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Monetary Policy Autonomy: An Examination in the Case of Malaysia

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Abstract. This paper examines Bank Negara Malaysia's (BNM) monetary policy autonomy from 1991-2009. Using the theoretical model developed by Brissimis, Gibson and Tsakalotos (2002), the paper's empirical estimates show that the same-period offset coefficients are significantly less than unity under all regimes. Similarly, the same-period sterilization coefficients are high under all regimes. This indicates that the Malaysian central bank possesses some short-run control over its monetary policy even under fixed exchange rate regime and an open capital account. These results show that Malaysia is exempted from the impossible trinity in the very short-run. Nonetheless, Malaysia abandoned its US dollar exchange rate peg on 20 July 2005 to move back to managed floating so as to increase its monetary policy independence. One implication of the Malaysian monetary policy experience is that managed floating with active sterilization may be a viable strategy for emerging market economies to deal with volatile capital flows.

Keywords: offset coefficient, sterilization coefficient, monetary autonomy

1. Introduction

The last two decades were a very volatile and difficult period for Malaysia's Bank Negara Malaysia (BNM), and its monetary policy. The first decade (1990s) began with strong economic activities and surges in capital inflows followed by the 1997-98 Asian Currency Crisis (ACC), volatile capital outflows and speculative attacks on its currency, the Ringgit. In the 2000s, recovery from the ACC again led to large inflows of capital, this time from mounting current account surpluses but the decade yet again ended with another financial crisis originating from the U.S. To deal with these shocks and volatile capital flows, BNM had to experiment with different exchange and capital regimes. It started the 1990s with managed floating and open capital accounts, but had to resort to imposing selective capital controls (1998-2000) and a fixed exchange rate regime during the ACC as part of a policy package to fend off speculative attacks on the currency. Upon recovery from the ACC, the capital controls were gradually lifted by 2000but the fixed rate regime was maintained through 2005. In 2005, however, BNM re-instated managed floating to deal in part with the significant inflows of capital from the high current account surpluses.

This paper aims to use this rich and diverse period to determine empirically whether BNM has been successful in maintaining its monetary autonomy under the myriad shocks and regime changes. The strategy used is that of estimating the capital-account offset and sterilization coefficients for BNM from 1991.1 to 2009.12. A complete loss of monetary control means that any BNM attempt to change its monetary stance would be completely offset through the capital account. However, this offset coefficient from a capital flow equation needs to be estimated simultaneously with the sterilization coefficient from a central bank reaction function, since any flow through the capital account is also subject to policy-driven sterilization attempts to limit its impacts on the monetary base.

The paper thus estimates the theoretical model of Brissimis et al's (2002)(BGT), which derives the offset and sterilization coefficients simultaneously by minimizing a central bank's loss function. The paper's estimates show that short-run offset remains significantly less than -1 and the short-run sterilization

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coefficients are high suggesting that BNM possesses a measure of short-run monetary control under all different regimes. The paper thus concludes that BNM has a measure of short-run monetary control under all regimes, and, hence, is exempted from the Impossible Trinity in the short run under the fixed rate, open capital account regime.[1]

This paper is organized as follows. Section 2 reviews the model, the data and the variables used in the empirical study. Section 3 reports and discusses the empirical results. The final section concludes with a brief discussion of the macroeconomic policy implications and tradeoffs facing Malaysia in the future.

2. The Theoretical Framework

The existing work on the offset and sterilization coefficients can be separated into four main groups. The first seeks to calculate the offset coefficient only from the portfolio balance approach and the monetary approach to the balance of payment. The second group estimates the sterilization coefficient from the central bank reaction function. The third group estimates both the offset coefficient and sterilization coefficient from separate functions. The offset coefficient is normally estimated from a capital flow equation while the sterilization coefficient is estimated from a central bank reaction function. The last group such as BGT (2002) estimates both the offset and sterilization coefficients from the minimization of a loss function by the monetary authority. This loss function is subjected to a number of constraints that reflect the transmission mechanism of the economy. Ouyang and Rajan (2005) modified the BGT model in a number of ways and applied it to several Asian economies. In this paper we used the simplified loss function of Ouyang and Rajan (2005).[2]

To take into account the period of capital controls, we let: duec = 1 in 1998.9 till 2000.12 ; duec = 0 for otherwise. To take into account the fixed exchange period, we let: dfixer = 1 in 1998.9 till 2005.7; dfixer= 0 for otherwise. So, altogether, we distinguish 3 periods: duec=0; dfixer=0 covers managed floating; duec = 1; dfixer =1 covers the period with capital controls and fixed exchange rates; duec = 0; dfixer =1 covers fixed exchange rates with no capital controls.

