The Effectiveness of Policy Makers during Uncertain Environment: Evidence from a Set of Emerging Market Economies

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Abstract

This paper ascertain the effect of changes in the domestic interest rate on exchange rate movement, using monthly data from a set of emerging market economies. The central banks are responding to the exchange rate movements in addition to the other core variables, namely, inflation gap and the output gap. In addition, countries with a high degree of financial openness are more responsive to the movement in the exchange rate, but this has weakened the effectiveness of disinflationary policy. Policy makers should behave pre-emptive and necessitate the exchange rate adjustment as alternative policy choice, in the calculus of formulating policy rule.

Keywords: Taylor Rule; Inflation Stabilities; Exchange Rate; Emerging Market Economies

JEL codes: E31, F31, E43

1. Introduction

An open economy version of IS-LM mode theoretically proves that monetary policy is a more potent stabilization tool in the flexible exchange rate regime for either the case of imperfect or perfect capital mobility. Under the assumption of an endogenous supply of money, New Keynesian economics have adopted the current popular assumptions that the central bank should use interest rate to respond to the deviation of inflation from its target values and the deviation of outputs from their long run values through Taylor (1993) rule. As the policy makers are not able to control inflation rate directly, they will utilize interest rate to adjust the rate of inflation. As the policy maker is assumed to be pre-emptive on these issues, especially under a flexible inflation targeting (IT) framework, this conventional optimal policy rule has been extended in the effort to include alternative policy choice–exchange rate. The extension of this monetary rule in an attempt to thin out the fluctuation of output, the gap between inflation and its target level and the fluctuation of the exchange rate.

The roles of IT and fluctuation in the exchange rate are still a puzzle in the empirical study. The issue of the fear-to-float phenomenon and external shocks into domestic inflation has prompted one question. It is interesting to find out whether the fear of floating has prohibited other countries to adopt IT monetary regime. The empirical research in this regard is still limited. Several studies (e.g. Akyurek & Kutan, 2008; Aizenman et al., 2011; Frömmel et al., 2011; Garcia et al., 2011) have taken into account the role of real exchange rate in setting the interest rate. By concentrating on a group of emerging market economies, Aizenman et al. (2011) contend the central bank responses to real exchange rate is more apparent in IT than the non-IT members. On the contrary, Poon and Lee (2014) find both IT (Indonesia, the Philippines and Thailand) and non-targeters (Brunei, Cambodia, Malaysia, Myanmar, Laos, Singapore and Vietnam) response relatively fast to reduce real gross domestic product and in dampening inflation. However, the non-IT members adopt mixed strategy as they found both inflation and real exchange rate provide important information in determining the policy rate.

We depart from the previous studies by focus on 25 emerging market economies in a panel setting with breaks. The motivation of this paper is to ascertain the effect of changes in the domestic interest rate on exchange rate. Besides that, it also investigates the effects of whether the fear of floating has prohibited other countries to adopt IT monetary regime. The knowledge on whether the monetary policy is grounded on the inflation, output gap or exchange rate is crucial for the public as well as private investors to form their expectation.

The rest of this paper is organized as follows. The next section discusses the methodology deployed in this study. Data of the study and empirical results are discussed in section 3. Section 4 provides a further discussion on the empirical results. Section 5 summarizes the main findings and offers some concluding remarks.

2. Estimation Strategy

2.1 Theoretical Framework

Following Taylor (2000), Mishkin and Savastano (2001) amongst others, and the objective of pre-emptive strategy, the underlying workhorse monetary policy reaction function for open economies presented as:

$$ir_{it} = \phi_0 + \phi_1 ir_{it-1} + \phi_2 ir_{it}^{*} + \phi_3 (\Delta p)_{it} + \phi_4 (y - \bar{y})_{it} + \phi_5 \Delta rer_{it} + \sum_{j=0}^{q} \alpha_i x_{it-i} + \upsilon_{it}, \quad (1)$$

where ir is the rate of short-term nominal interest target which set by the central bank, Δp is denoted as consumer price index inflation rate, y is real output, $\bar{y}$ is potential output, ir^{*} is equilibrium real interest rate, Δrer is the real exchange rate changes, and x refers to other control variables at i=1,2,…N and t=1,2,…T. The trend target rate is estimated by Hodrick-Prescott filter to the inflation rates and industrial production volume index, respectively. The expected sign for the parameters ϕ_2, ϕ_3, ϕ_4 and ϕ_5 in Eq. 1 is expected to be positive.

