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Queen's Economics Department Working Paper No. 1358

Transmission of Monetary Policy through Capital Inflows to Emerging Markets

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Transmission of Monetary Policy through Capital Inflows to Emerging Markets

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Abstract

In this paper, I examine the effects of advanced economies' conventional monetary policy on gross foreign direct and portfolio investment inflows to emerging economies. I use structural vector autoregressions to analyse and compare the response of each inflow category to world interest rate and emerging economies' monetary and exchange rate shocks. Gross foreign direct inflows respond slowly to shocks while gross portfolio reacts on impact. Furthermore, the reaction of foreign direct investment to the shocks is not as high. These results suggest that monetary and exchange rate policies of emerging economies influence portfolio inflows more than they impact foreign direct investment inflows. These results also imply the existence of fundamental differences in capital flow categories beyond what we know to date. I address the "push" and "pull" debate in categories capital flows by quantitatively comparing the forecast error variance decomposition. I do not find evidence of "push" over "pull" factors in either class of inflows.

Key Words: Monetary policy, Capital Flows, Emerging Markets, Exchange Rate, **Interest Rates**

JEL classification codes: E52 F32 E43 E58 F37

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1 Introduction

This paper provides an empirical analysis of the effect of global and domestic shocks on the size, composition, and dynamics of gross capital inflow types to emerging markets (EMs). Increased capital flows have significantly raised cross-border gross asset and liability positions in the last two decades (Lane and Milesi-Ferretti, 2007), potentially improving global risk-sharing. On the other hand, adverse shocks can be transmitted through capital flows to EMs. Thus, the effects of these shocks on emerging market economies through their impact on capital flows is unclear. Furthermore, the differential effects on different types of gross inflows such as foreign direct investment (FDI) and foreign portfolio investment (FPI), which constitute over 85% of capital flows to EMs, are not well understood. This paper seeks to increase our understanding of these issues.

Specifically, this paper has a threefold purpose. First, it documents empirically that conventional global monetary policy (MP) shocks from advanced economies influence gross FDI and FPI inflows differently using structural vector autoregression. Understanding the general responses of each inflow category to policy disturbances is important. Similarly, understanding the responses of each inflow category in each country is important as there may be some differences across the countries. I, therefore, compare and contrast the two types of inflows while observing the differences across countries. Secondly, it analyses the effects of domestic monetary and exchange rate policies on the two inflows. Thirdly, it revisits the pull versus external push factors debate in attracting capital inflows. Pull factors are domestic factors that attract a foreign investor to invest in EMs while push factors are factors in the home country of the foreign investor that induces her to invest in EMs. This paper quantitatively compares the two forces, a first step in quantitatively reconciling the debate.

Clear insights on how to mitigate the undesirable consequences and maximize the benefits of capital flows are important for many reasons. First, using capital inflows, EMs finance investment and stimulate economic growth, improving the standard of living in these economies. Second, investors in developed countries engage in foreign direct and portfolio investment as a source of international risk diversification and thereby enhancing global risk-sharing. Third, receiving capital inflows facilitates transfers of technology, management skills, and other efficient means of production from advanced economies to EMs. Fourth, capital inflows can have less desirable long-run consequences such as inflationary pressures, real exchange rate appreciation, widening current account deficits, instability, and difficulty in managing an EM's macroeconomy (Calvo et al., 1996). Finally, EMs have been the source of global growth, and because capital flows account for a significant portion of their GDP, global economic growth may be affected by the U.S. and other advanced economies as they normalize the interest rate from the zero lower bound.

Historically, the effects of global shocks and their capital inflow consequences have been significant. Alejandro (1983) emphasizes the importance of global monetary policy (MP) during the 1930s and 1940s in Latin-American countries' capital inflows and outflows. Eichengreen (1990) discusses the historical trend in capital inflows before 1914 to the operation of the international gold standard. Calvo et al. (1996) documents that in Latin America episodes of capital inflows during the 1920s and 1978-1981 were related to global factors such as cyclical movement in interest rates. According to Adelman (1998) and Calvo (1998) the Mexican balance-of-payments crisis of December 1994, also called the Tequila crises, was related to the activities at the "world money centres."

Recently, after the financial crisis of 2008 and the implementation of unconventional MP in the U.S., the central banks of emerging economies have shown concern regarding the impact of Quantitative Easing (QE) and its "tapering." Specifically, policy-makers of EMs argued that there was an acceleration of capital inflows due to excessive global liquidity. Rey (2015) also documents that MP in the centre country is an important determinant of capital flows. As a result, greater MP coordination among central banks was suggested to be necessary. Therefore, studying the transmission of advanced economies' MP shocks to EMs through capital inflows is paramount.

From the effect of capital flows on emerging markets macroeconomy point of view, Blanchard et al. (2015) find that macroeconomic effects of capital inflows on output depend very much on the nature of the flow. Thus studying different categories of flows which are different in nature and are imperfect substitutes, instead of focusing only on their aggregates or netflows is critical. Studying several disaggregates of financial inflow variables justified by many reasons. First, there are differences in the investors' behavioural decision-making process in investing in inflows and outflows. Secondly, long term and short term investments are determined by different underlying factors. For example, Janus and Riera-Crichton (2013) finds studying net flows ignores that either the causes or the effects of outflows from an economy may be distinct from those of inflows.¹ Furthermore, international short-term investments in general and portfolio investments, in particular, are often called "hot money" because they can be reversed quickly. In contrast, foreign direct investments are a more stable flow of capital, which is linked more closely to the permanence of the physical capital and is induced by long-term prospects of the receiving country. Therefore understanding these underlying differences and the behaviour thereof is essential for designing policy regarding each type accordingly.

There are some more fundamental differences between FDI and FPI inflows. FDI is an illiquid investment whose determinants are more linked to microeconomic considerations than the macroeconomic environment. Information asymmetry between managers, owners, and potential buyers characterize FDI more than FPI. The political atmosphere of the host country is also critical in FDI decisions than in FPI (Ahlquist, 2006). Additionally, FDIis likely to be less volatile than FPI. The standard deviations of FDI and FPI inflows to eight large EMs provided in Table 1 clearly shows that FPI are more volatile than FDI in all the EMs considered. Figure 1 shows the quarterly mean FDI and FPI inflows to the eight largest EMs.² It presents FDI and FPI inflows as a ratio of nominal gross domestic product in dollars (NGDP). It displays that the two inflow types behave differently. For instance, during the recent recession, one can see the sharp decline and rebound of FPI and a more gradual decrease in FDI.

²The countries are Brazil, India, Russia, South Africa, Mexico, Indonesia, Philippines, and Thailand.

¹Janus and Riera-Crichton (2013) points out the problems in considering the net flows in standard and new measurements of capital. Each measure diverges during external financial crises: during crisis foreign investors sell their claims on the domestic economy back to local agents. These investment reversals decrease capital inflows using the standard measure while raising outflows with the measure they introduce. Conversely, foreign countries whose investors sell domestic assets will have a falling outflow by the standard measure and an inflow by their measure. They underline that during the 2008-9 global crisis U.S. and U.K. investors repatriated large amounts of capital.

I use structural vector autoregressions (SVAR) to examine the differential effects of conventional global MP and domestic monetary and exchange rate shocks on each category of capital inflows to EMs. Numerous studies have used SVAR identification to investigate the transmission of domestic MP shocks.³ However, studies that apply structural VAR to study global conventional MP transmission through capital inflows to EMs seem to be lacking. This paper attempts to fill that void.

The empirical analyses show four main findings. First, in response to tightening of advanced economies MP, both categories of inflows increase. Secondly, FDI inflows respond slowly and weakly to shocks while FPI reacts on impact. Thirdly, FPI inflows decrease in response to domestic monetary and exchange rate shocks while the results for FDI cannot be generalized across countries. Finally, there is no strong evidence of push over pull factors in determining the size of the responses of both categories of inflows to EMs.

The results are robust to extensive checks. They are robust to using the index of inflow variables data instead of using them as a ratio of GDP, limiting the period of analysis to the period before 2008Q3 (before the beginning QE policies), and various orderings of the variables in estimation. Some results are provided in online appendix of this paper.

