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Taylor Rule-based Monetary Policy for Developing Economies- A Case Study with Malaysia

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This paper investigates whether Taylor rule can better guide the monetary policy in developing economies. Existing literatures do not focus on the implementability of rule-based monetary policy in emerging economies. In last two decades a number of industrialised countries have gained success in achieving macroeconomic policy goals by switching to rule-based policy regime from discretionary framework but emerging economies, in this regard, could not make much progress. As a case study, the paper examines whether macroeconomic performance of Malaysia could be improved through the implementation of Taylor rule as a monetary policy. Counterfactual historical simulation confirms that Taylor rule-based monetary policy improves overall performance of Malaysian economy through lowering output variability by a considerable amount. Findings of this study yield some incentives to propose rule-based monetary policy for developing economies.

Field of Research: Monetary Policy Rule, Developing Countries.

1. Introduction

This is widely believed that inappropriate monetary policy decisions like price, availability of credit, expansion of monetary aggregates result in damaging effects on monetary policy objectives of price and output stabilization. The best approach of monetary policy formulation and implementation remained controversial to a large extent. Industrial economies, in recent years, have undergone considerable changes in policy formulation in the wake of rapid developments in financial markets. Being independent and credible to a certain degree, monetary policy is implemented by the central banks in most of the industrialised economies through market oriented instruments with the aim of influencing short-term interest rate. There is a consensus regarding the success of monetary policy in advanced economies compared to the developing ones. The fundamental source of this success lies in the fact that since early 1990s the advanced economies rather focused on rule-guided monetary policy. It has been suggested by historical evidence that monetary policy rules, rather than discretion, can work well in the real world in that macroeconomic performance has been better when central bank decisions were described by such rules. A successful monetary policy strategy results in less variability in inflation and output. Inflation and output variabilities are seemed to be higher under discretionary policy framework.

This paper examines whether the central bank of Malaysia formulates any rule-guided policy or only employs full discretion while implementing monetary policy. As a benchmark, we accept the Taylor (1993) rule in which target rate of nominal interest depends on inflation and output gap. Unlike many other developing

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economies, Malaysian economy has undergone several researches related to the effectiveness of monetary policy but there is little study available that investigates the suitability and implementability of rule-based monetary policy in this economy. This is not very unreasonable because developing countries with weak financial institutions, low credibility of monetary institutions, currency substitution, liability dollarization and sudden stops in capital inflows do not have enough scope or credibility to launch a simple monetary policy rule in a complex economic structure. Nevertheless, a number of developing countries including Thailand, Indonesia, and Korea have already switched and some are attempting to switch towards rule-based policy with the objective of lowering inflation and output variability. There are some literatures that empirically investigate the suitability of rule-based policy in developing countries like India, Pakistan, China and many others. One study conducted by Mishra and Mishra (2009) justifies the suitability of rule-based inflation band targeting monetary policy strategy for India. Another research by Malik and Ahmed (2007) firmly suggests that Pakistan can adopt Taylor rule-based monetary policy. As I am aware of, this paper is the first effort to explore the implementability of Taylor rule-based monetary policy in Malaysia. The hypothesis that interest rate setting of Bank Negara Malaysia (BNM)- the central bank of Malaysia is guided by Taylor rule is examined by using quarterly data of last 30 years until 2010. We also hypothesize that Taylor rule-guided monetary policy is able to improve macroeconomic performance of Malaysia.

The paper is organised as follows. Literatures on money-price causality, rules versus discretion and different types of monetary policy rules are reviewed in Section II. Source of data and methodology of the study are presented in Section III. Empirical results are illustrated in Section IV. Conclusion and principal limitations of the study are documented in Section V.

2. Literature Review

2.1 Money and Prices

Monetary policy in Malaysia and in many other developing countries is rudimentary, discretionary, nontransparent, ad hoc and reactive rather than proactive in nature (see e.g. Malik, W.S. and Ahmed, A.M. 2007). Several distorting factors appear in the overall functioning of monetary policy in these economies. Instability of money demand function is one such that weakens the link between monetary aggregates and inflation. A stable relationship between money supply and inflation is not revealed by Malaysian data for the period between 1980:Q1 and 2010:Q2. A negative correlation between money and inflation is yielded by the whole sample although a positive correlation is generated by few subsamples. Monetarist view of inflation being fully monetary phenomenon in Malaysia has been challenged by the unstable relationship between money supply and inflation. On the other hand, it is viewed by the structuralists that inflation is the consequence of structural bottleneck in the development process but there is no reason why it should be the actual scenario in Malaysia. In order to resolve the controversy between monetarists and structuralists, a handsome amount of researches have been carried out without the establishment of unanimous link between monetary aggregates and inflation. Quarterly data from 1970:Q1 to 1992:Q4 have been used by Abdullah and Yusop (1996) in order to analyse the causal relationship between growth rate of money supply and inflation rate in Malaysia. A unidirectional causality running from money

