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Abstract

This paper discusses Islamic monetary policy which could potentially be a sustainable alternative to the conventional. Islamic banks and financial institutions have to set their benchmark based on London Interbank Offered Rate (LIBOR) which raises doubt and controversy of the uniqueness of Islamic finance. By analyzing current literature on Islamic monetary policy models it is proposed in this study that GDP growth rate adjusted for interest income and inflation can be set as a benchmark for money market instrument and reference rate for financial and capital market to set the cost of capital or rate of return. In order to test the two proposed models, one year data from 99 countries have been collected. The study uses the OLS regression and the result shows that real interest rate is not a viable instrument for monetary policy framework as no significant relationship has been found with key factors such as inflation and unemployment. On the other hand, GDP growth rate has a statistically significant relationship with inflation and unemployment, GDP growth rate is higher for OIC countries, however, unemployment rate is higher.

Key words: Monetary Policy, Islamic Monetary Policy, Real Interest Rate, GDP Growth Rate, Inflation, Real Exchange Rate, Gross Savings

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Introduction

Monetary policy is a mechanism to control the money supply and demand by manipulating interest rate in conventional economic system while in Islamic economic system Riba i.e. interest rate is prohibited, an alternative system, method or instrument is necessary which can truly control the supply and demand of money in the economy in order to maintain a stable local currency, sustainable growth, higher income, higher savings, lower and stable inflation and lower unemployment.

Monetary policy is generally mentioned to as either being expansionary or contractionary, where an expansionary policy increases the total supply of money in the economy more rapidly than usual, and contractionary policy expands the money supply more slowly than usual or even shrinks it. Expansionary policy is traditionally used to try to combat unemployment in a recession by lowering interest rates in the hope that easy credit will entice businesses into expanding. Contractionary policy is intended to slow inflation in order to avoid the resulting distortions and deterioration of asset values.

Conventional monetary policy literatures state that monetary policy, to a great extent, is the management of expectations (Svensson, 2004). Monetary policy rests on the relationship between the rates of interest in an economy, that is, the price at which money can be borrowed, and the total supply of money. Monetary policy uses a variety of tools to control one or both of these, to influence outcomes like economic growth, savings, inflation, exchange rates with other currencies and unemployment.

Interest rate mechanism has truly failed to reflect the real growth of an economy, moreover regulation of which has an adverse affect on inflation, employment, exchange rate, savings and investment. The last global financial crisis was the vivid example of colossal failure of interest based economic system, where we observed frictional reserve system, soaring low quality debt financing, which was the consequence of low interest rate, and numb speculation lead to the subprime mortgage collapse in the US and which ultimately has affected the global financial markets. As evidence shows this is not the last time of course, in the last 100 years global financial markets have faced several financial crisis which were directly or indirectly due to the failure of interest rate mechanism. In this paper an attempt has been made to provide an overview of Islamic monetary policy framework, argue why interest rate can't be an ideal instrument of monetary policy and benchmark for financial and capital market, and propose an alternative benchmark rate, which will be determined realistically, true reflection of real economic growth by full employment, low or stable inflation, stable currency, high savings and investment opportunities, moreover, based on the real sector.

Literature review

Islamic monetary policy literature has been growing rapidly since the end of the last century with the rapid development of Islamic finance especially Islamic banks have emerged as formidable competitors for conventional interest base banking system. As interest is prohibited in Islam, scholars in Islamic economics have been relentlessly working on to find an appropriate alternative benchmark which will be a realistic replacement and also fall under the compliance of Shariah.

Ariff (1982) conducted some preliminary observations on the working of monetary policy in an interest-based economy and the possibilities in an interest-free economy. The three main goals of monetary policy for an Islamic economic system: a) Economic well being with full employment and optimum rate of economic growth; b) Socioeconomic justice and equitable distribution of income and wealth and c) Stability in the value of money (Chapra, 1985).

A 25% of demand deposits with the banks for advancing interest-free loan to government was proposed by Chapra. To comply with the Islamic monetary policy he further emphasized the need fulfillment, optimum growth, full employment, equitable distribution and economic stability and proposed to include such monetary instruments as statutory reserve requirements, credit ceilings (in particular, goal-oriented allocation of credit), equity-based instruments, changes in profit-and-loss sharing ratio and moral suasion (Chapra, 1985; Chapra, 1996).

Khan and Mirakhor (1987) gave a flow-of-funds matrix for an Islamic economy in which the central bank provided equity-based support to banks. However, their analytical model rested on the conventional interest rate variable relabeled as an *a priori* variable rate of return. It is, therefore, not surprising that they did not find any difference in the effect of monetary policy in an Islamic versus a traditional one economy. Khan and Mirakhor (1994) highlighted the importance of mudaraba mode deposit mobilization, and list financing instruments that might be available in the Islamic financial system. They point out that apart from the Islamic banking system there would also be primary, secondary and money markets. There is a great semblance between their thinking and what is available in conventional economics. Of course, the instruments like mudaraba and musharaka certificates are expected to have Shari‘ah legitimacy. Moreover, they regard macroeconomic stability, characterized by price stability and viable balance of payments position as the chief goals for monetary policy. As for monetary policy, their conclusion is as follows: Monetary policy of an Islamic state takes place in a framework in which all conventional tools normally available in a modern economy are at the disposal of the monetary authorities with the exception of the discount rate and other policy tools that involve interest rate. All other tools, namely open market operations (where equity shares rather than bonds are traded) and credit policies, can be as effective in an Islamic system as they are in the conventional Western system. Additionally, the authorities in an Islamic system can utilize reserve requirements and profit-sharing ratios to achieve changes in the stocks of money and credit (Khan and Mirakhor, 1994).

Choudhry and Mirakhor (1997) also focused on the tools for monetary policy. Their main proposal is use of equity-based government securities with rates of returns based on budgetary surplus for the purpose of monetary management. A good deal has been written on goals of Islamic monetary policy and conventional instruments suitability for Islamic economic system and unique Islamic monetary instruments have also been proposed since the developments in the Islamic finance from the late-1990s and onward.

Analytical framework of the model

The rationale behind suggesting GDP growth rate as an alternative benchmark

The recent financial crisis has proven that interest rate, which is determined in the money market, is the ultimate instrument of monetary policy regulation has failed to control the

economic system not only in the east but also in the west. In this circumstance, we need to look for an alternative approach to run and control monetary policy in a sustainable way and rate of interest which is fixed without considering real sector and real economy cannot solve the problem of high inflation, unemployment, low income and savings, investment, and slow growth of a real economy. Therefore, in this paper an argument has been made to replace interest rate with GDP growth rate as a benchmark instrument for monetary policy based on the following works as it can be assumed that it would better reflect the overall performance of an economy and ensure greater welfare of the population.

An alternative to money management was presented by Zangeneh and Ahmad (1993) presented. They recommended that the central bank could charge the borrowing bank a weighted average rate of return in different sectors of the economy. However, this will create problems with reference to choice of sectors to calculate the weighted average rate of return. A particular bank may not have any investment in certain sector or sectors. Furthermore, this suggestion does not solve all the problems pertaining to pricing of products in Islamic finance.

