Fed's interest rate policy and capital reversals: Empirical evidence from BRICs

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ABSTRACT

Capital reversals have formed several financial crises around the world since the 1980s. However, there is no consensus among economists on whether push or pull factors are responsible for creation of capital reversal and financial crisis. Many economists including Reinhart et al. (1993), Broto et al. (2008), Fratzcher (2011), Ghosh et al. (2017), and Pagliari & Hannan (2017) believe that push factors are the main determinants of capital outflows during a financial crisis. This group of economists has emphasized that the Fed's interest rate policy has contributed to capital reversal. While others, including Alfaro et al. (2014), Chen, Griffoli, & Sahay (2014), Broner and Ventura (2016), and Alberola et al. (2016) have underlined the importance of pull factors such as macroeconomic fundamentals, productivity, domestic saving, level of foreign reserves, and soundness of the financial system. Given these contradictory findings, this paper attempts to investigate whether the Fed's interest rate policy plays a dominant role in explaining capital reversal for BRICs countries. One of the novel features of this study is that it implements fixed effects model to control for biased standard errors in finance panel data as suggested by Peterson (2009) and provides the results for each country separately. Using quarterly data for the period of 1987Q1-2017Q1, the estimated results for standardized regression suggest that the Fed's interest rate policy plays a dominant role compared to other push factors and country-specific macroeconomic fundamentals. However, real GDP and real exchange rate volatility are the most important pull factors that shape capital reversals and net portfolios.

Keywords: Fed's interest rate policy, capital reversal, push factors, pull factors, macroeconomic fundamentals, real exchange rate volatility.

1. Introduction:

The sensitivity of capital flow to Fed's interest rate policy has been investigated by several economists, including Broto et al. (2008), Fratzscher (2011), Ghosh et al. (2017), and Pagliari & Hannan (2017). However, none of these studies have controlled for country-specific characteristics. Indeed, one of the novel features of this study is that it implements Fixed Effects model to avoid the biased standard errors in finance panel data as suggested by Peterson (2009) . The reason the study covers BRICs countries is because capital reversal has plummeted in some of these countries substantially, leading them into a deep recession or lower economic growth. To find out whether the Fed's interest rate policy matters more than other push and pull factors for the capital flow we use regression models with a set of independent variables including macroeconomic fundamentals such as inflation, GDP growth, openness, real effective exchange rate volatility, stock market index, and a dummy variable for capital liberalization, and another dummy for controlling financial crisis periods.

Graphs 1-4 represent the negative effects of Fed's interest rate policy with capital flow to China and India, but not with Brazil, and Russia. The reason for the importance of FFR to China and India's economy might be due to higher trade and financial integrations of the former economies to the U.S. economy. The econometric results of the study suggest that the FFR has a negative correlation with capital flow to the emerging economies; the higher the FFR the less capital will flow to BRICs.

The rest of the paper is organized as follows. Section.2 briefly reviews the literature on the determinants of capital flows. Section.3 describes the data and methodology used in this paper. Section.4 discusses the estimated econometric results. Finally, Section.5 concludes and provides some policy recommendations.

2. Literature Review

There is no consensus among economists regarding the importance of pull versus push factors for capital reversals. Though many have emphasized the importance of push factors [(Broto et al. (2008), Fratzscher (2011), Ghosh et al. (2017), and Pagliari & Hannan (2017)], others have highlighted the crucial role of pull factors for capital flows [Alfaro et al. (2014), Chen, Griffoli, & Sahay (2014), Broner and Ventura (2016), and Alberola et al. (2016)]. This section briefly reviews the empirical studies that have investigated the determinants of capital inflows and outflows to different group of countries.

Reinhart et al. (1993) and Reinhart et al. (1996) indicate that capital inflow to Latin America in the 1990s was influenced by conditions generated outside the region, mainly by push factors. Prasad and Rajan (2008)argue that benefits of capital account liberalization for countries is indirect. However, they believe capital account liberalization is not an appropriate policy for all countries in all circumstances. Indeed, they believe capital account liberalization works best if other policies are disciplined. . Alfaro et al. (2014) emphasize the importance of domestic factors such as institutional quality and the soundness of macroeconomic policies in explaining capital flow volatility.

