Capital Flows, Stock Returns and the Global Financial Cycle in Emerging Markets

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Abstract

This paper proposes a simple methodology to identify push and pull factors using gross capital inflows and stock market returns. The analysis is conducted over a panel of 16 emerging markets from 1999 to 2015. A portfolio allocation model is used to guide the identification strategy. The model is consistent with the empirical results. Gross equity inflows are mainly driven by push shocks and total returns by pull shocks. Both shocks are correlated with the VIX.

Keywords: Capital flows, total returns, push versus pull, VAR

1 Introduction

Economic and financial variables of emerging markets react to both common and idiosyncratic factors. The international economics literature call these push and pull factors, respectively. The push-pull framework is widely used to study the drivers of international financial flows. This paper introduces stock returns into the picture and analyzes their role within the push-pull framework.

There are different ways in which international financial flows can be categorized. They can be classified as portfolio flows, foreign direct investment (FDI), and other flows. Portfolio flows can be either debt or equity flows, FDI involves controlling ownership in a firm abroad (usually 10% or more of voting shares), and other flows are mainly bank-intermediated funds (e.g. loans). International reserves, assets generally managed by central banks, are sometimes included as another class.

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International financial flows can also be categorized as net purchases of domestic assets by foreign investors and net purchases of foreign assets by domestic investors. This is why gross inflows are commonly associated with foreign investors and gross outflows with domestic investors. The difference between gross inflows and gross outflows is called *net* financial inflows or *net* capital inflows. By the balance of payments identity, this difference is equal to minus the current account balance. For example, a country with a current account deficit needs capital inflows to finance it so its net financial flows are positive.

Early studies on capital flows used net flows because they can be calculated using the more accessible current account information (Reinhart, Reinhart & Trebesch 2016) and because gross outflows were relatively small, thus usually ignored (Forbes & Warnock 2012). However, by their nature, net flows are limited by the size of the current account imbalance, while financial flows can be exchanged any number of times; therefore, gross flows better reflect the sensitivity of a country's balance sheet to economic shocks (Obstfeld 2012).

Recent interest has then emerged in studying gross financial flows. The key finding is that focusing on net flows instead of gross flows misses important dynamics. For example, foreign and domestic investors can respond differently to shocks (Forbes & Warnock 2012); and although gross inflows and outflows generally co-move, they are more volatile than net flows (Broner et al. 2013).

Koepke (2015) conducts a survey of the empirical literature on the drivers of international financial flows to emerging markets and concludes that push factors matter most for portfolio flows, somewhat less for banking flows, and least for FDI, while pull factors matter for all three components, especially for banking flows. Meanwhile, Fratzscher (2012) finds that the relative importance of the drivers of financial flows varies over time. During the global financial crisis push factors were the main drivers, while in the recovery phase pull factors, like macroeconomic fundamentals, were the main drivers for portfolio flows.[1]

Important push factors are the CBOE's Volatility Index, or VIX[2], and the monetary policy of the U.S. (Forbes & Warnock 2012, Fratzscher 2012, Miranda-Agrippino & Rey 2015, Rey 2015). These two variables are also at the heart of what Rey (2015) calls the global financial cycle, the widespread co-movement in capital flows, asset prices, and credit growth across countries. In particular, the cycle co-moves negatively with the VIX and the monetary stance of the Federal Reserve. When the VIX is relatively low and/or in times of loose U.S. monetary policy, credit conditions are relaxed facilitating economic agents to increase their leverage, especially global

[1] Another robust finding of the literature is that during crisis there is retrenchment towards home financial markets for every type of financial flow (Forbes & Warnock 2012, Fratzscher 2012, Broner et al. 2013).

[2] The VIX reflects the 30-day ahead implied volatility in traded options on the S&P 500 index. It is commonly used as a measure of risk aversion and economic uncertainty.

financial intermediaries. As a consequence, financial flows to emerging markets and asset prices increase. This elevates the price of collateral and fuels a reduction in credit spreads, which again increases credit availability. The mechanism is reversed when the VIX is relatively high and/or when the Fed tightens its monetary policy.

This paper proposes a simple methodology to identify push and pull factors using gross equity inflows and stock market returns. The next section presents a theoretical model that provides helpful insights, which are used to guide the identification strategy. The vector autoregression (VAR) models used in the empirical analysis are explained in section 3. Section 4 describes the data sources and performs a preliminary test of the theoretical model. The results of the VAR analysis are discussed in section 5. Section 6 concludes.

