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Dependency of Islamic bank rates on conventional rates in a dual banking system: A trade-off between religious and economic fundamentals

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ABSTRACT

The dependence of Islamic bank rates on the conventional bank rate violates the religiosity principle and the fundamentals of an efficient market due to the possibility of arbitrage profit from the rate differences. This study tests such dependency in a dual banking system by considering monthly data from January 2009 to April 2018 on Malaysian banks using several ARDL tests, supplemented by robustness tests using a 12-month correlation of the rolling standard deviation and causality models based on the Toda-Yamamoto approach to investigate the short- and long-run dependency of rates. The study finds that Malaysia's Islamic bank deposit and financing rates are influenced by both the conventional and Bank Negara Malaysia's policy rates. Results imply that Islamic banks do serve profit-driven customers. We suggest that Islamic banks are forced to benchmark their rates to conventional rates because of the trade-off between religious and economic fundamentals by profit-driven customers. The study demonstrates that the question of Islamic legitimacy of Islamic banks needs to be addressed considering the correct profiling of the customer-base and the regulatory environment in which Islamic banks operate. We discuss implications for Islamic rate-setting behavior in the presence of monetary shocks in a dual banking system.

1. Introduction

The core principle of Islamic finance is the prohibition of interest. Alternatively, Islamic banks use two main groups of contracts. Profit-loss-sharing (PLS) contracts involve the pooling of resources to support a real investment project. Trade-based Financing (TBF) contracts involve providing funds by buying and selling or leasing tangible assets (El-Gamal, 2006; Warde, 2000). Proponents argue that Islamic banks are more stable and resilient to economic shocks primarily because of the asset-linked interest-free nature of the contracts (Azmat, Azad, Ghaffar, Hayat, & Chazi, 2020; Hashem & Abdeljawad, 2018).

The presence of Islamic banks within a dual banking system creates challenges to the central banks in implementing monetary

Abbreviations: C32, E42 E43; G21, G41.

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policy. Most mechanisms of monetary policy are transmitted to banks through interest rates. Since Islamic banks are interest-free, current monetary policy frameworks may not work efficiently in countries with dual banking systems (Khatat, 2016). Central banks' ability to create a precise effect on market conditions depends on the extent of price spillover between Islamic and conventional banks. Recognizing how interest rates affect Islamic -banking in a dual banking system is necessary to formulate sound policies that could potentially detach and completely segregate Islamic banking from conventional banking (Asbeig & Kassim, 2015; Hamza & Saadaoui, 2018; Omer, 2019). Whether there is a need to implement dual or single monetary policy depends on the extent of transmission of interest rates to Islamic rates. Monetary policy needs to be exercised in a way that targets the Islamic banking sector by being fully Shari'ah aligned and ultimately asset linked.

The link between monetary policy, interest rates, and Islamic banks' rates are controversial. Theoretically, Islamic bank rates should be asset-linked and interest-free (Abbas, 2020; Khan & Mirakhor, 1990; Zarqa, 2003). However, many empirical studies demonstrated a statistically significant relationship between Islamic banks' profit rates and conventional banks' interest rates (Adewuyi & Mohamed Naim, 2016; Ergec & Kaytanci, 2014; Korkut & Özgür, 2017; Meslier, Risfandy, & Tarazi, 2017; Mohd & Azha, 2019; Saraç & Zeren, 2015; Tekin, Atasoy, & Ertugrul, 2017). These studies conclude that Islamic banks imitate conventional banks and implicitly follow conventional banks when setting their investment and financing rates. They assert that Islamic bank rates are neither inherently asset-linked nor interest-free. Competition among and market power of Islamic and conventional banks have been primary determinants of such rate-following behavior (Aysan, Disli, Duygun, & Ozturk, 2018; Meslier et al., 2017).

The interconnectedness of banks may amplify their vulnerability to risk spillovers from one bank to the other resulting in financial contagion. Financial contagion can create extra volatility that exceeds the expected effect of fundamentals. The financial contagion literature suggests many channels through which contagion occurs. Real shocks, i.e., macroeconomics, can spill over to other markets or countries through real channels, i.e., trade links, monetary policy coordination, and common external factors (Batten, Kinateder, Szilagyi, & Wagner, 2019; Dornbusch, Park, & Claessens, 2000; Ngene, Brodmann, & Hassan, 2019; Pavlova & Rigobon, 2007). Common shocks can also affect the sectors of the economy resulting in downside effects across sectors and consequently harming the entire economy (Guo, Chen, & Huang, 2011). Financial linkages can result in contagion (Allen & Gale, 2000; Kaminsky & Reinhart, 2002). Daly, Batten, Mishra, and Choudhury (2019) investigate if the volatility of the banking structure of a country increases the financial volatility of another and found evidence for strong correlations between banking systems. Investor behavior is another channel for contagion through informational problems, herding, learning, sentiment, and multiple equilibriums (Calvo & Mendoza, 2000). Shocks in one market can affect the investors' risk aversion. This may change the equilibrium risk-premium in all other markets, within the same country or across countries. Balli, Chowhdury, and Hassan (2021) show that the extremely large-scale drawdown across the global equity markets signifies an indiscriminate impact of COVOD-19. Collectively, Asian Islamic markets offer relative resilience to their conventional counterparts. Asian markets signpost a quicker recovery than the rest of the regions, the Middle East & Africa, Europe, and America. Despite the large-scale drawdown, several markets secure a positive return where Islamic markets outperform their counterparts.

Contagion can occur across multiple asset classes within one country. This can happen when the collateral value of a firm is affected by the volatility of assets value (Kiyotaki & Moore, 2002). Guo et al. (2011) investigate the contagion effect between four markets: stock market, real estate market, credit default market, and energy market. They found stock price shocks and oil price shocks during the financial crisis of 2007 are the main driving forces of the variations in the credit default market. The energy market is also affected by stock market variations more than shocks in housing or credit markets. Surprisingly, they found an insignificant impact of the credit default market and the stock market on the real estate market. Shakya (2021) found that banks offering home lending in the same geographic area exhibit higher bank-to-bank spillover. Holding correlated assets and interbank lending are typical reasons for interconnectedness. However, Morrison and White (2013) suggest that common regulation can be a channel for spillover. A negative shock to a bank may undermine the confidence in the regulatory system resulting in lower confidence in other banks operating under the same regulator.

Billio, Getmansky, Lo, and Pelizzon (2012) estimate the connectedness between banks, hedge funds, brokers/dealers, and insurance companies and found that the four sectors are highly interconnected, with banks playing the most important role in transmitting shocks. Ballester, Casu, and González-Urteaga (2016) used bank credit default swap to evaluate the contagion among banks. They distinguish between global factors contagion and bank-specific factors contagion and found that common factors are more important in spillover the risks. The study emphasizes the importance of banks in transmitting shocks at the international level. Peltonen et al., (2019) used macro-network to measure the interconnectedness of banks beyond the financial linkages between banks. The results indicate a higher probability of a banking crisis associated with the more central position of the banking sector in the macro-network.

This paper suggests two channels for the spillover of interest rates. The first is the homogenous monetary and money market policies for two banking systems. The second channel is the market forces that affect the two banks competing for the same customer base. Particularly to the latter, the degree of 'religiosity' among pious customers makes them less sensitive to competition, superseding their 'profit motive' (Aysan et al., 2018). On the other hand, based on rational choice theory (Burns & Roszkowska, 2016; Coleman and Fararo, 1992; Simon, 1955), profit-driven customers are more likely to be guided by their need for utility maximization. They will prefer to switch banks to take advantage of potential arbitrage opportunities of rate differences between Islamic and conventional banks. Consequently, there exists a trade-off between religiosity and rationality. However, the evidence on economic versus religious fundamentals is rare in a dual banking setting, mainly when discussed alongside the shocks of the policy change in a homogenous monetary and money market policy.

The main objective of this study is to determine whether Islamic banks implicitly follow conventional banks in their rate-setting behavior. Particularly, the paper aims to study this relationship considering the monetary environment in which Islamic banks operate in a dual banking system and the type of customers they serve. Specifically, using time series analysis on monthly data from

January 2009 to April 2018 on the Malaysian banking system, this study aims to fulfill the objective by utilizing an Auto-Regressive Distributed Lag (ARDL) approach. As robustness checks, correlations between 12-month rolling standard deviations of the Islamic, conventional, and monetary policy rates are examined together with the Toda Yamamoto procedure of Granger causality testing. Results reveal that the Islamic bank rates are closely benchmarked against their conventional counterparts and that the monetary policy rate strongly influences the movements in the Islamic bank rates. Results imply that Islamic banks strongly serve profit-driven customers who exploit potential arbitrage opportunities that arise from differences in rates. We discuss implications for the Islamic economic system, monetary policy in the dual banking system, and policymakers of the Islamic banking sector.

The remainder of this paper is structured as follows. Section 2 provides a review of the past studies and the development of hypotheses. Section 3 provides the methodology of the study. This section describes the data used, the estimation models, and procedures for robustness checks. Section 4 includes the findings and discussions of the empirical results. Finally, Section 5 provides a summary of the findings with concluding remarks.

