Overnight Policy Rate (ONR) for Malaysia Money Market Interbank Rate (MMIR) for Bahrain	IFS
GDP	Real Gross Domestic Product	Industrial Production Index (IPI) for Malaysia Refined Petroleum Production Index (RPPI) for Bahrain	IFS
REER	Real Effective Exchange Rate	The weighted average of the Malaysian / Bahrain exchange rate versus other major currencies calculated using the value of Malaysia's/Bahrain's trade with the respective countries and areas as its weights adjusted for inflation rate differences.	IFS

Note: BNM = Bank Negara Malaysia; CCB = Central Bank of Bahrain; and IFS = International Financial Statistics

4.2. The Model

Ramlogan (2004) asserts that in the money channel there are two classes of assets; money and all other assets. A reduction in the level of reserves prompts a fall in the level of deposits. Therefore, if money demand is related to interest, an open market interest rates need to rise to restore equilibrium. Consistent with the money channel theory as proposed by Keynes (1936), empirical model can therefore be represented as follows:

$$MID_t = \delta_0 + \phi_1 ONR_t + \varphi_2 IPI_t + \gamma_3 REER_t + \mu_4 M2_t + \tau_t \qquad (1.1)$$

$$BID_t = \delta_0 + \phi_1 MMIR_t + \varphi_2 RPPI_t + \gamma_3 REER_t + \mu_4 M2_t + \epsilon_t \qquad (1.2)$$

The Overnight Policy Rate (ONR) is used as the monetary policy indicator for Malaysia, while the Money Market Interbank Rate (MMIR) is used as the monetary policy indicator for Bahrain. The objective variables comprised of the Malaysian Islamic Banks' Deposits (MID) and Bahraini Islamic Banks' Deposits (BID), respectively. The other objective variables employed in this study are Broad Money Supply (M2) and real Gross Domestic Product (GDP) which is proxied by Industrial Production Index (IPI) for Malaysia and Refined Petroleum Production Index (RPPI) for Bahrain. Given that Malaysia and Bahrain are highly open economies, the conduct of monetary policy may be influenced by foreign shocks, thus we also included Real Effective Exchange Rate (REER) as a control variable.

The GDP represent the growth of an economy and therefore may be regarded as determinant of deposits in the banking system. An increase in GDP is expected to have a positive effect on the Islamic banking deposits. The money supply as measured by M2, on the other hand, can be regarded as primary indicator of future growth potential (Said and Ismail, 2005). Excessive growth in money supply signals a rising inflation and therefore is anticipated to have a negative impact on deposits. All series are adjusted with 2000 base year and except for ONR and MMIR, are expressed in natural logarithms.

A higher exchange rate, on the other hand, results in higher imports prices and in turn, increases domestic prices. Accordingly, a higher exchange rate reduces exports prices and thus leading to a higher

demand for exports (Kia and Darrat, 2007). As a result, the higher demand for resources creates a pressure on domestic prices and hence reduces deposits in Islamic banks.

4.3. Empirical Framework

A battery of time series techniques are used to empirically explore the dynamic interrelationships between the Islamic banks' deposits in Bahrain and Malaysia and the monetary policy variables. Autoregressive distributed lag (ARDL) model is employed to empirically examine the long-run relationship among the variables, while the vector error correction model (VECM) is used to explore the short- and long-run dynamics among the variables.

4.3.1. ARDL Bound Testing Approach

To examine the relationship between deposits of the Islamic banking system and the monetary policy variables, this study employs the newly proposed ARDL bound testing approach to cointegration (see Pesaran *et al.*, 2001). It involves estimating the conditional error correction version of the ARDL model. The choice of ARDL approach in this study is based on consideration of cointegration analysis are unbiased and efficient given the fact that, firstly, it can be applied to a small sample size study (Pesaran *et al.*, 2001) and therefore conducting bounds testing will be appropriate for the present study. Secondly, it estimates the short and long-run components of the model simultaneously, removing problems associated with omitted variables and autocorrelation and, thirdly, the ARDL method can distinguish between dependent and independent variables (Narayan, 2004).