Broto, Díaz-Cassou, & Erce-Dominguez (2008) investigate the determinants of volatility of different types of capital flows towards emerging economies using panel data for a sample of

48 emerging and developing countries for the period of 1980 to 2006. Their result indicate that global factors have gained weight for three types of flows.

Broto et al. (2011) analyze the determinants of the volatility of various types of net capital inflows to emerging markets for the period of 1980-2006. They find that global factors have become increasingly dominants relative to country-specific drivers in shaping capital flows.

Ahmed & Zlate (2014) examine determinants of net capital flow to emerging markets with quarterly data for the period of 2002:Q1 to 2012:Q2. They conclude that interest rate differentials are the most important factor for shaping capital flows. They also find there has been a change in post-financial crisis behavior, particularly for net portfolio inflows because it shows greater sensitivity to interest rate differentials. However, they do not find a statistically positive significant effect of the U.S. unconventional monetary policy on the capital flows to emerging markets.

Alfaro, Kalemli-Ozcan, and Volosovych (2014) measure the net capital flow for a series of developing countries and find that international capital flow is positively associated with country's productivity growth. Their results indicate that overemphasizing private saving and failing to consider public savings, official flows, and global imbalances are serious shortcoming of the recent theoretical literature.

Chen, Griffoli, & Sahay (2014) investigate the impact of monetary policy in advanced economies on the emerging markets. Using regression models and data for the period of January 2000 to March 2014, contrary to Ahmed & Zlate (2014) they find that U.S. unconventional monetary policy have larger spillover effects than conventional monetary policy on capital flows. However, they find that macroeconomic characteristics of the recipient countries also matter, and better macro fundamentals can dampen the effects of U.S. monetary policy shocks.

Nier, Saadi-Sedik, & Mondino (2014) investigate the determinants of capital flows to a large sample of emerging market economies. They investigate the role of global financial cycles and macroeconomic fundamentals of recipient countries and country-specific characteristics in shaping capital flows. They find that global financial cycles have become the main driver of capital flows. They also find that the effects of global financial cycles on capital flow increases with the level of financial sector development in the host country.

Ghosh et al. (2017) find that push factors such as U.S. interest rate plays a crucial role in determining capital surges to EMDEs. However, the magnitude of capital flow towards a particular country largely depends on domestic factors such as capital account openness, and exchange rate regime.

Dou and Verdelhan (2015) use a time varying probability model of a global disaster and use market incompleteness and heterogeneity across countries accounting for volatility of equity and debt international capital flows. They use quarterly data for OECD countries with variables such as international trade, trade openness, interest rates, equity, and currency return. Their estimated results suggest that changes in assets positions and foreign reserves reflect capital flows.

Ahmed (2015) uses a dynamic panel framework covering 48 countries over the period 1982Q1-2006Q4 to investigate the effects of Fed's interest rate policy on capital flows. His results suggest that the liftoff effect of Fed's interest rate policy for emerging market is significantly higher than advanced market economies.

Alberola, Erce, & Serena (2016) investigate the role of international reserves as a stabilizer for international capital flows. They use regression models with cross-country quarterly data for 63 countries during 1991-2010 and find that international reserves is a leading indicator to capital outflows. They also find larger stocks of foreign reserves are associated with higher gross inflows and lower gross outflows.

Pagliari and Hannan (2017) use regression models with quarterly data for 65 countries over the period of 1970Q1-2016Q1, with independent variables such as U.S. policy interest rate, shadow interest rate, oil price, real GDP growth differentials, openness, reserves/GDP ratio, and a dummy variable for the financial crisis. Their results indicate that global factors such as U.S. GDP growth and shadow interest rate are the most important drivers of capital flow volatility. They also find that real GDP growth differentials vis-à-vis advanced economies play an important role in determining capital flow movements. In sum, their regression results indicate that push factors can be more important than pull factors in explaining capital volatility among countries.

