Do islamic bank deposits depend on total islamic bank assets or the other way around ?

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Abstract: Whilst the growth of the Islamic banking and finance industry has been remarkable, uncertainty and the lack of standardization in the legal and regulatory framework governing the Islamic finance industry may be impeding the growth of Islamic finance (Wisham et. al., 2012). There is no dearth in literature regarding the need for standardization in the Islamic finance industry for vis-à-vis banking/accounting standards, legal and regulatory frameworks and contractual terms to ensure that Islamic banking and finance continues to experience double digit growth rates, but could there be something of significance internally and within the four walls of Islamic banks themselves, something on an Islamic bank's balance sheet, that can give us an insight on the growth of total aggregate assets of Islamic banks in Malaysia? This paper seeks to examine whether the growth of total aggregate assets of Islamic banks in Malaysia and the four significant components of Islamic banks' assets and liabilities respectively (loans and advances, amount due from designated financial institutions, total equities and total deposits) have a long run relationship. To conduct the study, this paper carries out the necessary preliminary diagnostic tests and thereafter employs the Long Run Structural Model (LRSM), the Vector Error Correction Model (VECM) and Variance Decomposition (VDC) to test the presence/absence/nature the long run relationship between the said variables. As there are no known previous studies that have attempted to do this, this paper seeks to fill in this lacunae. Whilst we have found that there is one cointegrating relation between the above five variables, total aggregate assets is a highly exogenous variable. It is ultimately recommended that a more conducive regulatory and legal environment be created to grant Islamic banks the proper platform for it to increase its financings, other components of its asset side and eventually the total aggregate assets of Islamic banks in Malaysia.

Keywords: Islamic bank deposits, Islamic bank assets, VECM, VDC, Malaysia

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INTRODUCTION

The remarkable growth rate of the Islamic finance industry is now a common knowledge. With interest in Islamic finance expanding beyond the borders of the GCC and South East Asian countries and now infiltrating western and African markets, a close inspection on the internal dynamics of the "balance sheet" variables of an Islamic bank at an aggregate level is timely.

To this end this paper seeks to conduct a study to examine whether the growth of total aggregate Islamic banking assets in Malaysia and the two most significant components (according to percentage contribution) of aggregate liabilities and assets respectively have a long run relationship. We have chosen to look at the Islamic banking industry in Malaysia as Malaysia ranks number 2 on the Islamic Finance Country Index (IFCI - a composite ranking that reflects the state of Islamic banking and finance in different countries, initiated in 2011 to capture the growth of the Islamic banking and finance industry), therefore making it a suitable candidate for the purpose of this study.

Given that we are essentially "looking inside the firm", reference to Modigliani and Miller's Dividend Irrelevant theorem is appropriate, where the theorem provides amongst other things that, dividend + Investment = New equity + net operating income. We can glean from the above theory that sources of funds will always equal uses of funds, or that assets will always equal liabilities. We know from rudimentary accounting principles that a bank's liabilities are its sources of funds and its assets are its uses of such funds and we also know that the growth of a bank's assets can stem from both sides of the balance sheet (ie from its liabilities or assets). However what actually happens within this equation/relationship? How does each component of a bank's liabilities and its assets move in the long run and do they move together?

In this respect, whilst there is numerous literature (as set out in the Literature Review section below) examining relationships between the growth of Islamic banking/finance and external factors (such as GDP, interest rates and market share for example), literature regarding the similarities/differences between Islamic and conventional banks, there appears to be little focus if none at all on the manner in which the internal components of Islamic banks' liabilities/assets and growth of aggregate total assets are related to one another and whether there is a long run relationship among these variables and this is what this paper seeks to examine.

There are however a number of theoretical limitations that must be highlighted at this juncture. It is pertinent to note that there is a dearth in theories and literature on Islamic banking for the purpose of this study which seeks to examine the internal dynamics of an Islamic bank at the firm level. Even the banking theories for conventional banks relate to the structure of banks and its relation with macro economic variables and the general (although "special") characteristics of banks. Corrigan (1982) for example expounds that a bank is special because of its status as an offeror of transaction accounts, a provider of backup source of liquidity for all other institutions and that it is the transmission belt for monetary policy. These theoretical limitations have yet to be resolved. More research certainly needs to be carried out on Islamic banks at the "firm level".

When we look at a financial institution's balance sheet (from an accounting perspective), there are a number of components that may constitute its assets and liabilities respectively which would reflect the financial institution's capital raising methods and the financing products which it opts to offer its customers. Whilst there are minor differences in banks' categories of its assets and liabilities, generally the following represents the categorical components of a bank's assets and liabilities:

Assets	Liabilities
Cash and short term funds	Deposits from customers
Deposits and placements with financial institutions	Deposits and placements from financial institutions
Financial investments portfolio	Other liabilities
Loans, advances and financing	Subordinated obligations and capital securities
Other assets	Share capital
Statutory deposits with central banks	Reserves
	Non-controlling interests

Bank Negara Malaysia (BNM hereinafter) categorizes the aggregate liabilities and assets of conventional and Islamic banks vide the following descriptive statistics. The following monthly data sourced from the BNM website is for the period covering eight years starting from January 2007.