This paper is related to several strands of literature. First, it is related to the theoretical literature that analyses business cycles of EMs. The importance of global monetary policy shocks have been documented in theoretical models such as Mendoza (1991), Neumeyer and Perri (2005), Schmitt-Grohé and Uribe (2003), Aguiar and Gopinath (2004) and Valderrama (2002) which discuss that in economies with a high debt-service ratio, such as heavily indebted developing countries, fluctuations in the world interest rate plays a significant role. Secondly, it is related to the literature that analyses transmission of MP such as Bruno and Shin (2014). Thirdly, it is related to the recent studies of capital flows such as Forbes and Warnock (2012) and Gourinchas and Jeanne (2013), and Rey (2015). Finally, it is related to the literature that explores unconventional monetary policy transmission such as Fratzscher

³For example, Sims (1980), Bernanke (1986), Sims (1996), Blanchard and Quah (1993), Christiano et al. (1999), Eichanbaum and Charles (1995), Kim and Roubini (2000), Scholl and Uhlig (2008). Liu et al. (2011) and Kilian (2011) provide reviews and explain the special challenges in the SVAR estimation associated with periods when the interest rate is pressed against the zero lower bound.

(2012), Lim et al. (2014), Ahmed and Zlate (2014).

The novelty and contribution of this paper are on several fronts. First, though the study of domestic monetary policy transmission using of SVAR technique is common, the application to capital flows seems to be lacking in the literature. This paper attempts to fill this gap. Secondly, comparing the "push and pull" factors debate in capital flows quantitatively using the forecast error decomposition is also a new application method to address the issue. Thirdly, this paper may be the first that applies gross *FDI* and *FPI* inflow data constructed from the old and a new reporting method of countries' balance of payments in International Financial Statistics. Namely, from Balance of Payment-5 (BPM5) and Balance of Payment-6 (BPM6). Fourthly, this paper uses two data sets of capital inflows: the inflows data as a ratio of GDP and the capital inflow data as an index. Using an index instead of inflows a ratio to GDP is extremely useful to avoid a spurious increase in the inflows ratio during recessions as GDP decreases. The analysis using the index data is reported as a robustness check in the appendix. Finally, the paper contributes by presenting a method of circumventing the potential challenge of effects of the QE periods on the results.

The structure of the paper is as follows. In Section 2, I explain the theoretical framework for identification and estimation. I then discuss the data used and underline why it makes sense to use the U.S. monetary policy to represent the global monetary policy in Section 3. In section 4, I estimate conventional monetary policy transmission using SVAR and discuss the implied variance decomposition. In Section 5, I discuss the robustness of the results. Section 6 provides concluding remarks and policy implications as well as some suggestions for future work.

2 Theoretical Framework of Identification and Estimation

Let an SVAR in K variables that contemporaneously affect each other be defined as:

$$B_0 Y_t = B_1 Y_{t-1} + \dots + B_p Y_{t-p} + \varepsilon_t \tag{1}$$

where Y_t is a $K \times 1$ vector of endogenous variables and ε_t is a $K \times 1$ vector of error terms, B_i 's are a $K \times K$ matrices of parameters for i = 0, 1, ...p, $E(\varepsilon_t) = 0$, $E(\varepsilon_t \varepsilon'_t) = \Sigma_{\varepsilon}$. ε_t is assumed to be uncorrelated orthogonal structural shocks. The coefficients B_i 's cannot be directly estimated. However, we can recover them from the estimation of reduced form VAR of the variables whose error terms are denoted as e_t in the matrix representation below. Then the contemporaneous matrix B_0 is identified by imposing recursive restrictions based on economic theory.

The variables used in the estimations are the U.S. short-term interest rate (ru_t) , the logarithm of industrial production index (y_t) , the logarithm of domestic consumer price index (p_t) , the domestic short-term interest rate (r_t) , the logarithm nominal exchange rate (in domestic currency per the U.S. dollar (e_t)), and the capital inflow variable as a ratio of GDP or its respective index.

The ordering of the benchmark recursive structure is a vector Y where the order of the variables is given as

$$Y_t = ru_t, y_t, p_t, r_t, e_t, inflow_t \tag{2}$$

Denoting the $K \times K$ elements in B_0 by b_{ij} the relationship in equation 1 can be written as

$$\begin{bmatrix} \varepsilon_{ru} \\ \varepsilon_{y} \\ \varepsilon_{p} \\ \varepsilon_{r} \\ \varepsilon_{e} \\ \varepsilon_{inflow} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ b_{21} & 1 & 0 & 0 & 0 & 0 \\ b_{31} & b_{32} & 1 & 0 & 0 & 0 \\ b_{41} & b_{42} & b_{43} & 1 & 0 & 0 \\ b_{51} & b_{52} & b_{53} & b_{54} & 1 & 0 \\ b_{61} & b_{62} & b_{63} & b_{64} & b_{65} & 1 \end{bmatrix} \times \begin{bmatrix} e_{ru} \\ e_{y} \\ e_{p} \\ e_{r} \\ e_{e} \\ e_{inflow} \end{bmatrix}$$

I use theoretically plausible identification conditions to order the variables in the benchmark recursive structure. The block recursive SVAR is ordered such that the least endogenous variable, the global MP, comes first and the most endogenous later in the order. It also allows estimation of a smaller, compact model than a reduced VAR does (Christiano et al., 1999). In section 5, I discuss how non-recursive and alternate orderings of the variables may be applied for robustness. The first identification condition I invoke is the assumption of a small open economy: a small open economy does not have a significant effect on macroeconomic variables of the global economy while the global economy can affect the macroeconomic variables of the small open economy. The U.S. is not a small open economy because the U.S. is not affected by the country-specific permanent shocks from other small open economies (Papanyan, 2010). Each EM is a small open economy because the global macro economy, in our case, global MP shocks influence the macro economy of EMs. Therefore, the first variable in the ordering, the first row in B_0 matrix, is the global MP variable because it is the least endogenous.

The second identification condition is the ordering of y, p, r as suggested by the Taylor Rule that central banks target the output gap and inflation in determining the interest rate. To capture the output gap and inflation, I include a constant and a trend in the estimation. The trend captures the trend in output data to estimate the output gap while the constant contains the information about the target inflation rate. In addition, including the trend term is tantamount to de-trending all the variables in the estimation. The Taylor Rule using the coefficients in the B_0 above, is given as:

$$r_{t} = \kappa_{1} + \kappa_{2}(ru_{t}) + b_{42}(p_{t} - p^{*}) + b_{43}(y_{t} - \bar{y})$$

$$r_{t} = \kappa_{3} + \kappa_{4}(trend) + \kappa_{5}(ru_{t}) + b_{42}(p_{t}) + b_{43}(y_{t})$$
(3)

where $\kappa'_i s, b_{42}$, and b_{43} are constants while p^* and \bar{y} are target inflation rate and potential output, respectively. In addition, the ordering is plausible because there is a delay of MP in impacting domestic economy – the lag in MP. Furthermore, a central bank has at its disposal monthly data on aggregate employment, industrial output and other indicators of aggregate real economic activity to make interest rate decision. It also has substantial amounts of information regarding the price level (Christiano et al., 1999). The ordering of p_t after y_t is that contemporaneous feedback from price to output has a delay as changing output level may take more time relative to changing prices. The fourth row is, therefore, world interest rate augmented Taylor Rule equation.

The third identification condition is that the exchange rate follows r as suggested by the covered and uncovered interest rate parity and empirical evidence by Eichanbaum and Charles (1995). The covered interest rate parity implies no exchange risk, while the uncovered entails such risks and elements of speculation. In both cases, the exchange rate is determined based on the interest rate in the market. The uncovered interest rate equation is given as:

$$E(e_t) = f(r_t) \tag{4}$$

where r_t is determined by world interest rate augmented Taylor Rule equation 3.