Davis, Valente, and Wincoop (2019) analyze the drivers of gross and net capital flows by estimating a latent factor model. They find that the global financial cycles (GFC) and commodity prices account for half of the variance of gross flows in advanced countries and forty percent of variance of gross flows in emerging countries.

Given the contradictory results of some of the findings in the literature, this study attempts to measure the effects of pull and push factors such as changes in the Federal Funds Rate on capital flows to BRICs countries. One of the novel feature of this study is that it implements Fixed Effects model as suggested by Peterson (2009) to avoid the biased standard errors that occur in OLS technique for finance panel data.

3. Data and Methodology

3.1. Data

The quarterly data for the period of 1987Q1 to 2017Q1 have been retrieved from Federal Reserve Bank of St Louis, the World Bank, and IMF websites. Table 1. represents the list of macroeconomic variables used in the regression model.

Table 1. List of Macroeconomic Variables.

Name of Variable	Definition
CA	Net capital flow to BRICs
FFR	Effective Federal Fund Rate
GDP	Real GDP in the U.S. economy
Inf	Inflation rate in the U.S.
S&P	S&P market index
S	Stock market index in the recipient country
Oil	Oil price (Brent crude)
Open	Openness in recipient country
REER	Real Effective Exchange Rate volatility in the recipient country
GDPE	Real GDP in the emerging economy
D1	Dummy variable for the capital market liberalization
D2	Dummy variable for financial crisis during the time

3.2. Methodology

To investigate whether push factors including the Fed's interest rate policy play a dominant role in shaping capital flow to BRICs compared to country-specific characteristics and macroeconomic fundamentals, equation 1. has been estimated.

$$CA = a_0 + a_1 FFR + a_2 GDP + a_3 Inf + a_4 S\&P + a_5 S + a_6 Oil + a_7 Open + a_8 REER + a_9 GDPE + a_{10} D1$$

Equation (1)

The higher FFR is associated with lower capital inflow to emerging markets; therefore, we expect a negative relationship between the two variables. A higher real GDP in the U.S. is associated with more capital flow to emerging economies. The inflation in the U.S. economy is expected to have a positive impact on capital flow to emerging markets; therefore, we expect a positive relationship between the two variables. The S&P index has a negative impact on the capital flow to emerging markets; the higher the stock market index in the U.S. economy, the less willingness to invest abroad. However, the stock market index in the recipient country (S) has a positive impact on the level of capital flow to emerging economies. In addition, the higher the openness leads to more capital flow to the emerging markets. The real exchange rate volatility in the recipient country is expected to have a negative impact on the capital flow to emerging economies. Finally, the real GDP in the recipient country is positively associated with level of capital flow to that country. Finally, the dummy variable for capital liberalization (D1) is expected to have a positive impact on the capital flow, while the dummy variable for financial crisis (D2) has a negative association with capital flow to emerging economies.

$$a_1 = \frac{\Delta CA}{\Delta FFR} < 0 \qquad a_2 = \frac{\Delta CA}{\Delta GDP} > 0 \qquad a_3 = \frac{\Delta CA}{\Delta Inf} > 0 \qquad a_4 = \frac{\Delta CA}{\Delta SP} < 0$$

$$a_5 = \frac{\Delta CA}{\Delta S} > 0 \qquad a_6 = \frac{\Delta CA}{\Delta Oil} < 0 \qquad a_7 = \frac{\Delta CA}{\Delta Open} > 0 \qquad a_8 = \frac{\Delta CA}{\Delta REER} < 0$$

$$a_9 = \frac{\Delta CA}{\Delta GDPE} > 0 \qquad a_{10} = \frac{\Delta CA}{\Delta D1} > 0$$

4. Results and Discussion

Standard errors in finance panel data sets are biased if estimated through OLS technique (Peterson 2009); therefore, the model should be estimated by other techniques such as Generalized Methods of Moment (GMM) or Fixed Effects (FE) models. The estimated results of net capital flow to emerging economies through Fixed Effects model are presented in Table 2. Using standardized variables indicate that Federal Funds Rate plays the most dominant role in shaping the net capital flow compared to other push and pull factors. Indeed, the results here are consistent with those of Ahmed & Zlate (2014), Ghosh et al. (2017) and Pagliari and Hannan (2017) who find that global factors such as U.S. interest rate plays a dominant role in shaping capital flows to emerging markets.