Ideally, for the purpose of this study, we need to incorporate all the variables in the modelling, but a VAR model can be poorly estimated in a finite sample, as the addition of a variable will quickly exhaust the degree of freedom. Following Gertler and Gilchrist (1993, 1994), we estimated a series of separate VAR models including M2, GDP, and REER, interest rate, and the Islamic banks' deposits. Thus, our models contain only five variables.

The error correction version of ARDL framework pertaining to the variables in the Equations (1.0) and (1.1) can be written as follows:

$$\Delta MID_t = \delta_0 + \sum_{i=1}^{p} \theta_i \Delta MID_{t-i} + \sum_{i=0}^{p} \phi_i \Delta ONR_{t-i} + \sum_{i=0}^{p} \varphi_i IPI_{t-i} + \sum_{i=0}^{p} \gamma_i \Delta REER_{t-i} + \sum_{i=0}^{p} \mu_i \Delta M2_{t-i} +$$

$$+\lambda_1 MID_{t-1} + \lambda_2 ONR_{t-1} + \lambda_3 IPI_{t-1} + \lambda_4 REER_{t-1} + \lambda_5 M2_{t-1} + \nu_{1t} \qquad (2.1)$$

$$\Delta BID_t = \delta_0 + \sum_{i=1}^{p} \theta_i \Delta BID_{t-i} + \sum_{i=0}^{p} \phi_i \Delta MMIR_{t-i} + \sum_{i=0}^{p} \varphi_i RPPI_{t-i} + \sum_{i=0}^{p} \gamma_i \Delta REER_{t-i} + \sum_{i=0}^{p} \mu_i \Delta M2_{t-i} +$$

$$+\lambda_1 BID_{t-1} + \lambda_2 MMIR_{t-1} + \lambda_3 RPPI_{t-1} + \lambda_4 REER_{t-1} + \lambda_5 M2_{t-1} + \epsilon_{1t} \qquad (2.2)$$

In the above equation, the terms with the summation signs represent the error correction dynamic, while the second part (term with λs) correspond to the long-run relationship. The null of no cointegration in the long-run relationship is defined by $H_0: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = 0$ is tested against the alternative of $H_1: \lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq 0$, by the means of familiar F-test. However, the asymptotic distribution of this F-statistic is non-standard irrespective of whether the variables are $I(0)$ or $I(1)$. Pesaran *et al*. (1996) have tabulated two sets of appropriate critical values. One set assumes all variables are $I(1)$ and another assumes that they are all $I(0)$. This provides a bound covering all possible classifications of the variables into $I(1)$ and $I(0)$ or even fractionally integrated. If the F-statistic lies above the upper bound level, the null hypothesis is rejected, which indicates the existence of cointegration. However, if the F-statistic falls below the bound level, the null cannot be rejected, showing that no cointegration exist. If, however, it falls within the band, the result is inconclusive. Finally, in order to determine the optimal lag-length incorporated into the model and select the ARDL model to be estimated, the study employs the Akaike Information Criteria (AIC).

4.3.2. VECM Framework

To examine the short- and long-run dynamic relationships among the variables, the study employs the vector error correction model (VECM) framework. The VECM regresses the changes in the both dependent and

independent variables on lagged deviations. The multivariate causality test based on VECM can therefore be formulated as follows:

$$\Delta Z_t = \delta + \Gamma_i \Delta Z_{t-1} + \ldots + \Gamma_k \Delta Z_{t-k} + \Pi Z_{t-k} + \varepsilon_t \qquad (3)$$

where Z_t is an n x 1 vector of variables and δ is an n x 1 vector of constant, respectively. In our case, $Z_t = (MID/BID, ONR/MMIR, IPI/RPPI, RRER, M2)$. Γ is an *n x n* matrix (coefficients of the short run dynamics), $\Pi = \alpha\beta'$ where α is an *n x 1* column vector (the matrix of loadings) represents the speed of short run adjustment to disequilibrium and β' is an *1 x n* cointegrating row vector (the matrix of cointegrating vectors) indicates the matrix of long run coefficients such that Z_t converge in their long run equilibrium. Finally, ε_t is an *n x 1* vector of white noise error term and *k* is the order of autoregression.