The fourth identification condition is that the capital inflow variables are the most endogenous. Capital inflow variables are endogenous because investors take into account the macroeconomic environment of a small open economy in making the decision of investment. Such a decision takes time. In other words, inflows are placed after exchange rate because investors observe exchange rate and other macroeconomic variables in deciding and implementing investment abroad. Though I need the contemporaneous feedback effects only, Brooks et al. (2004) and Bakardzhieva et al. (2010) show that the backward feedback from inflows to the exchange rate is weak. Mainly, they show that FDI has no significant effect on exchange rates. In relation with this, in studies that focus on monetary transmission through financial variables in the domestic economy, the recent literature has cautions that the domestic output is affected by the financial variables because the central banks may be indirectly responding to the effects financial variables. To deal with such problems, Gertler and Karadi (2014) use a high-frequency identification (HFI) to investigate domestic MP transmission. However, in an international capital flow set up, I assume a sufficient lag after a shock to monetary policy that endogeneity of capital flow may not be an issue because such investments take the time to plan and implement. Furthermore, the effect of capital inflow on domestic output is sluggish. A long enough high-frequency capital flow data especially that of FDI seems to be unavailable, and this paper does the best it can with the data that is constructed from various sources.

Given the above theoretically plausible identification conditions, any questionable ordering can be brought to investigation either through other ordering or non-recursive structure. Particularly, it is interesting to analyse the ordering ru, inflow, y, p, r, e because it can be argued that: 1) investors may care more about their return relative to the world interest rate and care less about where to invest as they have many countries to choose to invest in; 2) the inflows could be contractionary or expansionary that y is partly determined by inflows. However, such an argument implies that investors are not motivated by faster growth, return on their investments, and the risk involved in investing abroad.

The estimated coefficients of the SVAR with possibly non-stationary variables are consistent, and the asymptotic distribution of individual estimated parameters is the standard normal distribution (See Sims et al. (1990)).⁴ Phillips (1998) indicates that the results from such an estimation are consistent estimators of the true impulse responses. In addition, this paper tackles the shortage of the data by estimating degrees of freedom adjusted coefficients. Phillips and Spencer (2011) finds that for small samples degrees of freedom adjustment will eliminate bias and bootstrap confidence intervals exhibit improved coverage accuracy.

This paper presents impulse response functions (IRFs) of an SVAR estimated with degrees of freedom adjustment, with 68% and 90% bootstrap confidence bands from 1000 replications.⁵ In the estimated models, Schwarz Bayesian Information Criteria is used to select the maximum lags to be included in the model. Dummy variables for the periods of the first two QEs are included as exogenous variables as discussed in section **3**. By including QE Dummy variables, we obtain results from extended time series that includes the crisis period. Visual inspection of Figure **1** and the evidence from panel fixed-effects regression in Table **3** suggests that using QE Dummies for the first two QE periods is necessary. Related literature recognizes the special challenges in the SVAR estimation and the difficulty when the interest rate is pushed to the zero lower bound(see Bruno and Shin (2014); Liu et al. (2011); Kilian (2011)). To further deal with the issue of zero lower bound, the paper uses Treasury bill data that experienced cycles during the recession period. Using Treasury bill data, instead of the U.S. federal funds rate, is also reasonable when analysing capital flows because Treasury bills directly show the returns on investments. Generalizations based on

⁴see also Hamilton (1994) page 557 for further discussion.

⁵I report both the 68% and 90% confidence band. The common standard in the literature is reporting a positive and negative one standard deviation (68%) from the median response. However, this seems to be ignoring the conventional standard statistical significance that economists are accustomed to in empirical research.(For further detail on this issue, please see Murphy et al. (2015))

the overall responses across countries are inferred based on the median point estimates.

3 Data

I analyse the two major gross capital inflows: gross FDI and gross FPI inflow to EMs using quarterly time-series data from 1990 to 2014 as available.⁶

I assemble quarterly data on gross *FDI* and *FPI* inflows to eight EMs. This choice was made based on the availability of data. The data for Brazil, Russia, India, South Africa, Indonesia, Mexico, the Philippines, and Thailand are analysed. The data for Brazil, Russia, India, and South Africa span 1995Q1-2013Q4, 1995Q1-2014Q2, 1996Q4-2014Q1 and 1990Q1-2014Q2, respectively.⁷ The data for Indonesia, Mexico, Philippines and Thailand span 1993Q1-2014Q2, 1995Q1-2014Q2, 1990Q1-2014Q2 and 1993Q1-2014Q1, respectively. The length of the series was also chosen based on the availability of data.

The primary source of the data is the analytic presentation of the IMF's Balance of Payments Statistics Yearbooks (BOP) and International Financial Statistics (IFS) complemented with the countries' central bank statistics. The presentation of the capital flow data for the time series up to 2004Q4 is from BPM5 while the data after 2005Q1 is from BPM6.⁸ The data is complemented and cross checked with reports of the central banks of each country as well as the Federal Reserve Bank of St. Louis. Each of the financial flow variables is used as a ratio to nominal GDP in the same quarter (a commonly used measure). Nominal

⁶Foreign direct investment is defined as a category of cross-border investment associated with a resident in one economy having control or a significant degree of influence on the management of a company that is resident in another economy. Portfolio investment involves cross-border transactions and positions involving debt or equity securities. Thus, the main differences between the two are in ownership (the degree of managerial control), liquidity, and reversibility. The IMF and the World Bank define FDI as "investment to acquire a lasting management interest (10% or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments")

⁷Seven of these countries, except the Phillippines, account for more than 80% of the inflows receipt. The Philippines was included because its data was available. China's data was not available, and it may be difficult to assume China as a small open economy.

⁸Until 2004Q4, gross direct and portfolio investment inflows (FDI and FPI) were recorded as a liability (negative number to show the increase in debt of the recipient country) account in the BOP statistics, (BPM5). The data after 2005Q1 is recorded as a positive number. So I changed the sign of the data earlier than 2005Q1 to be consistent while checking for the accuracy. Therefore, the liability account dynamics could be due to changes in the real flows or changes in the asset prices and exchange rates.

GDP is converted to the U.S. dollar value using the exchange rate in the same quarter.⁹

The industrial production index (y) is used to represent each of the EMs' business cycles. However, the industrial production index is available only for Brazil, India, Mexico and Russia. I obtained manufacturing production index for Indonesia from Federal Reserve Bank of St. Louis. For Philippines, South Africa, and Thailand the real GDP indices are used. All the time-series variables except the interest rates used are seasonally adjusted using the X-12-ARIMA quarterly seasonal adjustment Method of the U.S. Department of Commerce, U.S. Census Bureau (Staff, 2002). I use the seasonally adjusted ratios FDI and FPI inflows to NGDP, their respective indices calculated from the ratio of each inflow to its 2005Q1 value for robustness, and the logarithms of y, p, and e. Both the domestic consumer price index (p)and the nominal exchange rate are used in the analysis. At the beginning of the project, for robustness analysis, I used both the nominal and real effective exchange rates, and they did not change the main story because of a close to unity correlation coefficient of the nominal, real, and real-effective exchange rates.

I use dummy variables for the first two of the three U.S. QE episodes: QE1 and QE2 spanning 2008Q4-2010Q1 and 2010Q4-2011Q2 respectively. In addition to the broadly studied effects of QE on capital flows, for example Fratzscher (2012), the panel fixed-effect regressions model of the data used in this paper shows that there were a significantly different from 0 changes in FPI and FDI during the first two QE episodes as shown in table 3. The result does not go away when using the indices of the flows as shown in the appendix.

I assume the MP shocks that originate from the U.S. as a global MP representative. Using the U.S. MP shock, specifically a shock to the U.S. interest rate, I analyse the effects on gross *FDI* and *FPI* inflows to EMs. A related literature discusses the justification for taking the U.S. MP as global MP representative. For example, Gourinchas and Rey (2013) reasoning is that: first, the U.S. is the largest economy in the world. Secondly, after the Second World War the U.S. has been a global liquidity provider. Thirdly, as the center country, the U.S. issues the currency used in most international exchanges whether in goods

⁹For further details of the method of recording and differences between BPM5 and BPM6, please see: http://www.imf.org/external/pubs/ft/bop/2014/pdf/GuideFinal.pdf especially, see Box 10.5 of the financial account recording for the consistent use of the exchange rate

markets or financial markets. Finally, the role of the center country is not only as a liquidity provider but also a global insurer. Therefore, the U.S. is usually considered as a source of global MP or macroeconomic shock. Also, the U.S. dollar is the most liquid international means of exchange, and it is also the currency denomination of U.S. Treasuries, which are held as a reserve asset across the globe.

