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**Impact of islamic money market development on islamic bank liquidity management:
a case study of Indonesia**

Janoearto Alamsyah¹ and Mansur Masih²

Abstract

Islamic banking industry is growing in Indonesia. Nevertheless, the growth in the industry has its limitation of choices for liquidity management, in terms of Islamic money market and sovereign sukuk market. In comparison to Malaysia, Indonesia started its Islamic money market and sovereign sukuk market in 2008, much later than Malaysia, which began in 1994, even though Indonesia has bigger potential for Islamic banks growth due to the size of its muslim population and its economy. This paper seeks to investigate the impact of the Islamic money market development on the Indonesian Islamic Bank's operational aspects. Logically, if the development of Islamic interbank market had successfully improved the liquidity management practices, then this interbank market would affect the operational indicators of the Islamic banks. To achieve this, the paper tested whether two variables from Islamic money market, i.e SBIS rate (Sertifikat Bank Indonesia Syariah rate), the benchmark rate generated from Islamic money market auction, and Islamic money market transactions volume, serve as signal to the changes of the operational indicators of the Islamic banks. The paper used one of time series technique called Auto Regressive Distributed Lag (ARDL) for testing the relationships amongst operational variables: total costs, total mudharabah deposits, total equity-based financing, banks' capital, profit sharing distribution, non-operating income, and Islamic money market variables: SBIS rate and Islamic Money Market transaction volume. Our findings tend to indicate that there had been an impact of Islamic money market activities on the operational indicators of Islamic banks in Indonesia, which implies that the initial development of Islamic money market had been on the right track in facilitating the Indonesian banks' liquidity management. The findings also suggest that future development of Islamic money market and capital market are essential to improve the liquidity management of Islamic banks in Indonesia.

Keywords: Islamic money market, Islamic bank liquidity, ARDL, Indonesia

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1.0 Introduction

Banks perform various roles in the financial system. Among its important functions is the role that it plays as financial intermediaries. In this respect, the role of banks as financial intermediaries depends on its ability to manage its liquidity position. In modern studies of finance theory, intermediation involves two concepts which is the concept of liquidity provision and concept of risk management (Zaernjuk, Kryukova, Bokareva, & Chernikova, 2014). This requirement is even more pronounced in Islamic banks, as often the balance sheets are predominantly represented by deposits of short term maturities (Qorchi, 2005). Due to this, the banks need to maintain high liquidity in terms of liquid assets and excess reserves. As a consequence, there is a natural requirement for a better liquidity management among Islamic banks particularly with regard to the application of the excess liquidity. Abdul-Rahman (1999) asserts that Islamic banks have the ultimate purpose of accumulating the savings of the community and reinvesting them back in the community to generate economic activities. Beck, De Jonghe, and Schepens (2013) in their study of 22 countries involving Islamic banks and conventional banks find that Islamic banks have better intermediation and better capitalised. However, in discharging the role, Islamic banks face various risk including liquidity risk.

Post Lehman crisis, there is a general decline in availability of funding to virtually all bank asset markets. Thus liquidity risk becomes a focus in banks operations when before that it was assumed that funding was always available to meet any shortfall (Karim et. al, 2013). Liquidity risk is the potential loss that a bank may face due to its inability to meet its obligations or to fund increases in assets as they are due. For banks, managing liquidity risk is one of the main functions to them. Essentially it means ensuring that both sides of the balance sheet find the right balance. But most often than not, liquidity risk refers to shortfall in meeting short term withdrawal of deposits on the liability side. When discussing liquidity issue among Islamic banks, the problem rather refers to the excess liquidity than shortfall (Mounira & Anas, 2009). This could be related to the nature of the deposits and depositors experienced by Islamic banks.

Islamic finance globally has seen a double digit compound annual growth of 17% between 2009-2013 with assets worth more than \$1.87 trillion as at 1H2014 (Islamic Financial Services Board, 2015). Indonesia with the largest Muslim population in the world offers a huge potential for Islamic finance. Presently, Indonesia represents less than 2% of the total global share of Islamic banking assets. Islamic banking assets in Indonesia is still less than 10% of the total banking assets in the country and has yet to achieve systemic importance. Nevertheless, Bank of Indonesia is set to promote the growth

in the Islamic banking industry to take a more significant role in supporting the economy. In terms of growth, Islamic banks in Indonesia has seen a tremendous growth surpassing the global growth.

The growth in Islamic banks in Indonesia has been higher than the growth in the conventional banks (Ismal, 2013). Bucking the trend in other countries, the share of investment based financing has formed a substantial percentage of the overall credit offered by the Islamic banks in Indonesia. Up until September 2012, investment based financing have captured 27% of the total financing. This phenomenon presents a unique opportunity for study as this indicates that Islamic banks industry in Indonesia mimic the ideal structure of Islamic finance based on risk sharing concept. Nevertheless, in a not so well-developed interbank market for Islamic banks in Indonesia, it is interesting to investigate how they manage their liquidity risk and achieve a large proportion of long term lending. This is in stark contrast with Malaysia that has a more advanced Islamic liquidity market, but the proportion of long term lending by Islamic banks still remains relatively low.

