EXCHANGE RATE REGIMES AS THRESHOLDS: THE MAIN DETERMINANTS OF CAPITAL INFLOWS IN EMERGING MARKET ECONOMIES

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ABSTRACT

This study investigates whether the impacts of the main common push (global financial conditions, GFC) and country-specific pull (growth) factors on capital inflows are invariant to the prevailing exchange rate regimes (ERRs) in emerging market economies. Our results suggest that endogenously estimated ERR thresholds do matter especially for the impact of GFC. The impact of GFC is substantially high under more flexible ERRs for all capital inflow types except FDI. FDI inflows are basically determined by the pull factor across all ERRs. Portfolio inflows are mainly determined by GFC. The sensitivity of aggregate and other investment inflows to the pull factor seems to be much higher under more rigid ERRs. Our results are broadly in line with the literature suggesting that credible managed ERRs encourage capital inflows by allowing countries to import monetary policy credibility of the center country and to provide exchange rate guarantee.

1. Introduction

Capital flows and global financial conditions have often been found amongst the main determinants of growth in emerging market economies (EME) as suggested by the seminal contribution by Calvo, *et al.* (1996). This important finding is strongly supported also by the recent studies including Cardarelli, *et al*. (2010) and Rey (2016). The recent two decades have witnessed a dramatic increase in capital flows not only in advanced economies (AE) but also in EME, leading to substantially higher international financial integration (Lane and Milesi-Ferretti, 2018). Consequently, investigating the basic determinants of capital inflows has become much more topical in international macroeconomics.

There is a wide and growing literature on the determinants of capital flows (see, e.g., Forbes and Warnock, 2012; Montiel, 2014; Sarno, *et al.* 2016; Avdjiev, *et al.* 2017). The recent literature typically classifies the determinants of capital flows mainly as country-specific (pull) and common (push) factors. "Push" factors primarily refer to changes in global financial conditions and monetary policy stance in AE. "Pull" factors are basically the variables representing domestic macroeconomic and institutional conditions. These include a broad range of factors such as growth, financial and trade openness, institutional quality, domestic policy stance and interest rate differentials.

The results by Forbes and Warnock (2012) suggest that extreme capital flow episodes are mainly driven by global factors. In the same vein, Bruno and Shin (2015) finds that global factors have a larger impact than domestic factors in more financially open economies with larger banking flows. The findings by Ahmed and Zlate (2014) support the postulation that both the domestic pull factors (growth and interest rate differentials) and global risk appetite are significant determinants of net capital flows to EME. Ghosh *et al.* (2014) suggests that while global factors act as "gatekeepers", pull factors including financial openness and ERR determine the final magnitude of the surges in capital inflows to EME.

Rey (2016, 2018) convincingly argues that the VIX index (Chicago Board Options Exchange's equity option volatility index) proxies global financial cycle which is closely associated with capital flows, credit growth and asset prices. In the same vein, Forbes *et al.* (2012) reports that the global financial conditions (GFC) is the only variable explaining surges and stops in capital flows. Cerutti *et al.* (2017), on the other hand, finds that GFC proxied by VIX explains systematically only a small proportion of the variation in capital flows. The

results by Sarno *et al.* (2016) suggest that global economic forces prevail over domestic variables in explaining movements in international portfolio flows. According to Rey (2016), capital inflows (except FDI) are negatively correlated with the GFC. Avdjiev, *et al.* (2017) finds that capital inflows are negatively associated with VIX and positively associated with GDP growth across all capital flow types, except portfolio equity flows.

According to the conventional wisdom, credible managed exchange rate regimes (ERRs) encourage capital inflows as they allow countries to import monetary policy credibility (and thus lower inflation) of the anchor currency country, reduce transaction costs and provide exchange rate guarantee (Rogoff *et al*. 2004). Under international capital flows, ERR flexibility gives economies greater ability to pursue an independent macroeconomic policy as postulated by the impossible trinity of international macroeconomics. Edwards (2011), for instance, presents evidence that ERR flexibility allows countries to accommodate external shocks. Accordingly, the impacts of external shocks are amplified in countries that have more rigid ERRs (di Giovanni and Shambaugh, 2008). In the same vein, Erdem and Özmen (2015) finds that, the impacts of external real and financial shocks and domestic variables are significantly greater under managed regimes as compared to floats.