Table A - Banks' Liabilities

Statistics	BANK LIABILITIES											
	Conventional						Islamic					
	Acceptances Payable	Bills Payable	Total Deposits	Total Equities	Amount Due to Designated Financial Institutions	Other Liabilities	Acceptances Payable	Bills Payable	Total Deposits	Total Equities	Amount Due to Designated Financial Institutions	Other Liabilities
Mean	1.14%	0.44%	73.58%	9.36%	7.08%	8.42%	0.59%	0.21%	81.69%	7.53%	6.19%	3.79%
Median	0.01	0.00	0.74	0.10	0.07	0.08	0.00	0.00	0.82	0.08	0.06	0.04
Maximum	0.03	0.01	0.77	0.11	0.10	0.13	0.01	0.01	0.84	0.09	0.11	0.10
Minimum	0.00	0.00	0.67	0.07	0.05	0.07	0.00	0.00	0.76	0.06	0.02	0.02
Std. Dev.	0.01	0.00	0.02	0.01	0.01	0.01	0.00	0.00	0.02	0.01	0.02	0.01
Skewness	0.59	0.05	(1.22)	(0.67)	0.26	2.08	0.81	1.62	(0.97)	0.49	0.09	3.03
Kurtosis	2.36	4.27	5.14	2.35	2.11	10.11	2.44	6.16	4.29	2.25	2.10	15.19
Jarque-Bera	7.99	7.07	45.87	9.83	4.65	296.40	12.78	89.55	23.88	6.73	3.72	810.62
Probability	0.02	0.03	-	0.01	0.10	-	0.00	-	0.00	0.03	0.16	-
Obs.	105	105	105	105	105	105	105	105	105	105	105	105

Table B - Banks' Assets

Statistics	BANK ASSETS							
	Conventional				Islamic			
	Amount Due from Designated Financial Institutions	Loans and Advances	Malaysian Securities	Negotiable Instrument Deposits Held	Amount Due from Designated Financial Institutions	Loans and Advances	Malaysian Securities	Negotiable Instrument Deposits Held
Mean	16.1%	57.0%	12.4%	2.1%	20.2%	59.2%	14.5%	2.1%
Median	0.150	0.575	0.128	0.021	0.190	0.587	0.146	0.022
Maximum	0.242	0.589	0.151	0.033	0.345	0.700	0.180	0.033
Minimum	0.120	0.530	0.080	0.010	0.109	0.516	0.107	0.008
Std. Dev.	0.031	0.014	0.016	0.004	0.064	0.050	0.021	0.006
Skewness	1.088	-1.063	-1.013	-0.266	0.440	0.442	-0.057	-0.520
Kurtosis	3.176	3.273	3.424	3.318	2.043	2.158	1.847	2.969
Jarque-Bera	20.861	20.104	18.755	1.677	7.387	6.518	5.872	4.730

Probability	0.000	0.000	0.000	0.432	0.025	0.038	0.053	0.094
Obs.	105	105	105	105	105	105	105	105

In choosing which of the above components to include as variables in our model when examining the long run relationship (if any) between the components of Islamic banks' assets and liabilities and the growth of total aggregate assets of Islamic banks in Malaysia, we have chosen the two components from the assets and liabilities set out above with the highest mean. As a preliminary step, we are assuming that the aggregate growth of the banks' assets come from both banks' liabilities (sources of its funds) and assets (uses of its funs).

We derive the following:

The variables:

Liabilities;

1. LNLI EQUI = LOG(Total Equities)
2. LNLI DPST = LOG(Total Deposits) = LOG(Deposits under the New Investment Fund + Special Deposit Account + Others)

Assets;

3. LNITOTASS = LOG(Assets)
4. LNIFININS = LOG(Amount Due from Designated Financial Institutions) = LOG(Bank Negara Malaysia + Commercial Banks+ Islamic Banks + Investment Banks + Other Banking Institutions + Non-Residents)
5. LNILOANS = LOG(Loans and Advances)

The Equation;

Dependent Variable: (LNITOTASS DLNITOTASS)

Independent Variables:

ASSETS: (LNILOANS DLNILOANS) (LNIFININS DLNIFININS)

LIABILITIES: (LNLI DPST, DLNLI DPS) (LNLI EQUI DLNLI EQUI)

It must be stated that this study was conducted with certain empirical limitations. For instance, we have assumed that there is a linear relationship among the variables, that there are no misspecifications of the models used and that the models are correctly specified, that there are

normal distribution of errors, and that growth of aggregate Islamic banking assets comes from the uses and sources of funds. A further assumption is that the Islamic banks are not protected, which may very well not be the case. Furthermore, we have excluded qualitative variables in the study which may be relevant, for example depositor sentiment (discussed below when considering the results of the Vector Error Correction Model (VECM) process). Be that as it may, given that there has been no studies conducted to date which examines the possible long run relationship between liabilities and asset side components of Islamic banks and growth of aggregate assets of Islamic banks in Malaysia, this paper seeks to fill in this lacunae.

The results of the co-integration tests conducted show us that there is one cointegrating factor carried out show that the VECM revealed that total assets is an exogenous variable whilst deposit and equity are dependent variables. This may at first blush be rather surprising as it contradicts our hypothesis that total assets is the dependent variable however if one were to take into account depositor sentiment, it could be that people prefer to deposit their monies into larger banks rather than its smaller counterparts. This also indicates that further research is required to ascertain whether market sentiment and other qualitative variables should be included as a variable when analysing aggregate growth in Islamic banking assets. Policy makers can however see from this study that as total assets is an exogenous variable, creating a more conducive regulatory and legal environment for Islamic banks to increase its financings and other components of its asset side in order to increase the total aggregate assets of Islamic banks is therefore necessary.

