Granger-causal direction between crude oil and islamic deposits: Malaysian evidence

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Granger-causal direction between crude oil and islamic deposits: Malaysian evidence

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Abstract: The focus of this paper is to conduct empirical tests in order to confirm the dynamic causal chain in the Granger temporal sense among Islamic deposits, money, real output, the exchange rates and crude oil future prices in the context of Malaysia. This paper is an extension of the empirical test on macroeconomic activity conducted by Masih & Masih (1996).The standard time series methodology has been applied. Given the cyclical nature of crude oil prices, the results quite in line with the expectations, tend to suggest that in the Granger-causality sense, with WTI futures prices as stimulant, money supply (particularly M1) and interest rate appear to have played the role of policy variables and other variables including output, exchange rate and Islamic deposits (highly regulated) appear to have gone through the short-run adjustment endogenously in different proportions in order to re-establish the long-run equilibrium with Islamic Deposit. This finding has clear policy implications in the sense that the up and down of the oil prices will not necessarily cause a wealth or income fluctuation to a developing economy (such as real output and saving) but will contribute positively to assist in achieving an impressive rate of economic growth with stable cash deposits, as reflected in Malaysia for the major part of the period under review.

Keywords: Islamic deposits, crude oil, VECM, VDC, Malaysia

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1.INTRODUCTION AND THEORETICAL UNDERPINNINGS

Procyclicality refers to the interactions between the financial system and the real economy which are mutually reinforcing (Abdellah, 2012). The definition presupposes the existence of two cycle, namely business and financial cycles that interacts and reinforces each other. The procyclicality as a mechanism that encompasses the interactions of at least three reinforcing cycles that move in tandem; business, financial and risk-taking behavior represented by fluctuation in asset price or the asset price cycle, which is self-reinforcing. Among the sources of the procyclicality in the Islamic Finance system is Oil cycles. Other sources are conventional benchmarks, short-time dimensionof risk in Islamic banking, domestic or foreign export of financial intermediation, Islamic vs conventional financial industry linkages and monitoring cost behavior and growth linkage.

The most controversial issue in empirical macroeconomics is Islamic banking and finance industry core success due to petro-dollars and the industry is cyclical proof (Khan & Bhatti, 2008). One of the main objectives of this study is to illustrate in what ways time-series econometrics may be appropriately exploited to shed light on such a controversial issue and concurrently offer plausible, justified implications based on econometric intuition and foresight to assist policy makers.

According to Masih & Masih (1996) the test for validity for Granger causality in cointegrated system is a subject at the very forefront of time-series econometrics (Toda and Philips, 1993). The test is important for the short-term dynamics while preserving any long term relationships over time, theoretically. The modeling testing for causal hypotheses in both theoretical and applied aspects offers conveniences as well as rigorous tools intuitively. It has stimulated interest and motivation for economic modelling, particularly in policy formulation and decision making process.

The causal relationship between hard cash (M1) and other macroeconomic variables such as output, interest rates, prices, and exchange rate has been in dispute for a long time in mainstream macroeconomics. The dispute has given rise to different schools of thought like the Classical, the Keynesian, the Monetarists, the New Classical, the New Keynesian and the Real Business Cycles (Masih & Masih, 1996).

However, with the recent emerging of Islamic finance and banking industry into the mainstream in the last 40 years has changed the landscape of these doctrines. The industry has emerged as an alternative to interest-based conventional finance and banking in a growing number of countries. It has grown significantly since beginning in 1970s and has moved beyond the confines of niche market, largely due to greater financial liberalization, an unprecedented inflow of petrodollars to the Middle East and the increasing demand to apply Islamic rules in financial transaction (Imam and Kpodar, 2010; Cevik and Charap, 2011). The vast empirical literature on saving behavior and management has listed a number of variables. Based on the discussion and elaboration presented in literature review and theoretical underpinning, the descriptive variables selected for this study are the Islamic deposits, money M1, real output, the exchange rates and crude oil futures prices. We seek to investigate whether the Islamic saving is influenced by the crude oils price as indicator and other any macroeconomic variables will give a significant impact and can directly deduce the Islamic finance and banking industry growth rate.

Similar to conventional banks, Islamic banks or Islamic financial institutions also depend on depositors' money either from institutions or individuals as a major source of fund. Since depositors' money is a major source of funds, it is important for the management of the banks, regulators as we all policy makers to know the factors that influence customers' decision making in depositing their money in the Islamic deposits.

Studies in savings management will continue to become a topic of interest for many researchers. Of all the topics widely discussed in the savings literature, the studies on saving determinants emerged at the top of the list. However, these studies focused mainly on economic variables and none have include religious dimension as one of the saving determinant.

Mainstream economics is claimed to be value-free. According to Alfred Marshall in his *Principal*, the course of the world history was mainly determined by two forces – economic and religious, of the two, economic forces were perhaps more significant. The debate went into hibernation for decades. However, the failure of more and more conventional model to account for economic performance through time and the devastating collapse of developed economies in recent years has induced many economists to look to more non-traditional explanation of economic performance, including religion. Several recent survey of published literature find both theoretical arguments on the economic role of religion and empirical studies equally inconclusive on the point. However, the inquisitions of the learned continue unabated. It will not perhaps surprise people that economists have something to say about the economics of religion, since economists believe they have something to say about everything, what is surprising is that religion has something to say about economics (Deirdre N. McCloskey, University of Illinois, Chicago). Muslims economists are insistent that Islamic provides a model of economic development constrained by a moral code of conduct that can ensure growth on a smooth path with peace and equity for all. The claim is pious and laudable but demonstration alone can win conviction (Hassan, 2015).