Shaikh (2010) mentioned that Usmani (2003) proposed issuance of GDP growth linked instruments to finance public debt. Secondary market can be made for it by directing banks to meet their statutory requirements by way of trading in these instruments. This will deepen money market and the rate at which this instrument will be traded can be taken as the benchmark for pricing and structuring other products. Since the source of funds and use of funds both use the same benchmark as in the current system, adopting an alternative benchmark on the source of funds side can be used in pricing commercial banking products on the use of funds side.

Khan (2004) argued against elimination of interest by a legal decree and favored free market forces to bring the interest rates down to zero. He further stressed on providing incentives for the use of equity over debt financing. He proposed following policy measures: i) reducing reserve requirements to increase supply of loanable funds; ii) enforcing unlimited liability; iii) gradual decline in interest to make investments in debt based instruments less lucrative and shift loanable funds towards equity based instruments; iv) allowing dividend as a tax deductible expense; and v) providing fiscal incentives to non-leveraged firms and disincentives to leveraged firms.

Hanif and Shaikh (2010) recommended the use of a nominal gross domestic product growth rate (NGDPGR) as a benchmark rate. They argued that the appeal in the use of NGDPGR is that not only can it be used as a base rate for the banking sector but also for central banks as their monetary policy tools that encompass both the conventional and Islamic financial systems. In their analysis using data from various countries, they showed that there is no statistical differences between NGDPGR and various benchmark rates (for example, discount rate, treasury bill rate, deposit rate) used in those countries under their study. Therefore, this instrument can be used for indexing financing for public exchequer and could also be a major investment alternative for money market players as well as an alternate to OMO.

By analyzing the literature and different Islamic monetary policy models, it can be argued that the aims of Islamic monetary policy and conventional monetary policy are quite similar even though in the Islamic economic system justice and equitable social welfare get priority and no existence of ‘Riba’ i.e., Interest rate makes the Islamic system unique. There are many tools

available in the conventional monetary policy which can easily be replicated in Islamic monetary policy with the exception of the discount rate and other policy tools that involve interest rate. Inflation, exchange rate, unemployment, gross savings and investment are variables frequently mentioned in the literature as the best indicators of effective monetary policy outcome both in the conventional and Islamic. Therefore, an attempt has been made to develop two models to compare and see whether real interest rate or GDP growth rate can better reflect and predict the monetary policy outcome.

Data and Methodology

Data (Appendix 5) used in this study is from the secondary source, World Bank and IMF database. A number of standardized Ordinary Least Square (OLS) regressions have been conducted to determine the impact of the independent variables on Real Interest Rate and GDP growth rate by using cross sectional data of 99 countries (Appendix 4) for 2012. In addition to that, for both dependant variables six different regressions have been run to identify model misspecification, detect the multicollinearity, identification of unnecessary variables and explaining power of the independent variables (Table 2 and 3 are presented in the Appendix 2). Also, descriptive statistics and correlation matrix (Table 4 and 5 Appendix 2) results are presented. Moreover, the following diagnostics tests are conducted: Jarque-Bera test for normality, Heteroskedasticity Test: Breusch-Pagan-Godfrey and Breusch-Godfrey Serial Correlation LM Test have been carried by using E-views 7.

Model Specifications (An OLS estimation)

Model:1

$$RIR = \beta_0 + \beta_1 INF + \beta_2 LOGRXR + \beta_3 LOGGS + \beta_4 UNE + \beta_5 OIC + \beta_6 OIC.UNE + \beta_7 OIC.INF + \varepsilon$$

Model:2

$$GDP = \beta_0 + \beta_1 INF + \beta_2 LOGRXR + \beta_3 LOGGS + \beta_4 UNE + \beta_5 OIC + \beta_6 OIC.UNE + \beta_7 OIC.INF + \varepsilon$$

RIR	Real Interest Rate (%)
GDP	GDP growth rate (%)
INF	Inflation, consumer price (%)
LOGRXR	Log of Real Effective Exchange Rate (%)
LOGGS	Log of Gross savings percentage of GDP (%)
UNE	Unemployment rate (%)
OIC	Organization of Islamic Conference Countries
β_0	Intercept
$\beta_1 - \beta_7$	Coefficient of the independent variables
ε	Error term

It is hypothesized that inflation, exchange rate, unemployment, and gross savings are highly correlated with the real interest rate and GDP growth rate. Furthermore, all independent variables together could better explain the GDP growth rate model than the real interest rate one. By adding OIC dummy and two other interactive dummies, it is also hypothesized that there are

statistically significant difference on the impact of unemployment and inflation between countries in OIC and non-OIC. Brief definitions of the variables are given in the Appendix 1.

Analysis and interpretation of the results

Table 1: OLS estimation output

Variable	RIR	GDP
Intercept	-64.711*	-12.596
	(26.834)	(23.814)
INF	0.275	0.419*
	(0.217)	(0.134)
LOGRXR	14.681*	2.426
	(5.759)	(5.154)
LOGGS	-0.138	1.072
	(0.797)	(0.580)
UNE	0.155	-0.153*
	(0.082)	(0.076)
OIC	3.071	3.561*
	(2.026)	(1.722)
OIC*UNE	-0.096	0.105
	(0.159)	(0.125)
OIC*INF	-0.535	-0.498*
	(0.295)	(0.193)
R^2	0.117	0.338
Adjusted R^2	0.047	0.285
F-Value	1.668	6.405
Probability	0.127	0.000

Notes: Standard errors are in the parentheses. * denotes statistical significance at the 5%

In the first regression of the Table 1, where inflation, exchange rate, gross savings, unemployment rate, OIC dummy and two interactive dummies were regressed on real interest rate. Real exchange rate has positive relationship with real interest rate at 5% significance level. In addition to that there is no significance difference in other independent variables.

In the second regression, all the independent variables are regressed on GDP growth rate. In this regression four statistically significant differences are observed. Inflation, Unemployment, OIC dummy and OIC.INF interactive dummy show statistically significant relationship with GDP growth rate at 5% significance level.

In the first regression the R^2 is 0.117 and adjusted R^2 is 0.047 which indicates all independent variables together could explain only 11.7% of change in GDP growth rate, which is not statistically significant as P-value is 0.127. On the other hand, in the second regression, R^2 is .338 and adjusted R^2 is 0.285 which means all independent variables together could explain 33.8% of change in GDP growth rate, which is statistically significant as P-value is 0.000. In

robustness test, both regressions were run through Jargue Bera normality test, Breusch-Pagan-Godfrey heteroskedasticity test and Breusch-Godfrey Serial Correlation LM test. The result show that the first model does not suffer with normality problem, heteroskedasticity and autocorrelation problem. On the other hand, second model doesn't suffer with normality problem and autocorrelation problem but has heteroskedasticity problem as it is a cross-sectional study. As a result for the second model the Newy-West method is used to resolve the problem. Appendix 3 presents the diagnostic tests conducted for both the models.

Discussion of results

Results of the OLS estimation in the table 1 (RIR column) indicates that one percent increase in exchange rate would lead to 14.68% increase in real interest rate. It seems too high; this might be due to the nature of the regression and kind of relationship between independent variables even though the number of observation was 99. On the other hand, the second model (GDP column) indicates that inflation rate has statistically significant positive correlation with GDP growth rate. 1 percent increase inflation would lead to increase in 0.419% increase in GDP growth rate. As low and moderate inflation can help the economy grow at a stable rate for a longer period of time, even though it is necessary to control the inflation, on the contrary, increase in interest rate would lead to increase in inflation and decrease in the real purchasing power of the people. The following graph shows the GDP growth rate and inflation for sample countries in 2012.