A test statistic is calculated by taking the sum of the squared F-statistics of Γ and t-statistics of Π. The multivariate causality test is implemented by calculating the F-statistics (Wald-test) based on the null-hypothesis that the set of coefficients (Γ) on the lagged values of independent variables are not statistically different from zero. If the null-hypothesis is not rejected, then it can be concluded that the independent variables do not cause the dependent variable. On the other hand, if Π is significant (that is different from zero) based on the t-statistics, then both the independent and dependent variables have a stable relationship in the long-run.

Finally, from the Equation (3), two channels of causation may be observed. The first channel is the standard Granger tests, examining the joint significance of the coefficients of the lagged independent variables. Whereas, the second channel of causation is the adjustment of the dependent variable to the lagged deviations from the long run equilibrium path, represented by the error correction term (ECT). If the ECT is found to be significant, it substantiates the presence of cointegration as established in the system earlier and at the same time; it tells us that the dependent variable adjusts towards its long run level. From these tests, we can reveal four patterns of causal interactions among pairs of the variables, i.e., (i) a unidirectional causality from a variable, say x, to another variable, say y; (ii) a unidirectional causality

from y to x; (iii) bidirectional causality; and (iv) independent causality between x and y.

5. Empirical Results and Analysis

In estimating the short and long-run relationships between the monetary policy variable and the objective variables consisting of the deposits of Islamic banks in both countries Bahrain and Malaysia and the selected macroeconomic variables, we need to determine the lag-length of the first-differenced variables. Bahmani-Oskooee and Bohl (2000) have shown that the results of this first step are usually sensitive to the lag-length. To verify this, in line with Bahmani-Oskoee and Wing Ng (2002), we impose the optimal lag length of 6 on the first difference of each variable to compute the F-statistics for the joint significance of lagged levels of variables for Equations (1.1), (1.2), (2.1) and (2.2).

Table 1: F-statistics for Testing the Existence of a Long-run Equation

Lag-Length	Bahrain	Malaysia
	Deposits	Deposits
1	3.0679	5.131[***]
2	3.2231	2.6054
3	3.2643	2.8189
4	3.2695	3.1405
5	3.1723	4.0748[**]
6	3.4642[*]	2.7035

Note: The relevant critical value bounds are taken from Narayan (2004) [Case II with a restricted intercept and no trend and number of regressors = 4 from]. They are 3.725 – 4.940 at the 99%; 2.743 – 3.792 at the 95%; and 2.323 – 3.273 at the 90% significance levels respectively. *, **, and *** denotes that F-Statistics falls above the 90%, 95% and 99% upper bound, respectively.

The computed F-statistics for each lag-length for all the models are reported in Table 1. As reported, the test outcome of the significance levels for the ARDL models varies with the choice of lag-length. The computed F-statistics are significant at least at 90% level when the order of lags = 6 for the Islamic banks' deposits of Bahrain. On the

other hand, the computed F-statistics are found to be significant at least at 95% level for the Malaysian Islamic bank deposits when order of lags =1 and 5 are used. This suggests that there seems to be a cointegration among the selected variables in both Bahrain and Malaysian Islamic banks' deposits models, implying that there is a tendency for the variables to move together towards a long-run equilibrium.