According to Hassan (2015) again, the normative aspect of economics instantly raises the questions of policy: For instance, in the case of the 2008 worldwide financial meltdown, what policy could correct the situation? Policy questions leads us to the art component of economics. The component links the positive elements of economics to its

normative content. The linkage is important. For example the inflation is speeding up in the economy and we feel that it may be injurious to economic development of the country. As remedy, we might suggest reduction in money supply or imposition in price controls. The discussion of such measures becomes an integral part of economic discourse. Thus, we can see how the three facets of economics – positive, normative and art (policy) are integrated. As different policies suit different nations, economies by its very nature operates in national frames.

However, the causal chain among the economics components such as output, interest rates and price level implied by the existing macroeconomic paradigm still remains ambiguous. Thus, the issue as to the dynamic causal relationships in Granger temporal sense remain unsolved and is an empirical one (Masih & Masih, 1996). According to Masih&Masih (1996) again, empirically, in order to resolve the issue of the direction of causation in a bivariate context, a lot of causality tests have been applied based mainly on the standard Granger (1969), Sims (1972), and the modified Sims suggested by Geweke, Meese, and Dent (1983).

To reiterate, the main purpose of this paper is to conduct empirical tests to distinguish the dynamic causal relationships in the Granger temporal sense among oil futures prices (West Texas Intermediate) and Islamic deposits with other macroeconomic variables such as money M1, output, interest rate, and exchange rate in developing economies such as Malaysia. In order to examine the dynamic interactions of these variables with the foreign trade sector, we want to incorporate the foreign exchange rate variable as well.Although the currency's level is largely supposed to be determined by the underlying economy, the tables are often turned, as a huge movement in a currency similar to the ASEAN economy crisis in 1996/97 can dictate the economy's fortunes.

In the foreign exchange (forex) market, currency valuations move up and down as a result of many factors, including interest rates, supply and demand, economic growth and political conditions. Generally speaking, the more dependent a country is on a primary domestic industry, the stronger the correlation between the national currency and the industry's commodity prices.In general, there is no uniform rule for determining what commodities a given currency will be correlated with and how strong that correlation will be. However, some currencies provide good examples of commodity-forex relationships (Gallant, 2015).

Consider that the Malaysian Ringgit is positively correlated to the price of oil. Therefore, as the price of oil goes up, the ringgit tends to appreciate against other major currencies. This is due to the fact that Malaysia is a net oil exporter; when oil prices are high, Malaysia tends to reap greater revenues from its oil exports, giving the Canadian dollar a boost on the foreign exchange market.

Does Islamic finance and banking sector would be the savior and alternativeto the current financing system as general believe? There is more prevalent evidence that the 2008 financial meltdown is due to high oil prices and the oil shock were the catalyst (Marconi, 2009). Therefore, it is paramount important to ascertain for a correlation between the Islamic finance and banking industry with the oils money in order to confer the industry as the savior and alternative to the current conventional system. Or the industry will vanish together with the oils when it dried up? These are the integral questions need to be answered and bid in this study.

2. METHODOLOGY AND ESTIMATION RESULTS

In this testing, ARDL model is applied after the 8-steps was tested but met with conflicts and challenges, especially with the 4 (four) cointegrations produced. The model consists of six variables: WTI Crude oil futures prices, real output, money, Islamic deposit, interest rate and exchange rate. The primary source of all these data is the International Financial Statistics published by the IMF and the Monthly Statistical Bulletin by the BNM. The data are monthly covering the period June 2007- September 2015 for Malaysia with 100 observations were obtained.

A simple model is used to examine the variations in Islamic deposits in Malaysia (ID), where there a number of factors that influence the deposit.

The function form of the model is as follow:

ID = f (WTIF, Y, M1, IR, ER)

Where

WTIF = WTI Crude oil futures prices

Y = Industrial Production Index

M1 = Money Supply

IR = Interest Rate (T-Bills)

ER = USD/RM Exchange Rate

The analysis of lead-lag for the above variables are performed, where all the variables except real output and interest rates are transformed into the logarithms to achieve stationary in variance. All the level form variables were transformed into the logarithm scale, however, this is no applicable to the already in percentage form like real output and interest rate.

The first start is to determine the stationarity of the variables used. For cointegration testing in the next steps, it is ideal for the variables in non-stationaryI(1) in their original form. Thus, it will become stationary I(0), when they were first differenced as example below:

DID = LID – LIDt-1

For cointegration, a necessary condition is that each of the variables should be cointegrated of the same order (more than zero) or that all series should contain a deterministic trend (Granger, 1986). Before proceeding with the test of cointegration, the order of vector auto regression (VAR), which is the number of lags to be used is determined. As illustrated below, the results show there are conflicts in number of lads in term of suggested AIC (2) and SBC (1). However, we chose the lower order for 1 lag in order to avoid over-parameterization.