By including these three dummy variables, we estimated the model as follows:

$$\Delta NFA_t = \alpha_0 + \alpha_1 \Delta NDA_t + \alpha_2 \Delta NDA_{t-1} + \alpha_3 \Delta NFA_{t-1} + \alpha_4 P_t + \alpha_5 IPI_t + \alpha_6 \Delta TB_t + \alpha_7 \Delta (r^*_{t-1} + E_t S_{t+1}) + \alpha_8 (d_1 - 1)\sigma_{r,t} + \alpha_9 (d_2 - 1)\sigma_{s,t} + \alpha_{10} duec \Delta NDA_t + \alpha_{11} dfixer \Delta NDA_t + \varepsilon_t \quad (1)$$

$$\Delta NDA_t = \beta_0 + \beta_1 \Delta NFA_t + \beta_2 \Delta NFA_{t-1} + \beta_3 \Delta NDA_{t-1} + \beta_4 P_t + \beta_5 IPI_t + \beta_6 \Delta TB_t + \beta_7 \Delta (r^*_{t-1} + E_t S_{t+1}) + \beta_8 (d_1 - 1)\sigma_{r,t} + \beta_9 (d_2 - 1)\sigma_{s,t} + \beta_{11} duec \Delta NFA_t + \beta_{12} dfixer \Delta NFA_t + v_t \quad (2)$$

Equations (1) and (2) are estimated using monthly data from January 1991 to December 2009. The data are obtained from International Financial Statistics (IFS; International Monetary Fund) and datastream. Table 1 summarizes the definitions and sources of the data. Because of the unavailability of monthly GDP and current account data, we used the industrial production index (IPI) and trade balance (TB) as proxies for those two variables.

To account for simultaneity problems, Equations (1) and (2) are estimated using the Two Stage Least Squares (2SLS) method. 2SLS requires the selection of instrumental variables. Our instrumental variables consist of all the explanatory variables; a dummy for the end-1993 spike in capital flows; a dummy to capture the first time BNM revalues its external assets into ringgit effective September 1998, and the net contribution of the Employees Provident Fund (EPF). The estimated equations were tested for the presence of heteroskedasticity and autocorrelation using the White test and the Lagrange Multiplier test (LM test) respectively. Autocorrelation and heteroskedasticity were corrected using the Newey-West method.

[1] For a comprehensive discussion, please refer to the full paper, Lim and Goh (2009).
[2] Readers are advised to refer to BGT (2002) and Ouyang and Rajan (2005) for the full derivation of the model.

Table 1: Description of variables used in the empirical study

Variables	Definitions	Measured as	Source
ΔNFA_t	The change in net foreign assets (NFA) scaled by reserve money (RM) from the previous period	$\Delta NFA_t / RM_{t-1}$	IFS
ΔNDA_t	The change in net domestic assets (NDA) scaled by reserve money (RM) from the previous period	$\Delta NDA_t / RM_{t-1}$	IFS
TB_t	Trade balance scaled by reserve money (RM) from the previous period	TB_t / RM_{t-1}	IFS
P_t	Year-on-year change of the inflation rate	CPI_t- $CPI_{t-12}/CPI_{t-12}*100$	IFS
IPI_t	Year-on-year change of the industrial production index	IPI_t-$ICPI_{t-12}/IPI_{t-12}*100$	IFS
Δr_t^*	The change in foreign interest rate	$r_t^* - r_{t-1}^*$	IFS
$\Delta E_t S_{t+1}$	The expected change in nominal exchange rate depreciation (RM/US)	$\frac{s_{t+1} - s_t}{s_t}$ if perfect foresight	IFS
σ_{ex}	Volatility of exchange rate	The standard deviation of the daily exchange rate, RM/$	Datastream
σ_r	Volatility of domestic interest rate	The standard deviation of the daily overnight rate	Datastream
d_1	Dummy variable for $\Delta NDA_t<0$	d_1=2 if ΔNDA_t <0; = 0 if ΔNDA_t >0	
d_2	Dummy variable for $\Delta NFA_t<0$	d_2=2 if ΔNFA_t <0; = 0 if ΔNFA_t >0	
Duec	Dummy variable for capital control periods	duec = 1 in 1998.9 till 2000.12 duec=0 for otherwise	
Dfixer	Dummy variable for fixed exchange rate periods	dfixer = 1 in 1998.9 till 2005.7 dfixer= 0 for otherwise	

3. Empirical Results

Prior to the 2SLS tests, all variables are tested for unit root. Both the Augmented Dickey Fuller and Phillips Perron tests consistently suggest that the dependent variables of the equations, ΔNFA and ΔNDA, are stationary in levels or I(0) process. Other exogenous variables are also stationary or I(0) except for the trade balance (TB) which is non-stationary in levels, I(1). Hence, TB is included in the estimation as first difference.