Table 2: The Long-run ARDL Model Estimates

	Bahrain [1,0,4,0,2]		**Malaysia** [1,0,0,0,0]
Constant	-41,968*** (-7.597)	**Constant**	0.8354 (1.104)
ONR	-0.230*** (-8.446)	**MMIR**	0.008 (0.398)
IPI	-2.959 (-1.718)	**RPPI**	-0.037 (-0.557)
M2	4.928*** (12.656)	**M2**	0.740*** (6.305)
REER	2.356*** (4.1494)	**REER**	-0.065 (-0.569)
	Adj-R^2 = 0.745 D-W= 1.682		Adj-R^2 = 0.834 D-W = 2.262

Notes: *, ** and *** denotes significantly at 10%, 5% and 1% level of significance, respectively. Figures in the parentheses and squared parentheses are the t-statistics values and the selected ARDL model. D-W denotes Durbin-Watson test for autocorrelation.

The next step involves estimating Equations (1.1) to (1.2) using the appropriate lag-length selection criterion based on the Akaike Information Criterion (AIC). Based on Table 2, the results provide evidence that the Bahrain Islamic banks' deposits seem to be significantly affected by MMIR, M2 and REER during the period of analysis. However, except for money supply M2, monetary policy variable is not significant in affecting the Malaysian Islamic banks' deposits. In the context of monetary transmission mechanism, this result implies that monetary policy shock (via MMIR) is transmitted through bank deposits (the money view) in Bahrain and to a certain extent via money supply M2 for Malaysia.

In the case of Bahrain, the results suggest that monetary policy variable have significant negative effects on the Islamic banks' deposits. In other words, an increase in interest rate results in a decline in Islamic deposits in Bahrain. Increase in the policy rate results in decline in liquidity of the Islamic banks, which curtails the ability of Islamic banks to supply new loans. This result is supportive of both the money view of monetary policy transmission. Islamic banks deposits in Bahrain are shown to be sensitive to interest rate changes, which is supportive of our earlier study (Kassim *et al.*, 2009). For Malaysia, on the other hand, the results indicate that the Islamic banks' deposits are not susceptible to interest rate changes. This may infer that interest rate changes do not significantly affect deposits and that perhaps other factors like Islamic awareness rather than profit driven attract depositors to deposit more funds in the Islamic banks.

In comparing the responses of the channels of monetary policies in both Bahrain and Malaysia, it is interesting to note that, Islamic banks deposits in Bahrain are more sensitive to interest rate and other macroeconomic variables shocks. This finding has significant monetary policy implications. Not only that it implies that the Islamic banks' deposits are better transmitter for monetary policy effects, it also reflects the vulnerability of the Islamic banks to monetary policy changes.

Next, we move on to the multivariate causality analysis which helps us to explore the short and long-run dynamics of the variables in the system. Based on the VECM framework, we estimate the changes in both dependent and independent variables on lagged deviations. The estimates of the error correction representations selected by the AIC are presented in Tables 3 and 4. The long run coefficients reported for both models involving Islamic banking deposits for Bahrain and Malaysia in Table 2 are employed to generate the error correction terms. The adjusted-R^2 values of more than 0.70 for all the models suggest that such error correction models fit the data reasonably well. In addition, the computed F-statistics clearly reject the null hypothesis that all regressors have zero coefficients for both cases. More importantly, the error correction terms (ECTs) carry the correct negative signs and are significant. This therefore, substantiates our earlier findings of the existence of cointegration between the Bahraini and Malaysian banking systems and their monetary policy variables. Furthermore, the speeds of

adjustment for all the models are about 15-17 percent. This indicates that last period disequilibrium is, on the average, corrected by about 15-17 percent in the following month.