	VARIABLE	ADF	VALUE	T-STAT.	C.V.	RESULT
LOG FORM	Variables in Level Form					
	LWTIF	ADF(2)=AIC	89.511	-2.805	-3.458	Non-Stationary
		ADF(2)=SBC	83.153	-2.805	-3.458	Non-Stationary
	LY	ADF(1)=SBC	153.862	-4.820	-3.458	Stationary
		ADF(2)=AIC	159.620	-4.777	-3.458	Stationary
	LM1	ADF(1)=SIC	225.530	-3.742	-3.458	Stationary
		ADF(4)=AIC	230.860	-2.254	-3.458	Non-Stationary
	LID	ADF(2)=SBC	67.329	3.079	-3.458	Non-Stationary
		ADF(2)=AIC	73.687	3.079	-3.458	Non-Stationary
1ST DIFF. FORM						
	Variable in Differenced Form					
	DWTIF	ADF(1)=SBC	80.2926	-4.7598	-3.4581	Stationary
		ADF(4)=AIC	86.2733	-5.172	-3.4581	Stationary
	DY	ADF(1)=SBC	143.5206	-9.753	-3.4581	Stationary
		ADF(5)=AIC	148.6871	-5.9959	-3.4581	Stationary
	DM1	ADF(1)=SBC	222.6932	-9.7329	-3.4581	Stationary
		ADF(3)=AIC	230.1111	-7.3798	-3.4581	Stationary
	DID	ADF(1)=SBC	63.6715	-6.9958	-3.4581	Stationary
		ADF(1)=AIC	68.7367	-6.9958	-3.4581	Stationary
	DIR	ADF(2)=SBC	144.8863	-4.8497	-3.4581	Stationary
		ADF(2)=AIC	151.2178	-4.8497	-3.4581	Stationary
	DER	ADF(1)=SBC	207.7461	-5.9586	-3.4581	Stationary
		ADF(3)=AIC	212.9559	-4.4406	-3.4581	Stationary

Table 1 ADF test. Notes: Definitions: Crude oil futures price (WTIF); Gross domestic products (Y); Money supply defined as money in circulation and cash deposits held in banks (MI); T-bill interest Rate (IR); spot exchange rate (ER); total Islamic deposits (ID). The data set consisted of 100 observation from 2007-2015 inclusive, sourced from various issues of International Financial Statistics.

PP

VARIABLE	T-STAT.	C.V.	RESULT
Variable in Level Form			
LWTIF	-1.4582	-2.8921	Non-stationary
LY	-3.1971	-2.8921	Stationary
LM1	-1.3628	-2.8921	Non-stationary
LID	-0.59133	-1.8812	Non-stationary
LIR	-1.8531	-2.8921	Non-stationary
LER	0.059605	-2.8921	Non-stationary
Variable in Differenced Form			
DWTIF	-6.7808	-3.024	Stationary
DY	-14.9786	-3.024	Stationary
DM1	-15.002	-3.024	Stationary
DID	-8.4427	-3.024	Stationary
DIR	-6.899	-3.024	Stationary
DER	-8.8672	-3.024	Stationary

KPSS

VARIABLE	T-STAT.	C.V.	RESULT
Variable in Level Form			
LWTIF	0.11545	0.39374	Stationary
LY	0.17677	0.39374	Stationary
LM1	0.59505	0.39374	Non-stationary
LID	0.25181	0.39374	Stationary
LIR	0.13003	0.39374	Stationary
LER	0.14611	0.39374	Stationary
Variable in Differenced Form			
DWTIF	0.10879	0.14246	Stationary
DY	0.12237	0.14246	Stationary
DM1	0.093674	0.14246	Stationary
DID	0.1321	0.14246	Stationary
DIR	0.092915	0.14246	Stationary
DER	0.13803	0.14246	Stationary

Table 2: Summary of Phillips-Perronand KPSS test

The testing for Augmented Dickey-Fuller (Table 1) and Phillips-Perron& KPSS(Table 2) were applied for the order of integration of the variables. Table 1 illustrates of all variables concerned, where we cannot reject the presence of a unit root for any of the variables. Thus, as initial conclusion, there is no evidence that the variables are not I(1), which is variables were found non-stationary at the "level" form but stationary after *first differencing*. Based on the results of unit root test above, they are varied and inconsistent from one test to another. Therefore, ARDL model is more applicable in such situation for the long run relationship among the variables. Nevertheless, Johansen's was also tested to prove that the conflict is there due to high no of integration, which make the analysis using this method would be complex. The results based on Johansen's multivariate cointergation tests in Table 3 tend to suggest that these six variables are bound together by long-run equilibrium relationships. The number of cointegrationis 4 (four), with the result from Engle-Granger testindicateconintergationis existed for the six variables as below:

Engel Granger	
T statistics	Critical Value
-4.1142	-4.8882

* CV is higher than T-stat

Table 3: Engel Granger Cointegration Test

An evidence of cointegration implies that the relationship among the variable is not spurious i.e there is a theoretical relationship among the variables and that they are in equilibrium in the long run. As illustrated in the table above, the critical value is higher than t statistics. Thus, we cannot reject the null that residuals are non-stationary. Statistically, the results indicate that the variables chosen in some combinations result in not a stationary error term. As it is not stationary that indicates that there is not any cointegration. From our

perspective these initial results are not intuitively appealing, so, we decided to go for Johansen cointegration test as highlighted above.