Among pull factors, real effective exchange rate and real GDP in the recipient country plays the most dominant roles in attracting capital flows, indicating the importance of stability of exchange rate and economic growth for capital flows to BRICs. The openness also plays an important role and has a positive statistically significant effect on the net capital flow to India and China, but not for Brazil and Russia; the reason might be that the former countries have integrated into the global financial markets more than the latter countries.. Interestingly enough, the coefficient for liberalization dummy variable is positive and statistically significant for all countries, indicating the importance of capital liberalization for net capital flows to this group of countries. In addition, stock market index in the U.S. economy has a statistically negative significant impact on capital flow. However, the stock market index in emerging market has a positive significant impact in shaping the net capital flow to India and China, but not Brazil and Russia. The reason might be that the former countries have better integrated into the world economy due to stronger financial and trade relationship with western countries. In addition, the inflation rate in the U.S. economy is positively associated with capital flow to emerging markets; though the coefficient is relatively small. Finally, the oil price does not seem to matter for capital flows to BRICs; and the dummy variable for financial crisis have a negative significant impact on capital flows to all emerging countries. In sum, all the independent variables together have been able to explain more than 75% of changes in capital flow to BRICs.

Method of estimation	OLS	FE	OLS	FE
FFR	-0.23 (2.79)**	-0.24 (2.34)**	-0.31 (3.56)**	-0.29 (3.17)**
GDP	0.04 (1.78)*	0.03 (1.85)**	0.03 (1.96)*	0.03 (1.74)*
Inf	0.08 (3.16)**	0.07 (3.14)**	0.07 (4.25)**	0.06 (4.22)**
SP	-0.37 (3.79)**	-0.27 (3.18)**	-0.24 (3.12)**	-0.31 (3.75)**
S	0.12 (3.17)**	0.14 (3.78)**	0.11 (2.78)**	0.10 (2.89)**
Oil	-0.06 (1.78)	-0.03 (1.45)	-0.07 (1.23)	-0.03 (1.45)
Open	0.04 (2.25)**	0.03 (2.75)**	0.03 (2.87)**	0.02 (2.35)**
REER	-0.14 (2.98)**	-0.16 (3.15)**	-0.17 (4.15)**	-0.18 (4.23)**
GDPE	0.09 (2.78)**	0.14 (2.35)**	0.12 (3.15)**	0.13 (3.76)**
Dummy	0.01 (2.45)**	0.03 (2.75)**	0.01 (2.17)**	0.02 (3.14)**
R-Squared	0.86	0.83	0.79	0.78
Number of Observation	124	120	124	120

Table2. Estimated Results for Net Capital Flows to Emerging Countries using Fixed Effects Model.

Independent variable	**Brazil**	**Russia**	**India**	**China**
FFR	**-0.11 (2.14)***	**-0.12 (2.74)****	**-0.27 (3.14)****	**-0.26 (2.98)****
GDP	**0.03 (2.83)****	**0.04 (1.78)***	**0.03 (2.14)***	**0.05 (2.45)****
Inf	**0.03 (2.56)****	**0.02 (1.87)***	**0.04 (1.97)***	**0.04 (2.34)****
S&P	**-0.07 (1.86)***	**-0.08 (2.24)****	**-0.12 (2.45)****	**-0.15 (2.78)****
S	**0.04 (1.19)**	**0.04 (1.38)**	**0.12 (2.41)****	**0.13 (2.39)****
Oil	**-0.04 (1.14)**	**0.06 (0.45)**	**-0.09 (0.78)**	**-0.12 (1.14)**
Open	**0.012 (1.34)**	**0.020 (1.17)**	**0.14 (2.7)****	**0.16 (3.25)****

