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Determinants of islamic banking investment account rates: Malaysia's evidence

Kartina Ariffin¹ and Mansur Masih²

Abstract

This paper makes an attempt to discern the determinants of the Islamic banks' investment account rates (IBIA). Malaysia is used as a case study. The standard time series techniques are employed for the analysis. The findings tend to indicate that the IBIA is the most endogenous (dependent) of all the variables in that it is driven by the most exogenous (independent) variable unemployment rate followed by the exchange rate, CPI and treasury bill rate. It appears that the IBIA is benchmarked against the treasury bill rate raising questions about the Shariah (Islamic) compliance of the Islamic banks' investment account rates. The findings have strong policy implications.

Keywords: Islamic bank investment account rate, VECM, VDC, Malaysia

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A. INTRODUCTION

Since Islamic Finance started in Malaysia in 1983 with the introduction of Bank Islam Malaysia Berhad (BIMB), the growth of Islamic Finance in Malaysia has witnessed positive movement. In recent years, the Malaysian Islamic banking sector has grown from 6% to 22% in overall banking activities¹. This growth is reflected in the worldwide banking industry where average growth of the worldwide banking sector is between 15-20% per annum over the last five years. To date, Malaysia holds the third largest share of Islamic banking assets with Iran being the highest at 42.7%, Saudi Arabia at second with 12.2% and Malaysia having 10% share².

Many studies have been done to identify the catalysts of Islamic banking growth. Some attribute it to the growing interest of population for more Shariah-compliant products and services, while others attribute the growth to the evolvement of certain macroeconomic variables. While there could be truths in both assumptions, a thorough study is required to ascertain an evidence of such claims, and the authors of this paper are aware of the extensive amount of work required to perform such an analysis.

B. OBJECTIVE AND MOTIVATION OF RESEARCH

This paper is a subtle attempt by the authors to address the second assumption of the industry, which says certain macroeconomic variables may have an impact on the growth of the Islamic banking sector in Malaysia. However, it will not be the growth of Islamic banking sector that will be measured against other variables. Instead, it will be the rates of change in the Islamic Banking Investment Account that will be measured. The authors believe that the rates of the Islamic Banking Investment Account are a factor in contributing to the growth of Islamic banking. Why this is so is because in investment activities, investors look for stability and competitiveness in the rates of their investment activities. This assumption however does not preclude the fact that the Islamic banking sector may on the other hand be the catalyst for changes in some of these macroeconomic variables.

¹ http://www.bnm.gov.my/files/publication/fsbp/en/BNM_FSBP_FULL_en.pdf

² Source from IFSB's internal research outcome which has yet to be published.

The authors wish to test the relationship between these variables by selecting those which to our minds may have certain kind of implicit, if not explicit relationship amongst them. These variables are:

- (i) Malaysian government's 3-month T-bills rates (IR)
- (ii) Islamic Bank's Investment Account rates (IBIA)
- (iii) Malaysian Ringgit/US Dollar exchange rates (ER)
- (iv) Malaysian Consumer Price Index (CPI)
- (v) Unemployment Rate (UR)

Some of the research questions that the authors wish to find out at the end of this paper include:

1. Does 3-month T-bills (IR) of Malaysian government have any kind of impact on Islamic Bank Investment Account rates (IBIA), or vice versa?
2. If changes in IR have significant impact on IBIA, how does that affect the behavior of the IBIA holders?
3. Does Consumer Price Index (CPI) have any kind of impact on the IBIA rates?
4. Will a fall in T-bills (IR) cause a rise in Unemployment Rate (UR)? If yes, why?

Prior to moving on to the next section, below is a brief explanation on each of the variable to provide a base understanding on how each of them may or may not have an impact on other variables.

3-Month T-Bills (IR)

These are short-term securities issued by the Government of Malaysia with original maturity of three months. The purpose of these T-bills is to finance the government's development expenditure and working capital³. With issuance being done on a weekly basis, these bills are sold at a discount which is facilitated by the Central Bank of Malaysia, Bank Negara Malaysia. The redemption of T-bills is done at par.

³ <http://bondinfo.bnm.gov.my/pdf/mgsguidefull.pdf>

T-bills are deemed one of the most secure type of investment since it is under the charge of the Bank Negara Malaysia and the possibility of default it considered minute and negligible.

Islamic Bank Investment Account (IBIA)

The Islamic Bank Investment Account in Malaysia operates under the contract of either Ijarah (leasing), Mudarabah (profit sharing - loss bearing), or Musyarakah (partnership). It provides return to the investment account holders on a periodic basis depending on the amount of returns obtained from the transactions done by the Islamic banks. Since Islamic banking started its operation in Malaysia 30 years ago, the annual growth rate has been between 15-20% with assets currently standing at USD65.6 million.

The author is inclined to feel that there is a strong relationship between the IBIA and the IR, given that the Financial Sector Blueprint (FSB) was recently issued by BNM on 7 June 2012. As stated in the FSB, the market share for Islamic Finance is expected to increase from 29% in 2010 to 40% by year 2020⁴. Many full-fledged Islamic Banks are expected to be awarded license to operate and this will increase the reliance on the Islamic Bank investment activities. Whether or not the rates are competitive depends on whether these rates are benchmarked against certain instruments. In this paper, the author would like to assume that there is a benchmarking exercise against the T-bills, which are secured and may be favorable by investors who are risk averse.