We will first set out the literature on Islamic banking, followed by a description of the data and methodology used. Subsequent thereto, we will look into the empirical results of the preliminary diagnostic tests and thereafter the Vector Error Correction Model and Variance Decomposition tests. The (policy) implications will be discussed together with the results. The paper will end with the concluding remarks consisting of overall implications and salient considerations of this study.

Literature Review

It would appear that the bulk of literature regarding Islamic banking revolves around either conducting comparative analyses between Islamic banking and conventional banking whether it be comparing the business model, efficiency and stability of the two (Beck 2013, Bourkhis & Nabi 2013) or a general comparison (Iqbal 2001, Bourkhis & Nabi 2013, Johnes, Izzeldin & Pappas 2014), studies pertaining to Islamic banking and economic growth (Furqani & Mulyani 2009, Abduh & Omar 2012), efficiency and profitability of Islamic banking (Hassan & Bashir 2003, Hussain, Abdullah & Shaari 2012, Kabir, Worthington & Gupta 2015, Wanke, Azad &Barros 2015, Shawtari, Saiti, Abdul Razak and Ariff 2015) and whether Islamic banking is does in reality comply with Shariah (Hamza 2015 and Khan 2010).

In this respect, what has been revealed is that there are a few significant differences between Islamic banking and conventional banking in business orientation generally however Islamic banks tend to have a higher intermediation ratio, higher asset quality, are better capitalized, are less likely to disintermediate during crises but are less cost-effective (Beck 2013). Furthermore, in the short run, fixed investment granger cause Islamic banks to develop whereas in the long-run there is evidence of a bidirectional relationship between Islamic bank and fixed investment and there is evidence to show an increase in GDP causes Islamic banking to develop and not vice versa (Furqani & Mulyani 2009).

When it comes to profitability, Abduh and Omar (2012) found that controlling for macroeconomic environment, financial market structure, and taxation, high capital and loan-to-asset ratios lead to higher profitability. Abduh and Idris (2013) on the other hand found that bank size is vital to profitability and that financial market development and market concentration has a significant positive impact on profitability.

As for efficiency of Islamic banks, it was found that variables related to cost structure have a prominent negative impact on efficiency levels (Wanke, Azad & Barros 2015). Wanke, Azad and Barros (2015) also found that the Malaysian Islamic banking market tends to impose cultural and regulatory barriers to foreign banks, so that their efficiency levels are lower when

compared to their national counterparts. Johnes and Izzeldin (2013) on the other hand opine that Islamic banks should explore the benefits of moving to a more standardized system of banking to encourage efficiency.

Despite the continuous interest and increase in research on Islamic banking, studies conducted to closely analyse the inner workings and internal dynamics of an Islamic banks' liabilities and assets and to scrutinize the important variables within the four walls of its balance sheet, are virtually non-existent. The focus is mostly on examining how macro-economic and/or external factors may affect the performance and viability of Islamic banking and how Islamic banking compares to and fares against conventional banking. In other words the focus appears to be on drawing comparisons between Islamic and conventional banking and looking outside the four walls of the Islamic bank's operations.

This paper therefore seeks to fill in this lacunae.

DATA AND METHODOLOGY

All data on the aggregate liabilities and assets of Islamic banks is obtained from the BNM website and consists of monthly data covering eight years starting from January 2007. As previously explained, we have narrowed down the date selection to the following:

1. Total aggregate assets of Islamic and conventional banks
2. Total Equities
3. Total Deposits (Deposits under the New Investment Fund + Special Deposit Account + Others)
4. Amount due from Designated financial institutions (Bank Negara Malaysia + Commercial Banks+ Islamic Banks + Investment Banks + Other Banking Institutions + Non-Residents)
5. loan and advances

METHODOLOGY

This study utilizes the Long Run Structural Model (LRSM), the Vector Error Correction Model (VECM) and Variance Decomposition (VDC) to test whether there are long run relationships among any one or more of the above five variables, the nature of such long run relationships (if any) and the individual impact of each variable on any other variables.

Before proceeding with the analysis of the above models, a few tests need to be carried out to ascertain the stationarity or non-stationarity of the variables, the order of the lags to be used and whether the variables are co-integrated.

The above preliminary steps are important for the following reasons. Testing the stationarity/non-stationarity of a variable is important as non-stationary variables have inherent time variant trends and will also result spurious regression. Inherent time variant trends and spurious regression render it difficult to accurately identify and/or measure the co-integration and long run relationship of two or more variables and inflate the R^2 with no meaningful relationship (in case coefficients can be significant)[1].

To illustrate this point, take for example the following hypothetical scenario. Say that LNILOANS (Loans and Advances) is found to be a non-stationary and when applying the VECM it is then found that the variable LNLI DPST is an exogenous variable which has an effect on and is co-integrated with LNILOANS. However, because LNILOANS is a nonstationary variable, it will be difficult to accurately measure to what extent changes in LNILOANS is caused by LNLIDPST or other external factors causing the inherent time variant trends. In other words, the statistical tests that are normally used, such as the usual t statistics have nonstandard distributions, which therefore render the use of the standard tables misleading[2].

In addition to the above, this study also seeks to examine the Impulse Reaction and Persistence Profile of the variables, to examine the response path of a variable owing to a one period

[1] J.Johnston and J.DiNardo, Econometric Methods, McGraw Hill, page 260
[2] Ibid

standard deviation shock to another variable. We have used the Microfit 4.1 to run the above tests and models.

