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Optimal Islamic Monetary Policy Rule for Malaysia: The Svensson's Approach

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Abstract

The aim of this paper is to determine optimal Taylor rule from Islamic perspective for open and emerging market economies. The method is based on Svensson (2000). The idea that monetary policy is not only concerned in conventional interest rate instrument, but also in Islamic interest rate instrument, constitutes the basis for the analysis. Further, the paper intends to explore the welfare gain. Using data from Malaysia, the empirical results indicate that (1) monetary policy responses of central bank to output gap, inflation and exchange rate are in accordance with expectations and are economically meaningful and, (2) Islamic monetary policy rule predicts better where *riba* is prohibited in the economy and (3) the specified instrument policy rule have to be considered as optimal in general.

Keywords: Grid search, Islamic economics, optimal monetary policy rule, reaction function, Taylor rule
JEL Classification Codes: C61, E5

1. Introduction

The aim of this paper is to determine optimal Taylor rule (TR) from Islamic perspective for open and emerging market economies using the example of Malaysia.[1] The idea that monetary policy is not only concerned in conventional interest rate instrument, but also in Islamic interest rate instrument, constitutes the basis for the analysis. Further, the paper intends to explore the welfare gain. This idea emerged because no central bank has so far published their explicit loss function [2] (McCallum and Nelson, 2004), be it for the reason of not wanting to publish it, or because such an explicit formula simply does not exist. Indeed, the natural problem an economist then faces is the correct parameterization of a loss function which no body has ever seen.

[1] Central Bank of Malaysia stated that they "takes price stability as the most important objective of its monetary policy" for a sustainable economic growth.

[2] In this paper, the lost function equation indicating the cost or loss to society associated with twin "evils" of deviations of inflation from equilibrium (desired) rate and deviations of output from potential (full employment) levels.

In conventional economics, the topic of monetary policy rules has undergone a long history evolution in macroeconomics. [3] Taylor (1993: 202) chose a specification for the TR – conventional interest rate instrument – that reflected "the general properties of the rules that have emerged from recent research", picking round numbers for the rule's coefficient "that make for a straightforward discussion".[4] Other researchers have computed policy rules that are optimal, respecting to a particular macroeconomic model and loss function (see Ball, 1997 & 1999; Clarida et al., 1999; Jaaskela, 2005; Jensen, 2003; Jondeau & Le Bihan, 2000; Svensson, 2000; Walsh, 1993). Meanwhile, other researchers have computed rules that maximize a representative agent's welfare in a typically small dynamic stochastic general equilibrium model (see Adjemian et al., 2007; Jondeau & Sahuc, 2008; Sofia et al., 2008; Woodford, 2003).

Similar case can be found in conventional economics, Islamic economics may face same macroeconomic issues like economic growth and price stability. While price stability or inflation is incompatible with the goals of an Islamic economy, prolonged recession and unemployment that cause human sufferings are also unacceptable. Monetary policy has, therefore, to aim at high rate of economic growth with full employment and utilization of productive resources. However, it should not lead to an excessive and overly-rapid use of Allah-given resources at the expense of future generations, and it should not harmful to present or future generations. Thus the role of monetary policy in Islamic economics is undeniable essential. Since in conventional economics, however interest rate is the key instrument for executing monetary policy. Prohibiting variable, which performs as a fundamental pillar in Islamic economics would cause problems in the process of monetary policy in Muslim countries than countries with conventional economic system.

From theoretical view, Islamic economics is different from conventional economics because interest rate – *riba* – is prohibited in Islam, for example, banks are not allowed to offer a fixed rate of return on deposits and are to charge interest on loans. An exclusive feature of Islamic economics is its profit-and-loss sharing paradigm, which is predominantly based on the Mudharabah [5] (profit sharing) and Musyarakah [6] (joint venture) concepts of Islamic contracting. Under the profit-and-loss paradigm, the assets and liabilities of Islamic financial system are integrated in the sense that borrowers share profits and losses with the financial institutions, and similarly sharing profits and losses with depositors. Advocates of Islamic economics, thus, argue that Islamic financial system is theoretically better structured than conventional financial institutions in term of absorbing external shocks because the financial institutions' financing losses can be partially absorbed by the depositors (Khan and Mirakhor, 1989; Iqbal, 1997). Correspondingly, the profit-and-loss paradigm featured the risk-sharing function, in theory, allows Islamic banks make a longer-term basis loan with higher risk-return profiles and, ultimately, to promote economic growth (Chapra, 1992; Mills and Presley, 1999).