The empirical literature, however, provides mixed and often conflicting results on the impact of ERR on capital inflows. Magud *et al*. (2014) and Boudias (2015) find that ERRs have no impact on the cyclical component of capital flows in EME. The results by Passari and Rey (2015) also provides a support to the postulation that the insulation properties of floating ERRs may have been overestimated. Cerutti, *et al.* (2017) indicates that the sensitivity of capital inflows to global financial cycle is independent of the ERR. Cerutti, *et al.* (2015), on the other hand, reports that the impact of global push factors on portfolio bond inflows higher in EME with more flexible ERRs. The results by Obstfeld *et al.* (2018) suggest that the transmissions of global financial shocks and domestic pull factors are magnified under a fixed ERR relative to more flexible regimes in EME. According to Ghosh *et al.* (2014), countries with less flexible ERRs are more likely to experience capital inflow surges.

The bulk of the literature has often focused on the behavior of net capital flows, measured as the difference of the purchases of domestic assets by non-residents (gross inflows) and the purchases of foreign assets by residents (gross outflows), which is, indeed a mirror of the negative of the current account balance. The recent literature, however, shows that gross capital flows are much larger and more volatile than net capital flows and, thus, crucially important for growth and financial stability issues (Forbes and Warnock, 2012; Broner, *et al.* 2013; Ghosh *et*

al. 2014). Furthermore, the literature, however, often considers aggregate capital inflows and ignores their main components. The recent studies, including Blanchard *et al.*, (2017), Igan *et al.* (2016) and Eichengreen *et al.* (2018), on the other hand, convincingly stress the importance of the evolution, causes and consequences of the main components of capital flows. Blanchard *et al.* (2017), for instance, reports that capital inflows can be expansionary or contractionary conditioning on their types. The results by Eichengreen *et al.* (2018) suggest that foreign direct investments are driven mainly by pull factors, portfolio flows seem to be driven mainly by push factors whilst other investment flows are driven by both push and pull factors.

The literature is yet to investigate whether prevailing ERR provide endogenous thresholds for the impacts of basic pull and push factors on capital flows. In this context, the main aim of this paper is to investigate this important issue empirically for a balanced panel of EME by employing panel threshold model of Hansen (1999). To this end, in accord with the main findings of the recent literature, we postulate global financial conditions proxied by VIX as the main push factor and real GDP as the main pull factor to explain capital inflows in EME. In this context, we consider also the main components of capital (portfolio, foreign direct investment and other investment) inflows.

The plan of the rest of this paper is follows. The following section presents our estimation results. In this section, we first maintain that the impact of the push factor may vary according to the prevailing ERR. We then proceed with the alternative case that ERRs provide an endogenous threshold for the impact of the main pull factor. Finally, Section 3 presents an evaluation of our main findings.

2. Exchange Rate Regimes as Thresholds: Empirical Results

To investigate the main determinants of gross capital inflows, we consider the following simple benchmark equation:

$$CIF_{it} = a_0 + a_1 GROWTH_{it-1} + a_2 \Delta vix_t + u1_{it} \tag{1}$$

In (1), the subscript i and t denote, respectively country and time, Δ is the difference operator, CIF is gross capital inflows scaled by GDP in current US dollars[1], GROWTH is the

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[1] All capital flows data, measured in US dollars, are from International Financial Statistics of the International Monetary Fund (IMF). Following the IMF's Balance of Payments Statistics Yearbooks, capital inflows are defined as net purchases of domestic assets by foreign residents. The GDP data are from World Bank World Development Indicators. The VIX data are from Chicago Boards Options Exchange website.

real GDP growth and vix is the natural log. of the VIX (Chicago Board Options Exchange's equity option volatility index) to proxy the global financial cycle. A decrease in VIX is associated with a greater risk-appetite or better global financial conditions. We postulate that capital inflows may parsimoniously be explained by the main pull (GROWTH) and push (Δvix) factors. Considering the potential endogeneity of real GDP growth for the evolution of capital flows, we consider lagged GROWTH in (1).