The other reason why the U.S. MP may represent global MP is that the interest rates of other advanced economies follow similar trends to that that of the U.S. Papanyan (2010) empirically verifies that the U.S. is not affected by the country-specific permanent shocks of Europe or Japan, which further supports the assumption that U.S. is not a small open economy. Therefore other advanced economies are also affected by an exogenous shock that arises from the U.S.

Figure 2 shows that the U.K. short-term interest rate, the Euro Area interest rates (Euribor), the U.S. Federal Funds Rate (ff), the U.S. 10-Year treasury rate (ten) and 3-Month rate (ru) follow a similar trend. Table 2 provides the correlation between the interest rates of advanced economies. Using the U.S. Federal Funds Rate (ff) is common in most empirical studies. The correlation between U.S. Federal Funds Rate (ff) and 3-Month rate (ru) is close to unity, and we use the latter in this paper. Further more, Gruber and Kamin (2009) finds that real long-term interest rates in the U.S. and other industrial countries follow a similar trend as shown in Figure 2. Using a panel regressions that include 21 industrial countries, they show that in recent years, U.S. long-term interest rates have neither averaged significantly below those of other industrial countries nor have they declined by a significantly larger extent. Therefore it is compelling to use the U.S. MP to as global MP representative.¹⁰

¹⁰Further evidence on the relationships of advanced economies' MP includes Barassi et al. (2001) that shows that there are structural causal linkages and an irreducible cointegrating relationship between the G-7 long-term interest rates. Barkoulas et al. (1999) show a very slow mean-reverting dynamics (fractional cointegration) in the system of five long-term interest rates of U.S., Canada, Germany, U.K., and Japan. Furthermore, Kiran (2012) presents the result that long-term interest rates are fractionally cointegrated for bivariate subsystems of paired advanced economies as well as for Canada–USA–France–UK. Therefore, by representing global MP shock with the U.S. interest rates, we can study the effect of global MP shocks on capital inflows to EMs. Thus, by using the U.S. interest rate as a representative, we are studying the general spill over of global MP shocks, specifically of the large advanced economies, to the EMs through the capital inflows.

4 Results

4.1 Global MP shock transmission

To capture global spillovers and externalities from MP in advanced economies, I use two U.S. interest rate variables: the U.S. 3-Month Treasury rate-ru, and the term-structure-rd. ru is a short-term return while rd which typically is used to understand investors expectation about how the interest rate unfolds. I analyse the impulse responses FDI and FPI following conventional global MP shock. I compare and contrast the two categories of inflows. However, I would like to remind the reader that understanding the responses of each inflow category in each country is important on its merit as there may be some differences across the countries.

The U.S. 3-Month Treasury rate: (ru): Here I will compare responses of FDI and FPI to an unexpected positive shock to the world interest rate, ru. Figures 4 and 5 present the impulse response functions (IRFs) to an unexpected increase in ru. Both Figures 4 and 5 show that FDI and FPI increase after an unexpected shock to ru. Figure 4 shows that FDI inflow increases and that the increase is significant after 2 quarters in India, Russia, South Africa, Philippines and Thailand. The median point estimates show an increase in Brazil and Mexico, while Indonesia is an exception. Similarly, the point estimates of Figure 5 shows that FPI also increases on impact in all the countries except Mexico. In contrast to FDI, the response of FPI is zero after two-quarters in most of the countries. The impulse responses of FPI are larger relative to that of FDI.¹¹ Figure 3 presents all median IRFs of the countries.

One can see these results as a net effect of an increase in interest rate from the supply and demand of international capital flow. EMs pay the world interest rate plus a premium on their borrowing. An increase in world interest rate represented by the U.S. 3-Month Treasury rate increases the return for the supplier of foreign capital in EMs increasing FDIand FPI inflow. In contrast, it increases the cost of borrowing by EMs firms which would decrease FDI and FPI inflow. The increase in FDI and FPI after a positive ru shock

¹¹Note that as a percentage of NGDP these are very large inflows per quarter.

suggests a stronger supply response relative to the demand.

An unexpected increase in the U.S. short-term interest rate leads to an appreciation of the U.S. dollar and thus a depreciation in the EMs currency. The underlying reasoning in this explanation is based on exchange rate and interest rate parity (Engel, 2014). The monetary contraction in the U.S. leads to a real appreciation of the dollar and the monetary expansion to depreciation, overshooting of the exchange rate (Dornbusch, 1976). Thus, an unexpected increase in the U.S. short-term interest rate makes the purchase of EMs investment cheaper on impact. In other words, a depreciation of EMs' currency that originates from contractionary MP in advanced economies leads to an increase in inflows to the EMs.

Closely related mechanism that leads to the increase in inflows is the response of EMs' interest rates. In response to an unexpected shock to world interest rate, domestic interest rate increases but the increase is not one to one (see Uribe and Yue (2006), Eichengreen and Mody (1998), Kamin and Von Kleist (1999)).¹² Therefore, an increase in world interest rate leads to increase in portfolio inflow on impact because domestic interest rate's increase is slow while exchange rate increase is immediate.

The importance of the global factors suggested by this results is consistent with those of Mendoza (1991), Calvo et al. (1993) and Calvo et al. (1996), who specifically discussed the importance of U.S. interest rates. However, Calvo et al. (1996) discuss that a sustained decline in the U.S. interest rate which reached its lowest level in late 1992 since 1960's attracted investors to high investment yields in Latin America and Asia. Then up to the beginning of the 1990s, lower interest increased capital inflow to EMs. Since the middle of the 1990s, many emerging economies adopted a floating exchange rate.¹³ As a result, EMs' exchange rates became also important factors in determining inflows. The effect of the world interest rate comes through not only the response of EMs' interest rate but also

 $^{^{12}}$ This claim can be easily verified by inspecting the impulse response of r to ru in the SVAR model we are discussing.

¹³Brazil adopted floating exchange rate since 1999. Mexico adopted floating exchange rate by the end of 1994. Thailand, India, Indonesia, Mexico, and Philippines adopted floating exchange rate since July-1997, March-1993, August-1997, March-1998.

through their exchange rate responses.¹⁴ Then it may be the case that the exchange rate response is immediate such that it attracts portfolio inflow on impact after an ru shock. The persistent FDI response to an ru shock is surprising as the exchange rate channel may not easily explain it.

The other reason behind the increase in the response of both FDI and FPI after the U.S. interest rate shock is that an increase in the U.S. interest rate typically signals expansionary phase of the U.S. business cycle. This, in turn, creates an environment in which many investors are optimistic to invest in both the U.S. and EMs. The high demand for investment and the positive signal of the economic condition allows investors to take a risk in both the U.S. and cross-border countries.

Though there is heterogeneity in the size of responses, the impulse responses of FDI and FPI display a clear disparity. The point estimate on impact of FPI inflow to an unexpected one standard deviation increase in ru is an increase of more than 20% as a ratio of NGDP (per quarter) in all countries except Mexico. On the other hand, as a ratio of NGDP, the response of FDI is much less than 10%. The timing of the responses is clearly different as well. FPI responds on impact while FDI response is after few quarters.

Term-structure: (rd = ten - ru): is the difference between 10-Year and 3-Month U.S. Treasury Bill rate. Figure 6 shows that the IRFs of *FDI* are below zero in response to the term-structure shock, (except in Mexico and Indonesia). In contrast, Figure 7 does not show a consistent negative response of *FPI* across the countries in response to the term-structure shock. Two-quarters after the shock to rd, *FDI* decreases by approximately 5% per quarter as a ratio of NGDP.