2. Review of the past studies and hypotheses development

2.1. Islamic banking: principles and Malaysia as a context

The macro perspective advocates that the widespread use of interest creates a wedge between the monetary value and real value of goods and services (Khan, 2002), causing inflation, economic instability, and repeated financial crises (Kassim, Majid, & Yusof, 2009). Since Islamic banks are closely connected to the real sector, they are deemed more stable than conventional banks, especially during financial crises (Kaleem, 2000; Kia, 2001; Mohieldin, 2012; Rosly, 1999), presenting an example of the ideal financial world (Dridi & Hasan, 2010; Khan, 2010). Based on Samuelson's (1958) explanation that zero nominal interest rate is a prerequisite for optimal resource allocation, researchers assert that Islamic finance has distinct advantages over conventional finance, not only from an economic rationale but also from a social development standpoint, including the objective of attaining justice and fairness (Al-Jarhi, 2017; Ibrahim & Mirakhor, 2014; Rashid, Abdeljawad, Ngalim, & Hassan, 2013; Zaman, 2015).

El-Hawary, Grais, and Iqbal (2004) explain that an ideal Islamic banking system transcends mere prohibition of interest and is built on the tenets of risk sharing,[1] materiality,[2] no exploitation,[3] and no financing of sinful activities[4]. When Islamic banks stay true to these tenets, they act as venture capital providers (Cevik & Charap, 2015), investing in entrepreneurs with promising ideas in exchange for a share of profits rather than lending on a cash flow basis and collateral (Khan, 2010). In practice, Islamic banks use TBF mode to extend credit to customers, reducing its difference with the typical banking system (Khan, 2010). Consequently, understanding the spillover of interest rate shocks from monetary policy to bank interest rates, Islamic banks rates, and the transmission between the Islamic and conventional banks rates are significant issues for the success of monetary policies (Khatat, 2016).

IFSB (2019) reports that by 2018, global Islamic banking assets are USD 1571.3 billion and that the sector dominates the global Islamic financial services industry as it holds the lion share: 71.7%. With the official introduction of Islamic banking in 1983, the banking sector in Malaysia has moved into a dual banking system. IFSB (2019) also cites Malaysia as one of the twelve systematically important Islamic finance jurisdictions globally, with Islamic banking shares amounting to 10.8% of the global Islamic banking assets and about one-fourth of Malaysia's banking sector assets as of the first half of 2018.

The central bank of Malaysia, Bank Negara Malaysia (BNM), uses its overnight policy rate (OPR) to influence the conventional money market rate. In contrast, an array of Shari'ah-compliant instruments can influence the liquidity in the Islamic money market. Yet, due to the establishment of Islamic windows by conventional banks and third-party transactions between customers in the two systems, the liquidity in the Islamic and conventional banking systems remains entwined (BNM, 2018). An examination of the composition of financing in the Islamic banking sector of Malaysia reveals that TBF modes of financing (99% in 2018) supersede the PLS modes (less than 1% in 2018) (PSIFIs, 2019). Hence, studying the Malaysian dual banking system in light of BNM's policy stance will help identify whether the widespread use of the TBF mode of financing is caused simply because of competition between the two banking systems or the regulatory environment the two systems operate in.

2.2. Monetary policy and Islamic money market rates

The interest rate channel for monetary transmission may not be effective with Islamic banks if the latter is not fully connected with conventional banks. This may call for a dual monetary policy framework where active Islamic inter-bank markets and developed Islamic money markets are prerequisites for monetary policy success (Khatat, 2016).

Interest-free banking improves overall macroeconomic performance and helps central banks achieve the policy goal for inflation, both in the short- and long run (Darrat, 2002; Kia, 2002). However, due to the regulatory environment, Islamic banks are susceptible to interest rate fluctuations in both form and practice (Baldwin, 2002, pp. 176–201; Kaleem & Isa, 2006). Islamic banks may suffer from

[1] Terms of a financial transaction should ensure symmetrical risk and return distribution between parties involved. If venture fails, the borrower does not bear all the losses. If the venture succeeds, the financier receives a larger return than a predetermined interest will allow (Khan, 2010).

[2] All financial transaction must have "material finality," and so, should be directly linked to a real economic transaction/asset/project.

[3] Neither party to the transaction should exploit an unfair advantage at the expense of the other.

[4] Funds should not be used to produce goods banned by Shari'ah such as alcohol and pork. Also, funds should not be used for illegitimate purpose such as for gambling.

liquidity surplus simply due to a lack of compliant money market instruments (Waemustafa & Sukri, 2016). This arrangement potentially presents conventional banks with arbitrage opportunities, providing lower borrowing costs for conventional banks. BNM offers returns on Islamic money market instruments that are similar to the conventional money market returns to prevent such arbitrage opportunities. Accordingly, Islamic money market returns are indirectly affected by the conventional money market returns, which can ultimately spill over onto the retail rates of Islamic banks.

In the long run, the Islamic Interbank Benchmark Rate (IIBR) is not found to be independently determined from their corresponding conventional interbank offer rates for five GCC countries (Nechi & Smaoui, 2019) and in six other countries, including Malaysia (Mohd & Azha, 2019). The IIBR, therefore, fails to gain recognition as a genuinely Shari'ah-compliant interbank rate. Due to Islamic and conventional banking segregation in a dual banking system, the central bank uses its interest-based monetary policy rate as a signaling tool in the conventional money market. The policy rate should not influence the Islamic money market rates for the Shari'ah-compliant instruments (Nechi & Smaoui, 2019). This study hypothesizes the following:

Hypothesis (1). Islamic money market rates are asset-linked, interest-free, and independent of conventional money market rates and monetary policy rates.

If a relationship exists between monetary policy and the Islamic money market rate, the segregation in the regulatory framework is incomplete. Additional measures are needed to Islamize the monetary policy.

2.3. Monetary shocks, interest rates, and Islamic bank rates

Numerous literature discusses the relationships between monetary shocks, interest rates, and Islamic bank rates. In general, there are three significant cohorts of studies. The most recent studies point out the implications of conventional rates vis-à-vis Islamic rates. The next group of researchers considers behavioral and religious aspects and how they influence the decision to deposit in Islamic banks. The last cohort discusses a mixed bag of issues, including monetary policy transformation.

Studies report Islamic rates are cointegrated or moving in tandem with the conventional rates (Mohd & Azha, 2019; Nechi & Smaoui, 2019; Zulkhibri, 2018). Khalidin and Masbar (2017) reported the exception to this on Indonesian monthly data, which states an indirect connection between the conventional and Islamic rates. Despite the consensus on the relationship and co-movement, there are diverse reasons identified by researchers and several jurisdictions that have raised the bar for newer studies in this area. Some of these reasons include the dimensions, such as displaced commercial risk (IFSB, 2017), maturity of investment (Sukmana & Ibrahim, 2017), selection and availability of benchmark rates (Khalidin & Masbar, 2017), competition and market power (Meslier et al., 2017), and the type of contracts in operation (Cevik & Charap, 2015). A list of recent selected papers is presented in Appendix A.

Four major groups of hypotheses emerge from the explanations behind the co-movement of rates. The first group of these hypotheses considers the type of contracts. While comparing the PLS and TBF modes of contracts, conventional banks easily adjust their deposits when market interest rates rise. In contrast, Islamic banks are supposed to diversify their asset side by using PLS modes, which provides a variable rate of returns (Rosly, 1999). Several studies claim that the TBF mode has enabled many jurists and practitioners to devise clever arrays of contracts and formalities allowing interest to be charged (Arif & Rosly, 2011; Kuran, 2005).

The PLS method faces several challenges, especially on maintaining the return to investment account holders (IAHs), overcoming information asymmetries (Hamza, 2016), and general lack of regulatory framework for prudential regulation and supervision of Islamic banks (El-Gamal, 2006). The transition of Islamic bank financing from PLS into TBF modes diminishes the crucial distinction between the Islamic and conventional banking systems (Khalidin & Masbar, 2017), leading to unfair exploitation (Chong & Liu, 2009; Haron & Ahmad, 2000a; Khan, 2010). Reliance on the TBF modes may increase the cost of Islamic financing (Cevik & Charap, 2015).

Secondly, regulation, regulatory infrastructure, and separation of conventional monetary policy from Islamic monetary policy are concerns that resulted in a series of studies. Al-Jarhi (2017) explains that strict regulations need to be enforced to prevent Islamic banks from following conventional banks. There is a general lack of concern about applying approved Islamic financial principles by Islamic banks in Malaysia (Anuar, Shamsher, & Shah, 2014; Haron & Ahmad, 2000a). Kaleem and Isa (2003) assert that monetary policy, Islamic bank term deposit rates and their conventional counterparts are inherently linked because BNM plays a central role in controlling and monitoring the financial system.