The benchmark equation (1) maintains that the impacts of the main pull and push factors are invariant to the prevailing exchange rate regimes (ERRs). Alternatively, ERR may be an endogenous threshold variable magnifying the impacts of the main determinants of capital inflows. In the context of the panel fixed effect threshold model of Hansen (1999), we first consider the impact of the push factor:

$$CIF_{it} = b_0 + b_1 GROWTH_{it-1} + b_2 \Delta vix_t (ERR \leq \lambda) + b_3 \Delta vix_t (ERR > \lambda) + u2_{it} \qquad (2)$$

Alternatively, the ERR may be postulated as a threshold for the impact of the main pull factor:

$$CIF_{it} = c_0 + c_1 \Delta vix_t + c_2 GROWTH_{i,t-1} (ERR \leq \lambda) + c_3 GROWTH_{i,t-1} (ERR > \lambda) + u3_{it} \quad (3)$$

In (2) and (3), λ is endogenously estimated single threshold value for the ERR. Under the null hypothesis that $b_2 = b_3$ in (2) or $c_2 = c_3$ in (3), there are no significant thresholds for the effects of the ERR and thus we obtain (1). We estimate the equations also for the main components (foreign direct investment, portfolio and other investment) of gross capital inflows. For the ERRs, we consider the *de facto* –i.e., the actually followed, rather than the officially declared- classification by Ilzetzki, *et al.* (2017) (IRR). The classification by IRR divides *de facto* regimes into 6 "coarse" -fixed, limited flexibility, managed floating, freely floating, freely falling, dual market in which parallel market data is missing- and 15 "fine" (ERR1, ERR2, ... ERR15) categories. IRR notes that classifying episodes of severe macroeconomic instability with very high inflation and exchange rate change as floating, intermediate or pegged may be misleading as they could be incorrectly attributed to the ERR[2]. IRR classifies these episodes as "freely falling". In these classifications, higher values (up till 4 and 13, respectively in the coarse and fine classifications) denote more flexible exchange rate arrangements. As it allows more flexibility to estimate the thresholds, we consider the "fine" classification of IRR in our empirical analysis.

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[2] Note that, Magud *et al.* (2014) and Boudias (2015) results are based on estimations of the equations which include ERRs defined by the IRR coarse classification ranging from 1 to 6. As already noted, in the IRR classification, the higher numbers correspond to more flexible ERRs up till 4. Consequently, maintaining that the "freely falling" and dual markets as more flexible ERRs than the floating regime may seriously be misleading. Therefore, the results by Magud *et al.,* (2014) and Boudias (2015) should be interpreted with an extreme caution.

However, we interpret our results considering also the "coarse" classification. Our effective estimation sample does not contain the fine (coarse) ERR classification greater than 13 (4). Our balanced panel data contain 27 emerging market economies[3] (EME) spanning the period between 1996 and 2015. The choice of the sample is basically determined by data availability to obtain a balanced data which is necessary to employ the Hansen (1999) procedure.

Table 1 presents the results of the estimation of Eq. (2) employing the Hansen (1999) procedure[4]. The equation specifies that the impact of the main push factor (GFC, proxied by Δvix) may change across the prevailing *de facto* ERRs. The results by Table 1 suggest that, the pull factor (GROWTH) is positive and significant in explaining all capital inflow types except portfolio inflows. These results also strongly suggest that, ERR10 (crawling band narrower or equal to +/- 5 %) is the threshold for the impact of GFC on aggregate and portfolio inflows. The ERR regime threshold is estimated as 8 (crawling band narrower or equal to +/- 2 %) for FDI flows. The threshold estimate for other investment inflows (12, de facto moving band +/- 5 %) appears to be statistically insignificant. For all capital inflow types except FDI, "managed floating" regimes in the *de facto* coarse classification of IRR are estimated as the endogenous threshold. For FDI inflows, the threshold appears to be the "limited flexibility" regime. The results suggest that, the push factor (VIX) is not significantly negative for all capital inflow types in the low regime (more rigid ERRs). The exchange rate stability appears to be effective in preventing a decrease in capital inflows in countries with more rigid ERRs. Worsening global financial conditions, on the other hand, leads to a decrease in aggregate, portfolio and other investment inflows in EME implementing more flexible ERRs. This is consistent with an interpretation that worsening GFC leads to capital move from EME to the other EME with more rigid ERRs or to AE, respectively, due to exchange rate guarantee or flight to safety concerns.

