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The feasibility of inflation targeting in Malaysia

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Abstract

This paper aims to examine whether inflation targeting fits in Malaysia. The relationship between CPI, money supply (M1), money market rate, and exchange rate of the Malaysian economies from 1976:M1 to 2007:M12 is tested, considering the major transmission mechanism channels in the conduct of monetary policy stance. The Johansen-Juselius (JJ) multivariate cointegration procedure and Vector Error Correction Modelling (VECM) are applied to investigate the joint dynamics variables for both short and long run. Results reveal cointegration between CPI and exchange rate, money market rate, and money supply. Results show that changes in interest rate and exchange rate have significantly impacted the CPI in Malaysia in the short run, but insignificant from money supply. Inflation targeting may not fit in Malaysia because of its economic structure and institution may not be conducive at the current stage.

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1. Introduction

There have been witnessed an increasing number of central banks[1], from both developed countries and emerging market economies, implementing inflation targeting since 1990s. Inflation targeting is a monetary policy that uses the announced inflation targets as a nominal anchor. Central banks who adopt inflation targeting tend to stress on the importance of pursuing monetary policy framework to achieve low inflation. However, targeting inflation may be difficult since monetary policy operates with a lag, and any fine tuning attempt may cause inflation to deviate from the target (Bernanke & Woodford, 1997). Maintain low and stable price remains the primary long run goal of monetary policy for policy makers. A target range allows the central bank some flexibility and discretion in policy making process, especially in relation to output stabilization, and this is closely related to the width of the band. Mishkin (1999) argued that inflation targeting framework is necessary when inflation is stable. Bernanke *et al*. (1999) claimed that a change to an inflation targeting regime is suitable when inflation is low. Meanwhile, Levin *et al*. (2004) argued that a change to an inflation targeting regime occurs most frequently after a period of moderate inflation, and Acemoglu *et al*. (2007) claimed that inflation targeting would be suitable to be introduced after a period of crisis, and should be avoided when an economy is escalating.

1.1 Malaysia Monetary Framework and Consumer Price Index (CPI)

Malaysia is an export-oriented economy. He has moved from fixed to managed float regime. As of today, the Bank Negara Malaysia (hereafter BNM, the Central Bank of Malaysia) is not an inflation targeting institution. The central bank independence is not fully institutionalized. He has shifted its monetary policy strategy from monetary targeting towards interest rate targeting in the mid 1990s. For the past decades, Malaysia experienced relatively favorable inflation performance under the present monetary framework. The inflation rate as measured by the CPI, on the average, has remained remarkably low and stable (i.e., 1970s:5.5%, 1980s:3.6%, 1990s:3.6%, 2000-2005:1.7%). The three topmost weights listing in the Malaysian CPI basket are on food and non-alcoholic beverages (31.4%), housing, water, electricity, gas & other fuels (21.4%), and transportations (15.9%) (Poon, 2008).

Malaysia has experienced significant high regimes of inflation in 1973-1975 following hike oil prices. The energy crisis has boosted consumer price to reach a high of 10.6% in 1973. The effect of an increase in oil price has further pushed inflation to double-digit levels to its record high of 17.3% in 1974, further pressurized the domestic price levels. Another oil shock cycle due to Gulf War has led to inflationary pressures to a lesser extent, where the inflation rate increased from 2.61% in 1990 to 4.35% in 1991. The July 1997 financial crisis has also placed inflationary pressure on Malaysia. Nevertheless, the currency peg at RM3.8/1USD had some controlling effect on inflation, where inflation rate fell considerably to 2.7% in 1999. Thereafter, the pressure on consumer prices subdued to a substantial extent, with the level compatible to the pre-

[1] Countries adopting inflation targeting and the year of adoption are: New Zealand (1990), Canada and Chile (1991), Israel and U.K. (1992), Australia, Sweden and Finland (1993), Austria (1994), Spain (1995), Czech Republic, Korea and Poland (1998), Colombia, Mexico and Brazil (1999), South Africa, Indonesia, Thailand and Switzerland (2000), Norway and Iceland (2001), Peru, Philippines and Hungary (2002).

crisis rate of less than 3%. Inflation has been on the uptrend during the 2008Q1, a spiral alarm on inflationary forces due to the crude oil price hit triple-digit per barrel. The Malaysia's annual inflation soared to 7.7% and 8.5% in June and July in 2008 when the petrol price was announced to rise 20% to RM2.77 per litre in June, and electricity price rises in July. Despite the surge in inflation, BNM has kept overnight rate unchanged for over two years at 3.8%.