In Malaysia, the establishment of the Islamic interbank money Market (IIMM) in 3th January 1994, which implied a short-term intermediary providing a ready source of short-term investment outlets based on Islamic law (*Sharia*) principles had well-developed. The Islamic interest rates then were introduced and applied in conjunction with the Islamic interbank money market, in which can be

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[3] Conventional economics call itself as positive economics, which only explain the rationale behind the facts without making any moral judgment. Still, conventional economics literature seems to favor efficiency, equity, growth, and to oppose unemployment and inflation.

[4] The original Taylor (1993) rule established:

$$i_t = r^* + \beta_1(\pi_t - \pi^*) + \beta_2 y_t$$

where i_t, π^*, r^*, π_t, y_t denote the nominal interest rate, the target inflation rate, the equilibrium real interest rate (constant), the rate of inflation over the past year and the output gap, respectively.

[5] Mudharabah contracts typically are profit-sharing agreements, in which a bank provides the entire capital needed to finance a project, and the customer provides the expertise, management and labor. The profits from the project are shared by both parties on a pre-agreed (fixed ratio) basis, but in the cases of losses, the total loss is borne by the bank.

[6] Musyarakah contracts are similar to joint venture agreements, in which a bank and en entrepreneur jointly contribute capital and manage a business project. The profit and loss from the project is shared in a predetermined way. The joint venture is an independent legal entity, the bank may terminate the joint venture gradually after certain period or upon the fulfillment of a certain condition.

viewed as an approach fulfilled with Islam's general vision of a moral economy. In addition, the determination of Islamic interest rates was justified according to the Mudharabah basis, in which it increases the efficiency of short-term intermediary.

Remaining portion of the study is organized as follow. Section 2 discusses the analytical framework of this paper. Methodology and data have been discussed in section 3. Section 4 includes results and finally Section 5 concludes the study.

2. The Model

The most appropriate means to identify a policy reaction function is through the construction of an entire macro model. This includes an IS curve, a Philips curve, a loss function for the authority, *et cetera*. In this paper, the model used to evaluate the performance of monetary policy rule is based on Svensson (2000). Among others, it is used by Ball (1997 and 1999) and by Jondeau & Le Bihan (2000). Consider the following standard macroeconomic model, with y the output gap, π the inflation gap, Δe the changes in real exchange rate [7] and Δr the changes in the real interest rate, supposed to be the instrument of the central bank.

$$y_t = \lambda y_{t-1} - \beta \Delta r_{t-1} - \delta_1 \Delta e_{t-1} + \varepsilon_t \quad (1)$$

$$\pi_t = \alpha y_{t-1} + \pi_{t-1} - \delta_2 \Delta e_{t-1} + \eta_t \quad (2)$$

$$\Delta e_t = \theta \Delta r_t + v_t \quad (3)$$

π, Δe, Δr and y are centered (i.e. are expressed in terms of gap with their equilibrium value). Parameters λ, α, and θ are positive. The macroeconomic model above is written in logarithms form (except for the real interest rate and inflation).

Equation (1) is an open economy IS curve. Output gap depends positively on its own past value; negatively on the Δr and the Δe. In addition, ε_t is a demand shock – that is a shock in demand in excess of that which is ascribable to the Δr and the Δe. The period length is assumed to be quarter so that a change in Δr or Δe translate into a change in demand with a one-quarter lag.