2 A Portfolio Model[3]

There is a single consumption good. There are two types of agents, foreign and domestic investors.[4] The domestic investor lives in a small open economy.

Agents live for two periods. At the end of each period, a new generation of investors decide how to allocate their resources between a foreign risk-free asset and a domestic risky asset (equity), in order to maximize their utility in the next period. In other words, every period each type of investor solves a one-period portfolio allocation problem with two assets.

2.1 Investors' Problem

The domestic investor allocates her wealth W between risky equity shares and risk-free bonds. Let A be the number of shares and M the number of risk-free bonds held by the domestic investor. The price of the risk-free asset is normalized to 1 and the price of the risky asset is denoted by P. The budget constraint for the domestic investor born in period t is thus,

$$W_t = P_t A_t + M_t.$$

When the investor born at t buys shares, she can have both capital gains (difference in price) and gains from dividends D, so her end-of-life budget constraint is given by

$$W_{t+1} = \left(P_{t+1} + D_{t+1}\right) A_t + R^* M_t,$$

[3]This section benefited greatly from conversations with Olivier Jeanne.

[4]Variables for the foreign investor are denoted with an asterisk.

where R^* is the time-invariant return on the foreign risk-free asset. Note that $Var_t[W_{t+1}] = A_t^2\sigma^2$, where $\sigma^2 = Var_t[P_{t+1} + D_{t+1}]$, and that W_{t+1} can also be expressed as

$$W_{t+1} = (P_{t+1} + D_{t+1}) A_t + R^* (W_t - P_t A_t).$$

A mean-variance investor solves the following problem

$$\max_{A_t} E_t[W_{t+1}] - \frac{\alpha}{2} Var_t[W_{t+1}],$$

where α measures the risk aversion of the domestic investor.

The domestic investor's demand for the risky asset is then given by

$$A_t = \frac{E_t[P_{t+1} + D_{t+1}] - R^* P_t}{\alpha\sigma^2}.$$

The foreign investor is identical to the domestic investor except for her risk aversion. Instead of being constant, the risk aversion of the foreign investor varies through time. Therefore, the foreign investor's demand for the risky asset is given by

$$A_t^* = \frac{E_t[P_{t+1} + D_{t+1}] - R^* P_t}{\alpha_t^*\sigma^2}.$$

Before proceeding, it is useful to re-scale the risk aversion of the foreign investor in terms of the aggregate risk aversion, so define

$$\chi_t = \frac{\alpha_t^*}{\alpha + \alpha_t^*}.$$

2.2 Equilibrium

In equilibrium, the number of shares bought by both the domestic and the foreign investors equal the total number of shares available, which is normalized to 1. Therefore,[5]

$$A_t + A_t^* = 1. \tag{1}$$

Using this equation and the demands for the risky asset from the previous subsection gives the price of the risky asset,

$$P_t = \frac{1}{R^*}\left(E_t[P_{t+1} + D_{t+1}] - \sigma^2\alpha\chi_t\right). \tag{2}$$

[5]In addition, what one investor borrows is lent by the other, thus $M_t + M_t^* = 0$.

Note that $A_t^*/A_t = \alpha/\alpha_t^*$, so $1 + A_t^*/A_t = 1/\chi_t$. Combining this result with (1) allows one to express the demands for the risky asset as

$$\begin{aligned} A_t &= \chi_t, \\ A_t^* &= 1 - \chi_t. \end{aligned} \tag{3}$$

Therefore, when the risk aversion of the foreign investor (α_t^*) increases, she will be less willing to hold the risky asset and, thus, the number of shares held by the domestic investor, A_t, will increase. Similarly for the number of shares held by the foreign investor (A_t^*) when the risk aversion of the domestic investor (α) increases.

2.3 Dynamics

The dynamics in the model are driven by two variables, the dividend paid by the risky asset and the re-scaled foreign risk aversion. Both variables follow AR(1) processes, which are given by

$$\begin{aligned} D_t &= \bar{D} + \rho_D \left(D_{t-1} - \bar{D}\right) + \epsilon_{D,t}, \\ \chi_t &= \bar{\chi} + \rho_\chi \left(\chi_{t-1} - \bar{\chi}\right) + \epsilon_{\chi,t}, \end{aligned}$$

where $\epsilon_{D,t} \sim N\left(0, \sigma_D^2\right)$ and $\epsilon_{\chi,t} \sim N\left(0, \sigma_\chi^2\right)$; it is assumed that $\epsilon_{D,t}$ and $\epsilon_{\chi,t}$ are serially and mutually uncorrelated. Those variables are associated with idiosyncratic (pull) and common (push) drivers of capital flows, respectively.