MYR-USD Exchange Rates (ER)

These exchange rates (ER) are based on the historical amount of Malaysian Ringgit obtained by the exchange of every one US dollar.

The author also feels that the ER may have certain kind of relationship with other variables since the growth of Islamic Finance has encouraged foreign firms' participation in Malaysia. This may be witnessed in the participation of UK,

⁴ http://www.bnm.gov.my/files/publication/fsbp/en/BNM_FSBP_FULL_en.pdf

Bahrain, Germany and Japan in the banking sector, as well as Takaful and Retakaful undertakings activities.

Consumer Price Index (CPI)

The Consumer Price Index (CPI) of Malaysia is a measure of percentage change in the cost of purchasing an average household's basket of goods and services. This is calculated based on a specified time period. An estimated 460 items are used in the monthly computation of the index.

There has been an increasing awareness among the Malaysians to subscribe to Islamic Financial products and services. Although the CPI measures over 400 items of goods and services, Islamic Finance services may very well be a small portion of that total, the author wishes to see if there is any significant relationship between CPI and other measured variables.

Unemployment Rate (UR)

The unemployment rate (UR) is the percentage of the workforce that is unemployed at any given period of time and actively seeking for a paid job.

The author feels that this variable may not have an impact on any of the variables above since UR depends not solely on the investment return of the T-bills, the investment rates of Islamic Banks, the exchange rates nor the Consumer Price Index. Nevertheless, this variable will be included to test the accuracy of the author's guts feeling.

C. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Many empirical studies had been done by researchers around the globe pertaining to the questions raised by the authors, although not directly.

One pertinent paper is ISRA Research Paper (No. 16/2010) "Islamic Pricing Benchmark"⁵. The objective of the paper circles around the issues of Islamic

⁵ *Islamic Pricing Benchmark* was a joint effort of three Principle Researchers and four Co-Researchers with the objective to develop an Islamic pricing benchmark model for the Islamic banking industry.

pricing benchmark, on whether it is permissible to benchmark against conventional OPR, LIBOR, KLIBOR, COF, and BFR/BLR. Some of the observations made are the benchmarking of Islamic banking rates against KLIBOR, to which these financial institutions considered as 'risk-free'. However, it is worthy to point out two conflicting statements made by the paper, where it said "***KLIBOR is generally higher than the Malaysia Treasury Bill rates. The reason is that KLIBOR in itself is not free from risk. Possibilities exist that the indebted bank may default its payment. Whereas Treasury bill is risk-free, in evaluating derivative contracts, financial institutions consider the KLIBOR as the "risk-free rate"***". The bold sentences created doubts in the mind of the author as to the intended meaning since they conflict each other. This conflict however does not defy the principle of benchmarking to a risk-free rate, to which is more essential to the objective of this paper. The conclusion by the paper however does not lead to the affirmation that there is a strong causality relationship between benchmarking of IBIA against IR.

Another paper worth highlighting in this paper is "*The Impact of Macroeconomic Variables on Islamic Banks Finance in Malaysia*"⁶. The paper studied the impact that interest rate, production index, real effective exchange rate, producer price index, and KLSE stock market index have on Islamic banks financing. The conclusion derived from the research is the existence of a long term relationship between these variables. One significant observation made is that the interest rate has negative impact on financing of Islamic banks in Malaysia. While the paper serves as an eye opener to the stakeholders of each variable, it does not address the issues raised in this project paper, except that the real effective exchange rate does not have significant impact on Islamic banks financing in the long run. This is something which may be retested in this paper.

A research paper written by the International Monetary Fund (IMF)'s Cihak and Hesse (2008) focused on the role of Islamic banks on financial stability. According to the paper, although Islamic banks are deemed to be more risky as compared to

⁶ The Impact of Macroeconomic Variables on Islamic Banks Financing in Malaysia, eSearch Journal of Finance and Accounting www.iiste.org ISSN 2222-1697 (Paper) ISSN 2222-2847 (Online) Vol 2, No 4, 2011

the conventional banks, due to the banks' ability to pass through a negative impact on the asset side for being a partner in *Musyarakah* to its investment account holders (loss bearing *Mudharabah* contract), the Islamic banks' contribution to financial stability is enhanced through certain mechanisms. The conclusion derived from that paper however mentioned that Islamic banks contribute to financial stability only when they operate in small scale. Two of the possible reasons given were that it is more complex to adjust the credit risk monitoring mechanism as the banks grow bigger or, it could be that smaller banks tend to focus on low-risk investments and fee income.

Although the conclusion is not directly linked to the objective of this paper, it triggered a thought in the author's mind whereby due to the more risky nature of Islamic banks and the existence of certain control over the management of Islamic banks by the customers, the Islamic banks may find certain comfort level by predetermining its profit rates. However, to be certain of a specified profit rates, the Islamic banks may need to benchmark against secure rates which is commonly done against T-bills issued by the government. This is a theory which the author has in mind while writing this which has yet to be proven.