Ball and Sheridan (2003) compared the seven OECD inflation targeting countries and 13 non-targets. They found that performance improved along many dimensions for both targeting and non-targeting countries during the 1990s. However, Cecchetti and Ehrmann (1999) used nine inflation target countries and 14 non-targets for the period of 1984-1997, and found that inflation targeting made little difference in the 1990s. Following the world oil price increases, a steady reduction in inflation is not assured under the present policies framework. Whether interest-rate base is a reliable anchor for monetary policy is questionable. Here, we investigate the feasibility of the inflation targeting as a means for the policy makers to establish its credibility towards price stability.

The paper is organized as follows. The next section examines related literature, followed by the testing method, data description, and results. The paper concludes with a summary and some suggestions for future research.

2. Literature Review

New Neoclassical Synthesis suggests that a central bank should pursue an activist policy to target inflation (Goodfriend & King, 1997). Inflation targeting reinforces accountability, credibility, resilience to supply shocks and helps stabilizing inflation level in most emerging countries. A strict inflation targeting is conducive for a desire low and stable inflation country that have historical high inflation (Krause & Mendez, 2007). Inflation targeting produces a persistent significant reduction in inflation rate.

Intuitively, the success of inflation targeting regime depends largely on the degree to which general requirements are met. Those criteria are: 1) central bank independence (Christoffersen *et al*., 2001); 2) degree of central bank accountability, and transparency to the public (Mishkin & Savastano, 2001); 3) stable relationship between inflation and the instruments of monetary policy (Christoffersen *et al*., 2001); 4) an explicit institutional commitment of the monetary authority to focus on price stability as its primary implicit and explicit goals of the policy (Genberg, 2002); 5) the development of models that allows the monetary authority to incorporate transmission mechanisms in the economy; 6) setting appropriate channels of communication between the monetary authority and economic agents; and 7) a mechanism to make the authority accountable for the outcomes (Mishkin & Savastano, 2001).

Transparency and public communication are two important features in an inflation targeting regime. It is crucial to keep the public inform any updates on the modification of policy stance, an inflation target pursued in a time frame, its inflation forecast, how the forecast is estimated, and the monetary instrument central bank is pursuing, and how does the policy stance affect the price level development. In the process to achieving greater transparency, however the enduring restructuring process in a nation may cause the inflation forecasting process a complicated task.

In addition, significant institutional reforms such as greater central bank autonomy, instrument independence, and greater central bank reporting transparency are difficult to quantify (Siklos, 2007). Despite easier to maintain inflation target in low inflation rates country (Hu, 2006), the country would obscure the communication of the central bank's goals, and reserve the benefits from adopting inflation targeting (Friedman, 2004).

Monetary authority has to react to deviations of the inflation forecast from the announced target. However, it is not an easy task to forecast inflation in transition economies. Monitoring the mechanism is one of the barriers of inflation targeting. Some inflation targeting countries such as Czech Republic, Poland and Hungary have successfully reduced inflation, but frequently missed their targets margin. Similarly, many studies have found inflation targeting countries successfully reached the target with lower output volatility after inflation targeting framework was adopted. For instance, Wu (2004) used quarterly inflation rate of 22 OECD countries for the period of 1985-2002, and compared the difference between the eight inflation targeting countries with the non-targeting countries, and found a decrease in the level of inflation rates for inflation targeting countries.

3. Brief Theoretical Framework

There are four models apply in this area of study generally, namely: i) the aggregate spending relationship or the IS curve (for instance, Fuhrer and Moore (1995) considered one lag of real interest, and two lags of output gap), ii) an aggregate supply or inflation equation (for instance, Svensson (2000) considered current inflation as a function of backward and forward looking components of inflation rate, with lag and current values of output), iii) a monetary reaction function (for instance, Clarida *et al*. (2000) considered an immediate adjustment of monetary policy rate to its target level using the rational expectation definition to measure the degree of interest rate smoothing for small open economy), and iv) an interest parity condition where it is a function of real exchange rate, foreign exchange rate risk premium, and current expectation of future real exchange rate.