The third Hypothesis surrounds competition, market size, and banks' market power. IFSB (2017) 's study finds that due to Islamic banks' exposure to Displaced Commercial Risk (DCR), a 2.00% rise in the interest rate can lead to a fall in Islamic bank financing by 12.06%, along with a decrease in Islamic bank deposits by 10.28%. This risk exposure forces Islamic banks to match conventional returns and even absorb a portion of the losses that should be borne by investment accounts holders (IAHs) (Kasri & Kassim, 2009), leading to higher insolvency risks of Islamic banks (Zainol & Kassim, 2010). Combating DCR this way enables Islamic banks to withstand commercial pressures and stay competitive in an industry already dominated by conventional banks (Hassan & Lewis, 2009; Sundararajan, 2008). However, this strategy does not eliminate nor minimize an Islamic bank's risk exposure. Hence, returns to IAHs converge towards the deposit rates of conventional banks because the pre-agreed profit (mark-up) rates under the TBF mode are closely pegged to conventional rates (Cevik & Charap, 2015).

Even though having higher market power has no significant impact on Islamic banks' rate, market power may lower rates in recent times and specific markets (Ito, 2013; Meslier et al., 2017). Consequently, banks' market power pushes the Islamic and conventional rates to comove over time (Chong & Liu, 2009). Notwithstanding the effect of rates on each other, the bank deposit rate in Malaysia is significantly influenced by market sentiment, which is a combined influence of local, regional and global factors (Mat Nor, Rashid, Ibrahim, & Yunyi, 2014).

The last Hypothesis that combined the above three relates to the type of customers and their investment objective. Based on utility

maximization theory, Haron and Ahmad (2000b) argue that deposits in Islamic banks are driven by the profit motive and are negatively affected by the conventional bank rates. Similarly, based on the substitution effect, while pious Muslim customers remain loyal to Islamic banks, increases in conventional base lending rates deterred profit-motivated customers from opting for Islamic financing, and vice versa (Kader & Leong, 2009).

Within the Muslim sub-group of bank customers, some customers closely adhere to the Islamic tenets on financial activities (pious customers) and those who are less sensitive to the religious values (profit-driven customers) (Abror et al., 2019; Iqbal, Nisha, & Rashid, 2018; Rahman, Chowdhury, Hoque, & Rashid, 2020). Based on the study by Omer (2019) on Pakistan, we argue that within a dual banking system, pious customers are expected to have inelastic demand for Islamic banking products and facilities. They are less likely to switch to conventional banks, regardless of the rates offered by Islamic banks. The religiosity effect for pious customers supersedes their profit motive.

Conversely, following the rational choice theory, demand for Islamic banking from profit-driven customers is likely to be highly elastic. With a large volume of deposits, Islamic customers switch to conventional banks when the rates change (Aysan et al., 2018), making them highly sensitive to competition. For these customers, the profit motive is stronger than the religiosity effect. Consequently, IAHs are aware that Islamic banks follow the PLS mode with depositors and that they cannot expect guaranteed returns on their investments with the Islamic banks. Thus, the investment accounts rates are not affected by conventional or monetary policy rates. Also, if borrowers looking to obtain financing are pious customers, the Islamic banks' financing rates are only affected by the performance of the respective investment projects. Thus, Islamic banks' financing rates are not affected by competitive lending rates or monetary policy rates. Therefore, standing on the Islamic principles will cost the Islamic investors the 'rationality' advocated by conventional finance. We forward religiosity as a behavioral trait that contradicts the efficient markets' conventions. Based on these arguments, we propose the following Hypothesis:

Hypothesis (2). Islamic banks' customers are generally pious, and Islamic banks' products are asset-linked, interest-free, and independent of maturity matched conventional bank products as well as the monetary policy rate.

Hypothesis (2.1). IAHs are generally pious customers, and Islamic investment deposit rates are asset-linked, interest-free, and independent of maturity matched conventional fixed deposit rates as well as the monetary policy rate.

Hypothesis (2.2). Borrowers from Islamic banks are generally pious customers, and Islamic bank financing rates are asset-linked, interest-free, and independent of conventional lending rates as well as the monetary policy rate.

3. Methodology

This study uses time-series analysis on monthly data from January 2009 to April 2018. The data is obtained from the May 2018 issue of Monthly Highlights and Statistics published online by BNM. The overnight Islamic money market rate (OVNIB) is obtained from the Islamic Interbank Money Market website of BNM.

3.1. Descriptions of the models and variables

Table 1 shows the variables used in each model. Three main models are estimated. Model 1 tests the relationship between conventional money market rate and policy rate with Islamic money market rate. Models 2a through 2e are for the effect of conventional fixed deposits and policy rates on Islamic investment deposit rates. Five maturity clusters for deposits are matched to validate model 2. Model 3 tests the relationship between the Islamic financing rate and the conventional lending rate. The Islamic Banks' Base Financing Rate is used as a control in Model 3. This rate should capture monetary policy and the other market factors related to the financing rate.

3.2. Model (1) – impacts on Islamic overnight interbank deposit rate

This model essentially tests Hypothesis (1). In this model, the relationships between the overnight Islamic money market rate (OVNIB) with the overnight conventional money market rate (OVNCB) and overnight policy rate (OPR) are examined. The OVNIB monthly data is compiled by BNM using the daily weighted average rate of *Mudharabah* interbank investments at the Islamic money market at the end of each respective month. The OVNCB monthly data comprise the weighted average rates of conventional interbank deposits at the end of each month.

Studies have shown that the federal funds rate (or the OPR in Malaysia's case) is a better measure of monetary policy stance (Bernanke & Blinder, 1988; Kashyap & Stein, 2000). Hence, the OPR is the monetary policy rate in this model.

BNM (2018) explains that OPR, which is implemented in the conventional money market, has a dual role – it indicates BNM's monetary policy stance. It is the target rate for the daily liquidity operations of BNM. The OPR is the primary reference rate for determining market interest rates and is also the interest rate at which major financial institutions borrow and lend money overnight among themselves. Thus, this model will primarily test whether the OPR impacts the OVNIB, an array of Shari'ah-compliant instruments, and, therefore, whether the two interbank markets are segregated as intended by BNM.

Table 1
Models and variables.

Model	Dependent Variable	Dynamic Regressors	
(1)	Overnight Islamic Money Market Rate (OVNIB)	Overnight Conventional Money Market Rate (OVNCB)	Overnight Policy Rate (OPR)
(2a)	Islamic Banks' Investment Deposit Rate, 1-month (1IDIB)	Conventional Banks' Fixed Deposit Rate, 1-month (1FDCB)	Overnight Islamic Money Market Rate (OVNIB)
(2b)	Islamic Banks' Investment Deposit Rate, 3-months (3IDIB)	Conventional Banks' Fixed Deposit Rate, 3-months (3FDCB)	Overnight Islamic Money Market Rate (OVNIB)
(2c)	Islamic Banks' Investment Deposit Rate, 6-months (6IDIB)	Conventional Banks' Fixed Deposit Rate, 6-months (6FDCB)	Overnight Islamic Money Market Rate (OVNIB)
(2d)	Islamic Banks' Investment Deposit Rate, 9-months (9IDIB)	Conventional Banks' Fixed Deposit Rate, 9-months (9FDCB)	Overnight Islamic Money Market Rate (OVNIB)
(2e)	Islamic Banks' Investment Deposit Rate, 12-months (12IDIB)	Conventional Banks' Fixed Deposit Rate, 12-months (12FDCB)	Overnight Islamic Money Market Rate (OVNIB)
(3)	Islamic Banks' Average Financing Rate (IBFIN)	Conventional Banks' Average Lending Rate (CBLN)	Islamic Banks' Base Financing Rate (BFRIB)

3.3. Model (2) – impact on investment deposit[5] profit rates

Hypothesis (2.1) is tested using Model 2. This model tests the relationships of 1-month, 3-month, 6-month, 9-month, and 12-month Islamic investment deposit rates (IDIB) with their respective maturity matched conventional fixed deposit rates (FDCB) and the OVNIB. The IDIBs and FDCBs are the volume-weighted monthly average term deposit rates reported by BNM. The OVNIB is used as a proxy for the monetary policy rate for each of these maturities.

3.4. Model (3) – impacts on average Islamic financing rate

Hypothesis (2.2) is tested using this model. This model tests the relationship between the average Islamic financing rate (IBFIN), average conventional lending rate (CBLN), and the average Islamic bank's base financing rate (BFRIB). The IBFIN and CBLN are weighted average financing and lending rates on financing and loans availed by Islamic banks and conventional banks. BFRIB is chosen as the monetary policy proxy rate in this model. The BFRIB refers to the average base financing rate that Islamic banks offer their best customers and reflects changes to Islamic banks' funding costs that arise due to changes in monetary policy stance or market financing conditions. Even though since 2015, BFRIB is replaced with the cost-plus statutory reserve requirement rate (BNM, 2014), due to marginal or no impact on the effective financing rate (BNM, 2018), we continue to use BFRIB for the full sample.

3.5. Short- and long-run relationships using ARDL

Due to its inherent benefits with sample size, cointegration approach, order of integration: I(0) or I(1), and short- and long-run estimations (Pesaran & Shin, 1998), this study uses an ARDL approach to empirically determine the short-run and long-run relationships of Islamic bank rates with the conventional bank rates and the monetary policy rate. Under the standard normal asymptotic theory, the ARDL model provides valid inferences regarding the population coefficients; therefore, the estimators are both realistic and efficient (Pesaran, Shin, & Smith, 1996).