The author anticipates that there may be other papers which may have addressed the questions raised earlier. However, given the limited time, the author wishes to be optimistic that her project paper may serve as a means for more empirical studies to be done. The result obtained from the following tests and analysis may or may not provide a concrete result to prove any theory. This however is hoped to be an initiation for a more detailed research to be done on this topic.

D. RESEARCH METHODOLOGY, RESULTS AND INTERPRETATION

This research uses the time series technique whereby an eight-step progression will be made to identify the relationship between the five variables, as mentioned in section B of this paper.

Regression method will not be used for this paper due to several reasons. First, the authors do not wish to assume any theories with regards to the level of endogeneity or exogeneity of each respective variable in this paper. Rather, we

wish to let the variables of each data determine its own long term effect on each other and compare it against her intuition. The authors will not decide upfront which variable is independent or dependent since the studies on this is still vague and inconclusive. This may only be done via time series technique, because regression requires the author to have a predetermined theory and equation in mind.

Secondly, non-stationary data contains long term or theoretical part of relationship between variables. Since regression does not generate valid statistical result from non-stationary data (due to misleading t-ratios and F statistics), the only way to generate valid results is by regressing these variables in their differenced form and making them stationary. This in consequence is not plausible since stationary data contains only short term, cyclical or seasonal effects, which do not explain the long term relationship between the variables and will not benefit the authors in their research. Hence, to truly comprehend if theories exist, the only way is to utilize time series techniques whereby non-stationary data is used at their level form.

The data used for this paper is obtained from Bank Negara Malaysia's website⁷ whereby 72 monthly data series starting from January 2002 is used.

(i) Step 1: Testing Stationarity of Variables

The first step of this research is to ensure non-stationarity of all the five variables. This needs to be ascertained to ensure that the long term trend or the theoretical part of the data is not eliminated. The Augmented Dickey-Fuller (ADF) test examines all the variables at both level and differenced form. As shown below, at level form, all the five variables are non-stationary. As at the first differenced form, all the five variables have been ascertained to be stationary.

Note that at level form, both SBC and AIC results are taken into consideration when comparing the test statistics against the critical value at 95%. Taking

⁷ http://www.bnm.gov.my/index.php?ch=en_publication&lang=en

the highest value of respective SBC and AID, with critical value of -3.4779, both SBC and AIC show consistent results where the test statistics are lower than the critical values. At this stage of the test, the null hypothesis of variables being non-stationary may not be rejected.

Level Form

Variable	Test Statistic	Critical Value	Results
LIR	-1.4903 (SBC)	-3.4779	Non-stationary
	-1.2779 (AIC)	-3.4779	Non-stationary
LIBIA	-2.8870	-3.4779	Non-stationary
LER	-0.35235 (SBC)	-3.4779	Non-stationary
	0.2066 (AIC)	-3.4779	Non-stationary
LCPI	-2.5219	-3.4779	Non-stationary
LUR	-3.2828	-3.4779	Non-stationary

Similarly, at differenced form, the test statistics of each variable are contrasted against the critical value at 95% of -2.9062. Each variable shows its test statistics being higher than the critical value, even at respective highest SBC and AIC level. Hence, with the null of variables being non-stationary, the ADF test result at differenced form will need to reject the null.

Differenced Form

Variable	Test Statistic	Critical Value	Results
DIR	-8.2802 (SBC)	-2.9062	Stationary
	-5.567 (AIC)	-2.9062	Stationary
DIBIA	-7.513	-2.9062	Stationary
DER	-4.9968 (SBC)	-2.9062	Stationary
	-4.475 (AIC)	-2.9062	Stationary
DCPI	-6.6717	-2.9062	Stationary
DUR	-7.0749	-2.9062	Stationary

The author also took the liberty to test stationarity of data using Phillips-Perron (PP) Test. The following results entail:

Variable	T-ratio	Critical Value	Critical Value
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		Level	Differenced
IR	-2.4772	-2.9062	-3.4779
IBIA	-4.8212	-2.9062	-3.4779
ER	1.2965	-2.9062	-3.4779
CPI	-1.3519	-2.9062	-3.4779
UR	0.26244	-2.9062	-3.4779

PP test shows the data to be non-stationary when compared against the critical value at level form, except for IBIA which has a higher T-ratio than 2.9062. As for comparison against Critical Value at differenced form, IBIA again has the only T-ratio that is higher than 3.4779 which makes it to be the only stationary variable among the five variables.

Although PP test may have advantage over ADF test since PP corrects for both autocorrelation and heteroscedasticity as compared to ADF test which corrects for just autocorrelation, for simplicity purposes as well as for ease of follow through process for this research, the authors wish to use the result of the ADF test.

(ii) Step 2: Determination of Order of the VAR Model

This second step of time series technique is required to test the number of lags to be used, which is the order of the vector auto regression (VAR).

A comparison of results between AIC and SBC indicates the highest AIC recommends a lag of 1 whereas the highest level of SBC recommends a lag of 0.