One can use the term-structure as a predictor of the long-term economic activity in the U.S. Analysing the responses of capital inflows to EMs following a shock in the term-structure is tantamount to analysing how capital inflow responds to the expectation of economic activity in the U.S. Term-structure is interesting because of its long-term nature similar to

¹⁴This should not be confused with a depreciation of EMs' exchange rate that originates from the macroeconomic environment in EMs. Depreciation of EMs exchange rate that originates from EMs macroeconomic environment signals volatility of the returns in those markets that it leads to a decrease in *FPI* inflow on impact.

that of FDI – that the motive to invest in FDI is driven by the long-term interest in capital instead of the short-term return. Term-structure is commonly argued to forecast the business cycle. The studies of Campbell (1996) and many others show in detail that term structure is a good predictor of the future economic activity in the U.S. Among others, Estrella and Hardouvelis (1991) shows a clear evidence of this predictive capacity of the term-structure. If the term structure is a good predictor of the economic activity in the U.S., then investors should take potential opportunities in EMs if they expect a higher return in the future in those markets relative to that of the U.S. An increase in the term-structure predicts an improvement in the U.S. economic activity, and thus, a decrease in capital inflow to EMs as the investors may return investment to the U.S. This suggests some substitutability of investment in the U.S. and EMs.

Thus, FDI is sensitive to long-term prospects of both the U.S. and EMs economic activity. FPI, in contrast, is neither strongly sensitive nor is its response similar across countries. This is because FPI is a short-term, easy to reverse, and a liquid type of investment.

In summary, the global shocks are transmitted to EMs through capital flows. Both FDI and FPI increase in response an increase in the U.S. short-term interest rate, ru. In response to an increase in term-structure, FDI decreases while FPI is not significantly affected because FPI is short-term in its nature.

4.2 EMs' domestic shocks

In this section, I analyse the impact of domestic macroeconomic shocks on capital inflows to EMs. I will again compare and contrast *FDI* and *FPI* IRFs to a one standard deviation increase in the exchange rate, the industrial production, the short-term interest rate, and the EMs consumer price index.

Domestic industrial production index (y): Figures 8 and 9 show the IRFs of *FDI* and *FPI* respectively after an unexpected shock to y. The contrast between the two figures is substantial. *FDI*'s response is positive in Russia and Indonesia in the horizon of up to three years while in other countries the impulse response is either negative or 0. In contrast,

in all the eight countries, as shown in Figure 9, the FPI responses are vividly positive on impact.

Industrial production index is usually used to represent productivity, terms of trade movement, and others business cycle statistics. Industrial production index (y) is procyclical and coincident with the business cycle. If capital inflows are also procyclical, then it is positively correlated with industrial production. Are FDI and/or FPI procyclical in EMs? From the standard endowment model of the small open economy, because households smooth consumption, saving is procyclical: households borrow during bad times and repay debt during good times. Therefore, capital inflows-borrowing from abroad, must be countercyclical. However, if the economy borrows during good times, as shown by Calvo et al. (1994) in the case of EMs, capital inflow can be procyclical and thus have a positive correlation with industrial production index. Now, we confirm that this is true in the case of FPIinflows but not necessarily for FDI inflows. There are several explanations for procyclical capital inflows to EMs. First, a positive productivity shock increases desired investment. Thus borrowing to finance profitable investment in EMs when the economy is expanding is a rational decision by investors. Second, during good times, consumption becomes cheaper, and a consumption boom is financed by borrowing from abroad. Third, foreign investors respond to improving domestic economies of EMs and thus capital inflow increases. For more explanation see Calvo et al. (1993), Calvo et al. (1994), and Calvo and Végh (1999).

These results are also consistent with Smith and Valderrama (2009) and Calvo et al. (1994) that capital inflows are procyclical in EMs. Smith and Valderrama (2009) show a positive impulse response of FPI in a theoretical real business cycle model. Thus, procyclicality is particularly true for FPI but not necessarily for FDI. The differences between the two types of inflows are notable again. There is a clear increase on impact in FPI after industrial production shock, but the response of FDI is not as clear.

Domestic price level (p): Figure 10 and 11 show the responses of FDI and FPI inflows to a positive domestic price shock, respectively. In the case of FDI, consistent with the results in the previous sections, the response is neither consistent nor strong. On the other hand, unlike the responses to the other macroeconomic shocks we analyse, FPI's response is

not statistically significant or consistent across the countries. We only see insignificant and negative point estimates in the first quarter in most of the countries, and then they either go to zero or are very small. For net portfolio inflow, Fratzscher (2012) finds that the effect of domestic consumer price index is minimal. However, the study is for the short period before the crisis.

Domestic interest rate (r): Figures 12 and 13 display IRFs of *FDI* and *FPI*, respectively, to a positive domestic interest rate shock. A positive domestic interest shock, a contractionary monetary policy, leads to a decrease in *FPI* inflows. In Figure 13, the response of *FPI* to a one standard deviation increase in r is negative in Brazil, Russia, India, South Africa, and the Philippines. The negative response shows up after a quarter in Indonesia. As Figure 12 shows, the response of *FDI* is insignificant and not consistent across the countries except for the positive on impact response in India and Thailand.

Calvo (1998) claims that capital inflows slow downs are typically associated with an increase in domestic interest rates. As a result, central banks commonly attempt to increase net domestic assets to control the interest rate rise. This leads to depreciation of the domestic currency (increase in the EMs' currency per U.S. dollar). The currency of the country with the higher nominal interest rate is expected to depreciate against the currency of the country with the lower nominal interest rate because higher nominal interest rates reflect an expectation of inflation. Theoretically, this link is referred to as International Fisher Effect and/or uncovered interest rate parity. If these links are true, then we expect the IRFs of domestic interest rate (r) to be similar to that of exchange rate IRFs because an unexpected increase in domestic interest rate leads to depreciation. The similarity of Figures 13 and 15 shows that the theoretical argument holds particularly for FPI inflows. In response to both e and r shocks, FPI decreases on impact while the result is mixed for FDI

Interest rate shocks are important factors in explaining business cycles in EM countries because they signal country risk (Neumeyer and Perri, 2005). We have seen that in response to U.S. interest shock both FDI and FPI increase. On the other hand, an EM's interest rate is related to the U.S. interest rate though it is not a one-to-one relationship, and therefore, we may expect a similar response of FDI and FPI to the domestic interest rate. However, Uribe and Yue (2006) show that in response to an increase in US interest rates (ru), country spreads first fall and then display a large, delayed overshoot. The impulse response of the SVAR model we are discussing shows a similar result. Thus, a decreasing FPI inflow in response to a positive domestic interest shock is plausible and consistent with results in the related literature. This reasoning involves the on impact changes in exchange rate after an interest rate shock, be it domestic or world interest rate.

As discussed earlier and once again, the response of FDI's IRFs are weak and inconsistent, similar to the FDI's response to the other shocks. On the other hand, in Figure 13, FPI's response is negative on impact in most of the countries. Thus, the differential impact on FDI and FPI still holds.

Exchange rate (e): Figures 14 and 15 display the IRFs of FDI and FPI, respectively. Figure 15 shows that in response to an unexpected exchange rate shock FPI decreases on impact in all the countries except Russia. The impact returns to zero within few quarters in most of the countries. The result is the mixed for FDI, in Figure 14. Thus, exchange rate is a more important determinant of FPI than it is of FDI.¹⁵

When an EM's portfolio is denominated in the EM's currency, investors are exposed to exchange rate risk or currency risk. Bartram and Dufey (2001) finds that in advanced economies with monetary discipline, return on securities (FPI) exhibits positive correlation with the exchange rate. However, similar to the result showed in Figure 15, in developing economies the correlation is negative. That means depreciation in our case, signals a high risk of investing in the portfolio of EMs as a result of which its inflow decreases.