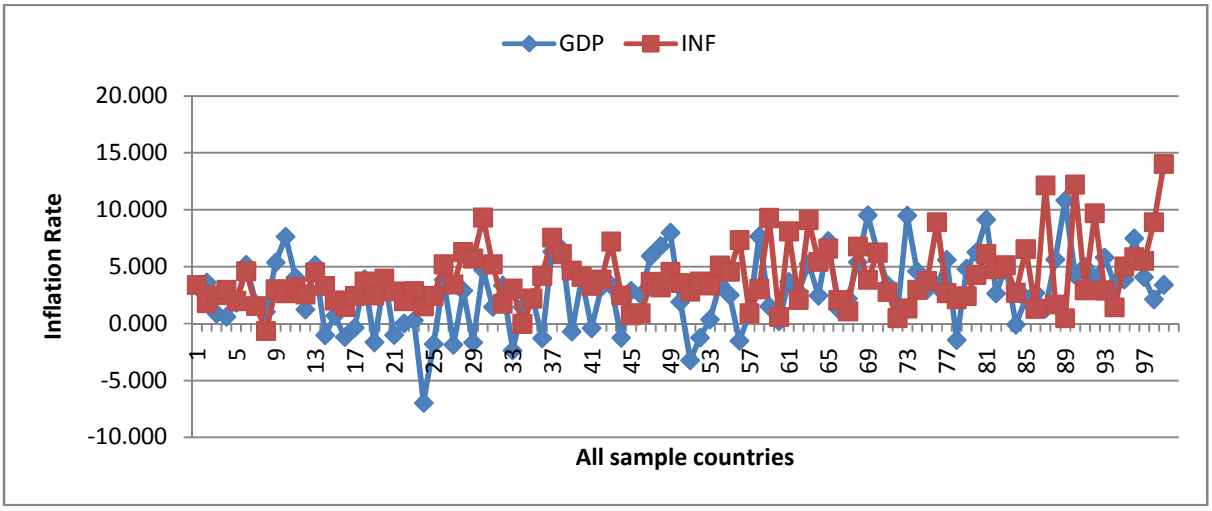

Figure 1: GDP vs Inflation of sample countries in 2012

a) Inflation in OIC countries

In the second model, OIC.INF interactive dummy has statistically significant correlation with the GDP growth rate. It can be explained as 1% increase in inflation, GDP growth rate in OIC countries would be -0.498% less than the non-OIC countries. It indicates that OIC countries are more vulnerable to inflation than the non-OIC countries. As most of the OIC countries are developing and the economy of GCC countries (mostly OIC countries) largely dependent on oil windfall, decrease in oil price would lead to skyrocketing inflation. As the oil price has been free falling for the last four quarters in this year, this relationship become evident in many oil dependent OIC countries where inflation is expected to rise. The following figure shows the inflation rate in non-OIC and OIC countries.

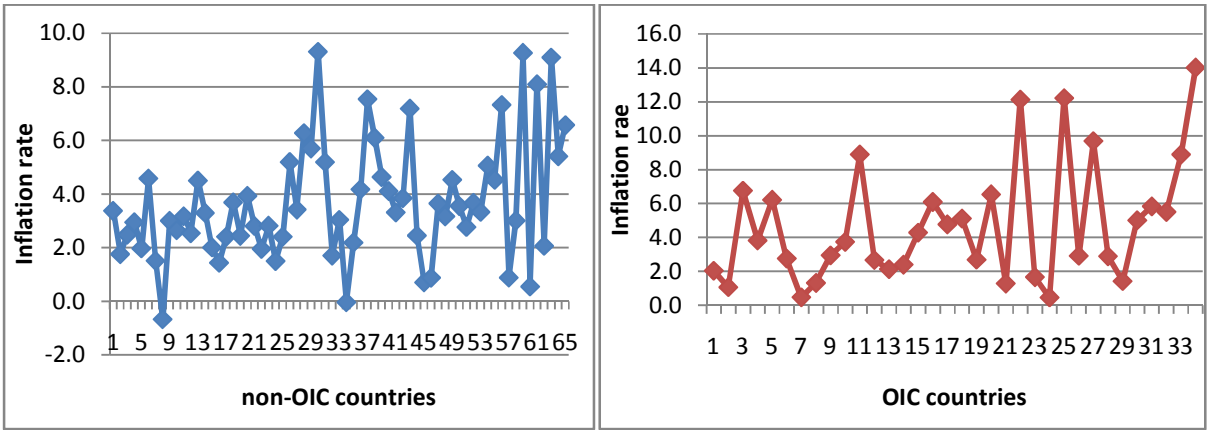

Figure 2: Inflation rate in non-OIC and OIC countries in 2012

b) Unemployment

In the second model, unemployment rate is negatively correlated with GDP growth rate. It can be said that 1% increase in unemployment rate would decrease the GDP growth rate by 0.153% which is statistically significant at 5% significance level. Unemployment is one of the most common problems in OIC countries but in the model OIC.UNE interactive dummy doesn't show any significant difference between in unemployment rate in OIC countries and non OIC countries. The following figure shows the unemployment rate in non-OIC and OIC countires.

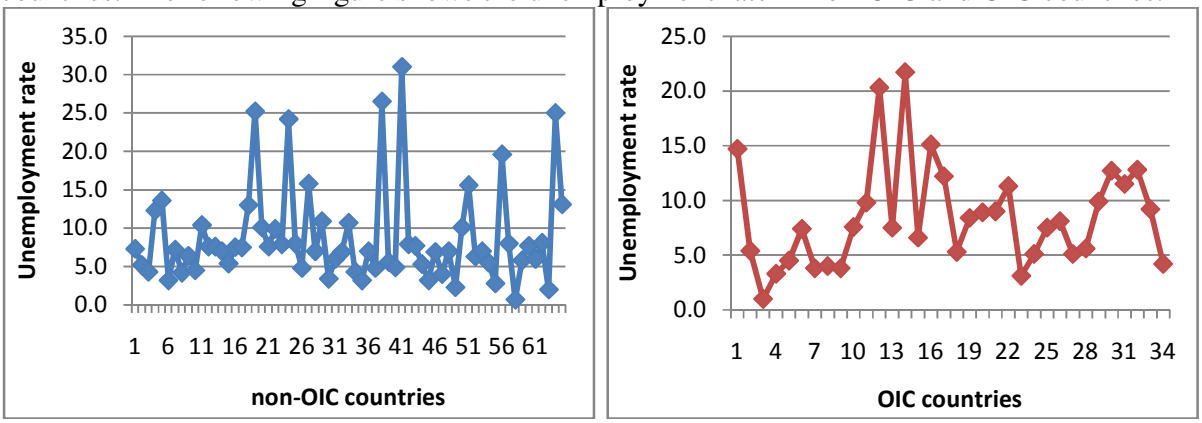

Figure3: Unemployment rate in non-OIC and OIC countries in 2012

c) OIC dummy

In the model, OIC dummy shows that GDP growth rate in OIC countries are 3.56% higher than the non-OIC countries which is statistically significant at % significance level. This can be explained as most of the OIC countries are developing countries and usually developing countries have higher GDP growth rate compare to developed countries but in non-OIC countries there are many developing countries as well. The following figure in the next page better illustrates the GDP growth rate for non-OIC and OIC countries in 2012.