To address the conflicting result, the authors went further to check on the existence of serial correlations among the variables. The table below exemplifies the result:

Variable	Chi-Sq p-value	Results at 10% comfort level
DIR	0.017	There is serial correlation
DIBIA	0.255	There is no serial correlation

DER	0.004	There is serial correlation
DCPI	0.970	There is no serial correlation
DUR	0.180	There is no serial correlation

Based on the result above, there are three autocorrelations out of five variables. This means that dropping any of the variables would cause the variable to go into the error term, causing error terms to be correlated. Hence for the purpose of this research, the authors wish to choose the lag of 1.

However, it is anticipated that using a lower lag (in this case, lag of 1) would trigger serial correlation issues and may even lead to unfavorable result, i.e. possibility of no cointegration among variables, whereas an ideal lag of 2 may lead to over parameterization. So the authors tested both lags 1 & 2 to see the impact on the overall results. At lag 1, there is at least one cointegration shown in step 3 and the subsequent steps 4 - 8 show results in favor of the author's intuition although not in entirety. Whereas at lag 2, there is no cointegration among the variables at step 3 which makes it impossible for the author to continue with the subsequent tests.

So for the following steps, the authors choose lag of 1.

(iii) Step 3: Tests of Cointegration

Step 3 tests whether all the five variables are cointegrated in one way or another.

Based on the cointegration test via the observation of Maximal Eigenvalue, Trace test as well as AIC, SBC and HQC, there is at least one cointegrating vector:

Criteria	# of cointegrating vectors
Maximal Eigenvalue	1
Trace	1
AIC	4
SBC	1
HQC	2

The Maximal Eigenvalue result is obtained based on the rejection of null at $r=0$. With null being variables are non-stationary, the test statistic for null is greater than the 95% critical value. Hence null is rejected at $r=0$. As for other nulls, the test statistic is less than the critical values at 95%. So null is accepted at nulls above 0.

For Trace test, similar approach is taken like the Maximal Eigenvalue result. On the other hand, for AIC, SBC and HQC, the number of cointegrating vectors is obtained based on each respective highest value of AIC, SBC and HQC.

Statistically, it is proven that there is at least one cointegrating relationship among the variables. From the economic sense, this simply affirms the author's theory that certain variables may be affected by the change in another variable.

Several observations may be made based on this statistical result. First, the change in ER between Malaysian Ringgit and US Dollar may have impact on the rates of the IBIA. One possible reason is that as the Malaysian Ringgit value decreases, i.e. every US dollar yields a higher amount of Malaysian Ringgit, the amount invested by international Islamic banks, Takaful or Retakaful Operators (whose currency is of lower value compared to US Dollar and higher value as compared to Malaysian Ringgit) in local Shariah-compliant Islamic banks will increase. As the demand to deposit in Islamic banks increases, the competitiveness increases. This leads to the need of Islamic banks to maintain a certain level of rates of return to sustain its investors. Any volatile fluctuation in the rates of IBIA would trigger loss of competitive advantage to these Islamic banks.

Secondly, in consequence to the need to stabilize the rates of returns of Islamic banks, there may be a need to benchmark the rates against a stable or secure investment instruments, which in this research, the benchmark is government 3-month T-bills rates (IR). Although some may argue that this

may not be Shariah compliant since T-bills are not asset-based, whether or not such practice is not being done has yet to be proven.

The above are just two possibilities of cointegration among three variables. It is important to know that by cointegration, it means that these five variables, in whichever combination of them, may be moving together in the same direction in the long run. What this simply implies is that any decision made with regards to the ER, CPI, IR, IBIA or UR will have an impact on any of those variables, although not proven as yet.

It is worthy to note that whilst the author feels there is a possibility of links between some of these variables, the endogeneity or exogeneity of these variables is still not obvious at this level. The implication of exogeneity of variables may be established at the next step.

(iv) Step 4: Long Run Structural Modelling (LRSM)

With intuition at the back of the mind, the authors then go through Step 4 to statistically validate the accuracy of her intuition.

Utilizing the exact identification component of Microfit, the author first normalizes one variable to which she believes has significant collective relationship with all other variables, that is IBIA. By making IBIA $A_2=1$, the following result entails:

Variable	Coefficient	Standard Error	T-ratio	Results
LIR	-0.31818	0.090842	-3.502564893	Significant
LIBIA	-	-	-	-
LER	0.668	0.3056	2.185863874	Significant
LCPI	-0.10765	0.46144	-0.233291436	Insignificant
LUR	-0.020932	0.091235	-0.229429495	Insignificant

This statistical result confirms the initial guts feel of the author since the earlier explanation gives indication that IBIA may have certain kind of signification relationship with both the IR as well as ER. This result however

makes the authors wonder if IBIA really has no significant relationship with CPI and UR.

This curiosity may only be answered through a verification process called over-identifying restrictions in Microfit. Under this process, the authors will retain the normalization of IBIA, and attempt to drop any of the shown (above) insignificant variables. The resulting Chi-sq will then show a statistical result which may render the authors to reject or accept the null.

The first and second scenarios tested by the author were the drop of IR and ER, respectively one after the other, while normalizing IBIA in both scenarios. This is done to reaffirm the significance of both variables. The resulting Chi-sq is shown below:

Variable	Chi-sq p-value	Results
Scenario 1 (LIR)	0.004	Significant
Scenario 2 (LER)	0.039	Significant

This confirms the earlier test result of both IR and ER being significant in their relationship with IBIA. With the Chi-sq value of 4% and 3.9% respectively for IR and ER, the author would be making 4% and 3.9% mistake by rejecting the null, i.e. to reject the null that IR or ER is insignificant. This is an acceptable error to be made since the percentage of error allowed is 10%.