Illustrated in the table below, the maximal Eigenvalue and Trace indicate that there is four cointegrating vectors:

Criteria	Number of cointegrating vectors
Maximal Eigenvalue	4
Trace	4

Table 4: Johansen's cointegration test

The statistics refer to Johansen's log-likelihood maximal eigenvalue and trace test statistics based on cointegration with unrestricted intercepts and restricted trends in the VAR. These results conflicts each other and also Engle – Granger. As these approaches have many limitations that are taken care by ARDL. For that we decide to go for ARDL approach for testing cointegration among variables.

Anyway, prior to proceeding with the ARDL cointegration testing, we determine the order of the vector auto regression (VAR), which is the number of lags to be used. As per table below, results show that AIC commends order of two whereas SBC suggests one lag as below:

	Choice Criteria	
	AIC	SBC
Optimal Order	2	1

Table 5: VAR Order

According to Masih and Masih, 1996, the evidence of cointergation among these six variables has several consequences. First, it eliminates spuriouscorrelations and also the possibility of Granger noncausality, which in turn implies at least a unique channel for Granger causality to emerge in either unidirectional or bidirectional. Secondly, the actual number of cointegrating relationship or equilibrium found in Table 2 will result in a corresponding number of residual series and hence error-correction terms (ECTs), which may embed as exogenous variables appearing in their lagged levels as part of the error-correction model (ECM) in Table 8. Thirdly, cointegration also exclude the use of modelling any dynamic relationships through ordinary first-differenced VARs as these will be misspecified and also structural VARs (Rogers and Wang, 1993) as these models do not imposed cointegration constraints (Masih&Masih, 1996).

Variables	F statistics	Critical Value Lower	Critical Value Upper
DWTIF	1.9647	2.365	3.553
DY	2.6681	2.365	3.553
DMI	3.5839*	2.365	3.553
DID	2.6245	2.365	3.553
DIR	2.0745	2.365	3.553
DER	2.9383	2.365	3.553

Table 6: Note: The critical values are taken from Pesaran et al. (2001), unrestricted and no trend with 6 regressors.

* denote rejecting the null at 5 percent level.

The range of the critical value at 1 percent and 10 percent are 3.027-4.96 and 2.035-3.153

The table 6 above shows the calculated F-statistics for M1 is higher than the upper bound critical value 3.553 at the 5 percent significant level. This implies that the null hypothesis of no cointegration long-run relationship can be rejected. These results reveal that a long-run relationship exists between the macroeconomic variables and Islamic deposit in our study. This is a significant finding in view of the fact that the long run relationship between the variables that is demonstrated here avoiding the pre-test biases involved in the

unit root tests and cointegration test required in the standard cointegrating procedure. The evidence of long run relationship rules out the possibility of any spurious relationship existing between the variables. In short, there is theoretical relationship existing between the variables.

Subsequently, the ECM's representation for the ARDL model is selected AIC criterion. Table 9 provides the estimates of the estimates of the ARDL long-run coefficient for the model. The result as illustrated in the table indicates that p-values of the ECM denoted by ecm(-1) is indeed significant at 95% significant level. It shows that WTIF, Y, M1, IR and EX have significant effects on the Islamic deposits. The error-correction coefficient being significant confirms our earlier findings of a significant long-run cointegrating relationship between the variables. Meanwhile, the size of the coefficient of the error-correction term is also indicative of the intensity of the arbitrage activity to bring about the long-run equilibrium. However, the error correction coefficient estimated at 0.13146 (0.148) is significant, has a positive sign implies the system moves away from equilibrium in the long-run. Finally, the 't' or 'p' value of the coefficients of the Δ (i.e. differenced) variables indicate whether the effects of these variables on the dependent variables are significant or not in the short-run. We noticed that WTI futures prices, interest rate and exchange rate have significant effects on the Islamic deposits.

As highlighted, the cointegration among variables cannot indicate the direction of Granger causality inherent between them. Therefore, we turn to results provided by the ECM (Table 9). For the results, the ECM tends to indicate that WTI futures price, interest rate and exchange rate stand out as exogenous as illustrated through the statistical significance or otherwise of both the t-tests of the error-correction term and the F-tests of the independent variables. Given the use of money M1 as the policy variable and the control on interest rates by the Bank Negara Malaysia, it is quite surprising that M1 is appeared as endogenous, whereas interest rate variables were relatively the leading variables. In retrospective, the

mechanics behind the ECM results imply that while crude oil futures prices, interest rate and exchange rate variables appeared as the initial receptors of exogenous shocks to the long term-term equilibrium relationship, and all the remaining variables including the real output, money supply and Islamic deposits are endogenously in different proportions in order to re-establish the long-term equilibrium.

No of lags in VAR order with conflicting value

Order	AIC	SBC	p-Value	C.V.
1		847.519	[.092]	5%
2	907.305		[.263]	5%

Cointegration LR Test Based on Maximal Eigenvalue of the Stochastic Matrix

Null	Alternative	Statistic	95% Critical Value	90% Critical Value	Result
r<= 3	r = 4	26.4285	25.420	23.100	4 cointegrations
r<= 4	r = 5	15.2165	19.220	17.180	

Cointegration LR Test Based on Trace of the Stochastic Matrix

Null	Alternative	Statistic	95% Critical Value	90% Critical Value	Result
r<= 3	r = 4	52.0866	42.340	39.340	4 cointegrations
r<= 4	r = 5	25.6581	25.770	23.080	

Table 8Johensen's Test for Multiple Cointegrating Vectors: r indicates the number of cointegrating relationships. Critical values are taken from Johansen and Juselius (1990). ** indicates rejection at the 95% critical value.