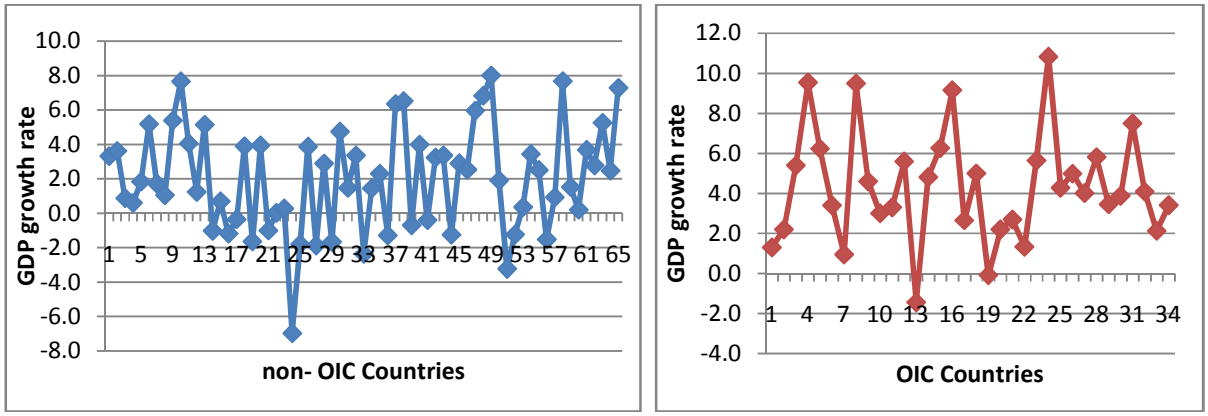

Figure 4: GDP growth rate in non-OIC vs OIC countries in 2012

The study has analysed the relationship of real interest rate and GDP growth rate with inflation, unemployment by taking into account other key macro economic and qualitative variables like OIC and interactive dummies. It can be confirmed after comparing the two models that key independent variables which indicate the effectiveness of the monetary policy of a country are not signficantly related with the real interest rate but most of them are correlated with GDP growth rate and many statstically signficant difference have been found in the study. The following figure shows that GDP growth rate and real interest rate for all sample countries have indentical movement even though no signficant correlation has been observed.

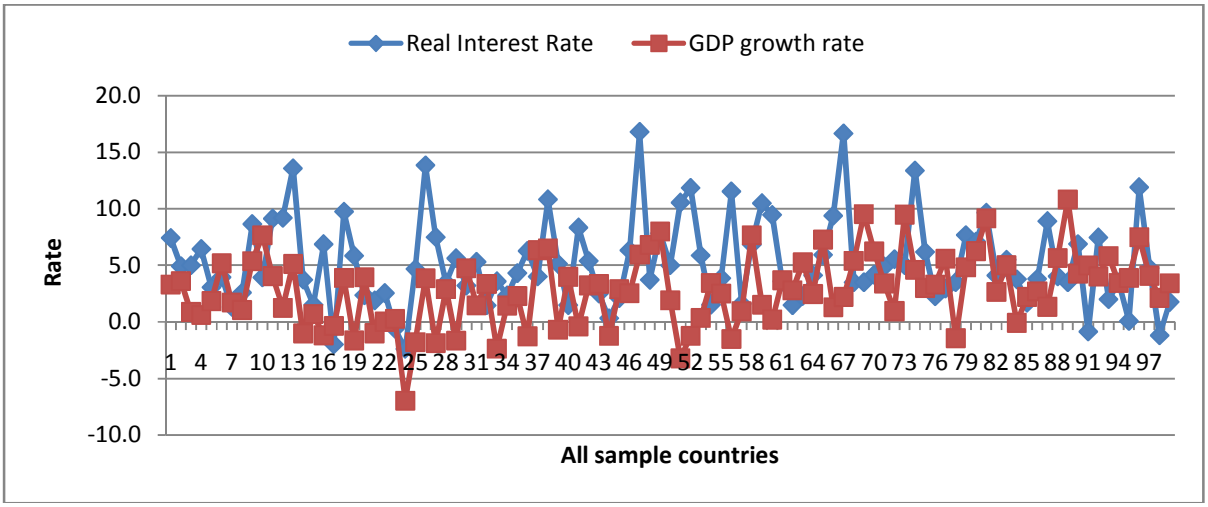

Figure 5: Real Interest Rate vs GDP growth rate of sample countries in 2012

As it has been discussed in Islamic economic system the main objectives of monetary policy are: to promote a sustained and balanced economic growth and mobilize resources for economic development; to create employment, to control inflation, to maintain stability in the value of money so as to avoid excessive periodic fluctuations; to maintain stability in the external value of money to promote an equitable distribution of income and wealth. Therefore, it can be argued that it is reasonable to use GDP growth rate as the benchmark for monetary policy instrument after adjusting for interest income and inflation. It is unlike a bond indexed for inflation which is not recommendable as inflation does not always imply growth in production especially in stagflation. Moreover, inflation is more subjective and relative a measure to index

an instrument with. Moreover, if Indexation for inflation allowed in financial intermediation at broad based level, then it is not practicable in the financial system. As interest rate is prohibited in Islamic economic system, and all loans linked with inflation, then more the loans taken, more will be the credit money generation (assuming fractional reserve system) and more will be the inflation (Hanif aand Shaikh, 2010). For example for those who had nothing to do with all this who were neither the borrowers nor the lenders, they will be suffering with this inflation and this cannot be controlled since there is no interest rate mechanism. So, we also need to think of how to control inflation which is in essence a tax, as argued by many economists rather than encouraging indexation for inflation and thereby fueling expected inflation.

Potential problems and measures with the proposed model

Shaikh and Hanif (2009) argue that in recession, Real GDP may be negative, but Nominal GDP growth rate will be positive. They ask question whether it will not give an undue upward bias to the cost of capital when the production to which it is linked with is not increasing in recession. They further argue that stagflation and cost push inflation can be better tackled with better supply chain management, reducing intermediaries, promoting market competition. Scarcity of Capital created by interest can better be managed by using effective fiscal policy such as a high wealth tax and inheritance tax (Piketty, 2014) i.e. Zakat (2.5% on wealth, 5% and 10% on production) in an Islamic economy. This will boost up production, improve competition and remove obstacles giving rise to cost push inflation and increase revenues for the government by increasing the tax base. Inflation is most likely to be low in recession and hence GDP growth rate won't be that high. Even if it is high, private sector financiers like banks would give financing based on Cash Flows discounted on that GDP growth rate. Therefore, cost would have to be paid by the financees who have higher Cash Flows discounted on GDP growth rate.

It could be further argued that by adjusting inflation in the public and corporate finance with the benchmark rate, GDP growth rate, which takes into account inflation; As a result the government do not need to resort to printing paper money, quantitative easing, to meet the fiscal deficit. If necessary changes are made to avoid budget deficits paper money may not need to be printed often and seigniorage, profit made by a government by issuing currency, will not be presented as a compelling problem.