Interest rate and exchange rate are two common transmission mechanisms channels. Higher interest rate tends to depress economic purchases. The real interest rate determines aggregate consumption and investment decisions. Central banks have been confronted with large capital inflows, and largely were speculative in nature, if inconsistencies in macroeconomic policies appear. To avoid excessive fluctuation of the domestic currencies, the central banks tend to sterilize large volumes of capital inflows to absorb the chronic excess liquidity from the money market. By adopting an inflation targeting regime and using interest rates as the nominal anchor to control inflationary pressures, the government would raise the interest rates to slow down the economy if inflation exceeds the target rate, and subsequently lower the inflation to get it closer to the target, *vice versa*. Meanwhile, real exchange rate incorporates the external sector in the domestic inflation process. It directly affects the cost of imported intermediate inputs to the production process on the inflation measure. Hu (2006) investigated factors associated with a country's choice of inflation targeting using 66 countries for the period 1980-2000, and he found that flexible exchange rate regime is an important condition for the decision of inflation targeting adoption. Generally, higher interest rate generally leads to a stronger currency that reduces

international competitiveness, impacts export performance, and leads to relatively greater import penetrations. Higher interest rate pushes up the value of currency and restrains economic activity, hence influences the aggregate demand and consumer price. On the other hand, money growth has direct correlation with the rise in inflation. Multiple studies have shown long run relation between money supply and inflation (Lucas, 1996). Even so, the effectiveness of using a narrow index of the money supply as inflationary index may not be a good option and it seems limited from public policy perspective.

4. Methodology: Model Specification and Data

The CPI model in log-linear specification is as follows:

$$LCPI_t = \beta_0 + \beta_1 LRM1_t + \beta_2 LRMM_t + \beta_3 LREXC_t + e_t \quad (1)$$

where $LCPI_t$ is the consumer price index (as proxy to measure inflation rate); $LRM1_t$ is narrow money that consists of all physical currency, demand deposits, traveler's checks, and checkable deposits (calculated using nominal M1/CPI,); $LRMM_t$ is real money market rate; and $LREXC_t$ is real exchange rate (measured as nominal exchange rate/CPI). All variables are expressed in natural logarithm, and the sample periods covered from 1976:January to 2007:December. All data in monthly frequencies are collected from International Financial Statistics.

$\beta_1 > 0$, $\beta_2 < 0$ are the expected signs, while that of β_3 is ambiguous. A real depreciation of the local currency represents an increase in *LREXC* ($\beta_3 > 0$) would make domestically produce goods more competitive with foreign good, and shift the demand from foreign to domestic output. Also, depreciation increases the overall price level via the pass-through effect. However, if the income effect is greater than substitution effect, $\beta_3 < 0$ is expected.

The presence of non-stationary behaviour in the autoregressive representation of the variable is examined by the Augmented Dickey-Fuller (ADF) unit root test. The lag length, *p,* is determined on the basis of Akaike information criterion (AIC). Meanwhile, Johansen and Juselius (1990) is employed for cointegration test. Maximum likelihood procedure is applied to detect the presence of cointegrating vectors. Trace test and maximum eigenvalue test are used to determine the number of cointegrating vectors.

Error correction model is employed to capture the short-run dynamic adjustments of cointegration variables. The error correction terms (ECT) may embed as exogenous variables in the lagged level as part of the Vector Error Correction Model (VECM). VECM has several advantages compare to conventional causality test. Besides indicating the direction of the causality, VECM allows the differentiation between "short-term" and "long-term" Granger causality. The *F*-tests of the 'differenced' explanatory variables provides the "short-term" causal effect. Meanwhile the significance of the *t*-test of the lagged error-correction term contains "long-term" causal relationship. The proportion by which the long-term disequilibrium in the dependent variable is corrected in each short period is represented by the coefficient of the lagged ECT (Masih and Masih, 1996).

5. Empirical Results

5.1 Unit root test and cointegration test

The results (Table 1) reveal that the variables *LCPI*, *LRM1*, *LRMM*, and *LREXC* are non-stationary at level. The series, however, depict stationary pattern after first-differencing, and it is concluded that all series are *I(1)* variables at 1 percent level. This shows that the variables applied in this study has fulfilled the necessary, but not sufficient condition, for cointegration which require each of the variable to be integrated of the same order.

Table 1: ADF unit root test

Variables	Level Constant With Trend	First Difference Constant No Trend
LCPI	-1.881426	-16.87133**
LRM1	-2.646406	-3.993969**
LRMM	-3.130364	-18.37260**
LREXC	-2.463033	-18.36874**

Notes: The asterisk denotes the rejection of the null hypothesis at the 1 percent significance level. The rejection of null hypothesis for ADF test is based on the MacKinnon critical values. Lag length selection is based on AIC.

Table 2 reports the results of Johansen and Juselius (1990) cointegration tests. For both the trace statistics and the Maximum Eigenvalue tests, the hypothesis of zero cointegrating vector is comfortably rejected at 1 percent significance level. This implies the evidence of a single vector. The presence of the cointegrating vector suggests that these four variables are bounded together in the long-run equilibrium. Any deviation from the relationship between inflation rate and the selected determinants is temporary. The evidence of cointegration among these four macro-aggregate rules out the possibility of "spurious" correlations and also the possibility of Granger non-causality, which in turn implies at least a unique channel of Granger causality exist either unidirectional or bidirectional.