Using both processes and equation (2) one obtains the price of the risky asset in terms of parameters and variables known at period t,

$$P_t = \frac{\bar{D}}{R^* - 1} + \frac{\rho_D}{R^* - \rho_D}\left(D_t - \bar{D}\right) - \frac{\sigma^2 \alpha \chi_t}{R^*} - \frac{\sigma^2 \alpha}{R^*}\left[\frac{\bar{\chi}}{R^* - 1} + \frac{\rho_\chi}{R^* - \rho_\chi}\left(\chi_t - \bar{\chi}\right)\right],$$

which, after some simplification, reduces to

$$P_t = \bar{P} + \frac{\rho_D}{R^* - \rho_D}\left(D_t - \bar{D}\right) - \frac{\sigma^2 \alpha}{R^* - \rho_\chi}\left(\chi_t - \bar{\chi}\right), \tag{4}$$

where

$$\bar{P} = \frac{\bar{D} - \sigma^2 \alpha \bar{\chi}}{R^* - 1}.$$

The price of the risky asset is thus endogenous to the model and reacts to the two types of shocks. Equation (4) is key in determining other relevant variables. The first one is the *total* return on the risky asset, which is defined as $R_t = (P_t + D_t) / P_{t-1}$. Second, the value of the constant σ^2 can be determined by combining the definition of σ^2 and the equation for P_t in (4), so that

$$\sigma^2 = \left(\frac{R^* \sigma_D}{R^* - \rho_D} \right)^2 + \left(\frac{\alpha \sigma_\chi}{R^* - \rho_\chi} \right)^2 \sigma^4,$$

which is a quadratic equation in σ^2. It is assumed henceforth that σ^2 is equal to the lowest positive root of that equation. Finally, gross equity inflows, IF_t, are equal to the value of the change in the equity shares held by the foreign investor, that is $IF_t = P_t \left(A_t^* - A_{t-1}^* \right)$, which can also be expressed as

$$IF_t = P_t \left(-\Delta \chi_t \right), \tag{5}$$

where $\Delta \chi_t$ is the difference in the re-scaled foreign risk aversion from $t-1$ to t.

Note that gross equity inflows IF_t as well as the total return on the risky asset R_t are affected by both types of shocks, $\epsilon_{D,t}$ and $\epsilon_{\chi,t}$. However, the number of shares held by the investors (A_t and A_t^*) is not affected by dividend shocks. Therefore, gross equity inflows net of valuation effects, IF_t/P_t, are only affected contemporaneously by (re-scaled) foreign risk aversion shocks. In this sense, IF_t/P_t would give a way to measure the exogenous push factor. In other words, IF_t/P_t is completely exogenous to dividend shocks. This is a direct result from (3), since the model allows the foreign investor to make changes in her holdings of the risky asset only if her risk aversion changes but not if the dividend paid by the domestic risky asset changes.

2.4 Simulations

The model is calibrated so as to reflect the correlation between gross equity inflows and total returns shown in section 4 as well as some statistical moments of the dividend yield, D_t/P_t.

Table 7 in the Annex shows that the correlation between gross equity inflows and total returns is equal to 0.21. On the other hand, a high dividend yield in the U.S. seems a good approximation for a medium dividend yield in emerging markets. Gomes, Kogan & Zhang (2003) and Conover, Jensen & Simpson (2016) report an average dividend yield in the U.S. of 4.3% with a standard deviation of 1.4%, and first three autocorrelations equal to 0.60, 0.36 and 0.26. Table 1 shows the parameters used to calibrate the model.

$\bar{D}$	ρ_D	σ_D	$\bar{\chi}$	ρ_χ	σ_χ	α	R^*
3	0.6	0.1	0.7	0.5	0.05	10	1.04

Table 1: Parameters for Simulations

Figures 1 and 2 show the impulse response functions implied by the model for the price, total return and gross equity inflows to dividend and risk aversion shocks, respectively. It is assumed that each process is hit by a one-standard-deviation shock at period 0.