ANALYSIS OF RESULTS

DIAGNOSTIC TESTS

Unit Root Tests

As explained above, it is necessary to test the stationarity of the five variables before examining whether there is a long-run relationship between them. To this end, we have utilised the Dickey Fuller and Augmented Dickey Fuller tests and the Philip Peron test and have found the following results set out in Table 3 and 4 below:

Table 3: Dickey Fuller and Augmented Dickey Fuller Test

	Level		Difference		
Variable	Test Model	Test Statistics	Test Model	Test Statistics	Integration Order
LNITOTASS	ADF(1)	-1.4261	DF	-12.3727*	I(1)
LNILOANS	DF	-1.3725	DF	-9.0555*	I(1)
LNIFININS	DF	-2.7858	DF	-10.1579*	I(1)
LNLI_DPST	DF	-2.3809	DF	-12.9558*	I(1)
LNLI_EQUI	DF	-2.1644	ADF(2)	-6.1077*	I(1)

*Significance level: 5%

All test model selections employ AIC (Akaike Information Criterion) and SBC (Schwarz Bayesian Criterion)

Critical value -3.4586 (level) and -3.4591 (differenced)

Table 4: Phillips-Perron Test

Variable	Level	Difference	Integration Order
	Test Statistics	Test Statistics	
LNITOTASS	-1.5404	-18.5426*	I(1)
LNILOANS	-0.989	-10.2498*	I(1)
LNIFININS	-1.3872	-7.4562*	I(I)
LNLI_DPST	-1.4544	-8.9457*	I(1)
LNLI_EQUI	-1.8589	-10.6150*	I(1)

*Significance level: 5%

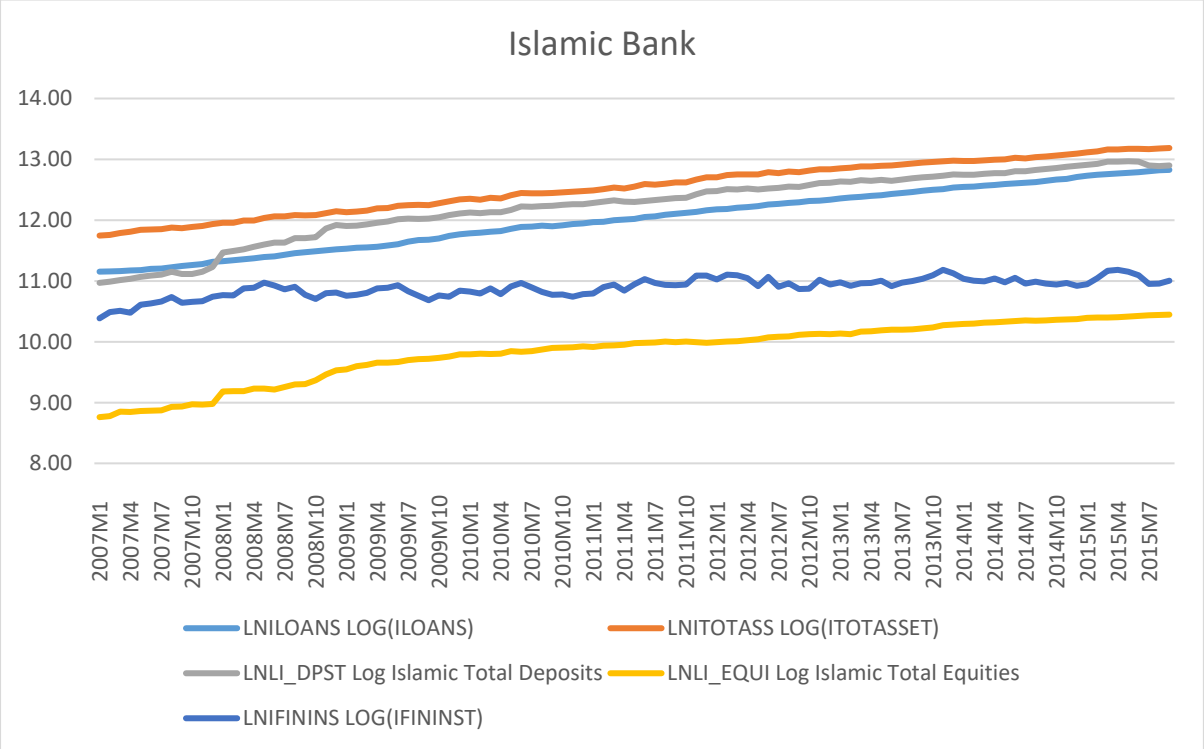
*All test model selections employ AIC (Akaike Information Criterion) and SBC (Schwarz Bayesian Criterion)

Critical value -3.4531 (level) and -3.4535 (differenced)

From the above results, as all the respective test statistics values of the five variables are lower than the critical value in its level form, all the variables are therefore non-stationary in its level form and stationary when differenced once, that is, integrated of order 1, I(1). It can also be seen that most of the variables utilize the Dickey Fuller test save for LNITOTASS and DLNILI EQUI, which utilize the Augmented Dickey Fuller test.

Having sight of the Graph 1 which illustrate the movement of the five variables set out below, the results stated in Table 3 and 4 above are expected given that the five variables are clearly trended, which therefore means that there in non-constancy in the variables' respective means. One will recall that the elements which render a variable non-stationary is when its mean, variance and co-variance are not constant.

Graph 1



Lag Order

Choosing the best order of the lags is important as one does not want to make the mistake of omitting relevant lags or including irrelevant ones. Both these mistakes can cause either misspecification of the model.