supply to inflation rate regardless of the lag structure has been discovered by them. Based on 122 quarterly observations starting from 1980, similar result has been obtained only when growth of money supply is taken into account instead of level of money supply. The causality between money supply and inflation has been investigated by Mashi and Masih (1998), Lee and Li (1985), Tan and Cheng (1995), Tan and Baharumsah (1999), Tang (2004), Toda and Yamamoto (1995). Most of them found that the causal effect runs from money supply to aggregate prices in the short run but there is no evidence of reverse causality. The results influenced them to consider monetary policy as a good choice for price stability in Malaysia. Recently the causality between money and prices has been successfully investigated by Tang (2008) with the conclusion that monetarists' views exist in Malaysian economy although the relationship is not stable throughout.

Causality however is not examined by this paper, rather the suitability of a rule-based monetary policy in Malaysia has been examined. Nevertheless, the issues of causalities have been digressed above since the success of monetary policy would be depending on whether policy can influence inflation and output.

2.2 Monetary Policy Rules Rather than Discretion

Monetary policy rule was defined by John B. Taylor as a description- expressed algebraically, numerically, graphically- of how the instruments of policy such as the monetary base or the interest rate, change in response to economic variables. Monetary policy rule was further defined by Svensson (1998) as a prescribed guide for monetary policy conduct. In the context of developing country, Rangarajan's (1997) definition of monetary policy appears as just a tool to achieve the broad economic policy objectives of faster rate of economic growth, a reasonable degree of price stability and promotion of distributive justice.

Economists have been interested in monetary policy rules since the emergence of economics as a distinct discipline. Adam Smith first delved into the subject monetary policy rules in the *Wealth of Nations* arguing that "a well-regulated paper-money" could have significant advantages in improving economic growth and stability compared to a pure commodity standard (see J.B. Taylor and J.C. Williams, 2010). In order to avoid the financial crises like hyperinflation or Great Depression, Rule-guided monetary policy was proposed by Henry Thornton and David Ricardo in the 19th century, Irving Fisher and Knut Wicksell in the 20th century. Constant growth rate rule was proposed by Milton Friedman with the aim of avoiding the flaws that caused Great Depression. Finally, with the aim of ending the severe price and output instabilities during the Great Inflation of 1960s and 1970s, Taylor (1993) rule was proposed by Stanford university professor John B Taylor.

Two kinds of monetary policy rules have been distinguished by Svensson (1998). Those are targeting rules and instrument rules respectively.

2.3 Targeting Rules

The assignment of a particular loss function that is to be minimised is the main focus of targeting rules. Monetary policy is described by this approach in terms of objectives and constraints the policy makers face. The ''targeting-rules'' approach

has been advocated by Svensson (2001) on the grounds that it better captures the essence of monetary policy making in inflation-targeting countries. A vector of target variables, a vector of target levels and a corresponding loss function that is to be minimised are specified by targeting rule. At a more specific level, a targeting rule can be expressed as an equation or a system of equations that the target variables must fulfil (Svensson, 1998).

There are two types of targeting rules, ‘‘general targeting rule’’ and ‘‘specific targeting rule’’. An operational loss function which the monetary policy is committed to minimise is specified by a general targeting rule. In specific targeting rule, a condition for setting the instrument is specified (Malik, Ahmed 2007). An implicit reaction function of the monetary authority is given by this that needs not to be announced. According to this type of framework, large amount of data are collected by the central banks and then the policy is formulated in a complex way. Such a framework can best describe the strategy adopted by most of the inflation targeting central banks. A simple specific targeting rule to guide policy has been formulated by The Bank of England and Sweden’s Riksbank which can be expressed as ‘‘set interest-rates so the inflation forecast about two years ahead is on target’’ (Goodhart, 2001. This type of rule has good theoretical base, as there is no simple representation of reaction function. Specific targeting rule is both simple and operational, it is not necessarily optimal.

2.4 Instrument Rules

Monetary policy instruments as prescribed functions of predetermined or forward-looking variables, or both are expressed by instrument rule. Depending on the nature of the variables on which instruments depend, two classes of instrument rules do appear in existing literatures, namely explicit instrument rule and implicit instrument rule. Policy instruments as function of only predetermined variables are prescribed by explicit instrument rules. On the other hand, policy instruments are prescribed as function of forward-looking variables by implicit instrument rules. Taylor rule $i_t = 1 + 1.5\pi_t + 0.5y_t$ is an example of instrument rule, where i_t is the federal funds rate in quarter *t*, π_t is four quarter average inflation and y_t is output gap. Taylor rule can be regarded as explicit or implicit instrument rule depending on the nature of π_t and y_t. If π_t and y_t are predetermined in period *t,* the Taylor rule is an explicit rule but π_t and y_t being forward-looking in period *t,* it is implicit rule. More examples of instrument rules are Henderson-McKibbin (1993) rule and McCallum (1988) rule. McCallum rule is the example of explicit instrument rule where the growth of monetary base is determined by deviation of nominal GDP from the target and change in the income velocity of the base. Bank of Canada’s Quarterly Projection Model (QPM) and Reserve Bank of New Zealand’s Forecasting and Policy System are the examples of implicit instrument rule.