In the context of liquidity availability in Indonesia, Islamic money market is still relatively new with its recent establishment by the Indonesian central bank in the Year 2000 (Lahsasna & Shayad, 2015). One of the instruments used is a certificate of investment based on mudarabah contract. In addition, Islamic financial institutions can place their surplus funds with the Central Bank of Indonesia. This instrument is issued by the central bank with returns lower than those of the Islamic inter bank money market and mudarabah. A short term Shariah compliant financing is also made available by the central bank to Islamic financial institutions based on mudarabah contract.

In this connection, this paper aims to examine the relationships between Islamic banks' operational indicators and Islamic money market activities indicators in Indonesia. We want to assess whether the recent development effort taken by the central bank (Bank Indonesia/BI) and the financial market authority (Otoritas Jasa Keuangan/OJK) in developing Islamic money market and sukuk market, had really affected the Islamic banks' operational aspects. We hypothesize that if the Islamic inter-bank money market and capital market are large and developed, banks will have better operation, which the improvement can be seen in the changes of their costs structure, profit sharing distributed to their customers and their income. This knowledge is important particularly for the regulator as this affect the overall bank's efficiency, and bank's efficiency will improve banks' willingness to finance businesses. The improved bank's financing capacity augers well for the real sector of the economy. Hence the regulator should support and promote the development of an inter-bank money market and capital market for Islamic banks if that can lead to a positive effect in spurring real sector of the economy.

2.0 The Objective of The Study

We intend to test empirically whether the 7 years of effort put by Indonesia banking and financial market authority in developing Islamic money market has really served the purpose, i.e supporting better liquidity management of Islamic banks in Indonesia. To meet this objective, we tried to move away from traditional regression model, by applying one of time series technique known as autoregressive distributed lag (ARDL) bounds test by Pesaran, Shin, and Smith (2001).

3.0 The Contributions of the paper

From humble perspective of the author, this paper could contribute in the Indonesian Islamic bank industry research by :

- (i) Departing from the previous study done in the same field which employs mostly conventional regression model, which may lack long run theoretical explanation of variables relationship in the model.
- (ii) Utilizing the strength provided in Variance Decomposition technique in time series, this paper can give suggestion which variable should be focused and prioritized by policy-maker in further developing the Indonesian Islamic money market, as the vehicle for supporting banks' liquidity management.

4.0 Literature Review

4.1 Liquidity

Supply and demand factors play a role in determining banks' lending decision. Using ARDL econometric approach for annual data from 1971-2010 for Pakistan, Imran and Nishat (2013) argue that in determining loans, the financial health and liquidity play a vital role. This view is supported by Sarath (2015) in her study of Vietnamese banks and Malede (2014). Her findings infer that liquidity constraint, significantly influence loan supply in private banks in Vietnam. Kořak, Li, Lončarski, and Marinč (2015) find in their study of worldwide banks sample from 2000-2010 that Tier 2 and interbank deposit to be important for increased lending during normal period. However, they posit that these factors are not significant in supporting lending activities during financial crises. In another study, quantitative easing policy by Bank of Japan injects liquidity into the interbank

market. Bowman, Cai, Davies, and Kamin (2015) argue because of that policy stance, robust, positive and statistically significant effect can be seen in lending especially for weaker banks. Banks' available funds for credit may also be affected by the capital adequacy requirement. Allen, Jackowicz, Kowalewski, and Kozłowski (2015) assert that banks may use reserves, tradable securities and interbank markets as source of liquidity and Acharya and Naqvi (2012) argue if the banks' liquidity is sufficiently high, they may engage in overly aggressive behaviour when lending out. In a study by Karagiannis, Panagopoulos, and Spiliotis (2012), banks' equity is one of important factors in determining loans. In summary, liquidity available to the banks is an important determinant of banks' willingness to extend lending to clients.

4.2 Liquidity Management in Islamic Banking Industry

Managing liquidity is in the realm of asset liability management. It is an expected functions of the bank to manage the timing mismatch between liabilities and assets for their maturities. It would be wishful thinking to have a perfectly match assets and liabilities for the banks. Under this circumstances, the bank will have no liquidity gap as the term and interest will be matched. However, this is far from the reality where banks require to juggle between both sides of the balance sheet, among the terms of the assets and liabilities, and interest rates basis for the both. Ismal (2010c) asserts that banks' liquidity problems stem from their failures in the management of funds or due to economic shocks that lead to unpredictable liquidity withdrawals by depositors. He further argues that liquidity management in Islamic banks can be explained by understanding the liquidity behaviours of the depositors and the efforts by the banks to manage liquidity. Abdul-Rahman (1999) asserts that Islamic banks are operating at self-imposed reserve requirement of 100 per cent due to central banks unwillingness to extend borrowing privileges in the case of bank run. However, if Islamic banks were to operate under this condition, it will be at the expense of efficiency and profitability. In addition to that, the bedrock of Islamic finance requires Islamic banks' liquidity management to be in accordance with Shariah rules (Ismal, 2008). Abdullah (2010) argues that due to the interconnected nature of the Islamic finance industry nowadays, it has become globally attached particularly post global financial crisis. The event of credit crunch has led to a renewed effect for a mechanism to integrate the liquidity market for the industry.