2.2 Dynamic Heterogenous Panel

Following Pesaran et al. (1999), the unrestricted specification for the autoregressive distributed lag (ARDL) model used in this study can be written as:

$$\Delta ir_{it} = \phi_i ir_{i,t-1} + \beta_i' X_{i,t-1} + \sum_{j=1}^{p-1} \lambda_{ij} \Delta ir_{i,t-j} + \sum_{j=0}^{q-1} \gamma_{ij}' \Delta X_{i,t-j} + \mu_i + u_{it}, \quad (2)$$

where ir_{it} is a scalar of interest rate, ϕ_i is a scalar coefficient on the lagged dependent variable, $\beta_i^{'}$ is the k × 1 vector of coefficients on the explanatory variables we mentioned before, X_{it} is k × 1 vector of regressors for group i, λ_{ij} are scalar coefficient on lagged first-differences of the interest rate, γ_{ij} are k × 1 coefficient vectors on first-difference of explanatory variables and their lagged values, μ_i represent the fixed effects, with the assumptions that the disturbances u_{it} are independently distributed across i and t, with zero means and variances $\sigma_i^2 > 0$. There exists an overwhelming evidence relationship between ir_{it} and X_{it} if $\phi_i < 0$ for all i as:

$$ir_{it} = \theta_i^{'} X_{it} + \eta_{it}, \quad (3)$$

where is the $\theta_i^{'} = \beta_i^{'} / \varphi_i$ is k×1 vector of the long run coefficients, and η_{it}'s are stationary with possibly non-zero means (including fixed effects) and can be then expressed as:

$$\Delta ir_{it} = \varphi_i (ir_{i,t-1} - \theta_i^{'} X_{it}) + \sum_{j=1}^{p-1} \lambda_{ij} \Delta ir_{i,t-j} + \sum_{j=0}^{q-1} \gamma_{ij}' \Delta X_{i,t-j} + \mu_i + u_{it}, \quad (4)$$

where φ_i is the coefficient error correction term measures the speed of adjustment towards the long run equilibrium. The error correction coefficient is expected to carry a statistically significant negative sign if the variables return to long run equilibrium. If $\varphi_i = 0$, then there would no long run relationship amongst the variables.

An advantage of pooled mean group (PMG, Pesaran et al., 1999) is that it allows the short-run dynamic specification to differ from country to country. The PMG estimator restricts the long run coefficient to be identical across groups, simply allows the short-run and adjustment coefficient as the error variances to differ across the cross-sectional dimension. The group-specific short-run coefficients and the common long run coefficient are computed by pooling maximum likelihood estimation. For robust checks, the Hausman test is utilized to test the hypothesis of homogeneity of long run parameters. In addition, lag order is chosen based on model selection criteria.

3. Results and Discussion

This paper applied the monthly data from 1986: M1 to 2013: M2. The sample countries consisted of 25 emerging market economies (Brazil, Chile, Colombia, Czech Republic, Hungary, Mexico, Poland, South Africa, South Korea, Thailand, Indonesia, Peru, the Philippines, Romania, Turkey, China, Egypt, India, Russia, Malaysia, Pakistan, Sri Lanka, Hong Kong SAR, Singapore and Taiwan) has complete data for the empirical study. The series for nominal interest rate, consumer price index (CPI, 2005=100), industrial production volume index (IPI, 2005=100), bilateral exchange rate were drawn from *International Financial Statistics* (IMF).

Table 1 provides the descriptive statistics for macroeconomic variables used in this paper. The variables of interest are all positively correlations with the domestic interest rate. This correlation analysis appeared to have confirmed the expected sign in the empirical literature. Following Pesaran (2004), the variables were pretested by testing the null hypothesis of the no cross-sectional dependence against the alternative of cross-sectional dependence. The results are displayed in Table 2, column two. Our test statistics are significant at the 1 percent level, suggesting a high degree of cross-sectional dependence among the panel members. The result from PCD, Pesaran's (2007) cross-section augmented Im, Pesaran and Shin (CIPS) suggesting that all the series in the present model are stationary—$I(0)$ except for the foreign real interest rate.

[Insert Tables 1 & 2]

The Quandt-Andrews structural breakpoint test was first performed to determine the structural alteration in the subset of the parameters. All the statistics (Sup/MaxF, ExpF and AveF) reject the null hypothesis of no structural breaks within the 15 percent trimmed data at 1 percent significance level. The strong evidence of break prompted this study to consider a different break date for the set of countries with the location of the date. The historical events in the late 1990s and 2000s had significant impacts on the responsive monetary policy in the developed and emerging countries. The extreme of the events varied from one country to another, depending on the response of these countries to the episodes.