J. B. Taylor and J. C. William (2010) have outlined at least three features of a better policy rule: (1) an interest rate instrument performed better than a money supply instrument, (2) interest rate rules that reacted to both inflation and real output worked better than rules which focused on either one, and (3) interest rate rules which reacted to the exchange rate were inferior to those that did not. One specific rule that

has the above properties is Taylor rule, saying that short-term interest rate, i_t should be set according to the formula:

$$i_t = r^* + \pi_t + 0.5(\pi_t - \pi^*) + 0.5y_t \quad \ldots\ldots \quad \ldots\ldots \quad \ldots\ldots \quad (1)$$

where, i_t is the nominal rate of interest, r^* is the long run equilibrium real rate of interest, π_t is the year on year inflation rate, π^* is target inflation rate and y_t is percentage deviation of real output from potential output. In steady state, $\pi_t = \pi^*$ and $y_t = 0$; according to equation (1) above, real rate of interest (nominal rate of interest minus inflation, $i_t - \pi_t$) equals the equilibrium real rate of interest when the economy is in steady state.

Both the equilibrium interest rates r^* and target inflation rate π^* are set equal to 2 by Taylor (1993). Setting these values and rearranging the terms, equation (2) appears as the mechanical form of Taylor rule.

$$i_t = 1 + 1.5\pi_t + 0.5y_t \quad \ldots\ldots \ldots\ldots \ldots\ldots \quad (2)$$

Equation (2) explains the mechanism of inflation and output stabilisation processes through interest rate response. Coefficient of π_t equalling 1.5 indicates that if inflation goes up by 1% nominal rate of interest should go up by 1.5%, which will increase real rate of interest and hence lower inflation through the dampening of demand. Positive coefficient of y_t represents that monetary policy reacts by increasing the interest rate by a particular amount when real GDP rises above potential GDP and by decreasing the interest rate by the same amount when real GDP falls below potential GDP. In this way, monetary policy plays required role to place the economy on the target rate of inflation and the potential level of output. Though simple in construction, Taylor rule has gained prominence among the researchers, policymakers and central bankers.

A few critical issues related to the operational aspects of the rule are to be addressed. Taylor rule uses information of current period but modern researchers advocate forecast-based rules because forecast-based polices can incorporate comprehensive and up-to-date macroeconomic information and can account for transmission lags and other structural features of the economy. In general, the empirical evidence does not show a substantial loss in performance when current data are used instead of forecasted values. Moreover, inflation and output are persistent enough such that current inflation rate and the output gap are good proxies for future values. Some researches have come out with the conclusion that it is not clear if forward-looking estimates have any advantage over contemporaneous or backward-looking versions of the rule. Although there are conceptual benefits to using forecast-based rules, the choice of an optimal rule still depends on the structure of the model under consideration, particularly the specific wage-price contracting process. In cases where wage bargaining is backward looking, Batini and Haldane (1999) show that forward-looking rules serve as stabilising mechanisms to counter-balance the backward-looking behaviour of the private sector. On the other hand, when wages are fully flexible, there is no need for forward-looking elements in

the policy rule. However, argued by Batini and Haldane that caution should be exercised in extreme cases where the monetary authority and the private sector have an excessive degree of forward-looking behaviour, forecast-based rules could be destabilising. Using a backward-looking model, Rudebushch and Svensson (1999) find forecast-based rules outperforms the contemporaneous Taylor-type rule. The advantage, however, is only marginal. In fact, their results suggest that contemporaneous rule is a very close second to the most favourable forecast rules. A model was used by Smets (1998), based on that of Rudebusch and Svensson (1999) with the exception that potential output is endogenous. With this modification, it was found that contemporaneous rules perform similar, and marginally superior, to forecast rules. The conclusion was drawn by Taylor (1998) that forecast-based rules have little advantage over contemporaneous rules while failing to find much difference between the performance of inflation forecasts and actual inflation in his policy rule. Also, there is evidence that as long as forecasts are not too far out into the future, they will be very close to their contemporaneous counterparts.

Taylor rule recommendations in a given quarter are based on the contemporaneous output gap and on inflation over the four quarters ending in the same quarter. The unavailability of current information to policy makers at the time decisions are made has led to a debate about whether to use current or lagged data in estimating interest-rate rules. To address this timing problem, there are some studies viewing interest rate in a given quarter as a function of output and inflation gap in the previous quarter. The costs of using contemporaneous data are small because inflation and output are persistent enough such that lags of the inflation rate and the output gap are good proxies for current values (Hamalainen, 2004). Also, it is reasonable to claim, the central bank has more information about the state of the economy at the time interest rate changes are made than is captured by inflation and output alone (Batini and Haldane ,1999). It has been argued on this premise that using contemporaneous data instead of lagged data can be thought to implicitly include information that is not reflected in inflation and output measures (Kozicki 1999, Rudebusch and Svensson 1999).