Conclusions

This study has reviewed the literature on Islamic monetary policy and identified three main goals of Islamic monetary policy, which are: a) economic well being with full employment and optimum rate of economic growth; b) socioeconomic justice and equitable distribution of income and wealth and c) stability in the value of money. A comparative literature review of Islamic and conventional monetary policy revealed that there are many monetary policy instruments which can be adopted in Islamic monetary policy with or without major modifications such as: Legal Reserve Ratio, Credit Rationing, Selective credit control, Issue of directive, and Moral suasion. At the same time, Islamic economists and researchers have come up with instruments which are unique and Shariah compliant such as: Profit sharing ratio, Refinance ratio, Public share of demand deposits, Value oriented allocation of credit, and Qard Hasan ratio. The success of Islamic money market operations in Malaysia and other OIC countries weighs in favour of those who advocate the development of a sustainable framework

for Sharia compliant monetary policy. For the last two decades an increasing number of Islamic monetary management tools and policies have been developed by financial institutions and markets in Malaysia and other Muslim countries around the world but still LIBOR is the ultimate benchmark in the money and capital market. As many economists argue after such a long time of great moderation, a reduction in the volatility of business cycle fluctuations starting in the mid-1980s, believed to have been caused by institutional and structural changes in developed nations in the later part of the twentieth century, the recent global financial crisis has proven to us that interest rate which is the definitive instrument of monetary policy regulation has not only failed to control the economic system but also has created inequality, social injustice and rampant corruption and manipulation by global financial institutions supported by the government officials (Mirakhor, 2014). For example, during the recession, the USA and many European countries have intentionally violated the so called market principles and intervened overwhelmingly to protect many giant financial institutions. This study found that real interest rate is not a viable instrument for monetary policy framework as no significant relationship has been found with key factors such as inflation and unemployment. On the other hand, GDP growth rate has a statistically significant relationship with inflation and unemployment, GDP growth rate is higher for OIC countries, although unemployment rate is higher. In this context, it is the order of the day to look for a realistic and sustainable alternative of Interest rate, which is abhorrently prohibited in Islamic economic system. As a result, we need to look for an alternative approach to run and control monetary policy in a sustainable way and rate of interest, which is fixed without considering real sector and real economy cannot solve the problem of high inflation, savings, income, investment, and growth of an economy. Therefore, it can be argued to replace interest rate with GDP growth rate linked instrument which could provide a benchmark rate for pricing products in Islamic commercial banking and provide an avenue for investment in the Islamic money market and capital market for example GDP growth linked Sukuk (Bacha and Mirakhor, 2013). The GDP growth linked benchmark can also be used to benchmark not only domestic debt but also foreign debt. Central Bank in an interest free economic framework will continue to have statutory reserve ratio to contain money supply and control credit creation. Furthermore, introducing GDP linked instruments would provide a base instrument for OMO and create a secondary market for the instrument. Using Refinance ratio, Qard-e-Hassan Ratio Issue of directive, and Moral suasion the central bank will be able to manage liquidity in the banking sector. It can be concluded that due to its limited and focused scope the study could not take into account other macro economic variables that may affect real interest rate and GDP growth rate, panel data might provide better estimation, therefore, further research is required in this area specially by taking panel data in order to see the relationship and consistency across countries, region and economy.

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Appendix 1
Variables explained

Real interest rate: Real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator.
Real effective exchange rate index (2010 = 100): Real effective exchange rate is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs.
GDP growth (annual %): Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2005 U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.
Gross savings (% of GDP): Gross savings are calculated as gross national income less total consumption, plus net transfers.
Inflation, consumer prices (annual %): Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.
Unemployment, total (% of total labor force) (modeled ILO estimate): Unemployment refers to the share of the labor force that is without work but available for and seeking employment.
OIC: 34 countries from the Organization of Islamic Conference Countries.

Appendix 2
Table 2 **Dependent variable: RIR** (6-regressions)
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwith = 4.0000)

Variables	1	2	(3)	(4)	(5)	(6)
Intercept	4.861* (0.784)	-44.931 (32.887)	-44.611 (33.154)	-64.965* (32.491)	-65.206 (32.915)	-64.711 (26.834)
INF	0.091 (0.158)	0.047 (0.166)	0.001 (0.174)	-0.002 (0.166)	-0.004 (0.171)	0.275 (0.217)
LOGRXR		10.796 (7.179)	10.979 (7.203)	14.993 (7.052)	15.040 (7.134)	14.681* (5.759)
LOGGS			-0.343 (0.765)	-0.139 (0.755)	-0.138 (0.763)	-0.138 (0.797)
UNE				0.138* (0.070)	0.139 (0.070)	0.155 (0.082)
OIC					0.071 (0.812)	3.071 (2.026)
OIC*UNE						-0.096 (0.159)
OIC*INF						-0.535 (0.295)
R^2	0.004	0.046	0.044	0.081	0.081	0.117
Adjusted R^2	-0.005	0.026	0.013	0.040	0.030	0.047
F-Value	0.423	2.319	1.427	2.012	1.594	1.668
Probability	0.517	0.104	0.240	0.099	0.170	0.127

Notes: Standard errors are in the parentheses. * and **denotes statistical significance at the 10%, 5% and 1% levels respectively.

Table 3 **Dependent variable: GDP** (6-regressions)

HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwith = 4.0000)

Variables	1	2	(3)	(4)	(5)	(6)
Intercept	1.946*	-30.846	-27.247	-7.428	-15.665	-12.596
	(0.660)	(18.110)	(20.339)	(20.683)	(22.875)	(23.814)
INF	0.214	0.185	0.213	0.221*	0.147	0.419**
	(0.107)	(0.109)	(0.111)	(0.106)	(0.125)	(0.134)
LOGRXR		7.109	5.525	1.616	3.232	2.426
		(3.906)	(4.476)	(4.438)	(5.003)	(5.154)
LOGGS			1.247*	1.048	1.091	1.072
			(0.620)	(0.660)	(0.611)	(0.580)
UNE				-0.135*	-0.121	-0.153*
				(0.067)	(0.061)	(0.076)
OIC					2.423*	3.561*
					(0.624)	(1.722)
OIC*UNE						0.105
						(0.125)
OIC*INF						-0.498*
						(0.193)
R^2	0.035	0.062	0.101	0.154	0.286	0.338
Adjusted R^2	0.026	0.043	0.071	0.117	0.246	0.285
F-Value	3.567	3.186	3.439	4.149	7.203	6.405
Probability	0.062	0.045	0.020	0.003	0.000	0.000

Notes: Standard errors are in the parentheses. *, **, and denotes statistical significance at the 10% and 5% levels respectively.