The ARDL relationship between the different Islamic bank rates, their conventional counterparts, and the monetary policy rate is specified as follows:

$$Y_t = \alpha + \sum_{i=1} \beta_i' X_t' + u_t \tag{1}$$

In equation (1), Y_t is the dependent variable (the respective Islamic bank rate), X_t' is a vector of the dynamic regressors (the respective rate for the conventional counterpart and the monetary policy rate), and β_i' is a vector of long-run coefficients for the dynamic regressors. u_t is a white noise error term. If the dependent variable is cointegrated with the dynamic regressors, equation (1) can be written in its error correction form where u_t is the Error Correction Term (ECT_t) at levels. Thus, the ECT at levels is given by:

$$ECT_t = Y_t - \alpha - \sum_{i=1} \beta_i' X_t' \tag{2}$$

In equation (2), ECT_t, the linear combination of the dependent variable and the dynamic regressors, which is stationary and integrated of order zero I(0), is the "equilibrating" error term that corrects the deviations of the dependent variable from its equilibrium value in equation (1).

Under the ARDL approach, if a long-run relationship exists between the variables, the cointegration vector is reparametrized into an Error Correction Model (ECM). Thus, the generalized ARDL (p, q) reparametrized into an ECM is as follows:

[5] Tawarruq Fixed Deposits.

$$\Delta Y_t = \sum_{i=1}^{p} \delta_i \Delta\, Y_{t-1} + \sum_{i=1}^{q} \gamma_i' \Delta\, X_{t-1}' + \lambda ECT_{t-1} + \varepsilon_t \quad (3)$$

In equation (3), Δ is the lag operator, $p = 0, 1, 2, \ldots, m$ lags of the dependent variable, $q = 0, 1, 2, \ldots, m$ lags of dynamic regressors for $i = 1, 2, \ldots, k$ number of the dynamic regressors. Y is the dependent variable, and δ_i measures the short-run response of the dependent variable to its p lagged values. γ_i' is a vector of slope coefficients that measure short-run responses of the dependent variable to respective q lagged values of the dynamic regressors included in the vector of dynamic regressors X_{t-1}'. The ε_t is a white noise error term. ECT_{t-1} determines the long-run causality, and the coefficient λ measures the speed of convergence of Y to its long-run equilibrium.

The Augmented Dickey-Fuller (ADF) test with an intercept term and lag specifications based on Akaike Information Criteria (AIC) and Schwarz Criteria (SC) is used, as suggested by Pesaran, Smith, and Shin (2001) and Enders (2015), on the level data and the first differenced form of each series to test for the presence of unit-roots. Once the lag is selected, equation (3) with an unrestricted intercept term is estimated using OLS for each estimation model. Then, ARDL cointegration tests are conducted using the 'Wald F' bounds testing procedure to determine whether a long-run relationship exists between the dependent and independent variables. The Null Hypothesis is there is no long-run relationship between the dependent variable and any of the dynamic regressors. To confirm that the models do not suffer from spurious regression, the R-square and adjusted R square from the models are compared to their respective Durbin Watson statistics as explained by Granger and Newbold (1974).

3.6. Robustness test: diagnostics and correlation of the rolling standard deviation

To minimize the problem of heteroscedasticity and serial correlation, autocorrelation heteroscedasticity consistent (HAC) standard errors proposed by Newey and West (1987) are used. To supplement this, Bresuch Pagan Godfrey test of homoscedasticity and Breusch Godfrey test of no serial correlation are used as residual diagnostic tests. Also, to test whether the models are correctly specified, Ramsey's Regression Equation Specification Error Test (Ramsey's RESET test) is conducted. We have also undertaken a correlation of the rolling standard deviation for 12-months to find the co-movement of the variability of Islamic rates, conventional rates, and policy rates.

3.7. Robustness test: Toda-Yamamoto procedure for Granger causality

First, following Cevik and Charap (2015), the correlation between the rates is examined using 12-month rolling standard deviations to assess the time-varying volatility pattern between the rates. Due to problems with correlation analysis and pairwise causality tests, following Tekin et al. (2017), the Toda and Yamamoto (1995) procedure for testing pairwise Granger causality is used. The final robustness of the models is tested by determining whether the results of the causality tests are consistent with the ARDL cointegration test results.

Table 2
Descriptive statistics.

Models	Variables	Mean	Median	Max.	Min.	Range	Std. Dev.	Ske.	Kurt.	n
(1)	OVNIB	2.8332	2.9350	3.2200	1.8800	1.3400	0.3820	−1.4498	4.0764	112
	OVNCB	2.8742	2.9900	3.2467	2.0000	1.2467	0.3629	−1.5302	4.1906	112
	OPR	2.8973	3.0000	3.2500	2.0000	1.2500	0.3805	−1.4567	4.0330	112
(2a)	1IDIB	2.8371	2.9082	3.3874	1.6000	1.7874	0.3054	−1.3935	5.2854	112
	1FDCB	2.8055	2.9100	3.0975	2.0000	1.0975	0.3273	−1.6305	4.4051	112
(2b)	3IDIB	2.9633	3.0400	3.5900	2.1600	1.4300	0.3247	−0.9784	3.8105	112
	3FDCB	2.8520	2.9700	3.1700	2.0300	1.1400	0.3374	−1.6033	4.3089	112
(2c)	6IDIB	3.0739	3.1444	3.6667	2.2800	1.3867	0.3445	−0.6225	2.9659	112
	6FDCB	2.9028	3.0200	3.2280	2.0400	1.1880	0.3515	−1.6511	4.4265	112
(2d)	9IDIB	3.1486	3.1864	3.7988	2.3800	1.4188	0.3344	−0.5160	2.9014	112
	9FDCB	2.9320	3.0500	3.2540	2.0500	1.2040	0.3595	−1.6471	4.4194	112
(2e)	12IDIB	3.1863	3.2107	3.6857	2.7300	0.9557	0.2342	0.0807	2.0533	112
	12FDCB	3.0796	3.1500	3.3320	2.5000	0.8320	0.2447	−1.3594	3.8269	112
(3)	IBFIN	5.7588	5.6100	7.0500	5.0323	2.0177	0.5603	0.3357	1.6622	112
	CBLN	4.7450	4.6963	5.7700	4.4367	1.3333	0.2265	1.3258	6.0255	112
	BFRIB	6.4582	6.5333	6.9046	5.5100	1.3946	0.3905	−1.4780	4.0983	112

Notes: 'n' is the number of observations.

4. Findings and discussions

4.1. General descriptive and trends of the data

The descriptive statistics of the models provided in Table 2 show that, on average, all the Islamic bank rates, except for the overnight Islamic money market rate, are higher than their conventional counterparts.

In Model (1), the standard deviation for OVNIB is higher than OVNCB and OPR, indicating low stability of OVNIB. This is the same for Model (3), where the standard deviation for IBFIN is higher than CBLN and BRIB. In Model (2), all the IDIBs show lower standard deviations compared to their maturity matched FDCBs and policy rate, indicating higher stability of IDIBs. The movements of the rates graphically illustrated in Fig. 1 show that Islamic bank rates fluctuated more frequently than their conventional counterparts.

The graph for Model (1) shows that the OVNIB is, on average, lower than both the OVNCB and OPR. This could mean that the liquidity in the Islamic money market is generally higher than the liquidity in the conventional money market. Hence, it is less costly for deficit Islamic banks to obtain overnight financing. This also supports Waemustafa and Sukri's (2016)'s findings that Islamic banks tend to hoard liquidity to be better prepared for possible withdrawals. The graph for Model (2) shows that the IDIBs for all maturities generally follow the policy rate. They are, on average, more significant than their maturity-matched FDCBs as well as the OVNIB.

This pattern is more pronounced for Islamic investment deposits of longer maturities. The higher Islamic investment deposit rate results from lower competitiveness and the strong presence of profit-driven customers in the deposit market. This supports the argument that Islamic banks tend to align investment account returns with conventional returns to avoid potential deposit outflows and maintain depositors' confidence, which means that the behavior of profit-driven customers significantly exposes Islamic banks to DCR.

The graph for Model (3) shows that the BFRIB is approximately 4% higher than the OPR throughout the period. This gap between the two rates reflects the other elements that comprise the marginal cost structure of Islamic banks. However, the IBFIN is markedly lower than the BFRIB since 2011, confirming that the Islamic banks offer financing at substantial discounts.

Further, both IBFIN and CBLN continue to decline throughout the period, with the IBFIN being consistently higher than the conventional bank lending rates always. The IBFIN is, on average, more significant than the CBLN but lower than the BFRIB. Consistent with Rosly (1999), the large gap between the two rates at the beginning of the period can be attributed to the view that Islamic bank financing is more attractive during the aftermath of the global recession of 2008.