One more limitation of Taylor rule has been widely discussed, Taylor-type rules do not consider the element of inertia. Many analysts have noted the Federal Reserve has a tendency to smooth movements of the funds rate (Clarida et al, 1998). Concern about the stability of financial markets may lead the Federal Reserve to smooth funds rate changes. Smoothing may also indicate responsiveness of policy actions to inflation and output gaps observed over several quarters rather than just a single quarter. Alternatively, smoothing may be justified when the economic impact of changes in the funds rate is uncertain (Sack, 1999). Taylor-type rules are commonly modified to incorporate interest rate smoothing by including a lagged interest rate term. With minor modification or fully ignoring the limitations identified above, a number of central banks from industrialised countries are designing Taylor-type policy reaction function but the performance of this rule remained unexamined in the developing countries where financial markets appear to be comparatively less mature.

3. Data and Methodology

Quarterly data of the period 1980:Q1-2010:Q2 have been retrieved online from IMF CD ROM version. Financial innovation and liberalization had taken place in Malaysia during late 1970s and early. Therefore, the adoption of data from year 1980 enables to capture the effect of financial reform. Another key reason why the data before 1980 are not examined is that the rule-guided monetary policy was not in place until 1980. Indeed, the Federal Reserve got well-organised monetary policy when Paul Volcker was appointed as the Chairman in August 1979. John Taylor (1993) demonstrated that US interest rate dynamics can be closely approximated by Taylor rule over the period 1987-1992. Since then many developed and developing countries around the world started to formulate rule-like policy. We have however collected pre-1980 data but using that data for current purpose would be devoid of empirical justification since our objective is to evaluate performance of the economy under Taylor rule.

For the short-run policy rate, overnight call money market rate is used. Yearly inflation rate for each quarter has been computed by using CPI. Seasonally adjusted industrial production index has been used to construct output gap. Following the previous literatures on the estimation of Taylor rules, output gap in percent has been constructed by using the Hodrick-Prescott (HP) cyclical component of the logarithm of industrial production.

Taylor rule is estimated after examining time properties of different series by employing the ADF unit root test. Inflation and interest rate series seem to have unit root but the null of no cointegration is rejected by the Cointegration test. A long-run relationship between interest rate, inflation and output gap is expected to hold. Estimated Taylor rule does not bear any evidence that Taylor rule is followed by Malaysia. Next, effort is put to empirically investigate macroeconomic performance had Malaysia followed Taylor rule. For this purpose, the economy has been simulated by using a two equation model proposed by Rudebusch and Svensson (1998) with Taylor rule as the monetary policy rule. This small Neo-keynesian type empirical model of the US economy consisting of equations (3) and (4) was used by Rudebusch and Svensson in order to examine the performance of

$$y_t = \beta_1 y_{t-1} - \beta_2(\bar{i}_{t-1} - \bar{\pi}_{t-1}) + \varepsilon_t \ \ldots\ \ldots(3);\ (0 < \beta_1 < 1, \beta_2 > 0)$$

$$\pi_t = \gamma_1 \pi_{t-1} + \gamma_2 y_{t-1} + \eta_t \ \ldots\ \ldots\ \ldots\ldots(4);\ (0 < \gamma_1 \leq 1, \gamma_2 > 0)$$

$$(\varepsilon_t \text{ and } \eta_t \text{ are i.i.d. shocks})$$

policy rules, where y_t is output gap in percent, $\bar{i}_t$ is four-quarter average interest in percent, π_t is quarterly inflation in percent at an annual rate and $\bar{\pi}_t$ is four-quarter average inflation. ε_t and η_t are demand and supply shocks respectively. The first equation can be treated as the IS equation which relates output gap to its own lag and to the difference between average interest rate and average inflation over the previous four quarters-an approximate *ex post* real rate. The demand side of the economy is represented by this equation. The second equation, in contrast, can be treated as the aggregate supply equation relating inflation to a lagged output gap and to lag(s) of inflation. The important feature of the model is that output is affected by

interest rate earlier than inflation. Equation (4) specifies that output influences inflation with one period lag and equation (3) reflects that interest rate influences output with one period lag. Ultimately this implies inflation is affected by interest rate with two-period lag.

In this model,

π_t: quarterly inflation in percent at an annual rate, i.e., $400(\ln CPI_t - \ln CPI_{t-1})$;

$\bar{\pi}_t$:four-quarter average inflation, i.e., $\frac{1}{4}\sum_{j=0}^{3}\pi_{t-j}$;

i_t : quarterly average interest rate in percent at an annual rate and

$\bar{i}_t$: four-quarter average interest rate, i.e., $\frac{1}{4}\sum_{j=0}^{3} i_{t-j}$.