An interesting note to observe in this result is that the significance of ER is contrary to the result of the paper "*The Impact of Macroeconomic Variables on Islamic Banks Finance in Malaysia*"⁸ mentioned earlier in the literature review which says that real effective exchange rate does not have significant impact on Islamic banks financing in the long run. The only reason behind this insignificance was the move made by the Central Bank to peg the currency at MYR3.80 for every USD, which started in 1999 and ended after seven years. This is the period which the research paper focused on. On the

⁸ The Impact of Macroeconomic Variables on Islamic Banks Financing in Malaysia, Research Journal of Finance and Accounting www.iiste.org ISSN 2222-1697 (Paper) ISSN 2222-2847 (Online) Vol 2, No 4, 2011

contrary, this project paper as mentioned earlier took the data from 2002 until 2011. This is inclusive of the period where the pegging was lifted. This could probably be the only significant reason for its vast difference.

Still normalizing IBIA, the author then attempted the third and fourth scenarios by dropping variables CPI and UR independent of each other. In the fifth scenario, the author dropped both CPI and UR together while normalizing IBIA. The results are shown in the table below:

Variable	Chi-sq p-value	Results
Scenario 3 (LCPI)	0.816	Insignificant
Scenario 4 (LUR)	0.819	Insignificant
Scenario 5 (LCPI & LUR)	0.921	Insignificant

Although the results from scenarios 3 - 5 seem to prove statistically that the author should accept the null (of these two variables being insignificant) since she will make respectively 81.6%, 81.9% and 92.5% error in rejecting the null for all the three scenarios, the author is uncertain if dropping both variables is the best alternative since intuition tells her that no matter how insignificant both these variables maybe, they still carry certain weight in determining the rates of IBIA, IR as well as ER. They could even have impact on each other. Based on this minimal sentimental consideration that she has on these two variables, the author decided to keep these two variables for the next test to determine causality whereby it will determine which variable is leading the whole equation and which variable is not.

This cointegrating equation is now established:

$$\text{IBIA} - 0.31818 \text{ IR} + 0.668 \text{ ER} - 0.10765 \text{ CPI} - 0.020932 \text{ UR}$$

(v) Step 5: Vector Error Correction Model (VECM)

Our progression thus far have established a cointegrating equation in which the statistical results show three variables that are significant, and two variables which the author wishes to keep in following her intuition that these variables may still have certain indication as to their significance in the whole equation.

This cointegrating equation however does not provide any indication of causality as to which variable is leading and which is laggard. The Granger-causation is needed to provide an insight to industry stakeholders who may have certain interest in knowing the connection between all these five variables.

As an example, a new international Takaful Operator CEO may wish to know if exchange rates will have an impact on its investment in Malaysia's Islamic banks. At the same time, the CEO may also wish to know if the Islamic banks' investment rates are benchmarked against the T-bills rates. Will he/she be able to provide a stable income to its stakeholders? If so, what would be the strategy to invest the funds under the Takaful Operators' care to ensure profitable returns to the stakeholders of a Takaful undertaking?

On the other hand, other stakeholders may have the inclination to believe that some other variables other than the IBIA may have a significant impact of their decisions. Another example would be the unemployment rate. How this may eventually be of interest to any stakeholder is the fact that as Islamic finance achieves 40% of Malaysia's market share by year 2020, many of the current conventional Islamic bankers would have moved to the Islamic banks. A rise or fall of the IBIA rates would trigger the expansion or contraction of the growth of the bank. This might lead to an impact to the unemployment rate. This has not been proven considering the fact that movement of employees could very well be from conventional to Islamic finance which translates to no real unemployment. However, we may be able to have an indication of this assumption by looking at the statistical result.

This Vector Error Correction Model (VECM) is focused on determining which variable is endogenous (dependent) and which is exogenous (independent). Any of the mentioned stakeholders may wish to monitor the movement of the exogenous variable to ensure that any change to the variable would not bring a big impact to other variables that are of interest to them.

Under this test, Granger-causality test determines the extent of change on one variable based on the change of another variable in the previous period. This is done by examining the error correction term, e_{t-1} , of all the five variables to identify its significance. The table below shows the result of the findings:

Variable	ECM(-1) T-ratio	Results
LIR	0.88739	Exogenous
LIBIA	-6.6526	Endogenous
LER	0.58806	Exogenous
LCPI	1.214	Exogenous
LUR	-1.6646	Exogenous

The results above explain an interesting connection between all variables. With IBIA being the only endogenous variable, the other variables being exogenous imply that these four variables (IR, ER, CPI and UR) are independent of e_{t-1} . This means that any change in any of the IR, ER, CPI or UR would bring an impact to IBIA, and not vice versa.

This test result however does not indicate which variable is the most independent of the four variables. Variance Decomposition (VDC) will be conducted in the next step to ascertain the level of independence of each variable.