Equation (2) is an open economy Phillips curve. The change in inflation depends positively on the lag of y, and a shock; negatively on the lagged Δe. Pressure in the economy – a positive output gap leads to higher inflation. In the first stance, high demand for goods and services results in firms increasing prices. Secondly, higher activity normally pushes up the cost level.[8]

Inflation is influenced by the exchange rate – consumer prices are a combination of prices for domestically produced and imported goods and services. Changes in the exchange rate will therefore affect consumer prices, in that prices for imported goods will change.[9] This will in turn affect prices for domestically produced goods as a result of competition and changes in firms' costs – due to changes in prices for imported intermediate goods and changes in wages as a result of changes in consumption-based real wages.

The variable η_t is the cost push shock in the model and shows the rise in inflation as a given level for the output gap and exchange rate. The most obvious shock would be an increase in wages over and above that indicated by the activity level, but it could also be caused by an increase in international commodity prices that pushed up enterprises' production costs.

Equation (3) posits a link between the interest rate and exchange rate. It captures the idea that a rise in the interest rate makes domestic assets more attractive, leading to an appreciation. The shock v_t captures other influences on the exchange rate, such as expectations, investor confidence, and foreign

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7 An increase in real effective exchange rate (REER) represents a real appreciation while a decrease represents a real depreciation of the domestic currency relative to its trading partners.

8 e.g. The trade unions will demand higher wage increases and employers will outbid each other in the competition for labor.

9 i.e. The inflation is passed directly into import prices.

interest rates. Equation (3) is similar to reduced –form equations for the exchange rate in many textbooks (Ball, 1999: 3).

The fourth equation is the TR. Firstly, we suppose that central bank targets one-period lagged output gap and inflation (one period corresponds to one quarter). This backward looking TR is then given by:

$$\Delta r_t = \beta_y y_{t-1} + \beta_\pi \pi_{t-1} - \delta_3 \Delta e_{t-1} + \zeta_t \tag{4}$$

with theoretical signs of the parameters that β_y & β_π > 0, and δ_3 < 0. As Δr_t is the real terms, the Taylor principle is satisfied; a one-percent increase in the inflation rate lead to a more than one percent increase of the nominal interest rate (so as to insure an increase of the interest rate in real terms). ζ_t represents monetary policy shocks (e.g. discretionary decisions of the central bank). The inclusion of the exchange rate variable (Δe_t) exactly aims to exploring the extent to which this variable is taken into account for monetary policy decisions. If shocks to exchange rate are large and persistent and the central bank places a higher weight on exchange rate stability, the study would expect significant negative coefficient on the exchange rate. For example, recurrent exchange rate depreciations may induce the central bank to increase interest rates to avoid price increases and hence keep inflation under control (particularly if a high pass-through prevails). It also provides for a simple tool to explore the nature of the documented fear of floating phenomenon.[10]

Following Woodford (2003), the central bank's objective is to minimize the following loss function, subject to the model of the economy described above:

$$E_t \sum_{\tau=0}^{\infty} \beta^\tau L_{t+\tau} \tag{5}$$

where the period loss function is modeled as

$$L_t = \mu_y (y_t)^2 + \mu_\pi (\pi_t)^2 + \gamma (\Delta r)^2 \tag{6}$$

and where μ_y, μ_π and γ denote weights attached to the stabilization of inflation, output gap and interest rate, respectively. Equation (6) implies that the exchange rate does not enter explicitly the loss function. The reason for the omission is that changes in the exchange rate are reflected in the changes in the output gap (Guender, 2005). Consequently, there is no need for the real exchange rate to appear as a separate argument in the loss function. Further, as the discount factor β approaches unity, it can be shown that the loss becomes proportional to the unconditional expected value of the period loss function. This equation is given by:

$$L_t = \mu_y V_y + \mu_\pi V_\pi + \gamma V_r \tag{7}$$

with V_y and V_π respectively the unconditional variance of the output and inflation. The variance of the monetary policy instrument is often inserted in the loss function of the central bank, V_r, to avoid an unrealistic situation of the high interest rate volatility. μ_y, μ_π and γ are the weighs attributed to the output gap stabilization, inflation, and interest rate. Finally, the optimal monetary policy rule is then $(\beta_\pi^*; \beta_y^*)$ which minimizes L, given the weights of μ_y, μ_π and γ (to be discussed in the next section).