Liquidity management is bank's ability to meet decreases in its liabilities as well as to fund any increases in its assets. In adverse conditions, bank's inability to meet its liquidity position could lead to solvency. A study in Japan by Fiedler, Brown, and Moloney (2002) find that transparency as an important element in liquidity management. In their study, they argue that liquidity management should also include contingent cash flow to give a true picture of the potential liquidity gap. The

financial crisis in the late 2000s provides a valuable lesson when financial innovation in the form of securitisation posed a danger to liquidity (Smolo & Mirakhor, 2010). Financial panic led to evaporation in liquidity which further amplifies the crisis.

Ismal (2010c) posits that in order for Islamic banks to manage its liquidity, they need to understand the depositors. He concludes in his study that in order for Islamic banks to do that, they need to produce continuous profits and pay competitive return to the depositors. In addition, the process must be executed in Shariah compliance manner and depositors expect Islamic banks to have a proper liquidity management. In the case of Indonesian Islamic banks, the deposits made up of almost 50/50 between long term deposits (Mudarabah time deposit) and short term deposits (Mudarabah saving deposit and Wadiah demand deposit) (Ismal, 2010c). This implies that only half of the deposits can be mobilised for long term lending activities. In another study done in Malaysia, Haron and Azmi (2008) find that determinants of deposits between conventional and Islamic banks' depositors do not generate the same results. They posit that religious belief plays an important role in the determining deposit behaviours among Islamic bank's depositors in Malaysia. This finding may have an impact on liquidity management of Islamic banks as factors affecting withdrawals may not follow the normal reasons such as returns and inflation rates for example. This finding is consistent with Al-Ajmi, Hussain, and Al-Saleh (2009) study in Bahrain where religiosity is also an important determinant in deciding to do business with Islamic banks.

4.3 Malaysia's experience in developing Islamic Inter-bank Money Market

The importance of banking industry institutional infrastructure in stimulating economic growth cannot be over-emphasised. Slesman, Baharumshah, and Ra'ees (2015) argue that better quality political and economic institutions can provide support towards economic growth. In the context of Islamic banking industry, required support for liquidity management will contribute to the banks' ability to better match the requirements. Nevertheless, designing Islamic instruments for monetary operations has proven conceptually difficult. Lack of non-interest bearing securities has limited the scope of monetary management. Indonesia is no exception in its pursuit to expanding its Islamic finance and Islamic banking. Limited interbank liquidity market provides a challenge to the banks in terms of ability to play an effective intermediary role. Banks would need a rather low liquidity if the portfolios are made up of many small stable deposits. However, banks would require high liquidity when the loans consist of large and long term loans whilst the deposits are made up of large and highly concentrated deposits.

In the context of central bank's support towards providing an effective provision of liquidity market, Malaysia is among the best examples. Prior to the establishment of the Islamic Interbank Money Market (IIMM) by the Central Bank of Malaysia (BNM), the Islamic banks had to rely on Government Investment Certificate (GIC) for their liquidity management purposes. Whilst it was the only Shariah compliant instrument available at that time, another limitation was its non-tradability in secondary market. Over the years, the development of a well functioning money market has been spearheaded by the BNM to support the expanding size of the Islamic banking system and to facilitate liquidity management of both industry players and government. Realising the inadequate arrangement of only a single available instrument i.e. GIC to support a fast growing Islamic banking sector, prompted BNM to introduce a full fledged IIMM (Ismath Bacha, 2008).

Islamic interbank money market (IIMM) in Malaysia was established on 9 January 1994, roughly 10 years after the first Islamic bank was formed in the country. The establishment of IIMM was primarily to facilitate the liquidity exchanges and short term investment by IFIs. Through IIMM, IFIs are able to match their assets and liabilities and manage their liquidity requirements appropriately. Without any example of a successful Islamic interbank money market, Malaysia adopted an approach whereby conventional money markets' template was used as a structure by removing all aspects that contradicts Shariah principles (Abduh, Sukmana, & Omar, 2013). Generally, Malaysian Islamic money market comprises of two components namely i. Islamic interbank market, and ii. Trading of Islamic money market instruments. Various instruments have been developed to suit the needs of the Islamic financial institutions for their liquidity management. Among the instruments are Mudarabah Interbank Investment (MII), Wadiah acceptance, Government Investment Issue (GII), Bank Negara Monetary Notes – i (BNM-i), Sell and Buyback Agreement (SBBA), Cagamas Mudarabah Bonds, When Issue (WI), Islamic Accepted Bills (IAB), Islamic Negotiable Instruments (INI), Islamic Private Debt Securities, Ar Rahn Agreement, Sukuk BNM Ijarah (Dusuki, 2007). (Ismath Bacha, 2008) asserts that the rapid growth of more than 100 folds in terms of market share in Islamic banking in Malaysia to the introduction of IIMM by the BNM in 1994 which provided access to the money market.