Table 4

Descriptive statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
RIR	5.228	4.307	16.797	-2.400	3.808	0.778	3.659
GDP	2.809	2.896	10.828	-6.973	3.131	-0.022	3.200
INF	4.028	3.316	14.016	-0.667	2.751	1.244	4.714
LOGRXR	4.629	4.611	4.888	4.459	0.073	0.956	4.505
LOGGS	2.997	3.037	3.932	1.518	0.491	-0.418	3.141
UNE	8.625	7.400	31.000	0.700	5.725	1.772	6.286

Table 5

r-Pearson Correlation matrix

	RIR	GDP	INF	LOGRXR	LOGGS	UNE
RIR	1.000					
GDP	0.124	1.000				
INF	0.035	0.199	1.000			
LOGRXR	0.206*	0.179	0.143	1.000		
LOGGS	-0.021	0.210*	-0.009	0.110	1.000	
UNE	0.104	-0.298**	-0.024	-0.378**	-0.165	1.000

Notes: * and **. Correlation is significant at the 0.05 and 0.01 level (2-tailed).

Appendix 3

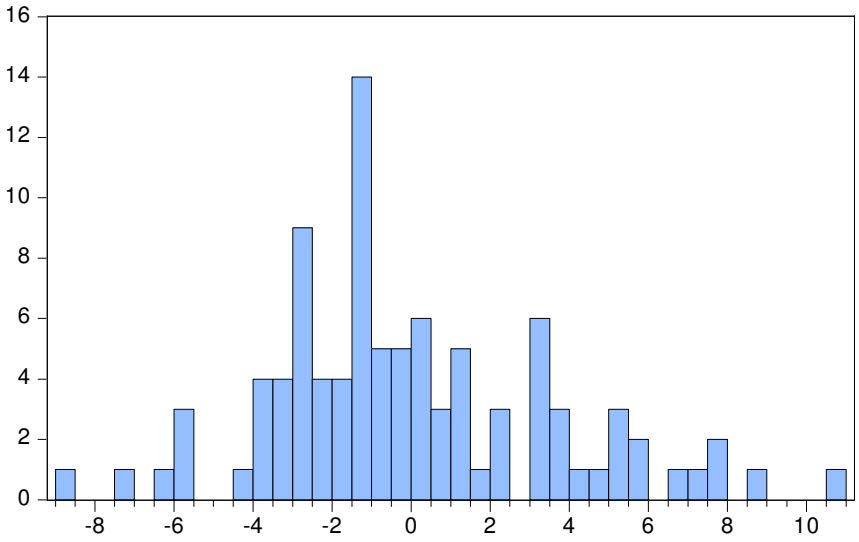
Diagnostic tests (First Model)

Dependent Variable: RIR
Method: Least Squares
Sample: 1 99
Included observations: 96

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-64.71117	26.83408	-2.411530	0.0180
INF	0.274968	0.216563	1.269692	0.2075
LOGRXR	14.68114	5.759473	2.549042	0.0125
LOGGS	-0.138063	0.797080	-0.173210	0.8629
UNE	0.154990	0.081913	1.892119	0.0618
OIC	3.071148	2.025547	1.516206	0.1331
OIC*UNE	-0.095731	0.159027	-0.601981	0.5487
OIC*INF	-0.534756	0.295216	-1.811405	0.0735

R-squared	0.117113	Mean dependent var	5.213762
Adjusted R-squared	0.046883	S.D. dependent var	3.844629
S.E. of regression	3.753424	Akaike info criterion	5.562869
Sum squared resid	1239.761	Schwarz criterion	5.776565
Log likelihood	-259.0177	Hannan-Quinn criter.	5.649249
F-statistic	1.667565	Durbin-Watson stat	1.632716
Prob(F-statistic)	0.127404		

Normality test:



Series: Residuals
Sample 1 99
Observations 96

Mean	1.49e-15
Median	-0.908494
Maximum	10.65940
Minimum	-8.774026
Std. Dev.	3.612494
Skewness	0.512944
Kurtosis	3.300624
Jarque-Bera	4.571287
Probability	0.101709

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.900930	Prob. F(7,88)	0.5096
Obs*R-squared	6.419760	Prob. Chi-Square(7)	0.4917
Scaled explained SS	6.205222	Prob. Chi-Square(7)	0.5160

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Sample: 1 99
Included observations: 96

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-299.9429	141.2906	-2.122879	0.0366
INF	0.097032	1.140277	0.085095	0.9324
LOGRXR	68.30425	30.32560	2.252363	0.0268
LOGGS	-2.849882	4.196898	-0.679045	0.4989
UNE	0.469502	0.431302	1.088570	0.2793
OIC	6.658343	10.66520	0.624305	0.5340
OIC*UNE	-0.040805	0.837334	-0.048732	0.9612
OIC*INF	-0.889575	1.554413	-0.572290	0.5686

R-squared	0.066872	Mean dependent var	12.91417
Adjusted R-squared	-0.007354	S.D. dependent var	19.69080
S.E. of regression	19.76306	Akaike info criterion	8.885162
Sum squared resid	34370.93	Schwarz criterion	9.098858
Log likelihood	-418.4878	Hannan-Quinn criter.	8.971541
F-statistic	0.900930	Durbin-Watson stat	1.825660
Prob(F-statistic)	0.509582		

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.174327	Prob. F(2,86)	0.3139
Obs*R-squared	2.552057	Prob. Chi-Square(2)	0.2791

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Sample: 1 99
Included observations: 96
Presample and interior missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.193710	26.82796	-0.007220	0.9943
INF	-0.053279	0.220627	-0.241488	0.8098
LOGRXR	0.039570	5.755084	0.006876	0.9945
LOGGS	0.012019	0.797098	0.015078	0.9880
UNE	0.016110	0.083191	0.193654	0.8469
OIC	0.003716	2.021715	0.001838	0.9985
OIC*UNE	-0.029685	0.161657	-0.183631	0.8547
OIC*INF	0.070178	0.300645	0.233424	0.8160
RESID(-1)	0.140993	0.117140	1.203627	0.2320
RESID(-2)	-0.022787	0.111358	-0.204630	0.8383

R-squared	0.026584	Mean dependent var	1.49E-15
Adjusted R-squared	-0.075285	S.D. dependent var	3.612494
S.E. of regression	3.746010	Akaike info criterion	5.577592
Sum squared resid	1206.803	Schwarz criterion	5.844712
Log likelihood	-257.7244	Hannan-Quinn criter.	5.685566
F-statistic	0.260962	Durbin-Watson stat	1.847072
Prob(F-statistic)	0.983200		