Tables 2 and 3 report the 2SLS estimates of Equations (1) and (2). Taking first the capital flow equation, note that the estimated coefficient of ΔNDA, which gives us the same-period (short-term) offset, is -0.38 and significant at the 1 percent level. The result indicates that under managed floating/no capital controls, capital flows offset 38% of any change in monetary stance during the same month. The interaction dummies allow us to distinguish different short-run coefficients for different exchange and capital regimes. First, consider the case of fixed exchange rates/no capital controls. The interaction dummy for fixed exchange rates is -0.47 and significant at 1 percent, thus, the amount of short-term offset under fixed rates, no capital controls is -0.85 (i.e. the sum of -0.38 and -0.47), sizably larger than the offset under managed floating. However, this higher short-term offset is still significantly different from -1at 10 percent significant level, underscoring that BNM continued to have short-run monetary control even under fixed rates/no capital controls. Second, consider the interaction dummy for capital controls. Capital controls had an effectiveness of 0.52 (significant at 1 percent). As such, it reversed any offset by 0.52, that is, the short-run offset during the fixed rate/capital controls period (1998 to 2000) was (-0.38 – 0.47 + 0.52) or – 0.33. While these offsets are sizable, they are both significantly less than unity, suggesting that BNM has some measure of monetary control in the short-run, most likely reflecting imperfect capital mobility or less than instantaneous portfolio re-adjustments.

Table 2: Estimated capital flow function

Dependent variable: ΔNFA Method: 2SLS Sample: March 1991 – October 2009 No. of observation: 224 Instrumental Variable : $\Delta NDA_{t-1}, \Delta NFA_{t-1}, IPI_t, P_t, \Delta TB_t, \Delta(r_t^* + E_tS_{t+1})_t, (d_1\text{-}1)vi_t, (d_2\text{-}1)vex_t$, duec* ΔNDA_t, dfixer* ΔNDA_t, du93, REV9809, epf_rm, dsrr		
Variable	Coefficient	Standard error (t-stat)
Constant	-0.001804	0.016708 (-0.107983)
ΔNDA_t	-0.385362	0.149036 (-2.582693)**
ΔNDA_{t-1}	-0.091845	0.060837 (-1.509692)
ΔNFA_{t-1}	0.008029	0.069588 (0.115385)
IPI_t	0.000509	0.000499 (1.018204)
P_t	0.001525	0.004076 (0.374269)
ΔTB_t	0.095541	0.131190(0.728265)
$\Delta(r_t^* + E_tS_{t+1})$	-0.364673	0.225284 (-1.618729)
$(d_1\text{-}1)vi_t$	0.004433	0.011903(0.372445)
$(d_2\text{-}1)vex_t$	-0.349283	0.132720(-2.631718)***
duec* ΔNDA_{t-1}	0.527775	0.105746 (4.990982)***
dfixer* ΔNDA_{t-1}	-0.470063	0.1744791(-2.689288)***
du93	0.316185	0.075598(4.182437)***
R^2 =0.738202 Adjusted R^2=0.723313		
SE of regression 0.058070		

Table 2 shows that the lagged terms for the change in NDA and NFA are not significant even at 10 percent level; this disallows us to compute the long-run offset coefficients. Table 2 also shows that the only significant variables are the exchange rate volatility and the dummy variable introduced to capture the 1993"super bull' surge in capital inflows. All the other independent variables in the reaction function were not significant at 5 percent level.

Table 3: Estimated monetary policy reaction function

Dependant variable: ΔNDA Method: 2SLS Sample: March 1991 – October 2009 No. of observation: 224 Instrumental Variable : $\Delta NDA_{t-1}, \Delta NFA_{t-1}, IPI_t, P_t, \Delta TB_t, \Delta(r_t^* + E_tS_{t+1})_t, (d_1\text{-}1)vi_{t-1}, (d_2\text{-}1)vex_{t-1}$, duec* ΔNDA_{t-1}, dfixer* ΔNDA_{t-1}, du93, REV9809		
Variable	Coefficient	Standard error (t-stat)
Constant	-0.003869	0.005915 (-0.654185)
ΔNFA_t	-0.812987	0.036474 (-22.28932)***
ΔNDA_{t-1}	0.007952	0.059576 (0.133482)
ΔNFA_{t-1}	0.010069	0.044482 (0.226356)
IPI_t	0.001057	0.000429 (2.466944)**
P_t	0.005170	0.001290 (4.008091)***
ΔTB_t	-0.040304	0.089425 (-0.450699)
$\Delta(r_t^* + E_tS_{t+1})_{t-1}$	-1.178882	0.199941 (-5.896141)***
$(d_1\text{-}1)vi_{t-1}$	-0.005957	0.005742 (-1.037311)
$(d_2\text{-}1)vex_{t-1}$	0.079373	0.041029 (1.934545)*
duec* ΔNFA_{t-1}	-0.000906	0.028661 (-0.031623)*
dfixer* ΔNFA_{t-1}	-0.186405	0.031948 (-5.834646)***
R^2 =0.741603 Adjusted R^2=0.728321		
SE of regression 0.065573		