3. Methodology and Data

From Section 2, the equation (1) to equation (4) provide the basis for formulating the optimal TR. This section considers the specification of the model. An empirical econometric method is used to examine the effect of all the suggested explanatory variables on macroeconomic model in (Section 2). Then, the coefficients obtained from the estimation may used to find the optimal reaction coefficients that minimize the loss function. The measurement involves the "grid search approach".

[10] Countries that say they allow their exchange rate to float mostly, in practice they do not (cf. Calvo and Reinhart, 2002).

Generalized Method of Moments

The generalized method of moments (GMM) was first proposed by Hansen (1982). Its generality makes several other estimators its special cases; in particular, under certain conditions, it is identical to the instrumental variable (IV) estimator. The main idea that distinguishes GMM from the ordinary least square (OLS) methods is that the regression model does not have to be linear function of the parameter of interest. GMM allows estimating such equations without resorting to linearization techniques and potentially losing valuable information in the process. So imposing linearity makes least squares models a special case of the GMM estimator. In addition, in the structural macroeconomic models, GMM allows us to estimate models of several equations with the same coefficients featuring in different equations. The most important step in the GMM procedure is the assumption that the independent variables involved are unrelated to the equation's residual.

In this paper, we have four equations for set of backward looking TR (from equation (1) to equation (4) in Section 2) that simultaneously determine the evolution of the variables. If we tried to estimate each equation separately, we would expect endogeneity to be palpable problem, because all four variables would be expected to interact through the four equations. Moreover, expectations about future values of variables cannot be considered exogenous because they depend on both past and current realizations of variables in the system. As the previous sections have outlined, we can use GMM to work around this issue (see e.g. Greene, 2000: 647; among others). In particular, to compute the GMM estimates we start with an identifying weighting matrix, get a first set of coefficients, use these to update the weighting matrix and finally iterate coefficients to convergence. To compute the HAC standard errors, we adopt the Newey and West (1994) approach with a Barlett kernel and fized bandwidth. These calculations are carried out with Eviews 5.1. Again, lags of variables in the system or other variables that may be considered exogenous can be uses as instruments.

Grid Search Approach: Finding the Optimal Reaction Coefficient

Grid search method is a direct search algorithm for solving nonlinear optimization, which requires objective functions. This methodology involves setting up of grids in the decision space and evaluating the values of the objective function at each grid point. The point which corresponds to the best value of the objective function is considered to be optimum solution.

Optimization in poorly modeled, noisy and complex domains is an important problem that is faced in many scientific and engineering areas. In such domains, traditional optimization algorithms, such as the simplex method (Nelder and Mead, 1965) or the Levenberg-Marquardt algorithm (Levenberg, 1944), do not yield satisfactory results and are usually very sensitive to the starting search points provided by the user. For these reasons, non-traditional optimization algorithms, including simulated annealing (Kirkpatrick et al., 1983), genetic algorithms (Holland, 1975; Goldberg, 1989) and hybrid evolutionary-classical algorithms (Nicholas and Patrick, 1994), have been proposed. While good results have been reported, the running times of these algorithms are often high, and they are not well suited to all domains (Fuentec and Solorio, 2004). Thus, more efficient and complementary algorithms are desirable.

Ruud (2000: 349) explained a simple and reliable method for finding roots of nonlinear equations and maxima of functions over closed intervals is a grid search. Levieuge (2008) provided technical tools for determining optimal TR in simple macroeconomic model. He revealed that a grid search procedure is time-consuming. But this method can easily be implemented when models are large enough and subject to matrix singularity. In other words, grid search approach is a reliable method.