Regressors	Coefficient	Standard Error	[P-Value]
LY	0.026579	0.14122	0.851
LM1	0.15522	0.060549	0.012*
LID	0.28344	0.072747	0*
LIR	-0.15306	0.11271	0.178
LER	-1.7976	0.39342	0*
INPT	1.5471	0.78099	0.051

Results of ARDL Long Run Coefficients, Dependent Variable is LID

Note: * denotes significant at 5 percent level

Regressors	Coefficient	Standard Error	[P-Value]
ecm (-1) dLWTIF	-0.2005	0.065089	0.003*
ecm (-1) dLID	0.13146	0.090124	0.148
ecm (-1) dLY	-0.16813	0.088477	0.061
ecm (-1) dLM1	-0.036018	0.023502	0.129
ecm (-1) dLIR	-0.25842	0.045639	0*
ecm (-1) dLER	-0.22158	0.062064	0.001*

Note: * denotes significant at 5 percent level

Table 9 Error Correction Model: All variables are in first differences.

However, as stated earlier, although the ECM can help us differentiate the exogeneity or endogeneity of a variable and also can give us an understanding of the direction of Granger causality within the sample period, it neither provide us with an indication of the dynamic properties of the system, nor does it allow us to gauge the relative strength of the variables beyond the sample period. While the ECM analysis could be thought of as a within sample causality test, the VDC (Table 10) could be deemed to be an exercise of an out-of-sample causality test.

	HORIZON	LWTIF	LY	LM1	LID	LIR	LER
LWTIF	25	51.45%	40.47%	11.33%	45.87%	8.34%	13.41%
LY	25	13.14%	45.93%	13.65%	62.49%	13.03%	0.92%
LM1	25	8.77%	29.52%	60.69%	14.41%	6.65%	3.07%
LID	25	16.26%	50.46%	3.48%	72.92%	17.06%	0.04%
LIR	25	12.46%	15.89%	4.70%	37.61%	11.56%	28.20%
LER	25	24.86%	49.21%	4.38%	60.95%	17.96%	8.53%

	HORIZON	LWTIF	LY	LM1	LID	LIR	LER
LWTIF	50	24.44%	52.89%	5.64%	66.78%	15.56%	1.32%
LY	50	16.76%	53.07%	5.28%	69.96%	16.68%	0%
LM1	50	16.05%	51.11%	26.80%	45.66%	14.42%	1.33%
LID	50	17.49%	53.13%	4.07%	70.23%	17.12%	0.07%
LIR	50	12.25%	51.87%	2.73%	73.61%	12.13%	1.50%
LER	50	19.22%	53.40%	4.28%	68.61%	17.49%	0.71%

	HORIZON	LWTIF	LY	LM1	LID	LIR	LER
LWTIF	75	18.93%	53.67%	4.46%	69.25%	16.85%	0.20%
LY	75	16.76%	53.07%	5.28%	69.96%	16.68%	7.05E-04
LM1	75	17.88%	54.69%	7.56%	65.73%	17.01%	0.25%
LID	75	17.72%	53.58%	4.18%	69.73%	17.12%	0.08%
LIR	75	16.65%	53.70%	3.89%	70.81%	16.12%	0.07%
LER	75	18.04%	53.65%	4.22%	69.46%	17.19%	0.15%

	HORIZON	LWTIF	LY	LM1	LID	LIR	LER
LWTIF	100	17.98%	53.68%	4.25%	69.55%	17.07%	0.10%
LY	100	17.73%	53.66%	4.24%	69.63%	17.10%	8.49E-04
LM1	100	17.82%	53.96%	4.70%	69.01%	17.13%	0.11%
LID	100	17.76%	53.66%	4.20%	69.63%	17.11%	0.09%
LIR	100	17.56%	53.70%	4.14%	69.85%	16.93%	0.07%
LER	100	17.82%	53.68%	4.21%	69.59%	17.13%	0.10%

Table 10: Figures in the first column refer to horizon (no of months). All other figures are estimates rounded to two decimal places.

An analysis of the dynamic interactions of various shocks in the post-sample period is brought to light through the VDCs and IRFs (Table 4 and Figure 1). The Granger-causal chain implied by the analysis of VDCs tends to suggest that the Islamic deposits (ID) is relatively the leading variable, being the most exogenous of all after 50 to 75-month horizon. For the example, about 70.23 percent of the forecast error variance of ID is explained by its own shocks compared to about 24 percent in case of crude oil WTI futures prices. Furthermore, a cross-check of variance decompositions (Table 4) indicates that while ID explains only about 18 percent of the variance of WTI futures at the 50 or 75-month horizon, WTI futures explains about 70 percent of the variance of ID. Meanwhile output and exchange rate explains only 17 and 19 percent of the variance of ID and even lesser for money supply (16%) and interest rate (12%), respectively.

VDCs exist in two types, Orthogonalized and Generalized. There are two significant limitations of Orthogonalized VDCs. Firstly, it depends to the particular ordering of the variables in the VAR. Secondly, it assumes that when a particular variable is shocked, all other variables in the system are switched off. However, this is not happened in Generalized VDCs, thus, we relied on it for further deliberation as discussed above and below.