(vi) Step 6: Variance Decompositions (VDC)

Under Step 6, each of these variables is shocked to test the impact of this shock to itself as well as to other variables at a specified time horizon. For this paper, since the data is on a monthly basis, a horizon of 50 months is

selected for forecast purposes whereby each variable will be shocked to see its long term impact.

There are two types of Variance Decomposition. First is the Orthogonalized VDC whereby the results depend on which variable is first shocked. Under this first type of VDC, there will be bias on the first variable and the result will portray that other variables remain in constant condition. This naturally would lead to the shocked variable to be the most exogenous among all variables in the VAR. The table below shows the result when the first variable to be shocked is IR. The author wishes to highlight forecast of results at 10 months as well as 30 months horizon.

Orthogonalized VDC (Forecast at 10 months)

	IR	IBIA	ER	CPI	UR
IR	99.069%	0.918%	0.011%	0.001%	0.001%
IBIA	71.439%	25.565%	2.641%	0.192%	0.163%
ER	3.969%	0.186%	95.844%	0.000%	.3030E-
CPI	0.344%	5.805%	1.222%	92.628%	0.001%
UR	1.600%	0.931%	0.031%	0.852%	96.587%

Orthogonalized VDC (Forecast at 30 months)

	IR	IBIA	ER	CPI	UR
IR	99.01%	0.97%	0.01%	0.00%	0.00%
IBIA	84.07%	11.93%	3.52%	0.26%	0.22%
ER	4.00%	0.19%	95.80%	0.00%	0.00%
CPI	0.36%	6.08%	1.24%	92.32%	0.00%
UR	1.65%	0.93%	0.03%	0.86%	96.53%

Based on the above tables, the shaded diagonal indicates the relative exogeneity of the variables. We may hence rank the level of exogeneity as follows:

No	Variable
1	IR
2	UR
3	ER
4	CPI
5	IBIA

Note that the test result is somewhat consistent with test result of Step 5 whereby the endogenous variable is IBIA. This is reflected in the ranking above where IBIA ranked 5th in the level of exogeneity.

As mentioned earlier under the characteristic of orthogonalized VDC, the variable that is most exogenous is the one that is first shocked, i.e. IR. Due to the limitations of orthogonalized VDC, the author will further test the validity of this ranking by generalized VDC.

Under generalized VDC, the assumptions are more realistic since the impact of shock does not depend on the order of variables. A shock on any particular variable will allow other variables to change concurrently. Similar to orthogonalized VDC, a horizon of 50 months is tested and the tables below show an excerpt of result at 10 months and 30 months respectively.

Generalized VDC (Forecast at 10 months)

	IR	IBIA	ER	CPI	UR
IR	99.069%	42.434%	3.736%	0.142%	0.623%
IBIA	71.439%	63.472%	0.331%	0.798%	0.052%
ER	3.969%	2.188%	99.561%	1.110%	0.016%
CPI	0.344%	5.309%	1.296%	98.165%	0.991%
UR	1.600%	2.163%	0.147%	0.593%	96.434%

Generalized VDC (Forecast at 30 months)

	IR	IBIA	ER	CPI	UR
IR	99.012%	42.978%	3.751%	0.146%	0.617%
IBIA	84.073%	51.280%	0.177%	0.659%	0.042%
ER	4.000%	2.276%	99.533%	1.117%	0.016%
CPI	0.360%	5.561%	1.315%	98.052%	0.996%
UR	1.655%	2.296%	0.155%	0.573%	96.208%

Based on generalized VDC, the ranking of exogeneity is as shown below:

No	Variable
1	ER
2	IR
3	UR
4	CPI
5	IBIA

The result shows a slight difference as compared to the ranking of orthogonalized VDC where ER is now ranked first, IR being second and UR being the third.

Given that the generalized VDC is not biased to the order to which the variables are arranged, in addition to the inconsistent results produced by the orthogonalized VDC (where a change in the order of variable resulted in a change of result), the authors decided to rely on the results of generalized VDCs.

It is important to note that since the accumulated numbers at each horizon for generalized VDC do not add up to 1.00 the way it is for orthogonalized VDC, the authors did further modification to each row to ensure that every row for every horizon would add up to 1.00. This may be done by taking the ratio of each variable's magnitude of variance explained by its own past against the total accumulated figure of each row.

The table below summarizes the result:

Forecast at 10 months

	IR	IBIA	ER	CPI	UR
IR	67.853%	29.064%	2.559%	0.097%	0.427%
IBIA	52.493%	46.639%	0.243%	0.587%	0.038%
ER	3.715%	2.048%	93.183%	1.039%	0.015%
CPI	0.324%	5.003%	1.222%	92.516%	0.934%
UR	1.585%	2.143%	0.146%	0.588%	95.538%

Forecast at 30 months

	IR	IBIA	ER	CPI	UR
IR	67.583%	29.336%	2.561%	0.100%	0.421%
IBIA	61.713%	37.642%	0.130%	0.484%	0.031%
ER	3.741%	2.129%	93.072%	1.044%	0.015%
CPI	0.339%	5.233%	1.237%	92.255%	0.937%
UR	1.640%	2.275%	0.154%	0.568%	95.363%