Table 2: Johansen and Juselius cointegration test

Hypotheses	Trace Statistics	Maximum Eigenvalue	Eigenvalue
$r = 0$	71.92432**	43.13165**	0.109199
$r \leq 1$	28.79267	20.16963	0.052638
$r \leq 2$	8.623044	8.560720	0.022690
$r \leq 3$	0.062324	0.062324	0.000167

Notes: The asterisk indicates the rejection of null hypothesis at 1 percent level based on Osterwald-Lenum (1992) critical values. The lag length is selected on the basis of AIC. This test is conducted under the assumption of no deterministic trend in the data, with intercepts.

5.2 Long-run equilibrium estimates

Normalizing the equation allows us to compare the hypothesized values of the β in equation (1). The normalized equation is obtained by dividing each cointegrating vector by the negative of the cointegrating vector on *LCPI*. All variables are tested for significance using likelihood ratio χ^2

test. The result from Table 3 shows that the null hypothesis of the coefficient on the relevant variables is equal to zero is rejected. Therefore, there is a significant long-run relationship between *LCPI, LRM1, LRMM,* and *LREXC*.

Table 3: Estimated normalizing cointegrating vector and likelihood ratio restriction test

Restriction test	Variables			
	LCPI	LRM1	LRMM	LREXC
$\chi^2(1)$ statistics	1.00	0.2820	-0.1199	-0.4568
		[8.75]**	[7.10]**	[10.58]**

Notes: Figures in parentheses are p-values. The asterisk indicates the rejection of null hypothesis at 1 percent level of significance.

All the coefficients are statistically significant with the expected sign. There is positive relationship between *LCPI* and *LRM1*, and inverse relationship between *LCPI-LRMM* and *LCPI-LREXC*. The real M1 is positively related to *LCPI.* The coefficient of 0.282 implies that a 1 percent increases in real M1 would cause inflation to increase by 0.28% in the long run. Meanwhile, the *LRMM* has a negative sign as expected with the estimated coefficient of –0.12. This indicates that a 1 percent increases in real money market rate would cause CPI to drop by 0.12% in the long run. The estimated coefficient of the real exchange rate indicates that a 1 percent increases in real exchange rate would cause CPI to reduce by 0.46%. This implies that devaluation strategy is effective, and depreciation in Malaysia would lead to an increase in exports. The normalized equation shows that the real M1, money market rate and exchange rate are crucial to determine the price level in Malaysia with the largest effect imposes by real exchange rate.

5.3 Vector Error Correction Model (VECM)

Results in Table 4 reveal that there are three pairs of bidirectional short term causal relations in the VECM model. They are *LCPI* and *LRMM*, *LCPI* and *LREXC*, and *LRM1* and *LREXC*. The main concern is the price level adjustment to a long-run equilibrium due to changes in real M1, money market rate and exchange rate. The estimated coefficients of the lag of ECT of all variables are negative and highly significant at 1 percent level, except for the *LREXC* equation.

The model has conformed to the assumptions of classical linear regression model. The disturbance terms are normally distributed (LB(6)=0.634 [0.996]), homoscedasticity (White=1.098 [0.284]) and serially uncorrelated (AR(1)=0.527 [0.468]), and the model is correctly specified (Ramsey RESET test =1.494 [0.234]).

The values of the estimated coefficients of ECT are ranged from 0.0124 to 0.3633. The ECT_{t-1} coefficient for *LCPI* equation of -0.01247 shows that there are 1.25% adjustments towards the long-run equilibrium per month. This slow adjustment is probably due to price rigidity, and any deviation in *LCPI* resulting from the selected variables would need longer time to fine-tuning to its long run equilibrium. From the short term perspective, there is causal effect from the *LRMM* and *LREXC* on *LCPI* at 5 percent and 1 percent marginal level respectively. It indicates that the central bank may employ money market rate and exchange rate as monetary policy tools to target for desirable inflation rate.

For *LRM1* equation, the ECT_{t-1} coefficient of -0.062 is significant at 5 percent level, which demonstrates that about 6.2 percent adjustments per month towards the long-run equilibrium. This is relatively faster as compared to the price level adjustment. Results also reveal that there is short term causal effect from *LREXC* and *LCPI* on *LRM1*. Meanwhile, for *LRMM* equation, the ECT_{t-1} is significant at 5 percent level and the coefficient of -0.363 implies that there is 36.3 percent adjustment per month towards the long run equilibrium. With its fastest speed of adjustment among all the other variables, any deviation in the real money market rate will be restored to its long run equilibrium speedily, perhaps due to its sufficient liquidity condition in the money market. Apart from that, there is also short term causal effect from *LCPI* on *LRMM* at 10 percent level of significance. In spite of the ECT_{t-1} is insignificant at 5 percent level for *LREXC* equation, the results reveal evidence of short term causal effect from *LCPI* and *LRM1* on *LREXC*.