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[3] Emerging market economies (EME) are those included in the Morgan Stanley Capital International (MSCI) index, and comprises Argentina, Brazil, Bulgaria, Chile, China, Colombia, Croatia, Czech R., Egypt, Hungary, India, Indonesia, Israel, Kenya, Lithuania, Mexico, Morocco, Pakistan, Peru, Philippines, Poland, Romania, Russian F., S. Africa, S. Korea, Thailand, Turkey.

[4] Our preliminary results (not reported to save the space but available on request) suggested not to reject the null hypothesis that two thresholds (three regimes) are insignificant for all the specifications considered in this paper. The trimming parameter for the Hansen procedure is set to be 0.05 at both ends of the threshold variable but our results are found to be robust for different plausible trimming values.

Capital flows variable	Aggregate Capital inflows	Portfolio inflows	FDI inflows	Other inv. inflows
Table 1. Exchange Rate Regimes and the Impact of the Push Factor				
Threshold ERR F_B[.]	10 9.47[0.02]**	10 7.83[0.05]**	8 5.68[0.02]**	12 5.33[0.19]
The Determinants of Capital Inflows				
Growth$_{i,t-1}$	0.360 (0.057)**	-0.007 (0.021)	0.128 (0.035)**	0.240 (0.036)**
Δvix_{it} ERR $\leq \lambda$	0.938 (0.851)	-0.691 (0.392)*	1.321 (0.573)**	0.503 (0.435)
Δvix_{it} ERR $> \lambda$	-3.269 (1.102)**	-2.126 (0.414)**	-0.601 (0.592)	-9.221 (4.223)**
Constant	2.412 (0.280)**	0.790 (0.105)**	1.718 (0.172)**	-0.106 (0.181)
Statistics	N=27 NT=513 R^2 = 0.10 F = 17.40[0.00]	N=27 NT= 513 R^2 = 0.06 F = 10.9 [0.00]	N=27 NT= 513 R^2 = 0.05 F = 7.9[0.00]	N=27 NT= 513 R^2 = 0.10 F = 19.6[0.00]

Notes: F_B is the bootstrapped F-test based on 1000 replications to test the statistical insignificance of the threshold level and [.] is the p-value of the test. The values in parentheses are the standard errors. * and **, respectively, denote significance at 5 % and 1 % levels. N and NT are, correspondingly, the numbers of countries and the effective number of observations.

We now consider the alternative case that the impact of the pull factor (GROWTH) changes across the ERRs. Table 2 presents the results of the estimation of Eq. (3) which maintains ERR as a threshold for the impact of GROWTH. For FDI and portfolio inflows, estimated threshold (ERR7) is statistically insignificant. Therefore, the ERRs appear not to provide a significant threshold for the impact of domestic growth on FDI and portfolio inflows. For aggregate capital and other investment inflows, on the other hand, ERR5 (Pre announced crawling peg; de facto moving band narrower than or equal to +/-1%) is estimated as the significant endogenous threshold. This threshold corresponds to mainly pegged ERRs in the "coarse" classification of IRR (2017). The impact of domestic economic conditions, proxied by GROWTH, appears to be substantially much higher on aggregate capital and other investment inflows under pegged ERRs than more flexible ERR arrangements. GFC, proxied by Δvix, on the other hand, is negative and significant only for portfolio inflows. This result, is indeed consistent with the results presented by Table 1 suggesting that ERRs provide thresholds for the impact of GFC. Consequently, ignoring these thresholds may lead to misleading results.