The analysis was divided into countries with low exchange rate stability (column 1, Table 3), countries with high degree of monetary independence (column 2), countries with high degree of openness (column 3), and countries with low degree of financial openness (column 4). The classifications of the country characteristics are based on the Trilemma index proposed by Aizenman et al. (2015). We took into account the model with breaks in the late 1990s and 2000s. The break date ($Dummy^{Q\text{-}A}$) is highly significant with a negative sign.

[Insert Table 3]

All the long run parameters carry a positive sign and are significant at 1 percent. These findings are consistent with Taylor's rule that a tight monetary policy reduces inflationary pressure, suggesting a high interest rate when there is high inflation or when the output is above its full-employment level. Additionally, a Wald test for inflation gap and output gap equal to 0.50 is rejected at the 1 percent significant level. Given the coefficient on the inflation gap and the output gap are significant difference from 0.50, the results indicate that the central banks do not follow a strict anti-inflationary monetary policy.[1]

These results suggest that countries under review adopted mixed strategy as the inflation, output and real exchange rate significantly determine the movement of

[1] Soon (2015) in her thesis found the response of the policy maker is indifference between the monetary policy framework.

interest rate in the long run. The findings also support the idea that the exchange rate is an important part of the monetary transmission mechanism in an open economy (Leitemo & Söderström, 2005) and that central banks can consider external variable—exchange rate—in setting the interest rate (Aizenman et al., 2011; Frömmel et al., 2011; Garcia et al., 2011; Leitemo & Söderström, 2005; Lubik & Schorfheide, 2007).

In addition, we found the countries (e.g., Singapore, Hong Kong SAR, Mexico) are more responsive to the movement in the exchange rate with a high degree of financial openness and integration (coefficient=0.241). On the contrary, the coefficient on the exchange rate is very small (coefficient=0.020) for the countries with low financial openness. These imply that the exchange rate has to be taken into account in open emerging market economies.

Column 2 focuses on the group with high monetary independence. The insignificant foreign interest rate has been expected. When the degree of monetary independence is higher, the central banks no longer respond to the foreign rate. The speed of adjustment is faster in the less open emerging economies with the upper bound around 8.69 months. This finding indicates that the disinflationary policy is more effective in the countries with lower degree of financial openness. The effectiveness is followed by the countries with high monetary independence, with a half-life estimate upper bound around 9.57 months. However, the countries with high financial openness and those with low exchange rate stability that explored themselves more in the open economies were found to be less effective in conducting policy. Hence, the results of this study suggest that the countries should increase their monetary independence and make their exchange rate stable.

5. Conclusion

The primary objective of this paper is to ascertain the effects of the changes in the exchange rate movement on the domestic interest rate for a set of emerging markets economies. The major remarks may be summed up as follows. The current results intend to support the idea that the exchange rate is an important part of the monetary transmission mechanism in an open economy. One of the issues that has emerged from the findings is that both members adopted the mixed strategy as the inflation gap, output gap and real exchange rate significantly determined the movement of interest rate

(divine coincidence). Our finding goes well with the Taylor's rule that a tight monetary policy is necessary to reduce inflationary pressure. The central banks are more responsive to the movement in the exchange rate with a high degree of financial openness relative to the countries with high monetary independence. The disinflationary policy is more effective in the countries with lower degree of financial openness. Policy makers should behave pre-emptive and necessitate the exchange rate adjustment as alternative policy choice, in the calculus of formulating policy rule.

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Table 1: Descriptive Statistics

	Mean	Median	Maximum	Minimum	Std.Dev.	Skewness	Kurtosis
Full sample (*N*=30; *N* x *T*= 8,046 observations)							
ir	2.383	2.345	11.793	-4.605	1.147	0.799	11.637
π	0.779	0.361	431.749	-262.467	8.031	16.291	1284.035
$(\pi-\overline{\pi})$	-0.021	-0.024	424.158	-260.619	7.742	16.825	1398.377
$(y-\bar{y})$	0.009	0.469	42.090	-84.638	7.196	-1.461	15.731
rir^{*}	1.602	1.660	3.298	0.212	0.475	-0.287	3.131
Δrer	-0.020	-0.101	267.707	-170.863	6.399	8.165	590.887
Correlation matrix							
	ir	π	$(\pi-\overline{\pi})$	$(y-\bar{y})$	rir^{*}	Δrer	
ir	1.000						
π	0.153	1.000					
$(\pi-\overline{\pi})$	0.023	0.973	1.000				
$(y-\bar{y})$	0.008	0.004	0.007	1.000			
rir^{*}	0.266	-0.001	-0.022	0.069	1.000		
Δrer	0.015	-0.590	-0.603	-0.003	0.020	1.000	

Note: ir , π, $(\pi-\overline{\pi})$, $(y-\bar{y})$, rir^{*}, Δrer , and σ^{rer} refer to nominal interest rate, inflation, inflation gap, output gap, foreign real interest rate, and real exchange rate changes, respectively.