Table 3 shows that the short-run sterilization coefficient from the central bank reaction function is – 0.81 under managed floating. Thus, BNM did not attempt to sterilize capital flows completely in the same period though the relatively high coefficient suggests that BNM was sterilizing changes in NFA extensively throughout this period. The interaction dummies show that the intensity of sterilization increased during the fixed exchange rate regime (1998-2005). In Table 3 the interaction dummy for the fixed rate/no capital controls period is – 0.18, statistically significant at 1 percent, such that the sterilization coefficient under fixed exchange rates/no capital controls is (-0.81 -0.18) or – 0.99. This estimates to nearly -1 suggesting that BNM attempted to sterilize completely changes in NFA during this fixed rate period. The higher coefficient confirms that the intensity of sterilization activity increased during the fixed rate period. This greater degree of sterilization most likely reflects more robust NFA flows during the fixed rate period culminating in an accumulation of huge amounts of foreign exchange reserves under the fixed exchange rate regime. The

interaction dummy for capital controls is also negative at – 0.00096, and significant at 10 percent, implying that sterilization activity was also intense during the fixed rate/capital controls period (1998-2000), estimated at (- 0.81 – 0.18 – 0.00096) or – 0.9909 which is not significantly different from minus 1. It is possible that this period coincided with very volatile capital flows that both heightened the sterilization intensity and prompted BNM to impose selective capital controls.

Table 3 shows that the estimates for a few independent variables are mostly in line with expectations and significant at 5 percent. For example, an increase in the adjusted foreign interest rates [$\Delta(r^*_{t-1} + E_t S_{t+1})$] reduces capital inflows, while an increase in the IPI variable increases capital inflows. The inflation variable and the exchange rate volatility variables are significant at 1 and 5 percent respectively but have the wrong sign.

4. Conclusions and Policy Implications

The last two decades proved to be a very challenging period for BNM, an emerging market central bank, and its monetary policy. Surges in volatile capital flows prompted BNM to impose different exchange/capital regimes and to sterilize heavily to maintain monetary control. This paper used monthly data from this rich and diverse period to examine empirically whether BNM succeeded in maintaining monetary control through the myriad shocks and regime changes. Hence, this allows the paper to assess whether BNM has been able to escape the constraints of the Impossible Trinity.

Using the theoretical model of BGT (2002), the paper's estimates of offset and sterilization coefficients indicate that BNM has some short-run monetary control under fixed rates and open capital. The paper thus concludes that Malaysia is exempted from the Impossible Trinity, that is, a central bank cannot conduct an independent monetary policy while simultaneously maintaining a fixed exchange rate regime and an open capital account.

BNM's general success in monetary management during the turbulent period under study offers hope for other emerging markets faced with similar problems. Buffeted by the adverse effects of one regional, and then later, an international financial crisis, BNM guided Malaysia towards an average inflation rate of 2.9 percent annually in 1991-09, while real GDP growth averaged 5.9 percent. Although sterilization has often been dismissed or viewed skeptically as a long-term instrument, BNM's success in restraining excessive money creation and containing inflation via intensive sterilization over two decades suggests that sterilization may be a more effective policy instrument than is commonly expected.

Although it is true that Malaysia could escape the Trinity's constraints, because sterilization's effectiveness was undercut by a full offset coefficient, a switch to managed floating could restore the effectiveness of sterilization. Perhaps this explains in part why Malaysia eventually abandoned its fixed rate regime and moved back to managed floating on 20 July 2005. Thus, a possible lesson from the Malaysian experience in 1991-09 is that a managed float (that offers an escape from the Trinity) combined with active sterilization could be a viable strategy for emerging economies faced with volatile capital flows. In addition, under very adverse situations, short-term selective capital controls could also be justified. The viability of managed floating and sterilization is also consistent with recent research by Aizerman et al (2008) that finds emerging markets trending towards intermediate regimes as opposed to the old polar regimes of either free float or fixed rates.

5. References

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