REER	**-0.07 (2.44)****	**-0.07 (2.78)****	**-0.09 (3.16)****	**-0.08 (3.25)****
GDPE	**0.07 (2.93)****	**0.12 (2.37)****	**0.11 (3.14)****	**0.14 (3.78)****
D1	**0.02 (1.95)***	**0.03 (1.87)***	**0.02 (2.55)****	**0.04 (2.96)****
D2	**-0.01 (1.75)***	**-0.01 (1.93)***	**-0.02 (2.15)****	**-0.04 (2.89)****
R-Squared	**0.76**	**0.77**	**0.79**	**0.78**
Adjusted R-Squared	**0.75**	**0.75**	**0.77**	**0.77**

Note: Numbers in parentheses are t statistics and * denotes 5 percent significance and ** presents 1 percent of significance.

5. Discussion and Policy implications

Empirical evidence suggest that capital flow has been very volatile during the past few decades, especially to emerging markets. To find out the importance of push and pull factors in shaping the capital flows to BRICs Fixed Effects Model was used in order to avoid biased standard errors in finance panel data as suggested by Peterson (2009). The estimated results for standardized regression suggest that Fed's interest rate policy plays the most dominant role for shaping capital flows to BRICs compared to country-specific drivers and pull factors, and has more importance for China and India than Brazil and Russia. However, some of pull factors such as real GDP and real effective exchange rate volatility play important roles in attracting net capital flow. This finding has a very important policy implication for policy makers in BRICs, suggesting countries who desire to attract more capital flow should improve their macroeconomic fundamentals such as economic growth and dampen the volatility of real effective exchange rate. Indeed, high volatility of real effective exchange rate is detrimental to capital flows. However, openness and capital liberalization in the host country have a positive significant impact for attracting capital flow.