4.2. Unit root, integration order, and cointegration test

Table 3 presents the ADF unit root test results on the levels and first differences of all the series used in this study. The results show that while some series are stationary at levels, others are stationary at first difference. The ARDL approach is particularly applicable in this case because each model contains variables integrated of different orders and, the integration orders are less than 2. The results of the ARDL bounds tests presented in Table 4 show that the Null Hypothesis of no cointegration is rejected for all the models, indicating a statistically significant long-run cointegrating relationship between the Islamic bank rates and the dynamic regressors.

4.3. ARDL estimation results

Table 5 through Table 7 present the ARDL cointegrating form and long-run coefficients for Models (1), (2), and (3), respectively. The coefficients of the one-period lagged ECTs support the ARDL bounds test results and affirm the presence of long-run causality. The negative sign of the ECT indicates convergence of Islamic bank rates to a long-run form or steady state in response to shocks and changes in the dynamic regressors. The absolute values of the respective ECTs indicate the speed of adjustment of Islamic bank rates to changes in the conventional bank rates and the monetary policy rates. On this note, the percentage of a disequilibrium created in the previous period that is corrected during each subsequent period is approximately: 62% for OVNIB, 3% for 1-month IDIB, 19% for 3-month IDIB, 12% for 6-month IDIB, 17% for 9-month IDIB, 11% for 12-month IDIB, and 8% for IBFIN.

In Table 5, results for model (1) show that both short-run and long-run coefficients for OVNCB are negative and statistically insignificant. In contrast, they are positive and statistically significant at the 1% level for OPR. Hence, the rates on the Shari'ah-compliant instruments used to influence the OVNIB are linked to the OPR and, consequently, to conventional interest rates. The results suggest a violation of Hypothesis (1), and contrary to BNM's intention to segregate the two banking systems, they are integrated.

For the short-run coefficients, results in Table 6 indicate that conventional fixed deposits and Islamic investment deposits are competitive and substitutes for each other in the short run. On the long-run coefficients from Table 6, the results indicate that Hypothesis (2.1) fails to hold and that the majority of IAHs are profit-driven customers. Due to their sensitivity to the competition between the Islamic and conventional banking sectors, the Islamic investment deposit rates are affected by the conventional fixed deposit rates. Further, because the OPR determines the overnight Islamic money market rate, the Islamic investment deposit rates are also affected by interest rates through the Islamic money market. Hence, these rates are not asset-linked nor interest-free.

Table 7 shows no immediate effect of changes in conventional lending rates on the Islamic bank financing rates, although there is an impact over time. The short-run coefficient of BFRIB is positive and statistically significant at the 10% level, whereas the long-run coefficient is positive but statistically insignificant.

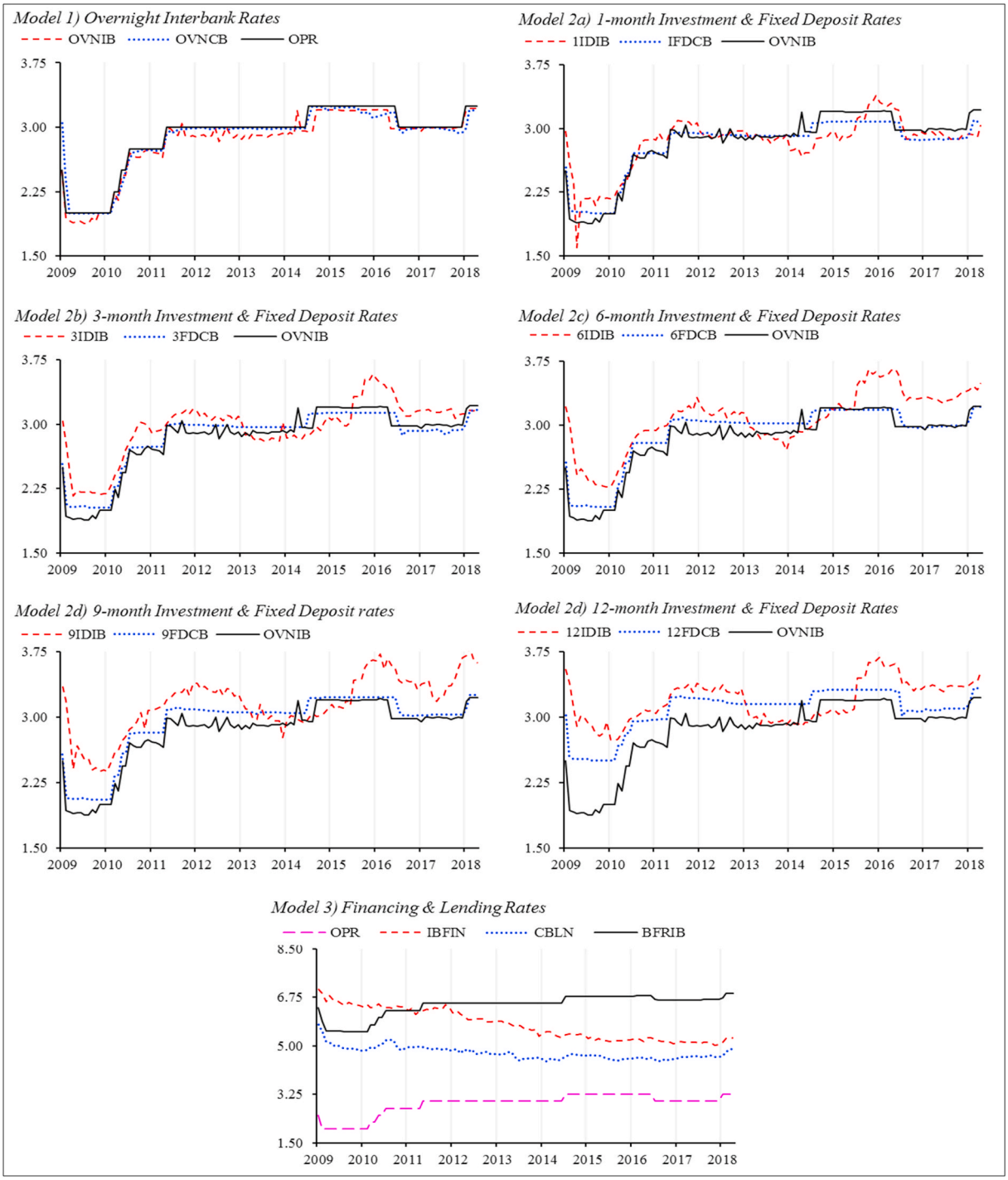

Fig. 1. Movements in Islamic bank rates and conventional bank rates.

Table 3
ADF unit root tests.

Series	Levels			First Difference			Order of Integration
	t Statistic	p-value		t Statistic	p-value		
OVNIB	−1.9190	0.3226		−15.2568	0.0000	***	I(1)
OVNCB	−2.5061	0.1168		−10.1457	0.0000	***	I(1)
OPR	−2.7310	0.0721	*				I(0)
1IDIB	−4.0514	0.0017	***				I(0)
1FDCB	−2.9652	0.0414	**				I(0)
3IDIB	−3.4581	0.0110	**				I(0)
3FDCB	−2.8650	0.0528	*				I(0)
6IDIB	−0.9191	0.7789		−7.9555	0.0000	***	I(1)
6FDCB	−2.9719	0.0408	**				I(0)
9IDIB	−1.9186	0.3227		−10.7564	0.0000	***	I(1)
9FDCB	−3.0315	0.0351	**				I(0)
12IDIB	−1.8562	0.3518		−9.6174	0.0000	***	I(1)
12FDCB	−1.2656	0.6436		−8.0259	0.0000	***	I(1)
IBFIN	−2.3420	0.1609		−14.3960	0.0000	***	I(1)
CBLN	−5.1532	0.0000	***				I(0)
BFRIB	−2.9102	0.0474	**				I(0)

Notes: OPR is the Overnight Policy Rate. OVNIB is the Overnight Islamic money market Rate, and OVNCB is Overnight Conventional Money Market Rate. IDIB is Islamic Banks' Investment Deposit Rate, with prefixes referring to 1-month, 3-month, 6-month, 9-month, and 12-month maturities, and FDCB is Conventional Banks' Fixed Deposit Rate, with prefixes referring to same maturities. IBFIN is Islamic Banks' Average Financing Rate, and CBLN is Conventional Banks' Average Lending Rate. BFRIB is Islamic Banks' Base Financing Rate. MacKinnon (1996) one-sided p values. P values for the rejection of the null Hypothesis are: * at 10% significance level, ** at 5% significance level, and *** at 1% significance level. I(0) means integrated of order zero and I(1) means integrated of order one.

Table 4
ARDL bounds test results.

Models			F critical values		
	F statistic		I(0)	I(1)	Result
(1)	16.6519	****	5.1500	6.3600	Cointegrated
(2a)	7.8292	****	5.1500	6.3600	Cointegrated
(2b)	7.8669	****	5.1500	6.3600	Cointegrated
(2c)	7.8193	****	5.1500	6.3600	Cointegrated
(2d)	7.4669	****	5.1500	6.3600	Cointegrated
(2e)	4.9362	**	3.7900	4.8500	Cointegrated
(3)	4.586	***	3.5500	4.3800	Cointegrated

Notes: *P* values for the rejection of null Hypothesis are: *at 10% significance level, **at 5% significance level, ***at 2.5% significance level and ****at 1% significance level. I(0) is the lower bound, and I(1) is the upper bound. F critical values are taken from Pesaran et al. (2001).