With this change, below shows a more consistent ranking of variables based on level of exogeneity:

No	10 month	30 month
1	UR	UR
2	ER	ER
3	CPI	CPI
4	IR	IR
5	IBIA	IBIA

This is an interesting finding for the authors since it explains many things in clearer manner as compared to our earlier intuitions:

1. This generalized VDC confirms the result of VECM whereby IBIA is the least exogenous, to the extent of being the only endogenous variable among the five variables.
2. The results show contradiction against the authors' intuition which authors mentioned earlier that there is a strong relationship between IBIA, IR and ER. As shown in both 10 month and 30 month horizons, the only variable that is affected by another variable's past to a significant level is

between IBIA and IR. As can be observed from both the tables above under different horizons, the reliance of IBIA on IR's past increase slightly from 52% in 10 month horizon to 62% in 30 month horizon, whereas IR's reliance on IBIA's past maintains at about 30%. This perhaps confirms the theory that there is a possibility that the IBIA rates are benchmarked against the rates of T-bills and the reliance may increase over time.

3. As for the assumption that IBIA rates may be affected by the ER, the result proved the author's intuition wrong since there is less than 3% impact from the past of each variable. Perhaps, this reliance of IBIA rates on ER's past may increase between now till year 2020 when the market share of Islamic finance eventually reaches 40% and more international organizations participate in local Islamic financial system.

(vii) Step 7: Impulse Response Functions (IRF)

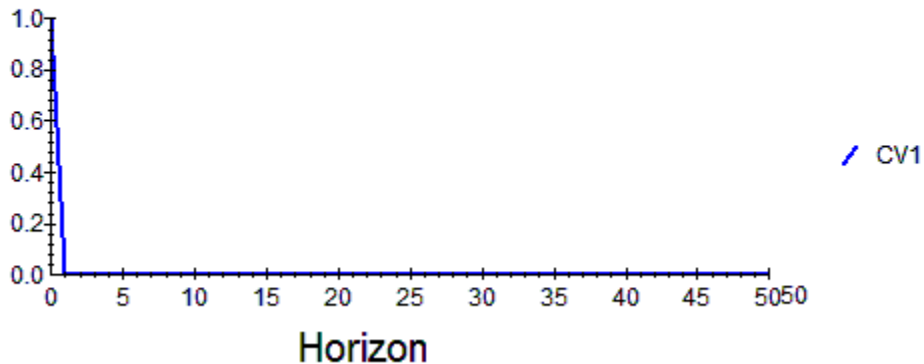
Impulse Response Functions (IRF) is a graphical representation of what had been explained in Step 6 of Variance Decomposition (VDC). Appendix 7A - 7J provides the graphs for easy reference.

(viii) Step 8: Persistence Profile

Step 8 is the Persistence Profile step where a shock is given to the entire system containing all the five variables. This is as opposed to the IRF steps where each variable is shocked separately to see its impact on other variables.

This is the chart showing the persistence profile for the cointegrating equation of this paper. From the graph, it takes an approximately one month for the system to come back to equilibrium.

Persistence Profile of the effect of a system-wide shock to CV'(s)



E. CONCLUSIONS

In concluding this paper, the authors wish to address the objectives set earlier by answering them individually:

1. Does 3-month T-bills (IR) of Malaysian government have any kind of impact on Islamic Bank Investment Account rates (IBIA), or vice versa?

Yes. This is supported by the statistical result where reliance is shown between these two variables. The intuition of the authors is also consistent with the statistical result since the author believes that due to the nature of non-guaranteed rates of the Islamic Bank investment account, the investment holders need certain benchmark to know the income that they can expect to earn from their joint venture with the Islamic banks. The only safe benchmark is the T-bills issued by the government and taken care of by the Central Bank. Whilst Shariah has certain reservations over benchmarking against T-bills which are not ascertained to be Shariah compliant, and the articles cited earlier confirmed the initiatives done to benchmark against Islamic indices, the reliance on T-bills may still be widely used.

2. If IR has a more significant impact on IBIA, how can any change in IR have an impact on Islamic Bank Investment Account holders' behavior?

The reasonable expectation of an investment account holder is based on the representation made by the Islamic banks. If the account holders feel secure with the benchmarked rates, it is likely that any proven tracked rates of Islamic bank rates which are similar to T-bills rates will increase the confidence of account holders towards the Islamic banks. This may increase the volume of investment amount in these Islamic banks.

3. Does Consumer Price Index (CPI) have any kind of impact on the IBIA rates?

Based on the statistical result, the reliance of CPI against IBIA and vice versa are less than 5%. The only reason for this could be that Islamic Banking Investment Account is either not included in the 460 items of the CPI, or even if it is, the proportion of its contribution to the whole basket of CPI is negligible. Perhaps, as the interest in Islamic finance increases and the market share of Islamic Finance eventually reaches 40% in year 2020, the reliance may increase. This slight optimism is reflected in the forecasted generalized VDC horizon of 10-month whereby it increases from 5.003% to 5.233% at 30-month.

4. Will a fall in T-bills (IR) cause a rise in Unemployment Rate (UR)?

The small percentage of reliance of IR against UR and vice versa shows that the reliance is negligible. The author feels that this is somewhat justified considering the fact that Malaysian government T-bills are usually offered in huge amount and individuals are not normally the targeted investors. This explains why the unemployment rates may not be affected by any change in IR.