Table 3: Multivariate 'VECM' Causality for the Islamic Bank (Malaysia)

Dependent Variables	Independent Variables					
	ΔMID	ΔONR	ΔIPI	ΔM2	ΔREER	ECT_{t-1}
ΔMID	-	2.267 (0.138)	1.355 (0.249)	0.289 (0.592)	2.893* (0.094)	-0.158** [-3.4533]
ΔONR	2.361 (0.129)	-	1.300 (0.259)	0.191 (0.663)	1.031 (0.314)	-0.133* [-1.717]
ΔIPI	0.155 (0.695)	3.799* (0.0562)	-	0.684 (0.412)	1.368 (0.247)	-0.152** [-2.110]
ΔM2	3.442* (0.068)	0.044 (0.835)	8.122*** (0.006)		0.878 (0.353)	-0.151* [-1.861]
ΔREER	0.035 (0.852)	0.029 (0.865)	0.301 (0.585)	0.567 (0.454)	-	-0.152* [-1.868]

Note: ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. ECT_{t-1} is derived by normalizing the cointegrating vectors on the dependent variable (i.e., MID), producing residual *r*. By imposing restriction on the coefficients of each variable and conducting Wald test, we obtain *F*-statistics for each coefficient in all equations. Figures in the parentheses and squared parentheses represent *F*-statistics and probabilities for *t*-statistics, respectively.

Analyzing the short-run causalities based on the VECM framework, we find further support to our earlier findings. Focusing on the direction of causalities between the monetary policy variable and the bank balance sheet items, we find that there is a significant causality running from ONR to IPI. However, the monetary policy variable is not significant in causing Islamic banks' deposits for both Bahrain and Malaysia. The results also show that for Malaysia, there is a significant channel for monetary transmission mechanism through the following nexus: ONR-IPI, IPI-M2, MID-M2 and REER-MID. As are being shown by the results based on the ARDL framework, Islamic Deposits in Malaysia are not a significant channel for monetary policy transmission for the period under review.

Table 4: Multivariate 'VECM' Causality for the Islamic Bank (Bahrain)

Dependent Variables	Independent Variables					
	ΔBID	ΔMMIR	ΔRPPI	ΔM2	ΔREER	ECT$_{t-1}$
ΔBID	-	0.628 (0.600)	0.775 (0.166)	0.856 (0.469)	0.284 (0.836)	-0.175** [-2.389]
ΔMMIR	0.304 (0.758)	-	0.115 (0.950)	0.064 (0.978)	1.194** (0.072)	-0.071** [-2.496]
ΔRPPI	2.158* (0.100)	0.031 (0.993)	-	0.882* (0.057)	0.345 (0.792)	-0.149* [-1.998]
ΔM2	1.323 (0.277)	0.033 (0.992)	1.112 (0.353)	-	0.351 (0.787)	-0.034* [-2.006]
ΔREER	0.189 (0.903)	0.399 (0.754)	2.132* (0.090)	0.493 (0.688)	-	-0.114*** [-3.179]