The Islamic Interbank Market is the largest component of Malaysia's Islamic money market. An active interbank market is crucial in providing signals to the central banks in determining the level of intervention required in its open market operations (Abduh et al., 2013). The overnight market sub component is where the IFIs trade among themselves for their reserves balances. Banks with large surplus, lend to deficit banks and vice versa. The transactions in overnight market adjust the overnight rate according to the level of demand and supply for bank reserve. Currently, the overnight

market forms the largest component of the overall money market operations. In 2009, approximately 83% of the transactions were in the form of overnight market transactions.

There are three types of contracts used in the Islamic interbank market namely Mudarabah, Murabahah and Wakalah. The first instrument was introduced in 1994 based on Mudarabah principle called Mudarabah Interbank Investment. Whilst initially the calculation of profit sharing was left with the individual bank, it was later discovered that the method lacked transparency (Abduh et al., 2013). In 1995, BNM came up with a new rule where a benchmark rate is equivalent to prevailing rate of the Government Investment Issue (GII) plus a spread of 0.05 percent. Later in 2004, BNM introduced a more comprehensive framework for the calculation of distributable profits to make the instrument more competitive and transparent. The second instrument is Commodity Murabahah also known as tawarruq which was introduced in March 2007 by BNM. The third instrument is Wakalah which is almost similar as a deposit account based on agency concept.

The other component of Islamic money market is the trading in Islamic money market instruments. These instruments facilitate placement among money market players through issuance of financial instruments. Unlike interbank money market, these instruments can be traded on secondary market, thus provide more liquidity to the participants. The players for these instruments are not just limited to the IFIs but also open to non-IFIs. This provides a sizeable market which is important for any secondary market to operate efficiently. Each instrument has its own characteristics in term of risk profile, yield, tenor, marketability and liquidity. In short these instruments offer a wider choice to the market players depending on their financial objectives. Examples of the instruments are Government Investment Issue, Islamic commercial papers, Islamic medium term notes, Malaysia Islamic Treasury Bills, Sukuk Bank Negara Malaysia Ijarah etc.

To address the controversies, the Central Bank introduced a commodity murabahah programme using palm oil as the underlying assets using tawarruq principle. The instrument was endorsed by the Shariah Advisory Council on 28 July 2005 and accepted as an instrument in the IIMM. Similar to the products based on bai-al-inah, commodity murabahah programme (CMP) are also targeted at providing instruments for liquidity management purposes among the IFIs. Certainty which is an important element for a successful money market instrument is what commodity murabahah provides when the return is pre-determined from the sale and purchase agreement. CMP is used for both injecting and absorbing liquidity from the market. While bai-al-inah involves sell and re-purchase transactions with the same 2 parties, CMP introduced the 3rd party into the transaction where the commodity, in this case palm oil, is ultimately sold on spot basis. Thus the availability of the trading place and many players are pre-requisite for the effective running of this type of liquidity instrument.

BNM for this reason introduced Bursa Suq-Al-Sila as a trading platform for this type of money market instrument.

In short, Malaysia has a relatively well-developed money market for its Islamic finance industry. The commitment from the central banks by providing the necessary infrastructure facilitates the growth of the industry. Liquidity management being one of the important functions of the financial industry players requires a market where their needs can be promoted in accordance with the Shariah rules and principles.

5.0 Methods

From the previous studies done in reviewing the Indonesian Islamic banks' liquidity management and the financing, we found that Ismal's study was one of the most comprehensive and thorough study in this field. Hence, in most of the research modeling and direction, we rely on his study, especially in selecting the variables of research and constructing them into a time-series model.

According to Ismal's survey on Indonesian Islamic Banks, the sources of liquidity problems are (Ismal, 2010a):

- a) Rational depositors who are very sensitive with interest rate return
- b) Large portion of short-term deposits
- c) Nonperforming financing, which can lower profit and revenue-sharing to depositors
- d) Increasing interest rates because of tight monetary policy
- e) Difficulty or limited access to Islamic money market
- f) Difficulty in finding prospective and profitable financing proposals

Consequently, in dealing with the liquidity problem, based on Indonesian banking survey conducted by Ismal, there are 3 policies which are used by banks to maintain the equilibrium of the asset and liability (Ismal, 2013):

- a) Matching tenor and amount of funds on the assets and liabilities
- b) Buying government sukuk for alternative financing allocation
- c) Pooling the short term and long term funds and distributing them to certain allocations.

Operationally how banks remedy the liquidity problem if it occurs and if the remedies are taken from the perspective of liquid instruments (Ismal, 2010b):

- a) Borrow funds from Islamic money market
- b) Borrow funds from parent company
- c) Repurchase of Money market instruments

- d) Withdraw private placements in other banks
- e) Use bank's capital to cover liquidity demanded
- f) Selling Islamic securities in secondary market
- g) Persuade depositors to extend the deposit tenors
- h) Use intraday emergency liquidity facility provided by central bank/authorities

Hence from factors above as laid out by Ismal, we can deduce that the success of asset side management, whereby financing takes major part of general Islamic bank's operation (Bank Indonesia, 2015b), would rely on the success of liquidity management practiced by Islamic banks. A Comprehensive liquidity management necessitates the well-functioning of money market and securities market, as well as the management of deposits raised from public.