4.4. Diagnostic tests and model stability

Table 8 shows that all the models are free from serial correlation and heteroscedasticity, except for Models (2a) and (2d). These models suffer from heteroscedasticity regardless of having used Newey West HAC standard errors. Despite this, the estimators remain unbiased and consistent (see Gujarati & Porter, 2009, p. 400).

4.5. Robustness test: correlation of the rolling standard deviation

The results in Table 9 show that the variability of Islamic bank rates is closely associated with the variability in conventional bank rates and the monetary policy rate. Islamic investment deposit rates are highly positively correlated with their conventional counterparts and the policy rate. Further, the correlations between Islamic financing and conventional lending rates are positive, but this correlation is not as strong as it was for investment/deposit rates. These findings are consistent with the ARDL estimations and support the notion that most IAHs are profit-driven customers. In contrast, most of the borrowers from Islamic banks are more religiously motivated.

4.6. Robustness test: Toda Yamamoto procedure for Granger causality

The Toda Yamamoto pairwise Granger causality test results presented in Table 10 confirm the ARDL estimation results. The pairwise causality direction for Models (1) and (3) show bidirectional causality between Islamic and conventional rates. For all submodels in Model (2), there is a unidirectional causality running from the conventional fixed deposit rates to Islamic investment deposit rates. Further, Model (1) shows bidirectional causality between overnight Islamic money market rates and overnight policy rates. The

Table 5
ARDL estimations for model (1) - overnight Islamic money market rate.

Dependent Variable:	△OVNIB
Cointegrating Form:	
△OVNCB	- 0.0917
	(0.1017)
△OPR	0.9370***
	(0.1096)
Constant	- 0.0154***
	(0.0061)
ECT $_{t-1}$	- 0.6204***
	(0.0890)
Long run Coefficients:	
OVNCB	- 0.2263
	(0.2445)
OPR	1.2110***
	(0.2309)
R^2	0.9770
Adjusted R^2	0.9761
DW statistic	1.9629
n	111

Notes: OVNIB is the Overnight Islamic money market Rate, and OVNCB is Overnight Conventional Money Market Rate. OPR is the Overnight Policy Rate. ECT is Error Correction Term. △ is difference operator. Newey West HAC standard errors are in parenthesis. P values are: *Significant at 10% level, ** Significant at 5% level, and *** Significant at 1% level. DW is Durbin Watson statistic. 'n' is the number of observations.

results show unidirectional causality running from the monetary policy rates to the Islamic bank rates for the other models.

5. Discussions and implications

5.1. Impact of conventional bank rates on Islamic Bank Rates

The results for Models (2) and (3) show that retail Islamic bank rates are positively affected by their conventional counterparts, suggesting that Islamic banks serve a significant number of profit-driven customers. The ARDL results show that Islamic investment deposits and conventional fixed deposits are substitutes. Since investment deposits are time deposits, due to the profit motive, some immediately transfer their funds to the more attractive conventional fixed deposit accounts, thereby initiating the short-run effects. Further, because of the exposure of Islamic banks to displaced commercial risk due to the behaviors of profit-driven IAHs, the short-run effect is not sustainable.

The short-run events shrink Islamic banks' deposit base and reduce funds available for financing. If the existing income stream is insufficient to cater to the rise in the rate of return for IAHs, then the inadequate portion needs to be met using the Islamic banks' capital. Due to the possibility of widespread substitution and subsequent reduction of the supply of investment funds by the IAHs, there is a possibility of a rise in the Islamic investment deposit rates as the availability of investment funds declines. Therefore, the profit-driven nature of the IAH customers may create multidimensional challenges for Islamic banks. In the short- and long-run, Islamic banks will benchmark their returns on conventional rates.

If the lending rate rises in the short-run and the Islamic banks' investment deposit funds remain unchanged during the period, Islamic banks cannot indefinitely increase their financing to cater to the increased demand. This is because of the regulatory limits[6] imposed by the BNM on Islamic banks' financing to insulate the Islamic banks from potential instabilities. Thus, in the long run, Islamic banks reduce the supply of financing available. The long-run positive and statistically significant relationship suggests that due to the presence of profit-driven customers, Islamic bank financing rates are affected by past financing rates and conventional lending rates for similar projects. Consequently, Islamic bank financing rates are neither inherently asset-linked nor entirely interest-free.

[6] These regulatory limits are imposed via the Capital Adequacy Framework for Islamic banks (Capital Components), Capital Adequacy Framework for Islamic Bank (Risk Weighted Assets), Statutory Reserve Requirement and Single Counterparty Exposure Limit for Islamic Banking Institutions, among others.

Table 6
ARDL estimations for model (2) - Islamic investment deposit rates.

Dependent Variable:	(2a)		(2b)		(2c)		(2d)	(2e)
	△1IDIB		△3IDIB		△6IDIB		△9IDIB	△12IDIB
Cointegrating Form:								
△9IDIB $_{t-1}$							−0.0829	
							(0.0849)	
△1FDCB	0.151							
	(0.1923)							
△1FDCB $_{t-1}$	0.1475							
	(0.1604)							
△1FDCB $_{t-2}$	0.7611***							
	(0.1197)							
△3FDCB			0.3122***					
			(0.1416)					
△6FDCB					0.3352**			
					(0.1316)			
△6FDCB $_{t-1}$					0.3275***			
					(0.0825)			
△9FDCB							0.4735**	
							(0.1932)	
△12FDCB								0.4193***
								(0.1369)
△OVNIB	−0.1306		0.0701		0.0901		0.0378	−0.0905
	(0.1215)		(0.0986)		(0.0892)		(0.1304)	(0.0901)
Constant	0.2242***		0.0854***		0.0553***		0.0837***	0.1203***
	(0.0469)		(0.0188)		(0.0132)		(0.0197)	(0.0319)
ECT $_{t-1}$	−0.304***		−0.1946***		−0.1186***		−0.1668***	−0.1051***
	(0.0621)		(0.0394)		(0.0243)		(0.0349)	(0.0271)
Long run Coefficients:								
1FDCB	0.4135							
	(0.3702)							
3FDCB		−0.0815						
		(0.4894)						
6FDCB			−1.671**					
			(0.7877)					
9FDCB				−0.8274				
				(0.9511)				
12FDCB								−0.0538
								(0.5792)
OVNIB	0.3307	0.9721***	2.6246***	1.786*				0.7764**
	(0.3685)	(0.4468)	(0.7788)	−0.9453				(0.3815)
R^2	0.9271	0.9544	0.9714	0.931				0.9125
Adj. R^2	0.922	0.9527	0.9697	0.927				0.9083
DW	2.0042	1.7775	2.1118	1.9338				2.0176
n	109	109	110	110				111

Notes: OVNIB is Overnight Islamic Money Market Rate. IDIB is Islamic Banks' Investment Deposit Rate, with prefixes referring to 1-month, 3-month, 6-month, 9-month, and 12-month maturities, and FDCB is Conventional Banks' Fixed Deposit Rate, with prefixes referring to the same maturities. ECT is Error Correction Term. △ is difference operator. Newey West HAC standard errors are in parenthesis. P values are: *Significant at 10% level, ** Significant at 5% level, and *** Significant at 1% level. DW is Durbin Watson statistic. N is the number of observations.

5.2. Impact of monetary policy rate on Islamic Bank Rates

The results for Model (1) suggest that the interest-based overnight monetary policy rate affects the Islamic money market rates for the Shari'ah-compliant instruments, leading to a potential spillover of money market rates into the retail Islamic bank rates. Kaleem and Isa (2006) observe that BNM offers returns on Islamic money market instruments similar to conventional money market returns. Thus, critically taken, alongside the effect of profit-driven customers' behavior on the retail Islamic bank rates, the relationship between the Islamic money market rates and the interest-linked monetary policy rate may contribute to strengthening the dependency of Islamic bank rates on conventional rates.

Model (2) shows the policy rate significantly influences the deposit rate in the long run and the financing rate in the short-run. During contractionary monetary policy with a rising overnight policy rate, Islamic financing will be costly in the short run, discouraging real investments. Simultaneously, Islamic banks will hoard liquidity to ensure that the returns for their IAHs are maintained. This may raise the perceived risk of Islamic banks by the IAHs, and they may withdraw and place their funds in less risky alternatives, such as treasury securities. Considering other effects on liquidity and regulatory requirements on sufficient liquidity, a chain reaction in the banking sector indicates that the contractionary monetary policy negatively affects both Islamic bank deposits and financing, causing the Islamic bank financing rate to rise in the short run and their investment deposit rates to rise over the long run. The reverse is true in the case of an expansionary stance. Capitalizing on the expectation of future rate change – an attribute of

Table 7
ARDL estimations for model (3) – average Islamic financing rates.