When testing the best lag order for the model, we have set the time span from January 2007 to April 2015 and have left out the following five months to allow for forecasting purposes and have set the maximum order of the VAR at 6. Table 5 set out below shows that the optimum order of the VAR model selected by AIC and SBC is 1.

Table 5: Test Statistics and Choice Criteria for Selecting the Order of the VAR Model

Based on 93 observations from 2007M8 to 2015M4 . Order of VAR = 6

List of variables included in the unrestricted VAR:

DLNITOTAS DLNILOANS DLNIFININ DLNLI_DPS DLNLI_EQU

Order	LL	AIC	SBC	LR test	Adjusted LR test
6	1302.6	1152.6	962.6	------	------
5	1280.8	1155.8	997.5	CHSQ(25)= 43.6417[.012]	29.5637[.241]
4	1254.8	1154.8	1028.2	CHSQ(50)= 95.6770[.000]	64.8134[.078]
3	1227.1	1152.1	1057.2	CHSQ(75)= 150.9900[.000]	102.2836[.020]
2	1204.6	1154.6	1091.3	CHSQ(100)= 196.0835[.000]	132.8307[.016]
1	1185.8	1160.8	1129.2	CHSQ(125)= 233.6374[.000]	158.2705[.024]
0	1108.2	1108.2	1108.2	CHSQ(150)= 388.9531[.000]	263.4843[.000]

AIC=Akaike Information Criterion SBC=Schwarz Bayesian Criterion

Given that there is only one lag required from the above results, there is no need for an autocorrelation test as the selection of the order criteria has already been selected through the respective criterions. The implication of the above results is that forecasting is relatively more

viable than if there were more lags, which is in line with the Markov process stating that best forecast for tomorrow's value is today's value (one lag)[3].

Table 6: Single Equation Static Forecasts

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Based on OLS regression of DLNITOTAS on:

INPT DLNLI_DPS DLNLI_EQU DLNILOANS DLNIFININ

99 observations used for estimation from 2007M2 to 2015M4

****

Observation	Actual	Prediction	Error	S.D. of Error
2015M5	.0072338	.0050970	.0021368	.0078768
2015M6	.0012344	-.1747E-3	.0014091	.0079076
2015M7	-.0064789	-.020422	.013943	.0083068
2015M8	.0090774	.011419	-.0023418	.0078920
2015M9	.010502	.014915	-.0044125	.0079223

****

Summary statistics for single equation static forecasts

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Based on 5 observations from 2015M5 to 2015M9

Mean Prediction Errors .0021468 Mean Sum Abs Pred Errors .0048486

Sum Squares Pred Errors .4518E-4 Root Mean Sum sq Pred Errors .0067217

Predictive failure test F(5, 94)= .66624[.650]

****

From the above, it is apparent that the prediction error is extremely minute, therefore meaning that the model is relatively reliable for forecasting purposes. From the Predictive failure test statistic, we cannot reject the null hypothesis that the prediction errors for all the forecasted observations are zero.

[3]Hull, John C., Options, Futures, And Other Derivatives, Pearson, 8th Edition, Page 280

Cointegration

The next step to measure is whether the variables are cointegrated, that is, whether the linear combination among the non-stationary variables is stationary or not. We have assumed that none of the variables are exogenous and have chosen one as the lag order (following the previous test conducted). We proceeded to run the co-integration test with intercepts and trends in the VAR based on the eigenvalue, trace and model selection criteria and obtained the results set out below:

Table 7a: Cointegration Test (Eigenvalue)

Cointegration with unrestricted intercepts and restricted trends in the VAR

Cointegration LR Test Based on Maximal Eigenvalue of the Stochastic Matrix

****

93 observations from 2007M2 to 2014M10. Order of VAR = 1.

List of variables included in the cointegrating vector:

LNITOTASS LNLI_DPST LNLI_EQUI LNIFININS LNILOANS

Trend

List of eigenvalues in descending order:

.35635 .17685 .11890 .084417 .055794 .0000

****

Null	Alternative	Statistic	95% Critical Value	90%Critical Value
r = 0	r = 1	40.9755	37.8600	35.0400
r<= 1	r = 2	18.0998	31.7900	29.1300
r<= 2	r = 3	11.7728	25.4200	23.1000
r<= 3	r = 4	8.2020	19.2200	17.1800
r<= 4	r = 5	5.3393	12.3900	10.5500

****

Table 7b: Cointegration Test (Trace)

Cointegration with unrestricted intercepts and restricted trends in the VAR

Cointegration LR Test Based on Trace of the Stochastic Matrix

****

93 observations from 2007M2 to 2014M10. Order of VAR = 1.

List of variables included in the cointegrating vector:

LNITOTASS LNLI_DPST LNLI_EQUI LNIFININS LNILOANS

Trend

List of eigenvalues in descending order:

.35635 .17685 .11890 .084417 .055794 .0000

****

Null	Alternative	Statistic	95% Critical Value	90%Critical Value
r = 0	r>= 1	84.3893	87.1700	82.8800
r<= 1	r>= 2	43.4138	63.0000	59.1600
r<= 2	r>= 3	25.3141	42.3400	39.3400
r<= 3	r>= 4	13.5413	25.7700	23.0800
r<= 4	r = 5	5.3393	12.3900	10.5500

****

Table 7(c): Cointegration Test (Criterion)

Cointegration with unrestricted intercepts and restricted trends in the VAR

Choice of the Number of Cointegrating Relations Using Model Selection Criteria

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93 observations from 2007M2 to 2014M10. Order of VAR = 1.