This study solves the optimization problem by applying technique explained in Levieuge (2008).[11] To apply the grid search technique, equation from one to four in Section 2 that follow a

[11] The RATS program in estimating the optimal reaction coefficients and the loss function are from Levieuge (2008: 18).

backward looking rule can be written as a general matrix system to define the following state-space form model:

$$A_1 X_t = A_2 X_{t-1} + W_t \qquad (8)$$

so that

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & -\theta & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & -1 & 1 \end{bmatrix} \begin{bmatrix} y_t \\ \pi_t \\ \Delta e_t \\ \Delta r_t \\ z_t \end{bmatrix} = \begin{bmatrix} \lambda & 0 & -\delta_1 & -\beta & 0 \\ \alpha & 1 & -\delta_2 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ \beta_y & \beta_\pi & -\delta_3 & 0 & 0 \\ 0 & 0 & 0 & -1 & 0 \end{bmatrix} \begin{bmatrix} y_{t-1} \\ \pi_{t-1} \\ \Delta e_{t-1} \\ \Delta r_{t-1} \\ z_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_t \\ \eta_t \\ v_t \\ \zeta_t \\ 0 \end{bmatrix}$$

with Ω the covariance matrix associated to W. The system can be written like $X_t = BX_{t-1} + S_t$ but now with:

$$B \equiv A_1^{-1} A_2 \qquad (9)$$

$$S \equiv A_1^{-1} W_t \qquad (10)$$

It follows that Σ, the covariances matrix associated with the error terms S is given by $\Sigma = E[SS'] = E[(A_1^{-1}W_t)(A_1^{-1}W_t)'] = A_1^{-1}\Omega(A_1^{-1})'$.

Since the objective of the central bank is to minimize a standard quadratic loss function (L), subject to the model of the economy:

$$\begin{cases} \underset{\{\beta_\pi, \beta_y, r\}}{Min} & L = \mu_y V_y + \mu_\pi V_\pi + \gamma V_r \\ s.t. & X_t = BX_{t-1} + S_t \end{cases}$$

Following the works of Jaaskela (2005) and Rudebusch & Svensson (1999) that set μ_y and μ_π equal to one; Jaaskela (2005) and Smets (2002) set $\gamma = 0.25$. This study set $\mu_y = 1.0$, $\mu_\pi = 1.0$ and $\gamma = 0.25$, which ensures the stabilization of the output gap, inflation and the interest rate.[12] As the fact central banks always move their instrument in moderate steps, V_r is often the variance of the interest rate volatility, i.e. $Var(r_t - r_{t-1})$. To consider this case, it is necessary to add an identity formula, $z_t = r_t - r_{t-1}$, in the system as shown above. The optimal monetary policy rule is then the couple $(\beta_\pi^*; \beta_y^*)$ which minimizes L, given the weights of μ_y, μ_π and γ.

Following Svensson (2000), the unconditional contemporaneous covariance matrix of X, devoted V, is given in vector form by:

$$Vec(V) = [I - B \otimes B]^{-1} Vec(\Sigma) \qquad (11)$$

with Σ the covariance matrix of S. Following this result, unconditional variances for the output gap (V_y) and inflation (V_π) are obtained by selecting the appropriate component in $Vec(V)$. The method consists then, given $(\beta_y; \beta_\pi)$ in solving this sequence:

$$(\beta_y; \beta_\pi) \Rightarrow B, S \text{ and } \Sigma \Rightarrow VecV \Rightarrow L \qquad (12)$$

In this backward looking rule example, V_y, V_π and V_r are then given by the 1^{st}, the 7^{th} and 25^{th} element of $VecV$. Note that considering the 19^{th} instead of the 25^{th} – element of $VecV$ comes down to consider the previous case, with $Var(r_t)$, instead of $Var(\Delta r_t)$, in the loss function.[13]

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[12] The appropriate values of the loss function remain debatable (see Levin and Williams, 2003). The parameter values chosen here are fairly standard in the policy rules literature (Jaaskela, 2005: 146).

[13] According to this viewpoint, this case is more general.