From the result in Table 10, at the end of the forecast horizon 75-month, we can see that Islamic deposits is the most exogenous variable and the variance is explained by its own past. Total deposit mostly affected by key economics resources like GDP and interest rate, exchange rate as well as monetary supply but all these parameters are endogenous relative to Islamic saving deposit. The only reasonable explanation for this phenomena is that the Islamic finance and banking industry is highly controlled and regulated by the authority, thus, making it exogenous and cyclical proof.

Another theory postulates that higher interest rate increases saving. The finding reveals that this theory is relevant to both the Islamic and conventional banking industries. There is positive relationship between the interest rate and Islamic bank deposits. The only

plausible explanation for this is possibly due to the usage of OPR by the Islamic banks as their benchmark and the BFR floating rate, the imitation of conventional floating interest rates mechanism.

Previous study and theory has indistinctive results about the effect of GDP on bank deposits. Theory postulates that higher growth of GDP will lead to lower saving in anticipating higher future income. In contrary, previous study shows that customers of Islamic banks tent to save more at the time of higher GDP. However, the result indicates that GDP does conform the theory. A reasonable explanation is that the increase in industrial production does affect the depositors's saving or withdrawal decision in Islamic bank in short-run.

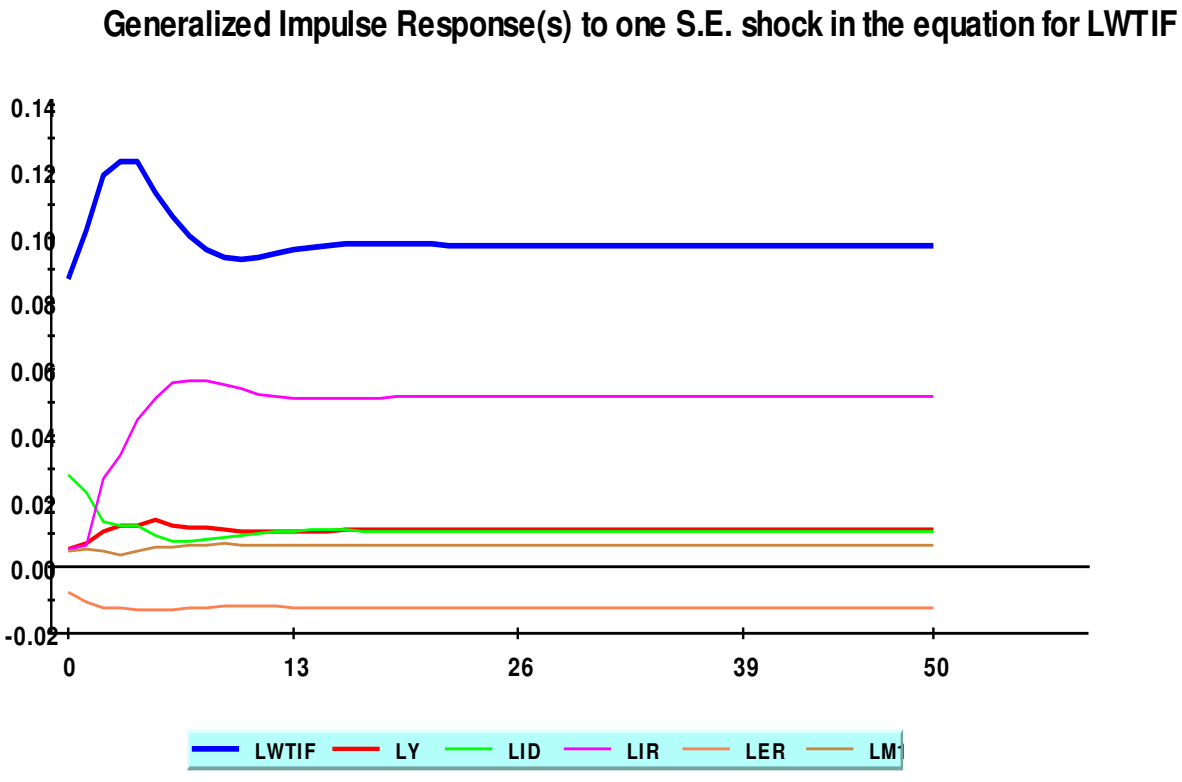
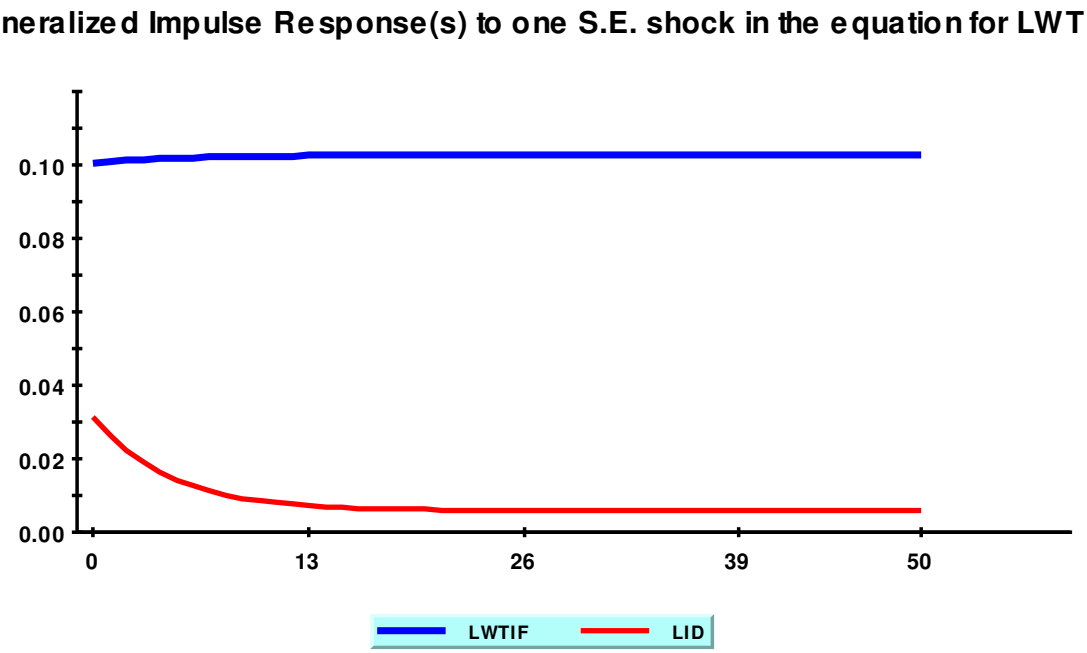
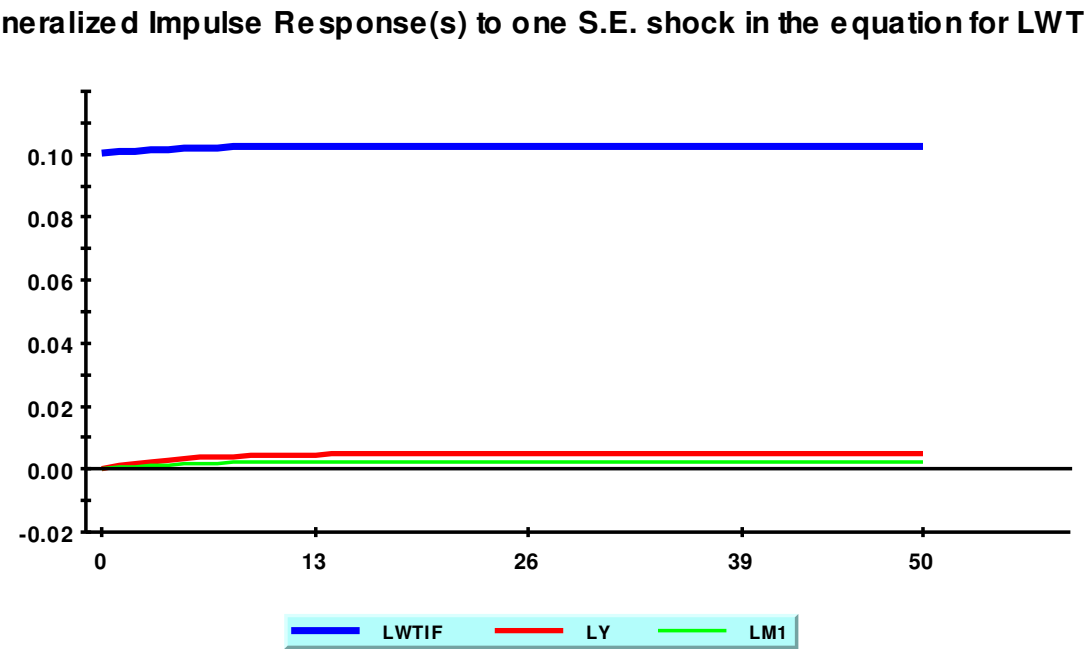