In his research, Ismal developed a dynamic model which covers four sectors of Indonesian Islamic banking operations:

- a) Liquidity reserve
- b) Central bank liquidity control
- c) Asset Side
- d) Liability Side

However, for the purpose of this research, which is focused on exploratory study after Indonesia launched sovereign sukuk market in 2008-2009 and the revamping of PUAS (Pasar Uang Antara Bank Syariah/Indonesian Interbank Money Market) in 2012, this study takes simplification of Ismal's sophisticated dynamic model. This paper only took asset side model, since asset side model give us picture on the impact of Islamic money market activities to the operational aspects of the bank.

Based on the above, we developed our time-series model based on the following variables:

- a) For Operational Aspect Variables:
 - i. Profit Sharing
 - ii. Total Costs
 - iii. Non Operating Income
 - iv. Total Mudharabah Deposits
 - v. Total Equity Based Financing
 - vi. Total Capital
- b) For Islamic Money Market Activities variables :
 - i. Islamic money market transactions volume
 - ii. Sertifikat Bank Indonesia Syariah Rate

The following table describes how the variables used in this research are constructed from the operational definition discovered in the previous research done in the Indonesian banks' liquidity management :

Table 1: Variables Construction from Previous Research in Indonesian Banks Liquidity Management

No	Factors as Identified in Bank Survey Conducted by Ismal	Variables to be Estimated in the Model
1	Rational depositors who are very sensitive with interest rate return	Total Mudharabah Deposits
4	Increasing interest rates because of tight monetary policy	SBIS Rate
5	Difficulty or limited access to Islamic money market	Islamic Money Market Transaction Volume
7	Borrow funds from Islamic money market	Islamic Money Market Transaction Volume
9	Repurchase of Money market instruments	Islamic Money Market Transaction Volume
10	Withdraw private placements in other banks	Banks' placement in the form of Central bank's certificate/demand deposit
11	Use bank's capital to cover liquidity demanded	Total Banks Capital
12	Selling Islamic securities in secondary market	Islamic Money Market Transaction Volume
13	Persuade depositors to extend the deposit tenors	Total Mudharabah Deposits
15	Profit sharing between banks and depositors/clients	Total Return-sharing paid by Islamic banks to depositors
16	Operational aspects of the banks	Operational Income/Non Operational Income Operational Cost/Non Operational Cost/Total Costs

For the operationalization of this research, we have resorted to Indonesian Islamic banking industry data provided by Bank Indonesia and also some data which is provided by Dr Rifki Ismal as his courtesy.

In Ismal's research, he focused on the progress of Indonesian Islamic bank industry from 2000 until 2009, therefore the period he looked at was just the beginning of Indonesia's sukuk market.

Whereas, in this research, we look at monthly data within the period of June 2006 until June 2015.

For the time series analysis, we applied the Auto-Regressive Distributive Lag (ARDL) method, a method which was proposed by Pesaran, Shin and Smith (Masih, Al-Hajji, & Umar, 2008). This method is free from the limits imposed in the unit-root and cointegration tests.

There are 2 stages in ARDL technique (Masih, Al-Hajji, and Umar, 2008):

1. At the first stage, the existence of a long-run relationship among the variables is investigated. This is done by constructing an unrestricted error correction model (UECM) with each variable in turn as a dependent variable and then testing whether or not the 'lagged levels of the variables' in each of the error correction equations are statistically significant. The test consists of computing an F-statistic testing the joint significance of the 'lagged levels of the variables' in each error-correction equation. The computed F-statistic is then compared to two asymptotic critical values. If the test statistic is above an upper critical value, the null hypothesis of no long-run relationship can be rejected regardless of whether the variables are $I(0)$ or $I(1)$. Alternatively, when the test statistic falls below a lower critical value, the null hypothesis of no long-run relationship is accepted regardless of whether the variables are $I(0)$ or $I(1)$. Finally, if the test statistic falls between these two bounds, the result is inconclusive. It is only in this case that the researcher may have to carry out unit root tests on the variables. As regards the implications of the F-statistics, if all the F-statistics in all equations happen to be insignificant, then that implies the acceptance of the null of 'no long run relationship among the variables'. However, if at least one of the F-statistics is significant, then the null of 'no long-run relationship among the variables' is rejected. In that case, there is a long run relationship among the variables. When the F-statistic is significant, the corresponding dependent variable is endogenous and when the F-statistic is insignificant, the corresponding dependent variables are exogenous or called 'long-run forcing variables'.
2. Once the long run relationship has been demonstrated, the second stage of the analysis involves the estimation of the long run coefficients (after selecting the optimum order of the variables through AIC or SBC criteria) and then estimates the associated error correction model.

6.0 Discussion of Results

6.1 ARDL Cointegration Testing

Based on above framework, this paper looks at 2 groups of variables:

1. Bank's Operational Aspect's variables:
 - a. Profit Sharing Variable
 - b. Total Cost Variable
 - c. Non Operating Income Variable
 - d. Total Mudharabah Deposit Variable
 - e. Total Equity Financing Variable
 - f. Total Capital Variable

2. Islamic Money Market Activities' Variables:
 - a. Islamic Money Market Total Transaction Volume
 - b. Sertifikat Bank Indonesia Syariah (SBIS) rate

All these variables are derived from previous similar research done in this field by Dr Rifki Ismal as discussed earlier.