Data

The data of Malaysia are quarterly from quarter one 1995 to quarter one 2007. All prices series are seasonally adjusted. As an exchange rate variable, this study uses the real effective exchange rate index (2000=100) that indicates that an increase in index means appreciation. As a monetary policy variable, the Islamic interbank rate as interest rate is used for Malaysia. The output applying in this study is gross domestic output (GDP), which is known national output or income. The data sources are IMF, *International Financial Statistics (IFS)*, CD-ROM. The specific details are described as follows:

Islamic interbank rate:	The series of Islamic interbank rate is taken from ECONSTATS in monthly basis from month nine 1998 to month twelve 2006. Since the quarterly series of Islamic interbank rate are inaccessible, alternatively, however those data can be interpolated from monthly series using RATS procedure DISTRIB to yield quarterly series.[14]
Exchange rate:	The quarterly series of the real effective exchange rate (REER) index (2000=100) is obtained from IFS.
Gross domestic product:	The quarterly series of the gross domestic product (GDP) is taken from IFS.
Consumer price index:	The quarterly series of consumer price index (CPI) is taken from IFS. The inflation rate is takes the first difference of the log of CPI level.

As noted earlier, the output gap is the difference between current output and potential output, inflation gap is the difference between current inflation and desired inflation, real interest rates is the difference between current real interest rates and real interest rates at potential output, and real exchange rate is the difference between current real exchange rate and real exchange rate at potential output. The potential output, desired inflation, interest rates at potential output, and exchange rate at potential output are constructed by using Hodrick-Prescott (HP) filter. The smoothing parameter, λ, set is equal to 1600.

The time series "Output Gap" is calculated by the difference of the logged time series of current output and potential output, and then multiplied by 100. Similarly, the time series "changes in the real exchange rate" is calculated by the difference of the logged time series of current REER and potential REER. To yield percentage point changes the time series is multiplied by 100. Difference between the current real interest rates and the potential real interest rates is calculated to gain a percentage point change to derive time series "changes in the real interest rate".[15] These time series are stationary.

4. Empirical Analysis and Results

The estimated model parameters for policy reaction function, using GMM and quarterly data for Malaysia from 1995 quarter one to 2007 quarter one, are reported in Table 1. From Table 1, the J-statistics statistically confirm that the null hypothesis of the instruments variables is exogenous. In other words, the null hypothesis is not rejected for the estimate.

The estimated parameters for all explanatory variables are in expected sign and significant. Starting with the estimated IS curve parameters, output gap (λ) process in estimate for policy reaction function is less weight. This would suggest that past output gap on the current output is lesser in the estimate. The strength of the interest rate transmission channel of monetary policy is higher in the estimate, in which the β estimate is -0.6. Further, the estimated elasticity of output to changes in the real effective exchange rate suggests that stabilization of output could be effective through the exchange rate transmission channel (see Bofinger and Wollmershauser, 2003; Pei-Tha and Kian-Teng, 2008; McKinnon, 2003).

Consider now the estimated Phillips curve. The elasticity of inflation to an increasing output gap proposes that given increase in capacity utilization (demand pressure) will be translated into

[14] The interest rate is justified according to Mudharabah basis with which it fulfills the principles of Islam. The codes for interpolation (i.e. RATS procedure DISTRIB) is available at www.estima.com/Interpolation.shtml

[15] To derive the real interest rate the quarterly inflation rate was subtracted from the quarterly nominal interest rate.

marginal costs. The elasticity of inflation to depreciation of the exchange rate suggests that depreciation causes the domestic currency price of the foreign goods increase.[16] A positive link between the interest rate and exchange rate of the estimate, the parameter of the exchange rate (θ) suggest that a higher real interest rate leads to a stronger real exchange rate.

Following the Table 1, the estimate of the β_y coefficient for policy reaction function suggests that a positive output gap – overheating – may induce higher than desired inflation. This should be offset through tightening monetary policy and vice-versa. It should be noted however that the coefficients of output gap is not exactly the same as Taylor (1993) proposes but it is significantly from that, as estimated by Wald coefficient restriction test.[17] The estimate of the β_π coefficient is less than one, which it means that central bank pro-cyclically responds to inflation deviation from the desired level. In addition, the estimate of the δ_3 coefficient suggests that the exchange rate constitutes an indicator for monetary policy.