Note: ***, ** and * represent significance at the 1%, 5% and 10% levels, respectively. ECT$_{t-1}$ is derived by normalizing the cointegrating vectors on the dependent variables (i.e., BID), producing residual *r*. By imposing restriction on the coefficients of each variable and conducting Wald test, we obtain *F*-statistics for each coefficient in all equations. Figures in the parentheses and squared parentheses represent *F*-statistics and probabilities for *t*-statistics, respectively.
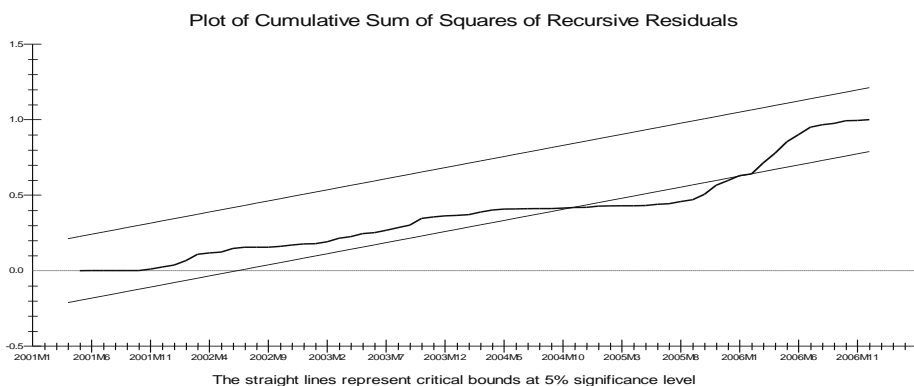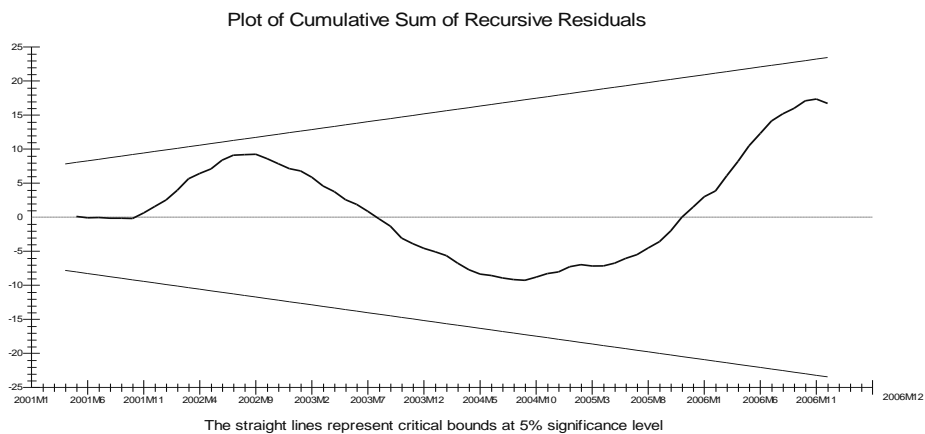
Shifting to the short-run causality of monetary policy variable and Islamic banks' deposits for Bahrain, we find that there is no short-run causality running from monetary policy variable to Islamic deposit. In the short run, an Islamic deposit in Bahrain is also not a significant nexus of monetary policy for the period under review. This may be due to the fact that the market share of Islamic banks is only 6.2 percent of the whole banking industry in Bahrain. However, based on the ARDL framework, in the long run, we find that the Islamic banks' deposits in Bahrain instruments are more sensitive to interest rate shocks and can be used to influence to achieve the objective of monetary policy.

We then proceed to examine the stability of the long run coefficients together with the short-run dynamics. Following Pesaran and Pesaran (1997), we apply the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ) stability tests for our chosen ARDL models. Figure 1 provides the plots of the CUSUM and CUSUMSQ stability tests for both Malaysia and Bahrain. From the figures, we find that the plots of CUSUM and
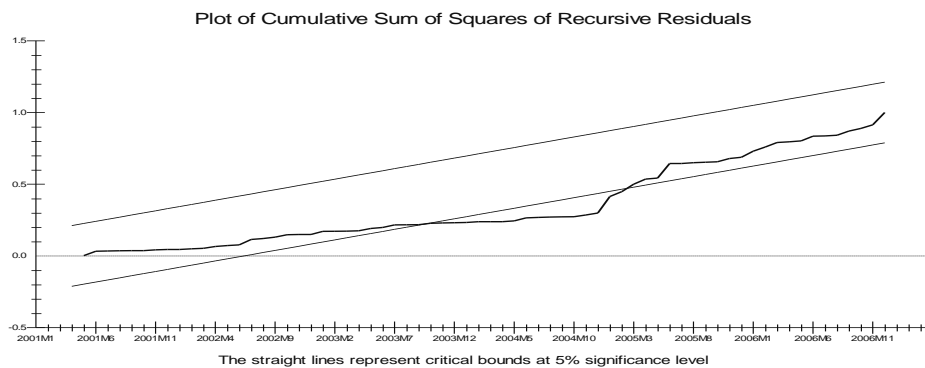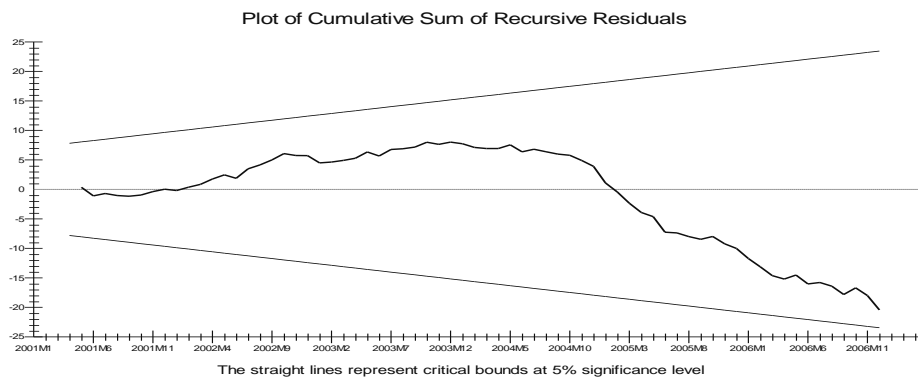
CUSUMSQ statistics remain within the critical bounds at 5% significance level. This implies that all coefficients in the error correction model are stable over the time. The selected ARDL models adopted in the study seem to be satisfactory and robust in estimating the short- and long-run relationships between Islamic banks' deposits and monetary variables.