The above specification would make sense only if β_2 is positive because then it will mean that the increase in real average rate of interest lowers output that is a simple representation of the monetary transmission mechanism.

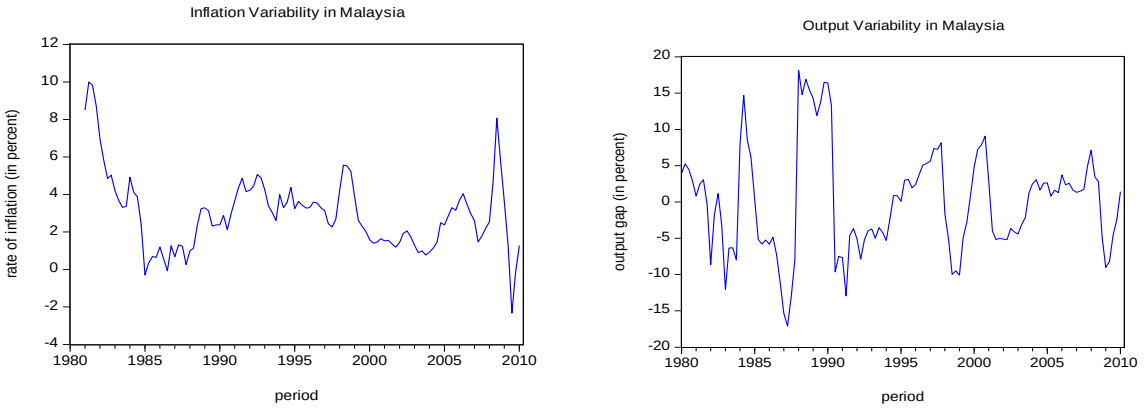
Social loss function is assumed $L_t = \frac{1}{2}\left(\sigma_{\bar{\pi}}^2 + \lambda\sigma_y^2\right)$.....(5)

$\sigma^2 s$ represent variances of inflation and output, λ is the relative importance attached to output stabilisation in computing social loss, that can assume any nonnegative value. Equal weight to both inflation and output is given by this paper, i.e., λ is assumed equal to unity.

4. Empirical Results

We have observed the performance of some advanced economies in terms of inflation and output variabilities from which it is obvious that low and stable inflation jointly with least output variability was the outcome of rule-based monetary policy. Among many others, the United Kingdom for example, had substantially improved macroeconomic performance by switching to inflation targeting regime. Quarterly data between 1980 and 2010 show that variance of output gap in the UK is only 3.17 whereas in Malaysia it is 52.86. Inflation variance is almost equal in these countries but the higher output variability in Malaysia is suspected to be attributed to the discretionary policy framework.

Figure 1
Inflation and Output Variability in Malaysia



Higher variability of output relative to inflation is visible in figure 1. The performance of existing policy framework in Malaysia may be questioned by this observation. These descriptive statistics supports the hypothesis that discretion instead of rule does not perform better.

Taylor rule estimates with Malaysian data comply with the hypothesis that Bank Negara Malaysia did not guide its monetary policy by Taylor rule.

Estimated Taylor rule : $\underset{(se)}{i_t} = \underset{(0.35)}{3.87} + \underset{(0.10)}{0.36}\pi_t - \underset{(0.03)}{0.03}\, y_t$

Where, $R^2 = 0.12$ and $DW = 0.20$.

Coefficient of inflation should be larger than unity and coefficient of output gap should be positive for the central bank of Malaysia to be the follower of Taylor rule. The coefficients in policy reaction function are devoid of economic meaning, leading to further instability in the wake of inflation or demand shocks.

This is not surprising that estimated Taylor rule produces absurd coefficients, because the central bank of Malaysia has never introduced them as the follower of Taylor rule. Low value of R^2 characterises the fact that output gap and inflation together can explain very small portion of variation in nominal rate. It may indicate the presence of other policy goals like exchange rate stability, financial sector stability or interest rate smoothing in interest rate setting. Low value of Durbin-Watson test statistic proves the presence of autocorrelation due to which Newey-West heteroskedasticiy-autocorrelation consistent (HAC) standard errors have been used.