Next, the macroeconomic model in Section 2 – equation one to four – is calibrated with the parameters of the estimate for policy reaction function in Table 1. The parameters of the estimate are λ = 0.519, β = 0.624, δ_1 = 0.113, α = 0.111, δ_2 = 0.043, θ = 1.059, and δ_3 = 0.089. The preference parameters of μ_y, μ_π, and γ are fixed to 1.0, 1.0, and 0.25, respectively.[18] From Table 2, the minimum of the loss function is computed. It is obtained with so-called optimal reaction coefficients – β_π^* and β_y^*.

According to the results reported in the Table 2, the optimal Islamic monetary policy rule of the estimate is $\Delta r_t = 0.4 y_{t-1} + 0.85\pi_{t-1}$ for μ_y = 1.0, μ_π = 1.0, and γ = 0.25. Since, societal loss function is in line with a welfare maximizing policy that aims at the minimization of the output gap and inflation gap.[19] The loss function is 12.51; the variances V_y, V_π and V_r are 5.70, 5.79 and 3.35, respectively. This suggests that the Islamic interest rate instrument follows the Islamic law (*sharia*). In other words, Islamic monetary policy promotes the economic growth and employment. Moreover, this policy also promotes the goal of distributive justice and prevents concentration of wealth and economic power in an economy. Several results for various values of μ_y are also reported.

[16] An increase in the exchange rate forces up the optimal price level, in which *ceteris paribus*, induces firms to raise the price of their output so as to minimize the deviation between the optimal price and the actual price charged. At the aggregate level the increase in the domestic price level causes the rate of inflation to rise (cf. Guender, 2005: 192).

[17] Estimate for Islamic policy reaction function – hypothesis: coefficient of output gap = 0.5; Chi-square statistics = 122.99; p-value=0.00.

[18] See again footnote 12.

[19] Although inflation is incompatible with the goals of an Islamic economy but ignoring the effect of inflation may cause human sufferings. Thus this effect is taking into consideration along with the concept of “sustainable development” to avoid harmful to society (cf. Manchester Center for Public Theology, 2006)

Table 1: GMM Estimations for the Policy Reaction Function

Parameter	Estimate for Islamic Policy Reaction Function
λ	0.5194 *** (0.0764)
δ_1	- 0.1128 ** (0.0484)
β	- 0.6239 * (0.3207)
α	0.1107 *** (0.0125)
δ_2	- 0.0429 *** (0.0081)
θ	1.0587 * (0.5949)
β_y	0.0958 *** (0.0364)
β_π	0.6515 *** (0.2257)
δ_3	- 0.0894 ** (0.0376)
J-statistics nJ-statistics p-value	0.2983 14.6163 0.997[a]

Notes: Standard errors are in the parentheses. *, **, and *** denotes statistical significance at the 10%, 5% and 1% levels respectively. The instrumental variables list for the two estimates above includes lags of output gap, lags of inflation, lags of interest rate and lags of exchange rate. nJ-statistics is the J-statistics reported in the Eviews are multiplied by the number of regression observations. [a] denotes do not reject the hypothesis that the overidentifying restrictions are orthogonal to the errors at the 5% level of significance.

Table 2: Estimate for Islamic Policy Reaction – Various Results Depending on μ_y, μ_π, and γ

Preference	β_y^*	β_π^*	V_y	V_π	V_r	L
$\mu_y = 0.0, \mu_\pi = 1.0, \gamma = 0.25$	0.25	1.60	12.62	3.91	5.42	5.27
$\mu_y = 0.3, \mu_\pi = 1.0, \gamma = 0.25$	0.25	1.00	7.33	5.01	3.43	8.07
$\mu_y = 0.6, \mu_\pi = 1.0, \gamma = 0.25$	0.40	1.00	6.56	5.28	3.69	10.14
$\mu_y = 1.0, \mu_\pi = 1.0, \gamma = 0.25$	0.40	0.85	5.70	5.97	3.35	12.51

Finally, in order to ascertain the forecasting advantage of using the optimal monetary policy rule to track the evolution of the current short-term interest rates. This paper computes simulated fitted values of the optimal monetary policy estimated rule. As an illustration of the results, Figure 1 depicts the interest rate (continuous line) and the within sample predictions obtained by the optimal monetary policy rule (dotted line). The Islamic optimal monetary policy rule demonstrated that it could be a good approximation to judge the usefulness of the model and the estimation (see Figure 2). Moreover, the Islamic optimal monetary policy rule is quite frequently within the $\pm 2\sigma$ broad bands arising from the current short-term interest rates.