While the initial issues raised at the beginning of this paper have been somewhat answered above, there are several other observations which the authors wish to highlight. This is on the implication side of the issues, how stakeholders of the industry may utilize the result of this paper to their benefits. The following shall explain these implications based on each respective stakeholders point of view:

1. Investors

The answer to the first question raised by the author may have an impact on the investors of the Islamic Banking Investment Accounts.

For the risk takers who are willing to take on high risk in return for higher rates of return, if such reliance on T-bills prolongs for a long time, this will deter them from investing in Islamic banks since the rates are not competitive given its nature of risk. For the risk averse investors on the other hand, being either a capital provider, or partner, the benchmarking seems encouraging. This is especially so since these investors know that the transactions at the back end of the banking activities take into consideration of the risk-free T-bills rates in coming up with its own banking products.

From the Islamic banking point of view, the benchmarking exercise will indicate to them the types of investors that they will bring into the organization. This indication could be used as a strategy to invoke the interest of the target market of a specified banking product.

2. Shariah Implication

Having highlighted the benchmarking activities, it is pertinent to note the consequences of this act. As highlighted in the paper written by ISRA, the benchmark of rates against conventional indices would trigger questions of Shariah permissibility. As the industry becomes more and more aware of the implications of benchmarking against conventional rates, the initiatives to come up with its own Islamic indices will increase. If the Central Bank Shariah Supervisory Board eventually rules against benchmarking of the conventional rates, the Islamic banks will need to realign its strategy to ensure that its risk averse customers will be comforted from a different angle. The reliance on the T-bills rates will need to be moved to other less-risky rates, which are Shariah compliant.

3. International Players

International Islamic finance market players who eye on Malaysia's growing Islamic finance activities may wish to keep the relationship between the exchange rates and investment accounts rates at bay. Although there is minimal reliance on the exchange rates currently, when the industry grows more competitive and the market share reaches 40% as aspired, the exchange

rates may come into play in effecting the IBIA rates. Although this should not pose as a deterrent or catalyst for any sort of movement to invest locally at this moment, it is worthy to note that when globalization of Islamic finance happens on a big scale and large amount of investment is channeled into Islamic banks in Malaysia, any fluctuations to the monetary value of investing countries will have an impact on its returns.

4. Central Bank

The industry is currently going through the most interesting transition of economy. From a 100% conventional finance prior to 1980s, Malaysia has slowly moved itself into a dual system where the Central Bank allows both Islamic and conventional system to co-exist. In struggling towards achieving its niche in this dual market, Islamic finance is slow gaining pace albeit various challenges faced by the market players. With the move of the Central Bank to gear Islamic finance in achieving at least 40% share by the year 2020 indicates a slight possibility to eventually turn Malaysia into a 100% Islamic economic system. Should this happen, the authors believe that a further understanding of how the cointegration between IR, IBIA and ER works has to be ascertained. In addition to that, although statistical results show minimal interaction between UR and CPI with other variables, in the eventuality of Malaysia operating a 100% Islamic economic system, there may be a day when all these five variables will be heavily reliant on each other's movement.

F. LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

Some of the limitations experienced were:

1. Knowledge

Although time series technique does not assume any sort of theory, nor decide upfront the equation to be solved, it does not rid the need to have prior knowledge on the topic to be researched. This is faced by the authors while

attempting to write this project paper. With a basic knowledge of how the economic system works as well as Islamic finance's impact on the growth of the economy, the outcome of the statistical research will benefit from at least some basic information at hand. Nevertheless, the authors believe that the result of this paper could have been more concrete if given more knowledge to understand the issues behind the assumptions.

2. Data Availability

Having the privilege to work with the Islamic Financial Services Board (IFSB) for the past three years helped the author understand the issues behind the Islamic financial system. To date, the attempt of the organization to collect worldwide Islamic finance data and build a comprehensive database seems to be an unfruitful attempt. Most regulators and supervisory authorities still regard their country's data to be confidential in nature. With this constraint, the authors feel that the data obtained to conduct this research may have been screened, and may even not represent the actual scenario faced by the country. The stationary surrender rates do not meet the expectation of the author since the author has been in the Takaful industry for 14 years, and knows that there is an implicit trend in surrender of policies which is not reflected in the data. Hence, data is a big limitation when it comes to the analysis of the actual scenario faced by the market.

3. Number of Variables

The number of variables used in this paper may have been limited by the availability of data. An example would be the 12-month T-bills rates which are not available online. The authors would like to think that if any test were to be done, a 12-month rate would be more compatible with all other rates which are on annual basis since the change occurs only annually and does not fluctuate as frequent as a 3-month rate.

The authors feel fortunate to have gone through the whole process of identifying the relationship between variables through statistical analysis. An intuitive comparison against statistical results provides the authors a comprehensive view of how theories and practical implications may collide. The authors, if given an

opportunity, wish to fine tune the findings of this paper by filling in the gap mentioned in the limitations list as shown above, because in the humble opinion of the authors, this paper is still far from conclusive.

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