Figure 1. Impulse responses of real output, money M1, exchange rate, Islamic deposits and interest rate from a one-standard deviation shock to WTI futures prices.





In essence the impulse response functions (IRFs), produce the same information as the VDCs, except they are represented in graphical form. An analysis of the impulse response functions are presented in Figure 1 tends to suggest that a shock to crude oil WTI futures prices results in significant positive response in interest rate but surprisingly a slight negative for the Islamic deposits at least in the short run, although accompanied by

sensitivities in some nominal variables as well such as output, exchange rates and money supply. During the period, there is a slight increase on real with trivial decreased in M1 and the exchange rate. Therefore, the IRFs appear to be consistent with the earlier VDC results that WTI futures prices (ranked 3rd and 4th in exogeneity during the sample period) does have insignificant influence on ID (most exogenous) but interest rate rate does (most endogenous).

During a major part of the period under consideration, Malaysia had maintained a relative macroeconomic stability by Southeast Asian standards amidst of global energy crisis in 2008 and 2015. As developing countries, whose income is greatly relying on commodities, Malaysia is quite fortunate as her income is diversified into industrial production and service sectors. During the period, budget deficit as a percentage of GDP average 3 percent, which is relatively high. Meanwhile the exchange rate was also relatively stable until recently due to huge domestic debts and scandalous crisis which eroded the investors confident. Although budget deficit, it did not generate inflationary spiral because the deficit was not financed mainly through the printing press, and the monetary policy was primarily counter-cyclical effect and conservative like imposing stringent taxes increase and introduction of GST in 2015. However, with the ongoing political crisis, the low oil prices and the slowdown in China has deeply impacted Malaysia's economy putting pressure on finances. In 2016, Oil and gas related revenues are expected to total 14.1 percent of the government's total revenue, down from 19.7 percent in 2015. The ringgit having plumbed 17 year lows to 4,43 ringgit against the dollar (Reuters, 2015).