List of variables included in the cointegrating vector:

LNITOTASS LNLI_DPST LNLI_EQUI LNIFININS LNILOANS

Trend

List of eigenvalues in descending order:

.35635 .17685 .11890 .084417 .055794 .0000

****

Rank	Maximized LL	AIC	SBC	HQC
r = 0	1176.5	1171.5	1165.2	1169.0
r = 1	1197.0	1182.0	1163.0	1174.4
r = 2	1206.1	1183.1	1153.9	1171.3
r = 3	1212.0	1183.0	1146.2	1168.1

r = 4	1216.1	1183.1	1141.3	1166.2
r = 5	1218.7	1183.7	1139.4	1165.8

****

AIC = Akaike Information Criterion SBC = Schwarz Bayesian Criterion

HQC = Hannan-Quinn Criterion

Upon conducting the above tests, we find that there is one cointegrating function. We can discern from tables 7 (a) and (b) above that we reject the null hypothesis that there is no cointegrating relation among the variables and we cannot reject the null hypothesis for r = 1 to r = 5. We therefore conclude that there is one cointegrating relation among the variables.

Identification – Long Run Structural Modelling (LRSM)

To estimate long run relationships one can use Long Run Structural Modelling (LRSM), a method in which identifying and over-identifying restrictions are imposed on the long run relationship. Such restrictions are based on economic theories and the particular interest of study.

At this juncture, we seek to analyse whether any one or more of the five variables can be omitted and to this end we place restrictions on the variables. The restrictions imposed consist of fixing the coefficient of total assets to 1 whilst fixing the coefficient of one other variable to 0. This is carried out for each of the four other variables as set out in Table 8 below.

Table 8: Summary of Identification (Restrictions)

Variable	Restrictions Applied to Respective Variables						
LNITOTASS	1	1	1	1	1	1	1
LNILOANS							0
LNIFININS			0	0			
LNLI_DPST					0		

LNLI_EQUI						0	
TREND		0	0				
CHSQ(1)		2.7086*	11.1750**	6.1217**	9.9331**	10.7459**	23.8230**

*Significant at 10%

**Significant at 5%

It can be inferred from the above results that the coefficients of all four of the independent variables cannot be restricted to zero that is, we cannot reject that there is no linear trend and therefore all four variables are important in the long-run vis-à-vis the aggregate growth of the Islamic banking assets.

Vector Error Correction Model (VECM) and Variance Decompositions (VDC)

Having conducted the above diagnostic tests, we can at this juncture examine which variables are endogenous or exogenous and also the relative exogeneity and endogeneity of such variables.

Error correction model in its standard form is given by the equation below:

$$\Delta y_t = \beta_0 + \beta_1 \Delta x_t + \gamma(\alpha_1 x_{t-1} - y_{t-1}) + u_t$$

The γ coefficient is the error correction coefficient or the speed of adjustment which we expect to be negative.

By utilizing the VECM equation above, we examine the significant of the error-correction coefficient, that is γ. Should γ be insignificant, the relevant dependent variable is considered exogenous, otherwise it would endogenous.

An endogenous variable is considered a “forcing variable” that brings short run disequilibirum towards long run equilibrium. As indicated above we expect the error correction coefficient, γ, to be negative in order for the disequilibrium to revert to equilibrium. The absolute value of γ

indicates the speed of adjustment towards equilibrium where the larger the value is the faster the speed.

In this analysis, the dependent variables which is represented by Δy_t in the equation above is replaced by our five variables one at a time. The complete analysis appears in Table 10 below:

Table 10: Summary of the VECM(1) results

Dependent variable (difference)	ecm(-1) Coefficient	T-Ratio [Prob]	F-stat [Prob]	Exogenous/ Endogenous
DLNITOTASS	0.0046	.20350[.839]	.20350[.839]	Exo
DLNILOANS	-0.0065	-.54063[.590]	.29229[.590]	Exo
DLNIFININS	0.1336	1.2960[.198]	1.6796[.198]	Exo
DLNLI_DPST	-0.0868*	-1.8552[.067]	3.4417[.067]	Endo
DLNLI_EQUI	-0.1324**	-3.4823[.001]	12.1266[.001]	Endo

*Significant at 10%

**Significant at 5%

We note that LNITOTASS appears to be an exogenous variable, which at first blush is rather surprising as it contradicts our hypothesis that LNITOTASS is the dependent variable. It appears that total assets is actually influencing the four other variables! This may at first not make sense, until one takes into account depositor sentiment. It could be that people prefer to deposit their monies into larger banks rather than its smaller counterparts. This also indicates that further research is required to ascertain whether market sentiment should be included as a variable when analysing aggregate growth in Islamic banking assets.

As stated by Peter Kennedy[4], the first commandment of applied econometrics is to use common sense and economic theory. However, this then begs the question, what is common sense and what is economic theory? We hypothesize that the four variables which consist of the sources and uses of funds present in any firm dictate the size of its total assets, which is safe to say does make sense according to rudimentary accounting principles. From our results however, assets in this instance appears to be an exogenous variable rather than an endogenous one.

[4] Gujarati, N.,Damodar & Porter, C. Dawn, Basic Econometrics, McGraw Hill, 5th Edition, Page 511

We should note from Table 10 above however that the error correction coefficient for LNITOTASS and LNIFININS is positive which does not make theoretical sense as it implies that these two variables will not, in the long run, converge towards equilibrium but will instead diverge from the same. We may therefore opt to reject the analysis of these two variables and instead focus on LNLI DPST and LNLI EQUI which now appear to be our endogenous/dependent variables and have a significant negative error correction coefficients. This in turn also implies that deposit and equity is the forcing variables that force any disequilibrium towards long run equilibrium.