Dependent Variable:	IBFIN
Cointegrating Form:	
△IBFIN $_{t-1}$	- 0.3985***
	(0.0827)
△IBFIN $_{t-2}$	- 0.0535***
	(0.0898)
△CBLN $_{t-2}$	0.1078
	(0.1183)
△BFRIB	0.2393*
	(0.1237)
ECT $_{t-1}$	- 0.0763*
	(0.0175)
Long run Coefficients:	
CBLN	2.0675***
	(0.7192)
BFRIB	- 0.0939
	(0.3935)
Constant	- 3.7090
	(5.7938)
R^2	0.9850
Adjusted R^2	0.9839
DW	1.9039
n	109

Notes: IBFIN is Islamic Banks' Average Financing Rate, and CBLN is Conventional Banks' Average Lending Rate. BFRIB is Islamic Banks' Base Financing Rate. ECT is Error Correction Term. △ is difference operator. Newey West HAC standard errors are in parenthesis. *P* values are: *Significant at 10% level, ** Significant at 5% level, and *** Significant at 1% level. DW is Durbin Watson statistic. 'n' is the number of observations.

Table 8
Results of model specification tests.

Models	BG LM Test	BPG Test	Ramsey's RESET Test
(1)	0.3005	1.7175	2.4632
(2a)	0.6014	6.0885***	7.3704*
(2b)	1.4955	0.4195	3.5575*
(2c)	0.3921	0.1876	2.1907
(2d)	0.3782	6.9917***	7.6197***
(2e)	0.0547	0.484	3.4664*
(3)	1.2635	1.6692	0.0439

Notes: Coefficients are *F*-statistics. BG LM Test is Bresuch Godfrey LM test for serial correlation. Ho: No Serial Correlation. BPG Test is Breusch Pagan Godfrey test for heteroscedasticity. Ho: Homoscedasticity. Ramsey RESET test's Ho: No misspecification. *P* values for the rejection of null Hypothesis are: * at 10% significance level, ** at 5% significance level and *** at 1% significance level.

profit-driven customers – may cause more harm to the Islamic banks when compared to the conventional banks (Kassim et al., 2009).

Also, during a contractionary period, a less costly deposit rate raises the consumption and investment in the short run. When the monetary shock settles down, Islamic banks cannot adjust the profit rates on their TBF contracts, and the higher policy rate is reflected in the general prices. Consequently, the economy starts to save more as consumption and investments decline. Since liabilities of Islamic banks consist of investment deposit accounts based on PLS mode with variable profit rates, Islamic banks may not generate enough profits from financing activities to compensate their IAHs with the higher returns expected in the previous periods. The conventional banks have already incorporated the rise in the policy rate into their deposit and lending rates, which are now higher. To retain profit-driven IAHs, Islamic banks raise their investment deposit rates, resulting in exposure to DCR, potentially destabilizing their operations.

Therefore, in a dual banking environment, changes in the monetary policy stance affect Islamic banks differently than conventional banks. While the profit-driven customers expose both Islamic and conventional banks to competitive pressures, such competition does not create questions about the integrity and legality of conventional banks. Instead, Islamic banks' integrity and Islamic legality are questioned primarily because of competitive pressure created out of the customers' profit-driven nature to benchmark their rates against conventional rates. Although BNM has specific regulations for Islamic banks, their policy measures do not directly discriminate between Islamic and conventional banks. These policies do not account for the impact of profit-driven customers on Islamic banks,

Table 9
Correlation of 12-month rolling standard deviations.

Model (1)	OVNIB	OVNCB	OPR	Model (2a)	1IDIB	1FDCB	OVNIB
OVNIB	1			1IDIB	1		
OVNCB	0.9042***	1		1FDCB	0.6322***	1	
OPR	0.9389***	0.9364***	1	OVNIB	0.565***	0.9473***	1
Model (2b)	3IDIB	3FDCB	OVNIB	**Model (2c)**	6IDIB	6FDCB	OVNIB
3IDIB	1			6IDIB	1		
3FDCB	0.6095***	1		6FDCB	0.5943***	1	
OVNIB	0.5403***	0.9346***	1	OVNIB	0.5255***	0.9434***	1
Model (2d)	9IDIB	9FDCB	OVNIB	**Model (2e)**	12IDIB	12FDCB	OVNIB
9IDIB	1			12IDIB	1		
9FDCB	0.5943***	1		12FDCB	0.3992	1	
OVNIB	0.5255***	0.9434***	1	OVNIB	0.2957	0.9484***	1
Model (3)	IBFIN	CBLN	BFRIB				
IBFIN	1						
CBLN	0.0756***	1					
BFRIB	−0.0105**	0.8814***	1				

Notes: *P* values are: * at 10% significance level, ** at 5% significance level and *** at 1% significance level.

Table 10
Toda Yamamoto Pairwise Granger causality Test Results.

Models	Causality Direction		Chi-Square	Result
	From (X)	To (Y)		
(1)	OVNIB	OVNCB	6.0495**	Causality
	OVNCB	OVNIB	5.8176*	Causality
	OVNIB	OPR	12.2990***	Causality
	OPR	OVNIB	12.3788***	Causality
(2a)	1FDCB	1IDIB	25.1952***	Causality
	1IDIB	1FDCB	0.0612	No Causality
	OVNIB	1IDIB	6.8427*	Causality
	1IDIB	OVNIB	0.6964	No Causality
(2b)	3FDCB	3IDIB	20.8230***	Causality
	3IDIB	3FDCB	2.6036	No Causality
	OVNIB	3IDIB	12.0889***	Causality
	3IDIB	OVNIB	2.9369	No Causality
(2c)	6FDCB	6IDIB	14.0650***	Causality
	6IDIB	6FDCB	2.9438	No Causality
	OVNIB	6IDIB	11.0230***	Causality
	6IDIB	OVNIB	2.1803	No Causality
(2d)	9FDCB	9IDIB	14.5219***	Causality
	9IDIB	9FDCB	2.6905	No Causality
	OVNIB	9IDIB	12.3472***	Causality
	9IDIB	OVNIB	0.9711	No Causality
(2e)	12FDCB	12IDIB	14.2285***	Causality
	12IDIB	12FDCB	0.992	No Causality
	OVNIB	12IDIB	9.0616**	Causality
	12IDIB	OVNIB	1.0666	No Causality
(3)	CBLN	IBFIN	8.7747**	Causality
	IBFIN	CBLN	10.4641**	Causality
	BFRIB	IBFIN	5.6333**	Causality
	IBFIN	BFRIB	0.7839	No Causality

Notes: Null Hypothesis: The variable (X) does not Granger causes the corresponding variable (Y). (X) refers to an exogenous variable, and (Y) refers to an endogenous variable in the VAR model. *P* values for the rejection of null Hypothesis are: * at 10% significance level, ** at 5% significance level and *** at 1% significance level.

which essentially prevents Islamic banks from being completely interest-free.

5.3. Potential impact of COVID-19, contagion, and response from banking sector

COVID-19 carries a powerful impact on the financial industry. Despite a limited number of studies on the topic, we choose Chowdhury, Balli, and Bruin (2021) and Akhtaruzzaman, Boubaker, and Sensoy (2021) to further discuss the impact. Akhtaruzzaman et al. (2021) studied the contagion among financial and non-financial firms in G7 and China during the COVID-19 period. They found a

strong correlation between stock returns of the selected firms, which is also connected to a higher hedge ratio and hedge cost. As the global economies are setting up plans to recover from COVID-19, Chowdhury et al. (2021) studied the recovery of Islamic and conventional markets. Their results indicate that Islamic markets experienced lower drawdown and their recovery was faster than the conventional markets. With an overall 30% drop in S&P Global, financial markets expected a long-term recovery plan from the government. With the help of central banks, banks started year-long recovery and assistance plans. Awad, Ferreira, Gaston, and Riedweg (2020) suggest that the recovery process should be divided into two stages. First, relatively less affected banks may use their buffers to silence the initial impact of the crisis. Second, the banks with more profound impact should plan for a longer-term capital restoration plan. Overall, IMF's suggestions are built on the principles of safeguarding the interest of the bank customers and ensuring the long-term financial stability of the sector.

Malaysia reported its first COVID-19 case on January 25, 2020. Bank Negara Malaysia (BNM), the country's central bank, introduced its measures for COVID-19 on March 24, 2020 (BNM, 2020). Deloitte (2020) summarized the BNM policy impact from four major standpoints: loans – quality and provisioning, capital restoration and buffer, liquidity, and other quick customer-centric issues. For most loans for a long-term period, a loan moratorium has been a common point of financial pastimes in Malaysia. Banks were allowed to draw down on the capital conservation buffer (of 2.5%) and liquidity coverage ratio (of 100%). Deloitte (2020) also suggested that banks should be ready with strong analytical support to simulate the probability of default, loss-given default, and exposure at default. BNM has offered several packages for SME and micro-enterprises. These come at the cost of fiscal balances while keeping the loan rate reasonable. BNM will help banks to restructure and reschedule customer loans. The central bank has also held the overnight policy rate (OPR) at 1.75% (BNM, 2020). These are some desperate measures for desperate times while keeping the customers' interest at the top and making banks run at the minimum. However, these policies, overall, may not positively influence the spillover between Islamic and conventional rates. Like Akhtaruzzaman et al. (2021), this study forwards that the benchmarking of rates between Islamic and conventional will be stronger during the crisis period. If the Islamic banks are recovering fasters, customers from conventional banks may switch to Islamic banks, forcing the rates to follow conventional rates in the long run.