Figure 2

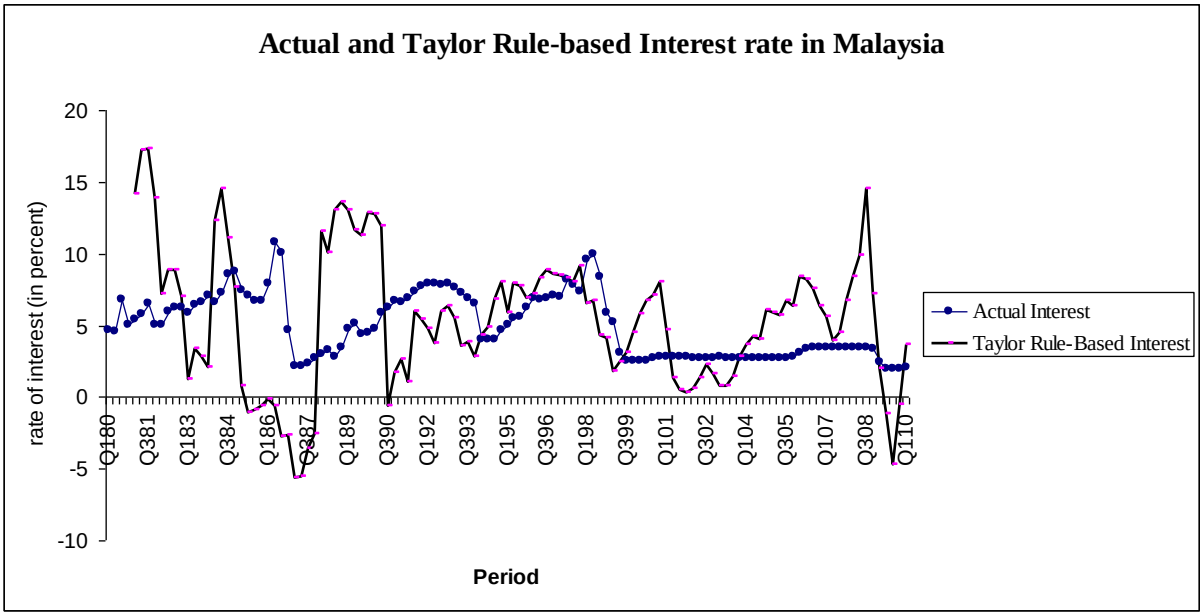


Figure 2 clears the fact that Taylor rule is not the policy reaction function in Malaysia as we observe Taylor rule-based interest rate has a different time path than actual interest. The hypothesis that Malaysia followed Taylor rule as their monetary policy can be clearly rejected on the basis of both empirical and descriptive evidences above.

This is, however, interesting to further notice that rule-based interest path fluctuates around actual interest series, which may be indicative of the feasibility of adopting Taylor rule as the policy reaction function in Malaysia. One more descriptive feature of Malaysian data is worth mentioning here. J. B. Taylor, while proposed his reaction function, suggested both equilibrium real rate of interest and target rate of inflation equal to 2. Malaysian data for the whole period between 1980 and 2010 account for an average real rate of interest equal to 2.06 and average inflation equal to 2.88. Unlike many other countries, these values are quite close to Taylor's suggestion. Even the US and the UK, who are believed to be well-described by the Taylor rule in terms of monetary policy, have average real interest and inflation rate that are not so close to Taylor's suggested values. In 1980-2010 average real interest and inflation rate for the USA are 2.39 and 3.28 respectively; in the UK these values are 3.61 and 4.02. This coincidence, however, is specific to Malaysian economy, and there is no reason why all other developing countries have such values close to Taylor's suggestion.

In addition to descriptive evidences, counterfactual historical simulation has been accomplished in order to evaluate the performance of Taylor rule in Malaysian economy. Estimated demand and supply equations are presented below:

$$y_t = \underset{(0.06)}{0.78}\, y_{t-1} - \underset{(0.15)}{0.19}(\bar{i}_{t-1} - \bar{\pi}_{t-1}) + e_{1t} \;\ldots\; \ldots(3.1)$$

$$\pi_t = \underset{(0.02)}{0.94}\,\pi_{t-1} + \underset{(0.01)}{0.01}\, y_{t-1} + e_{2t} \;\ldots\; \ldots\; \ldots\ldots(4.1)$$

e_{1t} and e_{2t} are the residuals' series resulted in estimation process, representing demand and supply shocks respectively. Both residual series are I(0)- indicating the nonspuriousness of above regression. Simulated series of inflation and output gap have been obtained through the interaction between demand and supply equations characterised by (3.1) and (4.1). Actual Taylor rule with original parameter values suggested by Taylor (1993) has been used as the monetary policy reaction function in simulation process. Corresponding social loss has been computed by utilizing the loss function (5). Simulated social loss is found smaller than the actual loss which signifies Taylor rule performs better than the existing monetary policy strategy in Malaysia. This result has wide range of robustness in terms of parameters in Taylor rule. For notational convenience, Taylor rule is written in a parametric form as:

$$i_t = r^* + \pi_t + \chi_1(\pi_t - \pi^*) + \chi_2 y_t$$

Social loss has been computed for different values of r^*, π^*, χ_1 and χ_2. The results are summarised in the following Table.