The data for the variables are taken from Bank Indonesia (the central bank) database from period 2006 and mid of 2015. The selected period should represent the period when the Indonesia's central bank and the financial market authority started to implement Islamic money market, to support the liquidity management of Indonesian Islamic banks.

This paper tried to employ the Engle-Granger and Johansen cointegration testing technique, however the results don't seem to be satisfied. As understood, there are some limitations of these techniques, as these methods are prone to be small sample bias and simultaneity bias among the regressors. Hence, this paper is resorted to ARDL method.

From bank's operational variables and Islamic money market variables identified above, this paper tested whether there is long run relationship between these 2 groups of variables, and also which variables from bank's operational variables group has long run relationship with Islamic money market variables.

Table 2 : Long run relationship amongst constructed variables

Variables Group	Dependent Variable	'F' Statistic
Bank's Operational Variables		
	Total Cost (DTC1)	4.6590 [.000]
	Profit Sharing (DPS1)	5.7237 [.000]
	Non-Operating Income (NOI1)	4.1095 [.000]
	Equity-based Financing (DEQFIN1)	3.7869 [.000]
	Total Capital (DCAP1)	0.93323 [0.495]
	Total Mudharabah Deposit (DTMUD1)	4.2463 [.000]
Islamic Money Market Activities		
	SBIS Rate (DSBIS1)	1.6782 (0.12)
	Islamic Money Market Total Transactions Volume	1.5138 (0.169)

The above 'F' statistic relates to the 'variable addition test' i.e., whether the 'lagged level form' of the variables added to the equation is significant or not. The 'F' statistic tests the joint null hypothesis that the coefficients of these 'level' variables are zero. A significant 'F' implies the rejection of the null hypothesis that there is no long run relationship between the variables (Masih, Al-Hajji, & Umar, 2008).

These results are compared against Pesaran, Shin and Smith (PSS) critical F values tabulation. If the F test statistic above is below than the lower bound, then we can't reject the null of no long-run relationship amongst the variables. If greater than the upper bound, then we reject the null hypothesis. However, if the value falls in between the lower and upper bounds, then the result is inconclusive.

From the above results, we can understand that:

1. From bank's operational indicators:
 - a. Total Cost (DTC1) and Profit Sharing (DPS1) variables are well above upper bound of Pesaran, Shin and Smith (PSS) critical F values tabulation, with 99% confidence level.
 - b. Total Mudharabah Deposit (DTMUD1) and Non-Operating Income (DNOI1) are above upper bound of PSS critical F values tabulation, with 97.5% confidence level.
2. From Islamic money market activities indicators:

- a. SBIS Rate (DSBIS1) which serves as the Islamic liquidity market benchmark rate is below the lower bound.
- b. Islamic Money Market Total Transactions Volume (DIFMS1) which shows the activity of Islamic money market instruments exchanges in the Indonesian interbank market and capital market, is also below the lower bound.

Hence, the test outcomes above show that when we add Total Cost (DTC1) and Profit Sharing (DPS1) as if dependent variables in our proposed model, we can reject the null hypothesis that there is no long run relationship amongst the variables:

1. Total Cost // Profit Sharing, Non-Operating Income, Total Mudharabah Deposit, Equity-Based Financing, Total Capital, Islamic Money Market Total Transactions Volume, SBIS Rate

OR

2. Profit Sharing // Total Cost, Non-Operating Income, Total Mudharabah Deposit, Equity-Based Financing, Total Capital, Islamic Money Market Total Transactions Volume, SBIS Rate.

The test outcomes above also gives us possibility to construct the following models, since they are above upper bound within 97.5% confidence level:

1. Total Mudharabah Deposit // Total Cost, Profit Sharing, Non-Operating Income, Equity-Based Financing, Total Capital, Islamic Money Market Total Transactions Volume, SBIS Rate
2. Non-Operating Income // Profit Sharing, Total Cost, Total Mudharabah Deposit, Equity-Based Financing, Total Capital, Islamic Money Market Total Transactions Volume, SBIS Rate.

However, this paper opts to select the first two models, which put Total Cost and Profit Sharing, since in the practice these two variables are within more in bank's management's control. Also, as we can see in the later stage of testing, Total Cost and Profit Sharing are actually the most two endogenous variables.

All variables within the Islamic money market activities group are shown within the lower bounds in the above test. Hence we may infer that they don't show long-run relationship, when they are added

into the model as if they are dependent variables. Based on the above test, we can't accept the following models:

1. Islamic Money Market Transactions Volume // Total Cost, Profit Sharing, Non-Operating Income, Equity-Based Financing, Total Capital, Total Mudharabah Deposit, SBIS Rate
2. SBIS Rate // Profit Sharing, Total Cost, Total Mudharabah Deposit, Equity-Based Financing, Total Capital, Islamic Money Market Total Transactions Volume, Non-Operating Income.