Table 2: Pesaran Cross-Sectional Dependence (PCD) Test and Panel Unit-Root Tests

	PCD		$\lvert\hat{\rho}_{ij}\rvert$		Hadri Z-stat	Consistent Z-stat	CIPS-stat
ir	225.66	[0.000]	0.639	τ	48.548[a]	48.650[a]	-8.171[a]
				φ	15.594[a]	16.408[a]	-6.644[a]
π	35.38	[0.000]	0.120	τ	10.764[a]	22.046[a]	-23.019[a]
				φ	5.816[a]	18.537[a]	-23.476[a]
$(\pi-\overline{\pi})$	13.58	[0.000]	0.077	τ	-5.105	-4.757	-25.672[a]
				φ	-5.104	-3.862	-25.748[a]
$(y-\bar{y})$	64.84	[0.000]	0.253	τ	-5.110	-5.019	-25.264[a]
				φ	-5.121	-4.798	-25.066[a]
Δrer	50.38	[0.000]	0.149	τ	1.152	1.986[b]	-26.483[a]
				φ	1.952[b]	3.402[a]	-26.792[a]

Notes: ([a]), and ([b]) indicate significance at 1 and 5% levels, respectively. The PCD test is based on the residual cross-correlation of the Augmented Dickey-Fuller (*p*) regressions, where *p* denotes the lag. The test follows a standard normal distribution under the null hypothesis of cross-section independence. The null for Hadri's test is stationary. Newey-West automatic bandwidth selection and Bartlett kernel. φ and τ refers to specification with trend and without trend, respectively.

Table 3: Taylor Rule and Country Characteristics

	(1) Low Exchange Rate Stability		(2) High Monetary Independence		(3) High Financial Openness		(4) Low Financial Openness	
Long run coefficients								
rir^*	0.220[a]	(0.049)	0.137	(0.130)	0.298[b]	(0.133)	0.169[a]	(0.037)
$(\pi - \bar{\pi})$	0.225[a]	(0.027)	0.345[a]	(0.114)	0.609[a]	(0.102)	0.111[a]	(0.023)
$(y - \bar{y})$	0.038[a]	(0.005)	0.057[a]	(0.018)	0.078[a]	(0.017)	0.018[a]	(0.003)
Δrer	0.071[a]	(0.010)	0.134	(0.127)	0.241[a]	(0.043)	0.020[a]	(0.007)
Short run coefficients								
Δrir^*	-0.031	(0.028)	-0.053	(0.043)	-0.046	(0.049)	-0.005	(0.008)
$\Delta(\pi - \bar{\pi})$	-0.036	(0.032)	-0.053	(0.048)	-0.062	(0.058)	-0.006[b]	(0.003)
$\Delta(y - \bar{y})$	-0.001	(0.001)	-0.001	(0.001)	-0.001[b]	(0.001)	0.001	(0.002)
$\Delta^2 rer$	-0.030	(0.029)	-0.048	(0.047)	-0.054	(0.052)	0.001	(0.001)
Constant	0.148[a]	(0.037)	0.185[b]	(0.076)	0.045[c]	(0.026)	0.259[a]	(0.082)
Dummy$^{Q\text{-}A}$	-0.077[a]	(0.025)	-0.098[b]	(0.039)	-0.034[c]	(0.020)	-0.083[c]	(0.050)
Diagnostic Checking								
No. of obs.	5657		4340		2999		3557	
No. of countries	21		16		12		13	
LogL	5860.458		5275.463		2890.036		4307.652	
Hausman test	PMG		MG		PMG		PMG	
Convergence coefficient	-0.055[a]	(0.011)	-0.083[a]	(0.022)	-0.027[a]	(0.010)	-0.092[a]	(0.028)

Note: ([a]), ([b]) and ([c]) indicate significance at 1, 5 and 10% levels, respectively. Standard errors are in the parentheses.