Table 4: Regression results for VECM

	ECT_{t-1} [t-statistics]	$\sum \Delta LCPI$	$\sum \Delta LRM1$	$\sum \Delta LRMM$	$\sum \Delta LREXC$	Summary statistics
$\sum \Delta LCPI$	-0.01247** [-3.69400]	-	1.112344 (0.2923)	3.584299 (0.0592)	12.59709 (0.0004)	$\overline{R}^2$ =0.1723, LB(6)=0.6345 [0.996], AR(1)=0.5270 [0.468]
$\sum \Delta LRM1$	-0.06224* [-2.32839]	13.31976 (0.0003)	-	1.141523 (0.2861)	15.64815 (0.0001)	$\overline{R}^2$ =0.1382, LB(6)=7.257 [0.298], AR(1)=3.0190 [0.083]
$\sum \Delta LRMM$	-0.36333* [-2.10946]	3.551272 (0.0604)	0.425514 (0.5147)	-	0.732720 (0.3926)	$\overline{R}^2$ =0.2102, LB(6)=0.6285 [0.996], AR(1)=3.1501 [0.076]
$\sum \Delta LREXC$	-0.023488 [-1.16656]	4.761822 (0.0298)	7.037256 (0.0084)	0.294089 (0.5880)	-	$\overline{R}^2$ =0.0529, LB(6)=1.5048 [0.959], AR(1)=0.0080 [0.928]

Notes: Figures in brackets indicate p-values; $\overline{R}^2$ is adjusted coefficient of determination, AR(1) is first order LM test of residual serial correlation, LB(6) is Ljung-Box statistics at lag 6, ECT is the error correction term. The asterisks (*, **) indicate the rejection of null hypothesis at the 5 and 1 per cent level of significance respectively.

6. Conclusions and Policy Implications

This paper examines the relationship between CPI, money market rate, money supply (M1), and exchange rate. Results reveal the presence of long run relationship between *LCPI*, *LRMM*, *LRM1* and *LREXC*. There is a short term causal effect from *LRMM* and *LREXC* on *LCPI*. Therefore, the central bank may employ money market rate and exchange rate as monetary policy tools to target for desirable inflation. However, the money aggregates as measured by M1 provides insignificant effect on *LCPI*. Hence, money aggregates may not have certain representations of inflation based on consumer consumption patterns.

Any deviation from *LCPI* resulting from the selected variables would need longer time to fine-tune to its long run equilibrium. While, there is about 36.3% relatively fast speed of adjustment per month towards the long run equilibrium for the deviation in the real money market rate. The speed of adjustment will be a function of how fast the authority gains credibility by meeting its

targets. Higher gains in credibility will be followed by faster reductions of the lagged inflation coefficient, while lower credibility gains will be followed by slower reduction of the coefficient.

Transparency is a necessary condition for inflation targeting. The ongoing restructuring process in the Malaysian economies causes the delay in inflation targeting process and creates additional source of uncertainty in the monetary and financial system. Having adoption of inflation targeting as a monetary policy framework enhances central banks' credibility in fighting inflation since the objectives of monetary policy itself were easier to be understood by the public, unfortunately the decision where the BNM decided to leave the overnight rate unchanged at the point of time might have damaged its credibility since the public belief that it had buckled under government pressure or political influential. Therefore, it is not surprise to note that inflation targeting monetary policy may not be feasible for Malaysia at the moment due to its economic and political structure and institution may not be conducive at the current stage.

In a nutshell, we can conclude that three instruments are available, and that BNM has the power to decide on the changes made on interest rate, exchange rate and money supply in line with the economic growth in the short run. Among the tools, interest rate is having the faster speed of adjustment. However, from institutional perspective, institutional reformation is at the alarming stage where political influential is on hand and influences the central bank independency. Increasing transparency and coherency of policy, at the same time providing discretion to deal with short run volatility are crucial, before the benefit of implementing inflation targeting could be realized. The selection process of the Gabenor of the central bank has to be independent and transparent too. For future enhancement, asset price channel indicator as another possible transmission mechanism channel could be incorporated since more than one-fifth of the CPI components are formed from housing, water, gas, electricity and other fuels.

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