The deviations of the results from expectations are not very serious. These deviations can be explained by different reasons. A first reason may be shortcoming in the theory used. That counts in particular for the simplifying modeling of the transmission process, which assumes only output gap, inflation gap and the changes in real exchange rate. Other important measures such as changes in technology, fiscal policy, changes in regulations, and factor prices are exogenous to the model. Another important reason for deviations of model outcomes from expectations may lay in the fact that the Central Bank of Malaysia has not followed a monetary policy approach that would optimal within the model. On the contrary, in the framework of this model the results of the instrument policy rule have to be considered as optimal in general.

Figure 1: Optimal Islamic Monetary Policy Rule

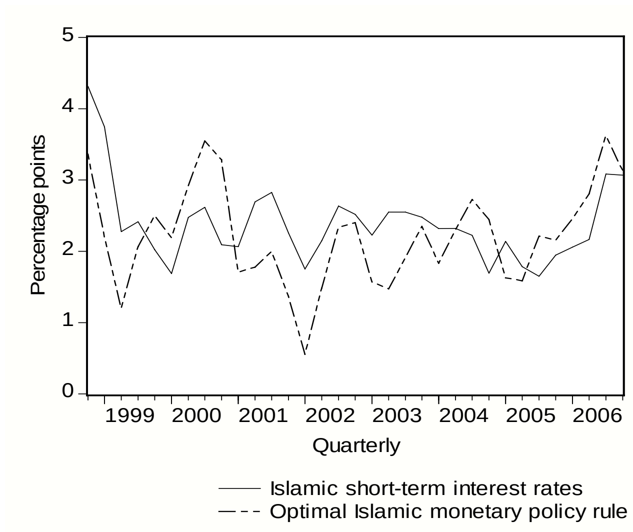
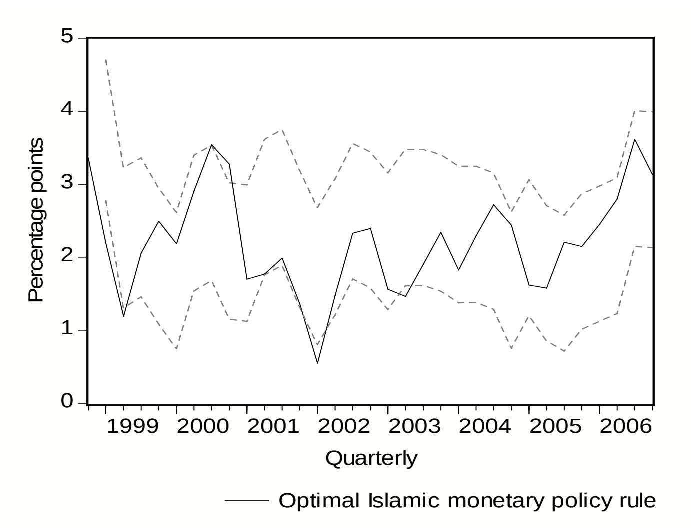


Figure 2: Optimal Islamic Monetary Policy Rule (with short-term interest rates 95% confidence band)



5. Conclusions

This paper contributes to the assessment of Islamic monetary policy rule by assessing the merits of the estimate for monetary policy reaction function. The study uses macroeconomics model to evaluate the performance of this policy rule where the monetary authorities may employ a loss function on output gap, inflation gap and interest rates from equilibrium values.

In sum, the results derived from monetary policy responses of central bank to output gap, inflation and exchange rate are in accordance with expectations and are economically meaningful. The results suggest that the Islamic interest rate instrument applied to TR is superior. Additionally, it was shown that the Islamic monetary policy rule predicts better where riba is prohibited in the economy.

Further research should incorporate additional explanatory variables into the model. A further question is whether or not central bank can follow the recommended policy or whether central bank should consider other policy rules.

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