In contrast, there is no consensus either in theory or empirical studies about the effect of exchange rate on FDI. One possible reason for the disagreement is that the impact of exchange rate on FDI is different across industries. The effect of an exchange rate shock depends on whether the motive of the FDI inflow is to gain market access in EMs or to reduce production costs. Besides, whether a firm exports its product or imports its factors of production determines the effect of exchange rate on FDI expansion or contraction. In

¹⁵Brazil adopted floating exchange rate since 1999. Mexico adopted floating exchange rate by the end of 1994. Thailand, India, Indonesia, Mexico, and the Philippines adopted floating exchange rate since July-1997, March-1993, August-1997, March-1998 respectively.

other words, an appreciation may increase profits through cheaper imported inputs or it may reduce profits through lower export receipts. FDI inflow of firms which source a relatively large share of their inputs at home should fall *ceteris paribus* if the domestic exchange rate appreciates. FDI of firms which sell a relatively large share of their output at home should increase as the domestic exchange rate appreciates (Buch and Kleinert (2008)). Thus, the mixed and inconsistent IRFs across countries for FDI after an unexpected shock in exchange rate shown in Figure 14 is consistent with the literature. In addition, Brooks et al. (2004) and Bakardzhieva et al. (2010) demonstrate that FDI has no significant effect on exchange rates.

Overall, we see that FDI and FPI respond differently to an exchange rate shock. FPI decreases on impact while the effect on FDI is either insignificant or mixed across countries. Exchange rate, as a macroeconomic shock, does not significantly influence FDI, while it is an important determinant of FPI inflow.

In summary, as Figure 3 shows, IRFs of FDI and FPI to EMs' macroeconomic variables show a stark contrast. In response to the unexpected exchange rate, industrial production, and interest rate shocks, FPI decreases, increases, and decreases, respectively on impact. In contrast, direct investment inflow responses to the same shocks are either weak or mixed across EMs. The responses of both inflows are weak and mixed in response to an unexpected consumer price index shock. This paper is consistent with Forbes and Warnock (2012), who show that domestic macroeconomic characteristics are less important in determining inflows of FDI but fails to share that conclusion in the case of FPI.

4.3 The 'pull' and 'push' debate in capital flows

Global factors are push factors that influence capital flow to EMs while EMs economic environment pulls capital flows. Some research emphasizes common global external shocks in explaining capital flows; others underline country-specific macroeconomic policies, institutions, and risk. If the common external shocks explain the dynamics of capital flows, then the implication is that countries cannot shield themselves from these shocks. The opposite argument is that, because capital flows are heterogeneous across countries (e.g. lesser inflows in Sub-Saharan Africa for example), then it is the country-specific factors that explain capital flows to those countries. This debate remained unresolved.

This paper attempts to quantify the contribution of global and domestic shocks to the variations in each inflow to see the relative importance of each factor for each country. Therefore, we reconcile the 'pull' and 'push' debate in capital flows quantitatively using structural forecast-error variance decomposition (FEVD) after SVAR estimation. The important implication of using SVAR is that we can quantify and rank the percentage contribution of push versus pull factors to the dynamics in capital inflows. Thus, though FDI inflow is not strongly responsive to domestic macroeconomic conditions, we can still quantify how much of its dynamics can be explained by these conditions.

Figure 16 shows the FEVD for FDI inflows. On the vertical axis, we denote the percentage contribution of each variable. On the horizontal axis, the 20 quarters after the shock are denoted. Each graph shows the percentage contribution of the variable at the specific quarter. For example, approximately 7% of the variation in FDI in South Africa and Philippines is explained by the U.S.interest rate (ru). In Indonesia and Thailand, exchange rate explains more than 20% of the variation in FDI inflows. Broadly speaking, domestic industrial production (y) is ranked in the top three of the ranking order in all the countries except South Africa. Exchange rate (e) is in the top three of the ranking except in South Africa again. ru is not in the top of the rankings as y and e are. Though there is heterogeneity across the countries in which of the variable explains FDI the most, ru does not seem to be the most important variable across the countries except for South Africa and the Philippines.

Figure 17 shows FEVD for FPI inflows. Brazil, Indonesia and the Philippines have the same ranking: e, y, and r. In India and Thailand y and r are ranked as the top two in explaining FPI respectively. Only in South Africa is ru ranked the top and it is mostly in the last of the rankings in the other countries.

Fratzscher (2012) and Calvo et al. (1993) argue that global common factors are more important in explaining capital flows to EMs. However, Fratzscher (2012) focuses on net portfolio flows during the recent crisis while Calvo et al. (1993) use change in reserves as a proxy for capital inflows. On the other hand, Chuhan et al. (1998) and Fernandez-Arias (1996) emphasize the role of domestic factors to be at least as important as external factors in explaining portfolio inflows. However, Chuhan et al. (1998) and Fernandez-Arias (1996) explain only equity inflows, which is only a portion of the total portfolio inflows. Baek (2006) finds that common global shocks are more important in Asia while domestic factors explain the dynamics of portfolio inflows in Latin America.

This results fails to confirm the claim of Fratzscher (2012) and Calvo et al. (1993) that ru is the most important explanatory variable of the dynamics of capital flows. Instead, domestic variables variables are at least as important in explaining the dynamics of FDI. Exchange rate seems to be the most important macroeconomic variable explaining FPI while y and r are also very important. In South Africa ru seems to be the most important variable explaining both inflows.

Therefore, though ru is important in explaining the dynamics of capital inflows to EMs, we conclude that there is significant room for domestic macroeconomic policies in shaping capital inflows to EMs.

5 Robustness Analysis

I perform a series of extensive robustness checks of the SVAR model.¹⁶ The robustness checks I performed are 1) using indices instead of FDI and FPI as a ratio of NGDP, 2) using data up to 2008Q3, 3) various alternate ordering, 4) removing insignificant coefficients in the reduced VAR and estimating an over-identified model, and 4) the inclusion of U.S. industrial production index in the model. I provide the results of the first two checks in the appendix.

First, I used the indices of FDI and FPI using 2005Q1 as a base quarter and checked the results. The results are qualitatively unchanged whether the index of FDI and FPI, instead of using the respective inflow as a ratio of GDP is used. This is one of the differences between this paper and other papers that study capital flows. The results of this robustness

¹⁶To save space, the robustness analyses results are provided in the online appendix.

exercise are provided in the online appendix.

Following Scholl and Uhlig (2008), I also checked whether the SVAR results change by using only the data up to 2008Q3. This choice was made to avoid the quarters after the period of the Great Recession and to verify the conventional global MP transmission during the non-crisis period. The results are also provided in the online appendix of this paper. Qualitatively the results presented continue to hold.

I study the sensitivity of the result to various alternative orderings of the variables. A caveat here is that I can not alter the position of U.S. interest rate variables because of the small open economy assumption. Altering the position of U.S. interest rate variables is tantamount to assuming that they are influenced by EMs macroeconomic variables, which is not a reasonable assumption. However, the alternative orderings, leaving the first variable in the order (U.S. interest rate) in its position, were used to check whether the results in the ranking of domestic macroeconomic variables to explain the variations FDI and FPI inflows using FEVD. From that exercise, the result for FDI and FPI continue to hold.

At the beginning of this project, I started including the U.S. industrial production index as the second element in the ordering of the SVAR. However, focusing on the effect of the U.S. MP on capital inflows to the EMs, I dropped the U.S. industrial production. The results are not altered by the inclusion or dropping of the U.S. industrial production index. I followed Bruno and Shin (2014) that also used U.S. industrial production index for robustness check.

6 Concluding Remarks

This paper examines the conventional monetary policy transmissions through capital inflows to EMs controlling for the unconventional policies. It explicitly compares *FDI* and *FPI* responses to the global MP as well as domestic macroeconomic shocks empirically using a data set constructed from various sources. It also quantified and compared the relative importance of push versus pull shocks.

The U.S. interest rate variables (the U.S. 3-Month Treasury rate and the spread between the U.S. 10-Year and 3-Month Treasury rates were used as a proxy for global monetary policy in the empirical model. EMs' exchange rate, the industrial production index, interest rate and consumer price index were used in the estimation.

The results show that FDI inflow responds negatively to an unexpected increase in the spread between the U.S. 10-Year and 3-Month Treasury rate while the response of portfolio inflow to the same shock is weak and mixed across the countries. In contrast, portfolio inflow is sensitive to the U.S. 3-Month Treasury rate. The reason for such responses could be illiquid and long-term nature of FDI as well as the capital market imperfections relative to that of FPI.

The results also show that FPI is strongly responsive to the macroeconomic environment of EMs in the first few quarters after a shock. EM's consumer price index is an exception in this regard. Thus, I attested the arguments in the literature that foreign direct inflow is weakly sensitive to macroeconomic variables.