6. Conclusion

This study has explored the relationships between Islamic bank rates and conventional bank rates and how the monetary policy affects Islamic bank rates in a dual banking setting. We consider monthly data on the Malaysian banking market from January 2009 until April 2018. We use ARDL as the primary test, supplemented by a robustness test using 12-month rolling standard deviation and Toda-Yamamoto Causality approaches.

Firstly, the study finds that the interest-linked overnight policy rate of BNM is a statistically significant positive determinant of the overnight Islamic money market rate both in the short- and long-run. Secondly, the study examines the maturity matched rates and finds a positive (negative) impact of conventional rates on Islamic rates in the short-run (long-run). The overnight Islamic money market rate used as a proxy for the monetary policy rate only impacts the Islamic rate in the long run. Thirdly, the conventional lending rate affects the Islamic financing rate positively in the long run only. However, the policy rate shows an impact on the Islamic financing rate in the short run. Causality, ARDL, and 12-month rolling standard deviation correlations reveal that the Islamic bank rates are closely benchmarked against their conventional counterparts. The monetary policy rate strongly influences the movements in the Islamic bank rates.

Consistent with past literature suggesting that the Islamic rates are seldom linked to the performance of projects, we establish that the degree of religiosity of a customer plays an important role in this connection. The profit-driven nature of the customers is a significant behavioral force in the Islamic banking market, particularly in a dual banking system. Against the principles of an efficient market, for the Islamic banks to be Shari'ah compliant, they should profile their customers to seek more religious customers, albeit challenging to do so in a dual-banking financial system. Islamic banks are serving the majority of profit-driven customers who exploit potential arbitrage opportunities that arise from differences between the rates offered in the dual banking system. It is against the religious ethos of Islamic banks. Still, they are forced to such behavior due to competition from the conventional banking system and the overwhelming presence of profit-driven compared to religious customers that they serve.

With the limitation of the dual banking system from a monetary standpoint, it is important to consider the constructs of the dual banking environment in Malaysia that prevents Islamic banks from fully adhering to the Islamic banking tenets (El-Hawary et al., 2004). Similar arguments are presented in Rashid, Hassan, and Yein (2014), suggesting separate stock markets for Muslim investors to be completely Shari'ah based. Until then, the Islamic legitimacy of Islamic banks is more likely to remain questionable.

Islamic banks can also reduce their reliance on TBF modes of financing and increase PLS-based financing. To ensure the success of this strategy, managers need to scrutinize the risk preference of IAHs, evaluate the feasibility and future outlooks of potential investment projects and be more willing to invest in long-term projects. Policymakers need to identify how to tackle the possibility of arbitrage opportunities arising between the two interbank markets. The instruments offered in the Islamic money market should be authentic asset-linked and interest-free products. When formulating regulations and altering the monetary policy stance, policymakers need to identify and cater to the specific vulnerabilities of Islamic banks that are uncommon in conventional banks.

Furthermore, there is a general lack of awareness regarding how Islamic products work. Few practitioners have a solid knowledge of Islamic economics, banking, and finance. Hence, for the Islamic banking sector to develop in a Shari'ah aligned manner, it is essential to create awareness about the essence and ethics of Islamic banking to improve customer loyalty. Hence, Islamic banks, policy makers, and even governments can initiate programs that educate customers, practitioners, and policy makers themselves on Islamic banking and finance.

Author statement

There is no conflict of interest.
All authors contributed equally.

Appendix A. Recent related literature

Author	year	Objective(s)	Methods	Main Findings
Nechi, & Smaoui	2019	The extent Islamic Interbank Benchmark Rate (IIBR) differs from the conventional Interbank rates.	Cointegration analysis, Granger causality test, and VAR model between the two rates in five GCC countries	The IIBR has a long-run relationship with the conventional rates.
Mohd & Azha	2019	The relationship between the conventional monetary policy rate and the Islamic monetary policy rate.	Panel cointegration test, panel VECM, and Wald test on a monthly and yearly datasets for six countries from 2009 to 2018.	The conventional and monetary policy rates are cointegrated and long run and short run causality exist from conventional to Islamic monetary policy rates.
Omer	2019	The spillover of monetary policy to the bank retail prices.	Monthly data from 2004 to 2016 using VECM	The monetary policy shocks affect retail prices for both types of banks similarly. Islamic banks are following the conventional banks in the pricing of lending but leading in the pricing of deposits.
Zulkhibri	2018	The financing rate responses to monetary changes at bank level in a dual banking system.	Pooled, fixed effect and random effect panel data analysis for Malaysian banks using annual data from 2006 to 2012	Financing behavior of Islamic banks is in tandem with conventional banks with similar characteristics.
Hamza & Saadaoui	2018	The monetary transmission through Islamic banks' financing and the role of the growth in investment accounts in moderating the effect of monetary policy on interest rates and consequently on the growth level of Islamic bank debt financing.	A dynamic panel model for 50 Islamic banks from 10 countries between 2005 and 2014 using system GMM.	A strong debt financing channel exists but the Islamic banks vary in reaction to monetary policy depending on bank specific characteristics, particularly size, growth of investment accounts and asset liquidity.
Aysan et al.	2018	The behavior of Islamic bank depositors in a dual banking system for different deposit amounts compared with conventional depositors.	Turkish data of quarterly deposits for the period from 2004 to 2012 using a panel VAR.	Depositors of both types of banks respond to interest rate changes but Islamic bank depositors are more responsive when deposits are large in size.
Korkut & Özgür	2017	The dependency between profit share and deposit interest rate	Turkish monthly data from 2006 to 2015 are used with OLS method.	There is strong dependency of Islamic profit share rate on conventional interest rate.
Sukmana & Ibrahim	2017	Assessment of Islamic rates against conventional rate non-linear relationship.	Malaysian monthly data from 1999 to 2016 using NARDL	There is a non-linear reaction of Islamic investment rates to conventional rates. The movement is faster upward than conventional rates and slower downward. This relationship is weakening as the maturity lengthens.
Khalidin & Masbar	2017	The relationship between interest rate and financing Islamic rate.	Indonesian monthly data from 2009 to 2015 using VAR model and Granger causality.	Interest rates indirectly affect the operation of Islamic banks. The financing rates are affected by the interest rate due to profit rates of Murabaha type products being benchmarked against interest rates.
IFSB	2017	stress determinants of Islamic banking industry	Panel data regression using fixed effect or random effect for data of 57 Islamic banks from 10 countries for the period 2008 to 2015 annual data.	Negative relationships between investment deposits and interest rates exist due to Islamic banks' exposure to Displaced Commercial Risk (DCR).
Meslier et al.	2017	Market competition and deposit rates of Islamic and conventional banks.	Panel data for a sample of 98 Islamic banks and 386 conventional banks from 20 countries with dual banking system over the period of 2000–2004.	Market power is significantly affect conventional banks rate, leading to lower rates, but has no effect on Islamic banks rates. In Muslim countries, conventional banks are affected by competitiveness of Islamic banks but Islamic banks are only affected by other peers.
Adewuyi & Naim	2016	The long-run relationship between conventional interest rate and rate of return on deposit of Islamic banks.	Use ARDL and Granger Causality using cross-country quarterly data from 2007 to 2015.	Finds bidirectional causal relationship running between rate of return and interest rate for three countries namely; Malaysia, Indonesia, and Bahrain.
Hamza	2016	The compliance of investment deposit return with PLS principle.	Used panel data for 60 Islamic banks for the period of 2004–2012 estimated using pooled regression model	Interest rate positively affects investment deposit return.

(*continued on next page*)

(*continued*)

Author	year	Objective(s)	Methods	Main Findings
Cevik & Charap	2015	The behavior of conventional deposit rate and the Islamic investment account return in Malaysia and Turkey.	Used monthly data from 1997 to 2010 analyzed by VECM, Granger causality, and correlation of volatility between the two types of rates.	Returns to IAHs converge towards the deposit rates of conventional banks. Conventional banks deposit rate Granger cause returns on IAHS.
Asbeig & Kassim	2015	The role of bank loans in the transmission of monetary policy in an environment of low interest rate within a dual banking system.	Balanced panel data on data from 2000 to 2011.	Monetary policy has no significant impact on the level of lending by both Islamic and conventional banks.
Ergec & Kaytanci	2014	Whether the Islamic bank rates of return are affected by the deposit rates of interest in Turkey.	Monthly data between 2002 and 2010 analyzed using Granger causality	Time deposit interest rate is the Granger cause of Islamic bank rate of return. This causality relation is more visible for the period after 2006.
Anuar et al.	2014	Examine the differences in the fixed deposit rates and investment deposit rates in Malaysia.	Monthly data for the period of 1994 and 2012. Used VAR model and Granger Causality and DCC-MGARCH.	Islamic banks in Malaysia do not behave differently from conventional banks due to the lack of infrastructure to promote the Islamic banking industry and the weak regulatory enforcement.

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