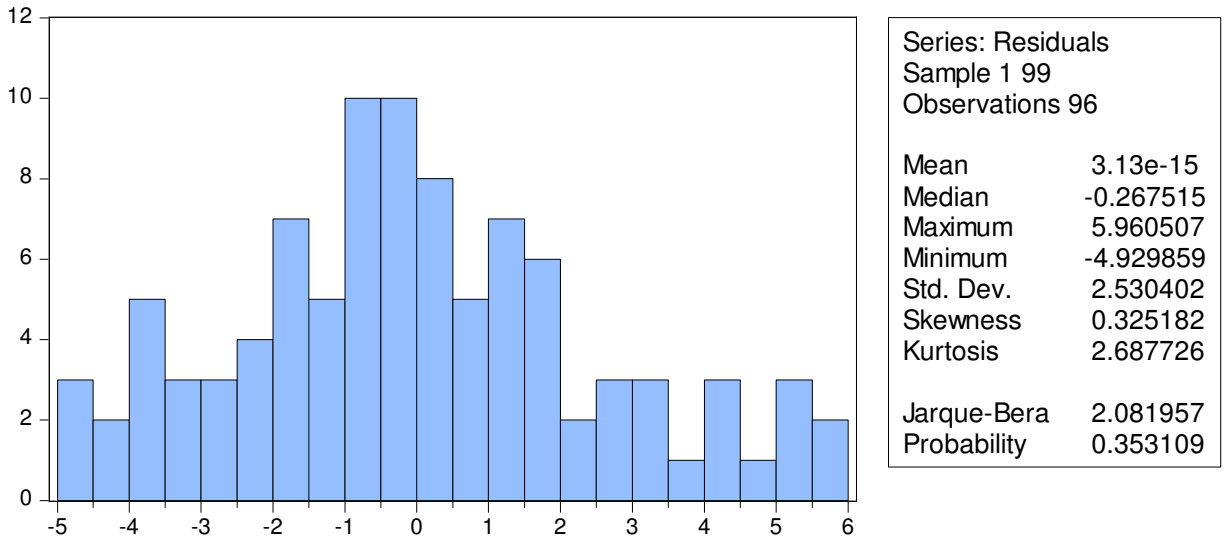
Diagnostic test (Second Model)

Dependent Variable: GDP
Method: Least Squares
Sample: 1 99
Included observations: 96
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-12.59562	23.81437	-0.528908	0.5982
INF	0.418863	0.134268	3.119613	0.0024
LOGRXR	2.425610	5.153723	0.470652	0.6391
LOGGS	1.071726	0.579609	1.849049	0.0678
UNE	-0.152839	0.075761	-2.017390	0.0467
OIC	3.561666	1.722014	2.068314	0.0415
OIC*UNE	0.104953	0.124649	0.841982	0.4021
OIC*INF	-0.498114	0.192673	-2.585281	0.0114

R-squared	0.337541	Mean dependent var	2.917177
Adjusted R-squared	0.284845	S.D. dependent var	3.108922
S.E. of regression	2.629117	Akaike info criterion	4.850829
Sum squared resid	608.2786	Schwarz criterion	5.064524
Log likelihood	-224.8398	Hannan-Quinn criter.	4.937208
F-statistic	6.405479	Durbin-Watson stat	1.673542
Prob(F-statistic)	0.000004		

Normality test:



Series: Residuals
Sample 1 99
Observations 96

Mean	3.13e-15
Median	-0.267515
Maximum	5.960507
Minimum	-4.929859
Std. Dev.	2.530402
Skewness	0.325182
Kurtosis	2.687726
Jarque-Bera	2.081957
Probability	0.353109

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.466635	Prob. F(7,88)	0.0233
Obs*R-squared	15.74651	Prob. Chi-Square(7)	0.0275
Scaled explained SS	11.16552	Prob. Chi-Square(7)	0.1316

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Sample: 1 99
Included observations: 96

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-90.53092	56.19944	-1.610887	0.1108
INF	0.395772	0.453554	0.872602	0.3853
LOGRXR	20.69787	12.06224	1.715922	0.0897
LOGGS	-1.367913	1.669349	-0.819429	0.4148
UNE	0.394461	0.171554	2.299343	0.0239
OIC	14.04808	4.242167	3.311534	0.0013
OIC*UNE	-0.749467	0.333056	-2.250273	0.0269
OIC*INF	-1.589517	0.618280	-2.570870	0.0118

R-squared	0.164026	Mean dependent var	6.336235
Adjusted R-squared	0.097528	S.D. dependent var	8.274774
S.E. of regression	7.860912	Akaike info criterion	7.041338
Sum squared resid	5437.867	Schwarz criterion	7.255033
Log likelihood	-329.9842	Hannan-Quinn criter.	7.127717
F-statistic	2.466635	Durbin-Watson stat	2.014218
Prob(F-statistic)	0.023322		

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.716312	Prob. F(2,86)	0.4914
Obs*R-squared	1.573004	Prob. Chi-Square(2)	0.4554

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Sample: 1 99
Included observations: 96
Presample and interior missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.380873	18.95512	0.020093	0.9840
INF	-0.018022	0.153762	-0.117209	0.9070
LOGRXR	0.012626	4.064891	0.003106	0.9975
LOGGS	-0.123100	0.567400	-0.216955	0.8288
UNE	0.002067	0.058010	0.035625	0.9717
OIC	-0.121109	1.471649	-0.082295	0.9346
OIC*UNE	-0.002141	0.114630	-0.018679	0.9851
OIC*INF	0.011433	0.210419	0.054333	0.9568
RESID(-1)	0.141356	0.116604	1.212272	0.2287
RESID(-2)	-0.081798	0.114117	-0.716792	0.4754

R-squared	0.016385	Mean dependent var	3.13E-15
Adjusted R-squared	-0.086551	S.D. dependent var	2.530402
S.E. of regression	2.637634	Akaike info criterion	4.875974
Sum squared resid	598.3117	Schwarz criterion	5.143094
Log likelihood	-224.0468	Hannan-Quinn criter.	4.983948
F-statistic	0.159180	Durbin-Watson stat	1.932155
Prob(F-statistic)	0.997307		

Appendix 4

Table 6: List of Countries

OIC Countries	**Other Countries**	
Albania	Antigua and Barbuda	Korea, Rep.
Azerbaijan	Australia	St. Lucia
Benin	Austria	Sri Lanka
Burkina Faso	Bulgaria	Lesotho
Bangladesh	Bahamas, The	Moldova
Bahrain	Bolivia	Mexico
Brunei Darussalam	Canada	Macedonia, FYR
Cote d'Ivoire	Switzerland	Mauritius
Cameroon	Chile	Nicaragua
Djibouti	China	Netherlands
Algeria	Colombia	Norway
Gabon	Cabo Verde	New Zealand
Guinea-Bissau	Costa Rica	Peru
Guyana	Czech Republic	Philippines
Indonesia	Germany	Papua New Guinea
Iraq	Dominica	Poland
Jordan	Denmark	Portugal
Kazakhstan	Dominican Republic	Paraguay
Kyrgyz Republic	Spain	Romania
Lebanon	Estonia	Russian Federation
Morocco	Finland	Singapore
Maldives	France	Serbia
Malaysia	United Kingdom	Sweden
Niger	Greece	Thailand
Nigeria	Grenada	Trinidad and Tobago
Oman	Honduras	Ukraine
Pakistan	Croatia	Uruguay
Saudi Arabia	Haiti	United States
Senegal	Hungary	Vietnam
Suriname	India	South Africa
Tajikistan	Iceland	Zambia
Tunisia	Israel	
Turkey	Italy	
Uganda	Japan	

Appendix 5

Table 7: Data: Unemployment rate, Real exchange rate, Real interest rate, GDP growth rate, Gross savings for 99 countries in the year 2012