I explicitly quantified and compared the percentage contribution of global and domestic shocks in explaining the inflows using variance decomposition. The results show that domestic macroeconomic environment is at least as important as global monetary policy shocks.

There are several important contributions of this paper. Few previous studies underscored the differences between *FDI* and *FPI* empirically. Studies that analyse the effects of both conventional and unconventional monetary policy in capital inflows to EMs are also lacking. Besides, quantifying the domestic pull versus global push factors has been rare in previous studies. Unlike the previous studies, I also used the index of the inflow variables in robustness analysis.

Studies that focus on exploring the role of institutions in determining FDI are important because the EMs' macroeconomic variables did not appear to be the most important factors in attracting direct investments.

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	FDI			FPI			Corr	
	Mean	St.dev.	$\frac{St.dev.}{Mean}$	Mean	st. dev	$\frac{St.dev.}{Mean}$	Corr(FDI,FPI)	
Brazil	2.632	1.284	0.488	1.064	2.013	1.892	-0.133	
India	1.536	0.929	0.605	0.935	1.189	1.272	-0.071	
Indonesia	1.084	1.755	1.619	0.937	3.046	3.251	0.431	
Mexico	0.714	0.327	0.458	0.391	0.814	2.082	-0.314	
Philipp.	1.148	1.178	1.026	1.340	2.458	1.834	0.239	
Russia	2.258	1.717	0.760	0.633	3.932	6.212	-0.067	
South Af.	0.332	0.638	1.922	0.681	1.03	1.512	-0.283	
Thailand	3.100	1.942	0.626	1.281	2.398	1.872	-0.162	

Table 1: Quarterly mean and standard deviation FDI and FPI inflows

Notes: Quarterly mean and standard deviation of FDI and FPI inflows to the eight EMs. Quarterly mean inflow of FDI is larger than that of FPI while the volatility of FPI is greater than that of FDI. The correlation coefficient between FDI and FPI is generally negative.

Table 2: Correlation coefficients of advanced economies interest rates

	U.K. rate	Euribor	U.S. 3M	U.S. ff	US $10Y$
U.K. rate	1.0	0.87	0.88	0.89	0.88
Euribor		1.0	0.76	0.79	0.76
U.S. 3M			1.0	1.0	0.87
U.S. ff				1.0	0.86
U.S. 10Y					1.0

Notes: Using the observations 1997:1–2013:4, n = 68

	Dep. Var:			Capital inflow				
	ΔFPI				ΔFDI			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
const	-0.092***	-0.083	0.010	0.012	0.029	-0.489**	0.012	-0.273**
	(0.032)	(0.106)	(0.018)	(0.137)	(0.019)	(0.196)	(0.009)	(0.124)
QE1	0.552^{***}	0.541^{**}	0.450^{***}	0.308^{***}	-0.184^{***}	-0.222*	-0.166^{***}	-0.171
	(0.124)	(0.116)	(0.106)	(0.107)	(0.062)	(0.120)	(0.049)	(0.105)
QE2	-0.330*	-0.303*	-0.432**	-0.505***	0.197^{***}	0.365^{**}	0.215^{***}	0.263^{**}
	(0.182)	(0.155)	(0.184)	(0.149)	(0.053)	(0.185)	(0.047)	(0.108)
QE3	-0.290**	0.042	-0.393***	-0.133	-0.055	0.270	-0.037	0.165
	(0.131)	(0.209)	(0.142)	(0.205)	(0.057)	(0.250)	(0.057)	(0.169)
$\Delta y u$		-14.400***		-18.100***		-13.100		-9.830
		(5.770)		(6.280)		(8.670)		(7.380)
$\Delta r u$		0.895^{***}		0.450^{***}		0.252		0.049
		(0.252)		(0.156)		(0.196)		(0.116)
Δr		-0.267***		-0.116		-0.323***		-0.022
		(0.051)		(0.098)		(0.120)		(0.055)
Δten		-0.364***		-0.129		-0.359		-0.173
		(0.106)		(0.243)		(0.315)		(0.233)
Δy		1.510		2.870		31.400*		20.000
		(6.430)		(5.030)		(18.400)		(14.900)
Δp		0.655		2.870		14.200*		6.150^{**}
		(7.930)		(7.380)		(8.231)		(3.101)
Δe		-6.99***		-6.87***		2.74		0.411
		(2.342)		(1.710)		(2.201)		(0.995)
n	280	280	472	472	280	280	472	472
\mathbb{R}^2	0.022	0.101	0.011	0.061	0.005	0.175	0.003	0.024
l	-579	-568	-1010	-999	-505	-479	-833	-819

Table 3: Fixed effect model of portfolio and direct investment inflow

Notes: The estimated coefficients are with robust (HAC) standard errors of fixed-effects model. Standard errors in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively. Columns(1) and (2) are estimated using data from 2005Q1 to 2013Q4. Columns (3) and (4) use data from 1999Q1 to 2013Q4.



Figure 1: Average *FDI* and *FPI* inflows as a ratio of GDP



Notes: Average FDI and FPI inflows as a ratio of GDP to eight EMs. The countries are Brazil, India, Russia, South Africa, Mexico, Indonesia, the Philippines, and Thailand. In most of the periods the size of FDI is larger than FPI inflow. Mean FDI and Mean FPI, the horizontal lines, are the average inflow per quarter to EMs since 1997Q1.



Figure 2: Interest rates across advanced economies follows a similar trend



Figure 3: Median IRFs to shocks

Notes: This Figure presents the median IRFs to shocks of the estimated SVAR. The ellipses indicate the IRFs that could be generalized across the countries.

Figure 4: FDI IRFs to a positive one Standard Deviation ru shock





Figure 5: FPI IRFs to a positive one standard deviation ru shock

Notes: Figures 4 and 5 present the IRFs of FDI and FPI to ru shock for a recursive VAR (ru, y, p, r, e) and an inflow variable with 68% (shaded) and 90% (solid line) bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, time trend, and exogenous dummies (QE1, QE2).

Figure 6: FDI IRFs to a positive one Standard Deviation rd shock





Figure 7: FPI IRFs to a positive one standard deviation rd shock

Notes: Figures 6 and 7 present the IRFs of FDI and FPI to rd shock for a recursive VAR (rd, y, p, r, e) and an inflow variable with 68% (shaded) and 90% (solid line) bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, time trend, and exogenous dummies (QE1, QE2).

Figure 8: FDI IRFs to a positive one standard deviation y shock





Figure 9: FPI IRFs to a positive one standard deviation y shock

Notes: Figures 8 and 9 present the IRFs of FDI and FPI to y shock for a recursive VAR (ru, y, p, r, e) and an inflow variable with 68% (shaded) and 90% (solid line) bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, time trend, and exogenous dummies (QE1, QE2).

Figure 10: FDI IRFs to a positive one standard deviation p shock





Figure 11: FPI IRFs to a positive one standard deviation p shock

Notes: Figures 10 and 11 present the IRFs of FDI and FPI to p shock for a recursive VAR (ru, y, p, r, e) and an inflow variable with 68% (shaded) and 90% (solid line) bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, time trend, and exogenous dummies (QE1, QE2).

Figure 12: FDI IRFs to a positive one standard deviation r shock





Figure 13: FPI IRFs to a positive one standard deviation r shock

Notes: Figures 12 and 13 present the IRFs of FDI and FPI to r shock for a recursive VAR (ru, y, p, r, e) and an inflow variable with 68% (shaded) and 90% (solid line) bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, time trend, and exogenous dummies (QE1, QE2).

Figure 14: FDI IRFs to a positive one standard deviation e shock





Figure 15: FPI IRFs to a positive one standard deviation e shock

Notes: Figures 14 and 15 present the IRFs of FDI and FPI to e shock for a recursive VAR (ru, y, p, r, e) and an inflow variable with 68% (shaded) and 90% (solid line) bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, time trend, and exogenous dummies (QE1, QE2).