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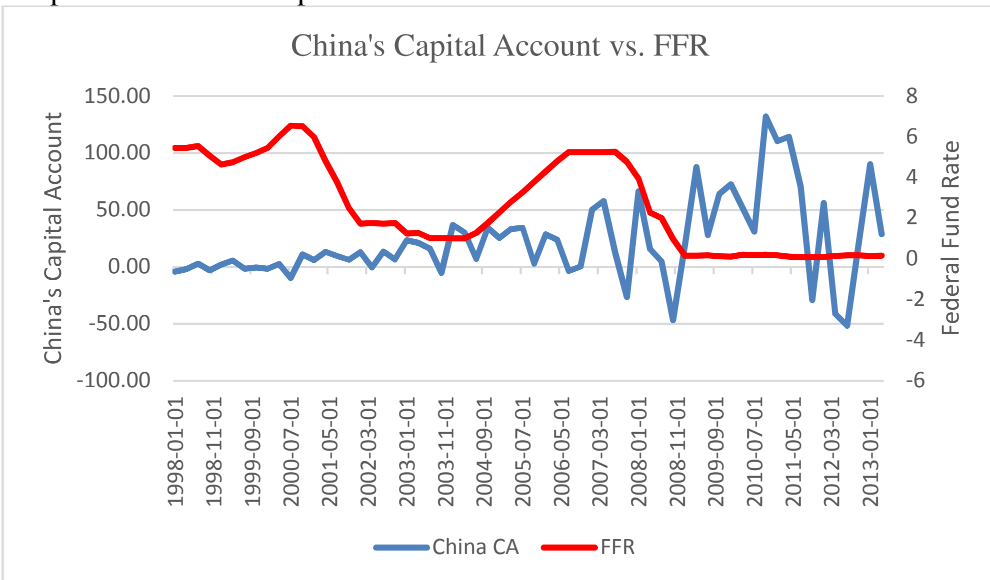
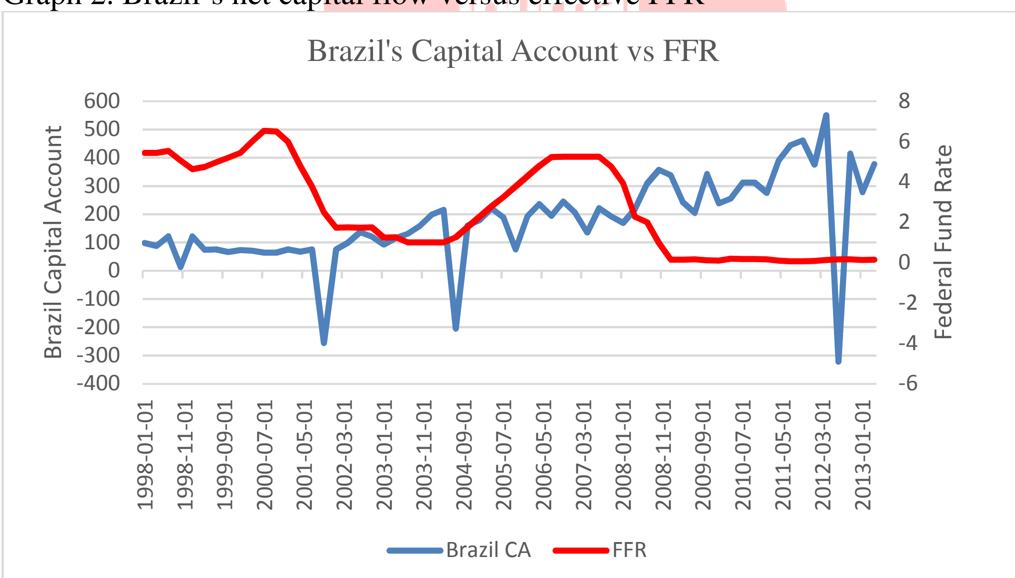
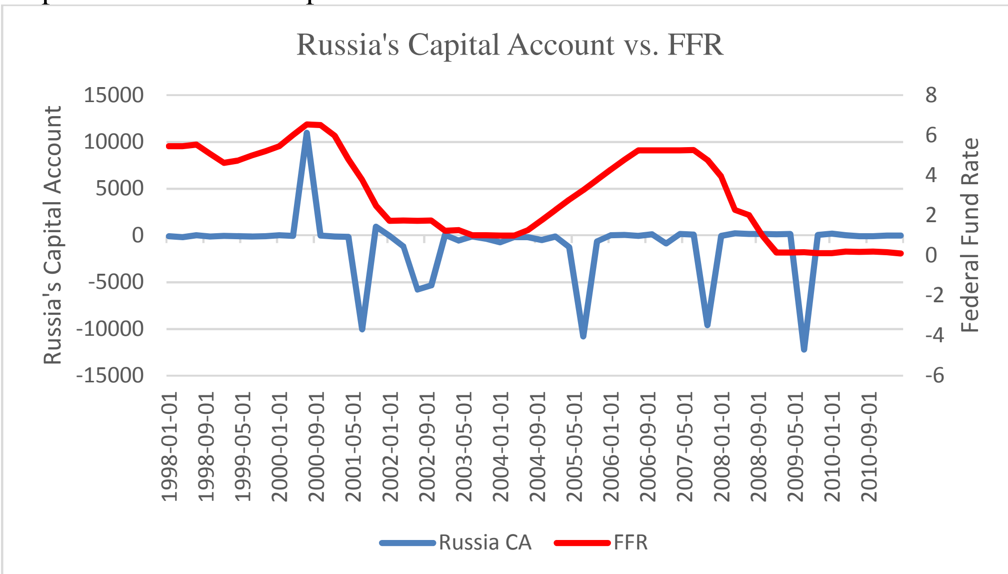
Graph1. China's net capital flow versus effective FFR



Graph 2. Brazil's net capital flow versus effective FFR



Graph 3. Russia's net capital flow versus effective FFR



Graph 4. India's net capital flow versus effective FFR