Figure 1: CUSUM and CUSUMSQ Plots

Islamic Deposits: Malaysia

Plot of Cumulative Sum of Recursive Residuals

The straight lines represent critical bounds at 5% significance level

Plot of Cumulative Sum of Squares of Recursive Residuals

The straight lines represent critical bounds at 5% significance level

Islamic Deposits: Bahrain

Plot of Cumulative Sum of Recursive Residuals

The straight lines represent critical bounds at 5% significance level

Plot of Cumulative Sum of Squares of Recursive Residuals

The straight lines represent critical bounds at 5% significance level

6.   Conclusion

In conclusion, the study shows that the Islamic banks' deposits in Bahrain are relatively more sensitive to monetary policy changes compared to that of Malaysian Islamic banks in the long run. The Islamic banks' deposits in Bahrain are, therefore, more directly impacted by the monetary policy shocks. The Malaysian Islamic banks' deposits, on the other hand, seem to be insensitive to interest rate changes and therefore more policy invariant suggesting Islamic banks in Malaysia are able to offset the de-stabilizing impact of monetary policy. Given the differences in macroeconomic environments, Islamic banks' deposits seem to response differently to changes in monetary policy variables. This brings us to underscore that monetary policy shocks have more de-

stabilizing impact on Bahrain Islamic banking compared to its Malaysian counterpart.

Due to vulnerability to interest rate changes, Islamic financial institutions in Bahrain as well as in Malaysia to a certain extent, have a long way to go in developing the risk management standards that could address the above concerns. Iqbal (1999) noted that despite the growing interest in the Islamic banking and finance, the Islamic financial markets are still lacking in terms of risk management tools. These are important issues that need to be considered and resolved in ensuring that Malaysia's and Bahrain's efforts to promote the interest-free banking and monetary system would become successful. These results have important implications for both Bahrain and Malaysia in enhancing further efforts in achieving its objectives to become two largest International Islamic financial hubs of the world.

As shown in this study, it could also be implied that the variables that are relevant in the monetary policy transmission would have to be continuously monitored due to the dynamic nature of both economies. As being shown in the study, the importance of the Islamic bank's deposits in the monetary transmission in Bahrain needs to be noted in designing monetary policies in both economics. In this aspect, an area for further research extension would be in providing a mechanism that could continuously take into account the latest economic and financial data so as to ensure the most relevant policy targets. This study attempts to provide an avenue towards this effort.

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