Table 2. Exchange Rate Regimes and the Impact of the Pull factor

Capital flows variable	Aggregate Capital inflows	Portfolio inflows	FDI inflows	Other inv. Inflows
Threshold ERR $F_B[.]$	5 20.3[0.00]**	7 5.39[0.13]	7 4.67[0.17]	5 28.4[0.00]**
The Determinants of Capital Inflows				
Δvix_{it}	-0.578 (0.672)	-1.204 (0.255)**	0.361 (0.416)	0.408 (0.422)
$Growth_{i,t-1}$ ERR $\leq \lambda$	0.734 (0.099)**	-0.650 (0.342)*	0.226 (0.056)**	0.519 (0.062)**
$Growth_{i,t-1}$ ERR $> \lambda$	0.252 (0.062)**	0.021 (0.240)	0.936 (0.039)**	0.161 (0.039)**
Constant	2.460 (0.278)**	0.803 (0.106)**	1.681 (0.172)**	-0.121 (0.740)
Statistics	N=27 NT=513 $R^2 = 0.12$ F = 21.2[0.00]	N=27 NT= 513 $R^2 = 0.06$ F = 10.0 [0.00]	N=27 NT= 513 $R^2 = 0.04$ F = 7.6[0.00]	N=27 NT= 513 $R^2 = 0.15$ F = 28.0[0.00]

Notes: F_B is the bootstrapped F-test based on 1000 replications to test the statistical insignificance of the threshold level and [.] is the p-value of the test. The values in parentheses are the standard errors. * and **, respectively, denote significance at 5 % and 1 % levels. N and NT are, correspondingly, the numbers of countries and the effective number of observations.

3. Concluding Notes

Capital inflows have often been assessed as amongst the main determinants of growth especially in EME. This paper investigates whether the impacts of the main common external (push) and country-specific (pull) factors on capital inflows are invariant to the prevailing *de facto* exchange rate regimes (ERRs) in EME.

Our results are mainly consistent with Eichengreen *et al.* (2018) suggesting that FDI are mainly driven by pull factors, portfolio flows seem to be driven mainly by push factor and other investment flows are driven both by push and pull factors. However, we find that ERRs do often matter for the impacts of the main push factor (global financial conditions captured by (Δvix)) and the main pull factor proxied by GROWTH. The impact of GFC is substantially high under more flexible ERRs for all capital inflow types except FDI. We find that, FDI inflows are basically determined by GROWTH across all ERRs. The sensitivity of FDI to domestic economic conditions seems to be much higher under more floating regimes but the estimated ERR threshold is not statistically significant. Portfolio inflows are mainly determined by GFC.

This support the recent Sarno *et al.* (2016) finding that global economic forces seem to prevail over domestic economic forces in explaining international portfolio flows. The sensitivity of portfolio inflows to GFC is substantially higher under more flexible ERRs. The impact of the domestic pull factor on aggregate and other investment inflows is significantly positive and to be much higher under more rigid ERRs. We also find that GFC are not significant in determining the evolution of aggregate and other investment inflows under rigid ERRs.

We find that the impact of the external financial conditions on capital inflows increases with ERR flexibility. This result may be interpreted as being consistent with the conventional wisdom suggesting that credible managed ERRs encourage capital inflows by allowing countries to import monetary policy credibility of the center country and to provide exchange rate guarantee. Our findings provide a further support also to the seminal paper by Calvo *et al.* (1996) which argues that greater exchange rate flexibility introduces uncertainty and thus may discourage cross-border flows. An adverse global financial shock may be expected to lead to domestic currency depreciation and thus to increase exchange rate risk in EME with floating ERRs. All these may discourage foreign residents to buy domestic assets (capital inflows) of these countries. Consistent with this interpretation, Ghosh *et al.* (2014) finds that countries with less flexible ERRs are more likely to experience capital inflow surges. Our results also support the Passari and Rey (2015) postulation that the insulation properties of floating ERRs may have been over-estimated[5].

To conclude, ERRs appear to matter for the impacts of the main global push and country-specific pull factors on the evolution of capital inflows to EME. Exchange rate regime flexibility, albeit potentially providing a buffer against external shocks by allowing more monetary policy independence, also contains uncertainty and exchange rate risk discouraging capital inflows during the episodes of global financial turbulence.

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[5] Our results, however, fail to provide a support to the recent Obstfeld *et al.* (2018) finding that the transmissions of global financial shocks and domestic pull factors are magnified under a fixed ERR relative to more flexible regimes in EME. Obstfeld *et al.* (2018) defines the ERRs thresholds as exogenous and maintains floating ERR as the reference category. Furthermore, this finding by Obstfeld *et al.* (2018) is basically based on the estimation of equations containing a dummy variable to control for the recent global financial crisis.

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