Figure 16: FEVD of FDI







Notes: Figures 16 and 17 present the FEVD of FDI and FPI in a recursive VAR (ru, y, p, r, e) and an inflow variable estimated with degrees of freedom adjusted, one lag, time trend, and exogenous dummies (QE1, QE2). It is notable that the U.S. interest rate explains significant percentage of the variations in both flows. However, it is difficult to conclude that it is the most important variable explaining inflows. Domestic exchange rate is the most important variable in explaining the variation in FPI.

Appendix

Appendix 1: Panel fixed-effects regression using indices of capital inflows

The following table provides another justification for using the dummy variables for the first QE periods in the SVAR estimation. The regressions using the indices show that there were significant changes in inflows during the QE periods similar to the regressions in which the data of inflows as a ratio of NGDP showed.

	Dep. Var:			Capital inflow				
	$\Delta FPIIndex$;	$\Delta FDIIndex$			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
const	-0.008	-0.139	0.024	0.050	0.185**	-0.316**	0.089**	-0.199**
	(0.066)	(0.316)	(0.036)	(0.099)	(0.082)	(0.140)	(0.038)	(0.091)
QE1	0.784^{**}	0.585^{**}	0.752^{**}	0.636^{**}	-0.503**	-0.711	-0.407^{**}	-0.532
	(0.324)	(0.263)	(0.316)	(0.293)	(0.225)	(0.450)	(0.179)	(0.351)
QE2	-0.476^{*}	-0.602^{**}	-0.508^{**}	-0.640**	0.492^{***}	0.352	0.588^{**}	0.382^{**}
	(0.265)	(0.240)	(0.251)	(0.251)	(0.146)	(0.259)	(0.169)	(0.189)
QE3	-0.946	-1.330	-0.978	-1.080	-0.523	-0.199	-0.427	-0.332
	(0.621)	(1.120)	(0.621)	(0.842)	(0.334)	(0.355)	(0.289)	(0.373)
$\Delta y u$		-4.910		-15.101**		-17.202		-10.611
		(5.640)		(6.140)		(10.500)		(6.820)
$\Delta r u$		1.900		1.160^{*}		-0.196		-0.350
		(1.290)		(0.640)		(0.290)		(0.357)
Δr		-1.070^{*}		-0.122***		-0.285***		0.011
		(0.584)		(0.030)		(0.037)		(0.033)
Δten		1.280		0.518		0.046		0.375
		(0.930)		(0.540)		(0.388)		(0.529)
Δy		-20.501*		-13.850*		12.000		9.270
		(11.300)		(7.870)		(10.823)		(7.641)
Δp		36.800		16.900		29.200 **		16.800
		(33.800)		(12.220)		(11.500)		(10.600)
Δe		2.240		-1.708		-6.970		-4.810*
		(11.900)		(4.330)		(4.860)		(2.450)
n	280	280	472	472	280	280	472	472
R^2	0.008	0.058	0.007	0.026	0.007	0.030	0.004	0.017
l	-891	-884	-1399	-1394	-765	-762	1258	1254

Table 4: Panel fixed effect model of portfolio and direct investment inflow in indices

Notes: The estimated coefficients are with robust (HAC) standard errors of fixed-effects model. Standard errors in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively. Columns(1) and (2) are estimated using data from 2005Q1 to 2013Q4. Columns (3) and (4) use data from 1999Q1 to 2013Q4.

Appendix 2: Analyses using the index of FDI and FPI



Figure 18: FDIN IRFs to a positive one Standard Deviation ru shock

Figure 19: FPIN IRFs to a positive one standard deviation ru shock



Notes: Figures 18 and 18 present the IRFs of *FDIN* and *FPIN* to ru shock for a recursive VAR (ru, y, p, r, e) and an index of the inflow variable with 68% (shaded) and 90% (solid line) bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, time trend, and exogenous dummies (QE1, QE2).



Figure 20: FDIN IRFs to a positive one standard deviation y shock

Notes: Figures 20 and 21 present the IRFs of FDIN and FPIN to y shock for a recursive VAR (ru, y, p, r, e) and an index of the inflow variable with 68% (shaded) and 90% (solid line) bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, time trend, and exogenous dummies (QE1, QE2).



Figure 22: FDIN IRFs to a positive one standard deviation p shock

Figure 23: FPIN IRFs to a positive one standard deviation p shock



Notes: Figures 22 and 23 present the IRFs of FDIN and FPIN to p shock for a recursive VAR (ru, y, p, r, e) and an index of the inflow variable with 68% (shaded) and 90% (solid line) bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, time trend, and exogenous dummies (QE1, QE2).



Figure 24: FDIN IRFs to a positive one standard deviation r shock

Notes: Figures 24 and 25 present the IRFs of FDIN and FPIN to r shock for a recursive VAR (ru, y, p, r, e) and an index of the inflow variable with 68% (shaded) and 90% (solid line) bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, time trend, and exogenous dummies (QE1, QE2).



Figure 26: FDI IRFs to a positive one standard deviation e shock

Figure 27: FPI IRFs to a positive one standard deviation e shock



Notes: Figures 26 and 27 present the IRFs of *FDIN* and *FPIN* to *e* shock for a recursive VAR (ru, y, p, r, e) and an index of the inflow variable with 68% (shaded) and 90% (solid line) bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, time trend, and exogenous dummies (QE1, QE2).

Figure 28: FEVD of FDI







Notes: Figures 28 and 29 present the FEVD of FDIN and FPIN in a recursive VAR (ru, y, p, r, e) and an inflow variable estimated with degrees of freedom adjusted, one lag, time trend, and exogenous dummies (QE1, QE2). It is notable that the U.S. interest rate explains significant percentage of the variations in both flows. However, it is difficult to conclude that it is the most important

variable explaining inflows. Domestic exchange rate is the the most important variable in explaining the variation in FPI.

Appendix

Appendix 3: Analyses using the period before 2008Q4







Notes: Figures 30 and 31 present the IRFs of FDI and FPI to ru shock in a recursive VAR (ru, y, p, r, e) and an inflow variable for the period until 2008Q3 with 68% (shaded) and 90% (solid line) bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, time trend, and exogenous dummies (QE1, QE2).



Figure 32: FDIN IRFs to a positive one standard deviation y shock

Figure 33: FPIN IRFs to a positive one standard deviation y shock



Notes: Figures 32 and 33 present the IRFs of FDI and FPI to y shock for a recursive VAR (ru, y, p, r, e) and an inflow variable for the period until 2008Q3 with 68% (shaded) and 90% (solid line) bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, time trend, and exogenous dummies (QE1, QE2).



Figure 34: FDIN IRFs to a positive one standard deviation p shock

Figure 35: FPIN IRFs to a positive one standard deviation p shock



Notes: Figures 34 and 35 present the IRFs of FDI and FPI to p shock for a recursive VAR (ru, y, p, r, e) and an inflow variable for the period until 2008Q3 with 68% (shaded) and 90% (solid line) bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, time trend, and exogenous dummies (QE1, QE2).



Figure 36: FDI IRFs to a positive one standard deviation r shock

Notes: Figures 36 and 37 present the IRFs of FDI and FPI to r shock for a recursive VAR (ru, y, p, r, e) and an inflow variable for the period until 2008Q3 with 68% (shaded) and 90% (solid line) bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, time trend, and exogenous dummies (QE1, QE2).



Figure 38: FDI IRFs to a positive one standard deviation e shock

Figure 39: FPI IRFs to a positive one standard deviation e shock



Notes: Figures 38 and 39 present the IRFs of FDI and FPI to e shock for a recursive VAR (ru, y, p, r, e) and an inflow variable for the period until 2008Q3 with 68% (shaded) and 90% (solid line) bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, time trend, and exogenous dummies (QE1, QE2).





Figure 41: FEVD of FPI



Notes: Figures 40 and 41 present the FEVD of FDI and FPI in a recursive VAR (ru, y, p, r, e) and an inflow variable estimated with degrees of freedom adjusted, one lag, time trend, and exogenous dummies (QE1, QE2). It is notable that the U.S. interest rate explains significant percentage of the variations in both flows. However, it is difficult to conclude that it is the most important variable explaining inflows. Domestic exchange rate is the most important variable in explaining the variation in FPI.