Table
Actual and Simulated Social Loss with Different Alternatives

Choice	r^*	π^*	χ_1	χ_2	Simulated Social Loss	Actual Social Loss	% fall in Social Loss
1.	2.0	2.0	0.5	0.5	27.17	29.12	6.71
2.	2.0	2.0	0.0	0.5	27.40	29.12	5.92
3.	2.0	2.0	0.5	0.0	28.46	29.12	2.29
4.	2.0	2.0	0.5	2.0	25.01	29.12	14.12
5.	0.0	2.0	0.5	2.0	25.04	29.12	14.03
6.	2.0	1.0	0.5	0.5	27.14	29.12	6.82
7.	2.0	3.0	0.5	0.5	27.20	29.12	6.60
8.	2.0	4.0	0.5	2	25.03	29.12	14.06
9.	2.0	6.0	0.5	2.0	25.04	29.12	14.01
10.	3.0	2	0.5	2.0	25.0	29.12	14.17

The Table has at least three leading implications in the context of choosing parameters for Taylor rule in Malaysia.

1. First three choices imply that Taylor's proposal of attaching some weights to both output and inflation stabilisation result in lower social loss and thus better macroeconomic performance than attaching no or full weight to either inflation or output stabilisation.
2. Choice 4 in Table above is the best strategy among all those presented. This combination results in a comparatively smaller amount of social loss through attaching more weights to output than inflation stabilisation. This may not be very surprising in that the developing countries are more vulnerable to output stabilisation than the industrial ones. This requires developing countries pay higher attention to output growth. Malaysian data, for example, represent output gap variance equal to 55 whereas inflation variance is 4, therefore, authority should emphasise output stabilisation.
3. Social loss is increasing in target rate of inflation and decreasing up to a certain rate of real interest. Lower targeted inflation results in lower overall

loss, nevertheless developing countries should not target zero or negative inflation since it will involve substantial output cost which is really a bigger concern for these economies.

The conventional trade-off between inflation and output variability appears in the simulation outcome. For all the combinations presented above, variance of output falls but of inflation rises (to save space, decomposition is not presented here). This finding is not conformable with that of Malik and Ahmed (2007) who, by using Pakistani data between 1991 and 2005, noticed a drop in both inflation and output variability when existing policy was counterfactually replaced by the Taylor rule. Findings of Malaysia, however, is not disappointing in the sense that the proposed rule poses to lower output variability in every situation, which should be the preferable concern for Malaysia.

Figure 3

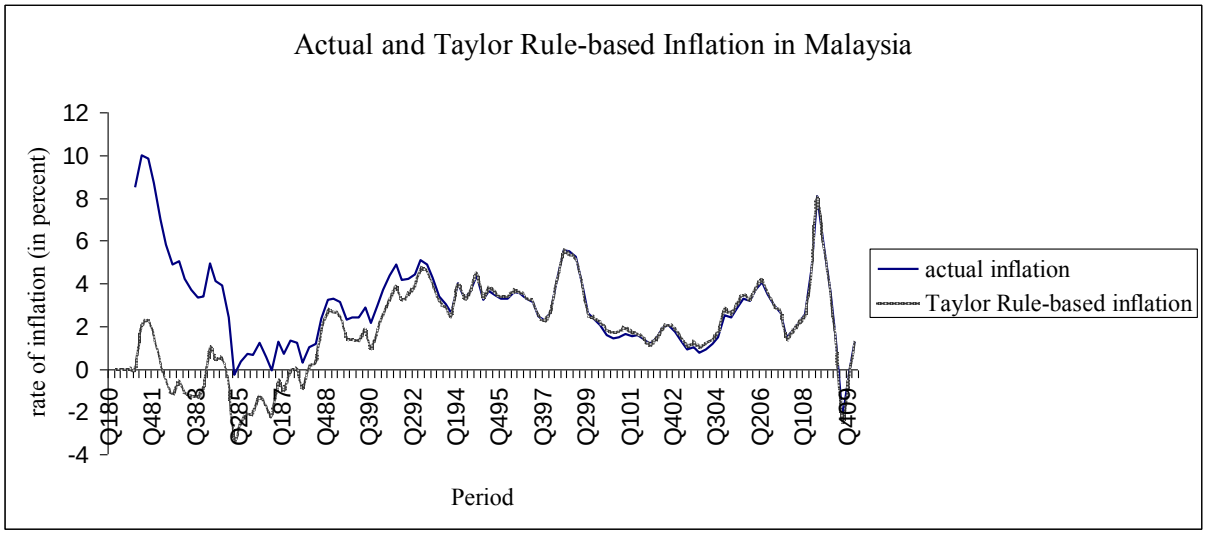
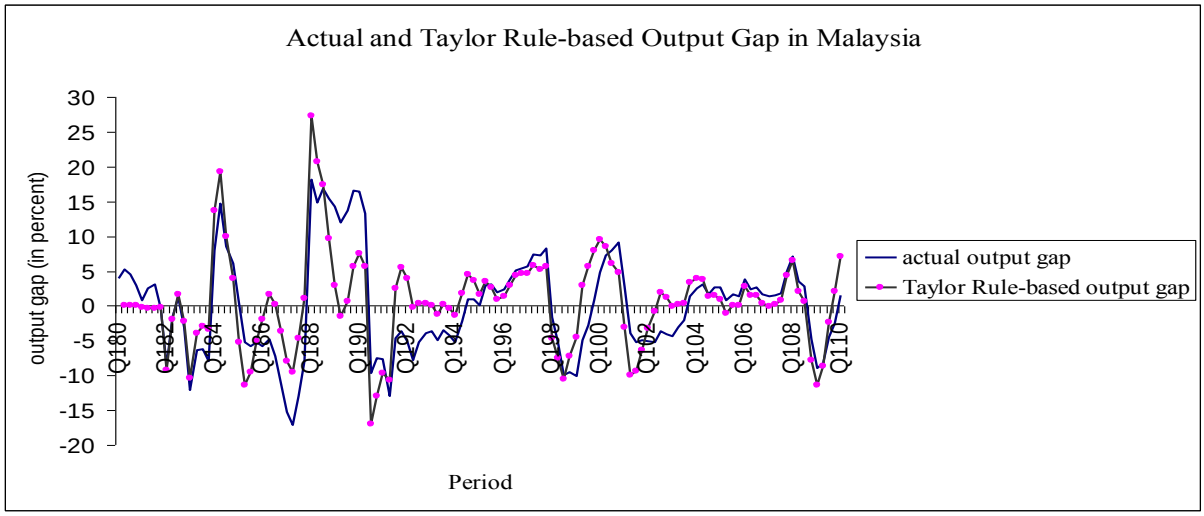