According to Masih & Masih, 1996, compared to the industrially and financially advance economies with this developing countries like Malaysia, there are relatively more rigors in wages and prices, and less market perfection. The perfect and instantaneous adjustment are visible by their absence because of institutional and structure inflexibilities. Imperfection also stems from costly and imperfect information and delays in the

transmission of information to the economic agents due to information asymmetry. In these circumstances, given the overall environment of a relatively stable macroeconomic balance as well as the stability and continuation of the major economic policies of the government during most of the sample period, it is not surprising that a monetary expansion (especially M1) was not necessarily dissipated merely in terms of higher nominal variables (such as exchange rates or interest rates) but rather contributed positively to help achieve an impressive rate of economic growth.

In this type of scenario, quite in line with expectations, an increase in money supply M1 appears to have played role of a policy variable in counter increase or decrease of prices in relation to futures oil price changes and the other variables including output, rate of interest, exchange rate and Islamic deposits appears to have impacted of short-run adjustment in different propositions in order to re-establish the long-term equilibrium.The Granger–causal chain implied by our evidence that WTI futuresprices in some ways influence money supply M1, real output and the other four endogenous variables, appears to be consistent with Malaysia. It is interesting to see, whether this evidence is more obvious if the same study can be done to the countries, where their income is mainly generated by oil and gas industries.

3. SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

The main objective of this paper is to recognize the causal relationship in the Granger temporal sense among WTI futures prices, money, interest rate, exchange rate and Islamic deposits in the context of developing economies, such as Malaysia. The methodology employed used various unit root tests and Johansen's cointegration test followed by error-correction model, variance decompositions and impulse response functions in order to capture both within sample and out of sample Granger causality among macroeconomic activity.

The broad policy implications from this analysis are varied but offer quite clear messages from a methodological and economic viewpoint. It is worth highlighting that this study made an initial attempt at placing the empirically controversial issue of causality between petro-dollars and Islamic finance and banking industry in a temporal multivariate and cointegrated Granger-causal framework in the context of developing economies like Malaysia. Specifically, this study is important for policy designers and decision makers with respect to:

1. The evidence of cointegration among these variables tends to suggest that these six macro-aggregates are bound together by common trends or long-term equilibrium relationship(s). This implies that although these cointegrated variables will have a short-term or transitory deviations or departures from their long-term common trend(s), eventually forces will be set in motion that will drive them together again. Moreover, evidence of cointegration eliminates the possibility of the estimated relationship being spurious and implies that Granger causality must exist among these variables in at least one direction either unidirectional or bidirectional. This

finding of cointegration or long-run equilibrium relationship among all these variables is very important for the policy makers (Masih & Masih, 1996).

2. The Grange-causal chain implied by three tools of our dynamic analysis namely error-correction modelling, variance decompositions, and impulse response functions implies valuable information regarding the lead-lag relationship between these macro-aggregates. Knowingly Malaysia as a relatively stable macroeconomic environment over the years, the results quite in line with our expectations, tend to suggest that in the Granger-causality sense, with WTI futures prices as stimulant, money supply (particularly M1) and interest rate appear to have played role of a policy variable and other variables including output, exchange rate and Islamic deposits (highly regulated) appear to have gone through the short-run adjustment endogenously in different proportions in order to re-establish the long-run equilibrium. This finding has clear policy implications in the sense that, as long as there is stability and continuation of economic policies within the framework of a proper macroeconomic discipline, a monetary or finance expansion or contraction to counter the cyclical price of crude oil would be necessary in order to ensure a sustainable and impressive rate of economic growth for a small developing economy that rely on commodities like Malaysia as a source of income.
3. Although in theory, the Islamic financial system is more stable than the conventional one and it contains the forces that make it less procyclical (due to highly regulated), their exist some exogenous sources that can make it shock amplifier rather than absorber such as, oil cycles, using the LIBOR as benchmark for the Islamic financial return, short-time dimension of risk in Islamic banking, domestic or foreign export of financial intermediation, Islamic and conventional financial industry simulation and monitoring cost behavior and growth linkage. For policy makers and financial regulators, they need to take into account all the explained sources of procyclicality

of the Islamic financial system and make sure that all these factors are neutralized from the practices and architecture in the design of an Islamic financial system. For the central bankers, they need to understand the potential mechanisms of the financial accelerator effect to make the monetary policy more effective in transmission of their tools. From the result, oil prices is somewhat influencing the Islamic finance and banking industry and to conclude that the industry exists due to the petrol dollar is likely to be true but requires further study with bigger scope that comprises major oil producing economies.

4. The general belief that Islamic finance and banking industry is cyclical proof requires further study and extend to bigger scope to M2 and M3 but from the result, the Islamic deposit is exogenous to some extent. This could be due to the industry being highly regulated by the authority, which makes it more stable and exogenous especially with the introduction of IFSA2013 that requires the separation of investment accounts from saving accounts. According to the theory, with the high oil price it will directly increase GDP but contract the saving deposits.

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