It has become apparent at this stage that we are unable to confirm the rudimentary accounting principle aforementioned (that total assets is a function of sources/liabilities and uses/assets) from our model, which may be a result of misspecification error where variable(s) representing behaviour/sentiment is missing.

Having said that however, it is possible that the public prefers to deposit their money in a big bank for safety reasons and size of the bank is an exogenous variable and deposit is in this sense the endogenous variable. The above VECM results imply that should policy makers wish to encourage for both higher deposits in Islamic banks and for Islamic banks to increase its total assets, there should be concerted effort among regulators and legislators to issue regulations/guidelines and enact laws that create a conducive regulatory and legal environment for Islamic banks to increase their total assets and to ensure that Islamic banks carry out its financing operations efficiently.

Variance Decomposition

We now seek to detect the contribution of each variable to shocks. The order of the variables is total assets, deposits, equity, loan to financial institutions and loans. We begin by shocking the variables one by one in the said order.

We know from theory (Choleski factorization) that the result is not unique as it depends on the ordering of the variables[5]. We have maintained the same order throughout the process of shocking each variable so as to allow for a meaninful comparison.

Table 11- Summary of Variance Decompositions

Variable	Orthoganlized	Generalized
LNITOTASS	Relatively exogenous LNITOTASS LNLIEQUI LNLIDPST LNIFININS LNILOANS	Relatively exogenous LNITOTASS LNIFININS LNLI DPST LNILOANS LNLIEQUI
LNLI DPST	Relatively exogenous Its variance is explained by: LNLI DPST LNITOTASS LNIEQUI LNIFINNS LNILOANS	Relatively Exogenous Its variance is explained by: LNLIDPST LNIFININS LNITOTASS LNLIEQUI LNILOANS
LNLI EQUI	Relatively endogenous Its variance is explained by: LNLI DPST LNITOASS LNIFINNS LNLI EQUI LNILOANS	Relative endogeneity/exogeneity uncertain Its variance is explained by LNLI DPST LNIFININS LNITOTASS LNLIEQUI LNILOANS
LNIFININS	Relative endogeneity/exogeneity uncertain Its variance is explained by: LNITOTASS LNIFININS LNLI EQUI	Relatively Exogenous LNIFININS LNITOTASS LNLIEQUI LNLIDPST LNILOANS

[5] Page 301, Johnston and DiNardo

	LNLI DPST LNILOANS	
LNILOANS	Relatively exogenous Its variance is explained by: LNILOANS LNITOTASS LNIFININS LNLI EQUI LNLIDPST	Relatively exogenous Its variance is explained by: LNILOANS LNITOTASS LNLIDPST LNIFININS LNLIEQUI

Combining the above results, deposit, loans and total assets are strongly exogenous whilst equity and loans to financial institutions are endogenous. The above results from variance decomposition exhibits a notable contradiction with that obtained in VECM vis-à-vis deposit. VECM provides that deposit is an endogenous variable whilst variance decomposition (both orthogonalized and generalized) provides that deposit is an exogenous variable.

What is the reason for this contradiction? Well, it is pertinent to note that VECM is usually utilized for purposes of understanding the relationship between the variables and the analysis is carried out within the sample . On the other hand variance decomposition is utilized to forecast beyong the sample. It is therefore not alarming that there would be different results for the same variable. Furthermore, the nature of the information obtained from VECM and variance decomposition is starkly different. VECM reveals to us the nature of a variable in absolute terms, that is, whether it is either exogenous or endogenous. Variance decomposition on the other hand evaluates the relative endogeneity and exogeniety of a variable.

Be that as it may, policy makers in Malaysia may opt to use the results in variance decomposition which corrorborates the results in VECM above stating that total assets is an exogenous variable. This may assist policy makers to look at other facotrs that may have a direct impact on total assets should they wish to increase aggregate total assets of Islamic banks. As mentioned above, regulators and legislators to issue regulations/guidelines and enact laws that create a conducive regulatory and legal environment for Islamic banks to increase their total assets.

IMPULSE RESPONSE FUNCTIONS

We now seek to conduct further analysis on how a shock/impulse to one variable affects the response path of another variable.

Table 12: Summary of Impulse Response Functions

Variable	Orthoganlized Impulse Response to one S.E. shock in equation	Generalized
LNITOTASS	LNIFININS LNLIDPST LNLIEQUI LNITOTASS LNILOANS	LNITOTASS LNIFININS LNLI DPST LNILOANS LNLIEQUI
LNLI DPST	LNLI DPST LNIEQUI LNILOANS LNITOTASS LNIFINNS	LNLIDPST LNIFININS LNITOTASS LNLIEQUI LNILOANS
LNLI EQUI	LNIFINNS LNITOASS LNILOANS LNLI EQUI LNLI DPST	LNLI DPST LNIFININS LNITOTASS LNLIEQUI LNILOANS
LNIFININS	LNIFININS LNLI EQUI LNLI DPST LNITOTASS LNILOANS	LNIFININS LNITOTASS LNLIEQUI LNLIDPST LNILOANS
LNILOANS	LNILOANS LNITOTASS LNIFININS LNLI EQUI LNLIDPST	LNILOANS LNITOTASS LNLIDPST LNIFININS LNLIEQUI

An analysis of the above results shows us that deposits, loans to other financial institutions and loans are exogenous variables. We can see that according to the generalized impulse reaction function vis-a-vis total assets, it too is an exogenous variable (similar to the scenario in variance decomposition above, the different results most likely stem from the ordering of the variables).