Country	UNE	RXR	RIR	INF	GDP	GS
Antigua and Barbuda	7.3000	104.088	7.417	3.377	3.312	22.833
Australia	5.2000	109.876	4.920	1.763	3.615	25.333
Austria	4.3000	98.836	5.000	2.486	0.870	24.590
Bulgaria	12.3000	100.569	6.442	2.955	0.601	20.241
Bahamas, The	13.6000	99.546	3.051	1.973	1.832	8.412
Bolivia	3.2000	107.152	3.947	4.586	5.176	25.725
Canada	7.2000	101.708	1.309	1.516	1.709	20.681
Switzerland	4.2000	106.442	2.582	-0.667	1.049	32.800
Chile	6.4000	103.550	8.644	3.007	5.382	21.653
China	4.5000	108.432	3.927	2.652	7.653	51.007
Colombia	10.4000	106.791	9.126	3.177	4.049	19.266
Cabo Verde	7.6000	105.111	9.192	2.543	1.236	31.804
Costa Rica	7.6000	107.699	13.569	4.504	5.134	16.266
Czech Republic	7.0000	99.039	3.719	3.299	-1.021	21.000
Germany	5.4000	95.637	1.500	2.008	0.689	24.187
Dominica	7.5180	94.917	6.866	1.439	-1.184	10.234
Denmark	7.5000	97.068	-2.000	2.411	-0.359	23.612
Dominican Republic	13.0000	100.885	9.746	3.695	3.888	9.586
Spain	25.2000	98.350	5.850	2.446	-1.641	18.934
Estonia	10.1000	100.590	2.347	3.935	3.939	25.007
Finland	7.6000	97.147	1.880	2.808	-1.008	18.633
France	9.9000	96.383	2.540	1.956	0.014	17.519
United Kingdom	7.9000	106.786	-0.610	2.822	0.278	10.863
Greece	24.2000	97.552	-2.400	1.502	-6.973	10.425
Grenada	8.0000	98.706	4.667	2.411	-1.797	-8.898
Honduras	4.8000	117.833	13.846	5.196	3.863	16.558
Croatia	15.8000	96.052	7.491	3.423	-1.870	18.690
Haiti	7.0000	110.133	3.465	6.280	2.885	25.425
Hungary	10.9000	97.757	5.618	5.706	-1.665	20.430
India	3.4000	92.060	3.202	9.312	4.736	30.325
Iceland	6.0000	101.031	5.312	5.195	1.463	9.511
Israel	6.9000	96.203	1.461	1.708	3.352	21.011
Italy	10.7000	98.190	3.586	3.041	-2.368	17.591

Japan	4.3000	100.547	2.339	-0.033	1.447	21.749
Korea, Rep.	3.2000	103.690	4.307	2.192	2.292	34.596
St. Lucia	7.0000	100.063	6.273	4.178	-1.283	10.613
Sri Lanka	4.8000	119.700	4.010	7.543	6.341	23.959
Lesotho	26.5000	94.650	10.826	6.104	6.511	28.849
Moldova	5.6000	110.108	5.120	4.640	-0.700	16.815
Mexico	4.9000	97.536	1.475	4.112	3.983	22.340
Macedonia, FYR	31.0000	97.751	8.336	3.316	-0.400	35.700
Mauritius	7.9000	114.456	5.381	3.852	3.228	14.229
Nicaragua	7.7000	99.107	2.504	7.194	3.355	17.796
Netherlands	5.3000	96.906	0.309	2.454	-1.247	24.779
Norway	3.2000	100.247	2.100	0.709	2.896	39.224
New Zealand	6.9000	107.812	6.327	0.883	2.530	16.252
Peru	4.0000	115.140	16.797	3.654	5.951	26.876
Philippines	7.0000	105.542	3.707	3.172	6.815	42.290
Papua New Guinea	2.3000	129.980	7.820	4.537	8.000	5.330
Poland	10.1000	95.988	5.000	3.557	1.905	17.191
Portugal	15.6000	99.517	10.550	2.773	-3.231	15.561
Paraguay	6.3000	110.042	11.849	3.676	-1.239	15.675
Romania	7.0000	96.590	5.867	3.334	0.354	22.183
Russian Federation	5.5000	106.404	1.510	5.068	3.436	28.123
Singapore	2.8000	110.403	3.852	4.529	2.504	48.082
Serbia	19.6000	92.117	11.531	7.330	-1.523	9.928
Sweden	8.0000	105.682	1.590	0.888	0.928	25.437
Thailand	0.7000	101.520	6.843	3.015	7.667	30.230
Trinidad and Tobago	5.8000	107.053	10.490	9.269	1.522	25.640
Ukraine	7.7000	102.668	9.453	0.556	0.200	15.567
Uruguay	6.0000	105.157	3.566	8.098	3.676	14.859
United States	8.1000	97.991	1.476	2.069	2.779	16.542
Vietnam	2.0000	121.817	2.295	9.094	5.247	31.615
South Africa	25.0000	92.584	4.111	5.414	2.467	12.615
Zambia	13.1000	100.552	5.912	6.576	7.270	28.505
Albania	14.7000	86.393	9.390	2.032	1.300	15.577
Azerbaijan	5.4000	132.639	16.664	1.064	2.200	41.876
Benin	1.0000	94.896	3.500	6.753	5.400	8.230
Burkina Faso	3.3000	98.536	3.500	3.818	9.537	13.680
Bangladesh	4.5000	105.979	4.167	6.218	6.234	39.856
Bahrain	7.4000	95.099	4.881	2.755	3.400	27.629
Brunei Darussalam	3.8000	108.239	5.551	0.464	0.948	25.000
Cote d'Ivoire	4.0000	97.847	5.000	1.313	9.496	11.900
Cameroon	3.8000	96.410	13.380	2.943	4.600	15.126
Djibouti	7.5800	108.089	6.170	3.731	3.003	14.530
Algeria	9.8000	104.769	2.246	8.895	3.300	46.648

Gabon	20.3000	96.434	2.950	2.662	5.600	43.897
Guinea-Bissau	7.5000	96.633	3.500	2.131	-1.450	-0.570
Guyana	21.7000	100.856	7.673	2.392	4.816	11.083
Indonesia	6.6000	93.750	7.101	4.280	6.264	30.687
Iraq	15.1000	97.502	9.660	6.089	9.156	31.481
Jordan	12.2000	111.656	4.096	4.768	2.652	10.565
Kazakhstan	5.3000	102.145	5.500	5.114	5.000	26.186
Kyrgyz Republic	8.4000	114.605	3.767	2.687	-0.089	11.509
Lebanon	8.9000	106.893	1.678	6.537	2.200	15.909
Morocco	9.0000	95.728	3.800	1.279	2.695	25.358
Maldives	11.3000	105.276	8.904	12.131	1.332	-8.169
Malaysia	3.1000	100.100	4.018	1.655	5.640	31.866
Niger	5.1000	102.775	3.500	0.455	10.828	21.611
Nigeria	7.5000	114.484	6.883	12.217	4.279	33.319
Oman	8.1000	109.828	-0.865	2.911	4.986	44.627
Pakistan	5.1000	104.358	7.464	9.685	4.016	20.400
Saudi Arabia	5.6000	99.266	2.000	2.886	5.812	47.295
Senegal	9.9000	93.553	3.500	1.417	3.453	7.369
Suriname	12.7000	103.111	0.067	5.007	3.878	4.563
Tajikistan	11.5000	96.992	11.905	5.831	7.500	16.581
Tunisia	12.8000	96.466	4.750	5.504	4.090	17.449
Turkey	9.2000	92.780	-1.200	8.892	2.127	14.239
Uganda	4.2000	109.034	1.757	14.016	3.411	14.311