The outcomes of the test makes sense since it is understood in the reality:

1. SBIS Rate is the Islamic money market benchmark rate which is generated through open market auction organized by the Indonesian Central Bank, i.e Bank Indonesia, therefore the rate is solely the outcomes of final yield accepted by Central Bank in the auction.
2. Islamic Money Market Transactions Volume is solely market based activities, which is driven by Islamic banks' needs for meeting their liquidity management purposes. Hence this variable is shaped by market forces, whereby no party could control at its discretion. Even Bank Indonesia currently doesn't put any market-maker to shape the activity in the market.

6.2. Vector Error Correction Model Testing

Finally, we estimated the error correction representation of the selected ARDL Models (Table 3)

Table 3: Error Correction Representations for the Selected ARDL Models

Dependent Variable = dPS with ARDL (1,0,0,1,1,1,0,0) based on Akaike Information Criteria (AIC)			
Regressor	Coefficient	Std Error	t-Ratio
ECT(-1)	-0.23533	.062140	-3.7871 [.000]*

Dependent Variable = dTC with ARDL(1,1,0,1,1,0,0,0) based on Akaike Information Criteria (AIC)			
Regressor	Coefficient	Std Error	t-Ratio
ECT(-1)	-0.26182	.066532	-3.9353 [.000]*

Dependent Variable = dSBIS with ARDL (1,0,0,0,0,0,0,1) based on Akaike Information Criteria (AIC)			
Regressor	Coefficient	Std Error	t-Ratio
ECT(-1)	-0.044346	.019015	-2.3322 [.022]

Dependent Variable = dIFMS with ARDL (1,0,0,0,0,0,0,1) based on Akaike Information Criteria (AIC)			
Regressor	Coefficient	Std Error	t-Ratio
ECT(-1)	-0.39114	.080165	-4.8792 [.000]

The above results show the four error correction models with the total costs, profit sharing, SBIS rate and Islamic money market transactions volume as dependent variables respectively. The ‘t’ ratios of the error-correction term are significant at 1% level when the Total Costs, Profit Sharing and Islamic Money Market Transactions Volume are the dependent variables but not significant when the SBIS rate is the dependent variable. That tends to indicate that the SBIS rate is the exogenous variable and the other three variables are endogenous. That implies that in the relation to Islamic money market as the vehicle of Islamic banks’ liquidity management, SBIS rate, the Islamic money market benchmark rate is the driver or the leading variable and the other variables (the total costs, profit sharing and the Islamic money market transactions volume) bear the burden of short-run adjustment to bring about long-term equilibrium.

The above results implies that when the central bank (Bank Indonesia) conducts an Islamic money market auction through offering of SBIS certificate, the rate (yield) resulted from the bidding process leads the decision made by Islamic banks in the country by structuring its operational and overhead costs which eventually determine their total costs. The SBIS rate generated in the auction will also affect the decision of Islamic banks to determine its financing costs, which eventually leads to profit sharing amount distributed to their Investment Account Holders.

However, in this Error Correction Model testing, we found ambiguity with the results finding of Islamic Money Market transactions Volume. In the ARDL cointegration testing, we found that such a model with:

“Islamic Money Market Transactions Volume // Total Cost, Profit Sharing, Non-Operating Income, Equity-Based Financing, Total Capital, Total Mudharabah Deposit, SBIS Rate”

whereby we put Islamic Money Market Transactions Volume as if dependent variable in the model, should not be accepted. Nevertheless, in this ECM testing we found indication that Islamic Money Market Transactions Volume is endogenous, which don’t really meet our initial expectation, i.e as exogenous variable.

To verify this ambiguity, we move on to the next test, which is variable decomposition, to determine the relative exogeneity and endogeneity amongst variables.

6.3 Variance Decomposition (VDC) Testing

In the Error Correction Model (ECM), we have established that SBIS Rate is the exogenous variable, while at same time we also found that the Islamic Money Market Transactions Volume is endogenous variable, even though in the ARDL cointegration testing, it shows that long run relationship can’t be established when the Islamic Money Market Transactions Volume is added as if it is dependent

variable in the model. Also, in the ECM, we have not been able to say anything about the relative endogeneity of the remaining variables from Banks Operational Variables group and Islamic Money Market Activities Variables Group. With VDC testing, we'd like to see the relative exogeneity and endogeneity amongst the observed variables, or we'd like to know which variables have strongest leading influence in relative to other variables, and which variables are the laggard variables ? Beside that, with this VDC testing, we expect that the finding can answer the ambiguity of exogeneity/endogeneity of the Islamic Money Market Transactions Volume variable

This paper decided to rely on Generalized VDCs, since this method is renowned as invariant to the ordering of variables. From microfit VDC test results, we arrange a table which consists of variances of each variable of a specific horizon. For a given variable, at a specified horizon, we total up the numbers of the given row and we then divide the number for that variable (representing magnitude of variance explained by its own past) by the computed total. In this way, the numbers in a row will now add up to 1.0 or 100%. The results are shown in the following table:

Table 4: Forecast Horizon = 13 weeks

	Horizon	DPS	DNOI	DIFMS	DSBIS	DTMUD	DTC	DCAP	DEQFIN
DPS	13	45.35%	13.12%	3.82%	2.06%	1.10%	22.82%	7.54%	4.19%
DNOI	13	15.46%	52.39%	4.10%	3.94%	3.82%	8.82%	7.18%	4.29%
DIFMS	13	4.89%	4.55%	58.93%	6.40%	13.17%	4.62%	3.11%	4.32%
DSBIS	13	4.97%	2.50%	8.90%	59.65%	1.56%	7.13%	8.75%	6.55%
DTMUD	13	12.59%	4.50%	6.50%	10.57%	48.62%	4.37%	8.50%	4.36%
DTC	13	23.27%	8.34%	3.61%	2.00%	2.15%	43.22%	7.49%	9.93%
DCAP	13	6.06%	3.05%	17.55%	7.73%	6.90%	5.99%	47.19%	5.53%
DEQFIN	13	9.40%	5.30%	7.23%	4.07%	2.13%	20.78%	2.51%	48.59%

Based on above variable's variance magnitude mapping, we can sort the ranking of variables by their relative exogeneity strength (from most exogenous to least exogenous):

Ranking	Variables	Magnitude of Variance
1	SBIS Rate	59.65%
2	Money Market Transactions Volume	58.93%
3	Non-Operating Income	52.39%
4	Total Mudharabah Deposit	48.62%
5	Total Equity Based Financing	48.59%
6	Total Capital	47.19%
7	Profit Sharing	45.35%
8	Total Costs	43.22%

From the above results, we can make the following key observations:

1. The Generalized VDCs confirm the results of the VECM in that SBIS rate is the most exogenous variable.
2. Also the generalized VDCs confirm that Money Market Transactions volume is the 2nd exogenous variable.
3. The relative variance magnitude of SBIS Rate and Money Market Transactions Volume to other variables are below 10%, except for Total Mudharabah Deposit.

The above results give plausible implications for policy makers, since with this VDCs finding, we can understand that the central bank (Bank Indonesia/BI) and financial market supervisory authority (Otoritas Jasa Keuangan/OJK) have been in the right track by developing Islamic money market and sukuk market as the vehicle to support the liquidity management. This findings implies that the activities in the money market has been able to send signal to the Islamic bank's operation, whereby Islamic bank will follow by managing its costs structure which is reflected through its total costs variable, and its financing costs which is reflected through its profit sharing variable.

However, as described in the point 3 of above key observations, there is still much room for the central bank and financial market supervisory authority to extend the breadth of instrument choices, and increase the liquidity in the market, since from the relative variance magnitude in the VDC results above, most operational variables are still below 10% when the two exogenous variables, i.e SBIS rate and Islamic Money Market Transactions volume are shocked. This makes sense since Indonesia has just implemented Islamic money market for 7 years, and the additions of money market instruments are relatively limited compared to Malaysia's Islamic money market.

6.4 Impulse Response Functions

IRFs essentially map out the dynamic response path of a variable owing to a one-period standard deviation shock to another variable. An impulse response function is helpful in tracing the time path of the various shocks on the variables contained in the VAR system. It is normalized such that zero represents the steady state value of the response variable.

This paper tried to see the path of each bank's operational variable, when the most exogenous variable, i.e SBIS rate is shocked. On average, the shock on each variable generally lasts around 30 months, except for Equity-based Financing variable which experience least disturbance variance and least period of disturbance, the plausible rationale for this is due to the fact that equity-based financing is least-preferred financing provided by Islamic banks to customers, whereby Murabahah is mostly employed financing by Islamic banks.

7.0 Conclusion & Recommendation

From the analysis of the findings above, we can understand that Islamic interbank money market benchmark rate, i.e SBIS rate, has been showing a leading exogenous variable to the Islamic bank's operational variables. Even though, there was ambiguity at initial testing stage, about the exogeneity of Islamic money market transaction volume variables, the VDC gives indication of its exogeneity, therefore we can also understand that the development of Indonesian Islamic bank money market which began in 2008, had created a relatively liquid market. Only a liquid market can support the liquidity management of bank's operation, since bank can utilize it to channel its excess liquidity or to tap funding to boost its liquidity needs. However, also from the VDC results whereby the relative variance magnitude of each bank's operational variable is low when the exogenous variables are shocked, we can also understand that there should be much more room to improve in extending the breadth of Islamic money market instruments choices, and in increasing the Islamic money market liquidity, therefore it can be more attractive for Islamic banks in utilizing it for vehicles in supporting its liquidity management.

In the future, Bank Indonesia and Otoritas Jasa Keuangan should closely monitor the cost structures of Islamic banks, especially monitoring the financing costs incurred by the Islamic banks, especially the financing costs coming from the profit sharing distributed to its Investment Account Holders and financing costs coming from tapping more liquidity from Islamic money market. As found out in this paper, that the total costs and profit sharing distribution are the most endogenous variables affected by money market activities. From this monitoring, then Bank Indonesia and Otoritas Jasa Keuangan can design better the future development of Islamic money market.

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