The implications of the above results is that should a policy maker seek to increase the deposits in Islamic banks, then deposits itself must be shocked. One way to shock deposit in Islamic banks is to either lower/increase interest rates which would affect the deposits of conventional banks and cause a domino effect on the profit rates for Islamic banks (a similar scenario applies for loans). This can be a good thing for policy makers as they can opt on a corresponding strategy depending on whether the economic climate requires increased saving or increased financing.

Conclusion

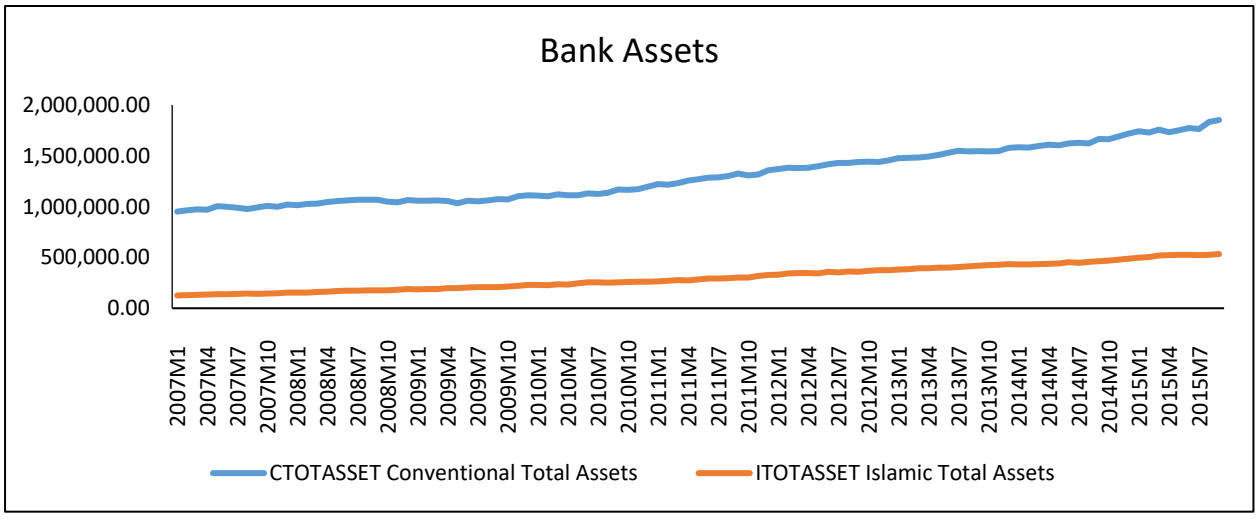
Whilst we can confirm from our results above that there is one cointegrating relationship among the five variables, the differing results we obtained from VECM (where deposit and equity are endogenous variables) and VDC (where deposits are exogenous variables) exhibits that age old conundrum many researchers face when applying different econometric methods - each different method will lead to different results. Which brings us to the ever present obstacle in the field of economics and finance – often times it is difficult to conclude with certainty causality between variables. Do interest rates cause an increase in exchange rates or do exchange rates cause an increase in interest rates? Or could it be simultaneous? In the present case, do deposits depend on total assets or do deposits affect total assets?

Be that as it may, whilst we may not at this juncture be able to confirm granger causality/direction of causality of the five variables, we do know that there is one cointegrating relationship among the variables and that total assets appears to be an exogenous variable (as confirmed by the VECM, variance decomposition and impulse reaction function). We can therefore conduct further studies which may entail changing the assumption of the dependent/independent variables and including a host of other variables to improve the model (for example qualitative variables such as sentiment, the effect of legal and regulatory frameworks and standardization in the industry). At it stands however, policy makers can see that as total assets is an exogenous variable, it is necessary for policy makers to create a more conducive regulatory and legal environment for Islamic banks to increase its financings and other components of its asset side in order to increase the total aggregate assets of Islamic banks and to ensure that Islamic banks improve its internal operations to become more efficient. As

a pioneer and spear-header of Islamic banking and finance industry in the world, this is no doubt a key goal for Malaysia.

Another important point that warrants mentioning is that whilst VECM and variance decomposition churned out different results, such difference was expected given the differing purposes of these two methods. An integral part of the research process is therefore to ascertain the objective of the study. Is one seeking to analyse past occurrences to understand the existing relationship between two or more variables or is one intending to forecast beyond the sample and predict future outcome? These are two very different things. Ultimately, should we want to use the results of this study (and any other study for that matter), one the needs to appreciate and to understand exactly the nature of *what* is being studied. We can tell policy makers, if the intention is to understand the existing relationship then one should use VECM, however if the intention is to forecast then one should employ variance decomposition. Therefore ask your policy maker, what are you seeking to study and what do you want to achieve?

To end this paper, we invite the reader to consider the following graph depicting the total aggregate assets of conventional and Islamic banks respectively from January 2007 to September 2015. Whilst we can see that both banking sectors are experiencing an increase in its respective total aggregate assets, we notice that circa 2011, conventional banking assets appears to be growing at a faster rate.



Malaysia needs to sit up and take notice and policy makers need to take necessary action to ensure that the growth rate of Islamic banking in Malaysia does not plateau, or worse, decrease.

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