Figure 3 and 4 display actual and rule-based inflation and output gap situations in Malaysia. It seems, time paths under proposed policy do not deviate too much from actual paths. This may be viewed rather positively as policy-makers may be hopeful observing that if the existing policy is replaced by the Taylor rule-based monetary policy, economy would not experience any remarkable shake, lowering the likeliness of sudden instability.

Figure 4



A central bank that adheres to a Taylor rule reveals to the public that it is committed to price stability and systematically takes step to achieve it. The public therefore keeps its expectation of inflation low and stable, and financial markets in addition, anticipate the central bank's next move and increase market interest rates immediately when inflation goes up. In an investigation of the relative strength of four monetary policy transmission channels namely exchange rate, asset price, interest rate and credit, Tang (2006) found interest rate channel is most important in influencing output and inflation in Malaysia. Proposed Taylor rule is an interest based policy which incorporates many of the features of good monetary policy like transparency, accountability and credibility.

5. Conclusion and Limitation

This is widely believed that rule-based monetary policy can perform better than discretionary policy by lowering inflation and output volatilities. Many industrialised economies follow implicit or explicit rule in formulating monetary policy strategy. A few emerging economies are also exercising inflation targeting at least in limited range. The paper endeavours to examine the suitability of Taylor rule-based monetary policy in developing economies. Central bank's reaction function under Taylor rule has the straightforward mechanism of stabilising inflation and output. The rule proposes an increase in interest rate when inflation is above target and/or output is above normal; and a reduction in interest rate in the face of low inflation or output. Malaysian economy has been taken as a test case to experiment what happens if Taylor rule-based monetary policy replaces the existing policy structure. In order to confirm that existing monetary policy does not adhere to the Taylor rule, the rule for Malaysian economy has been estimated and it is found that estimated Taylor rule is far from the original rule in terms of sign and magnitudes of the estimates.

Counterfactual historical simulation confirms that Taylor rule improves overall macroeconomic performance of Malaysia through the lowering of social loss defined over inflation and output variances. This result is robust for several pairs of stabilization parameters. Although monetary policy transmission is a complex mechanism that requires the consideration of dozens of variables but the Taylor rule,

defined over only two right hand side variables, demonstrates the improvement of macroeconomic performance of Malaysian economy.

The principal limitation of our study is the results are based on counterfactual historical simulation alone. Stochastic simulation may be performed to justify the validity of the results. Besides, constrained minimisation of social loss function should produce same parameter values in order for the results to be representative and policy purposive. Taylor rule is criticised on the ground that the rule proposes interest rate targeting on the basis of contemporaneous inflation and output gap. Such criticism stems from the fact that central banks may not have the data of inflation and output at the time when they set interest rate. Under this circumstance, alternative proposal for the use of lagged inflation and output gap is made by the opponents. But, John Taylor argues, because of the persistence property of inflation and output gap there is no significant advantage in using lagged inflation and output gap. However, monetary policy affects the real economy with some time lag therefore it is worth to examine the performance of forward-looking Taylor rule. It will be further useful to examine the performance of exchange rate augmented Taylor rule in developing countries.

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