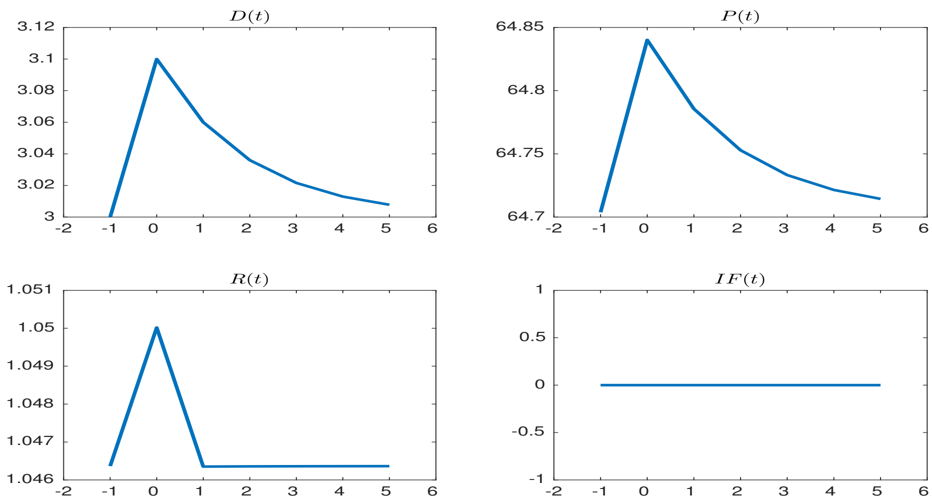


Figure 1: Impulse Responses to a Positive Dividend Shock

A positive dividend shock increases the price of the risky asset contemporaneously. Given the positive relationship between P_t and R_t, the total return on the risky asset also increases at the time of the shock but returns to its pre-shock level in the next period. Gross equity inflows, however, do not react at all (neither contemporaneously nor after) to a dividend shock. This property is further discussed below and is exploited later in the identification strategy.

Due to its usefulness for the analysis in section 5, Figure 2 shows the effect on the variables to a *negative* foreign risk aversion shock. At the time of the shock, the price of the risky asset, the total return and equity inflows all three increase. However, due to the negative relationship between R_t and P_{t-1} and the positive relationship between IF_t and χ_{t-1}, both R_t and IF_t decline one period after the shock. That is, after the shock, the total return is lower given the euphoria caused by the reduction in foreign risk aversion, as a consequence the foreign investor reduces her holdings of the risky asset. The resulting decline in gross equity inflows one period after the shock, however, does not completely offset the strong increase at the time of the shock.

The same calibration is used to simulate the variables in the model. Table 2 reports the means

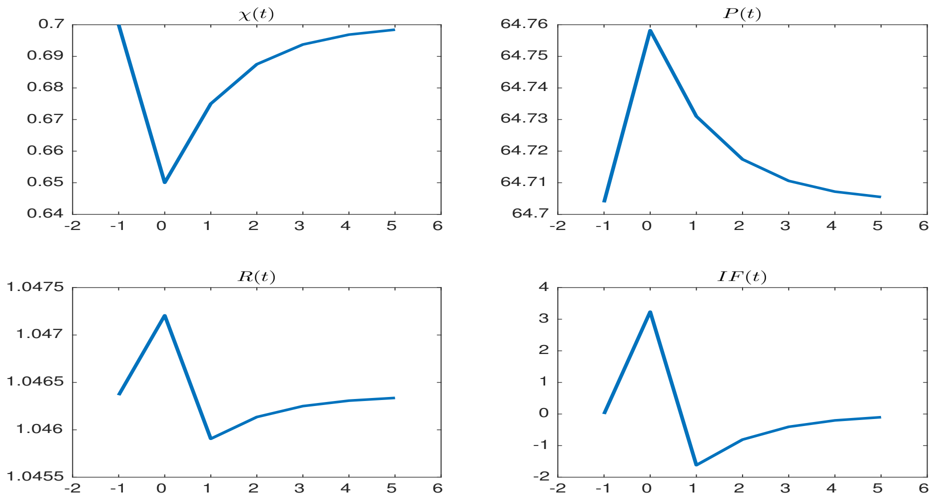


Figure 2: Impulse Responses to a Negative Risk-Aversion Shock

and standard deviations of the simulated variables ($100,000$ simulations), while Table 3 shows their correlations. As expected, the average values are close to the theoretical ones. For example, the parameters imply that $\bar{P} = 64.7$ and, thus, an average dividend yield of 4.64%; however, the model had difficulty replicating the 1.4% standard deviation of the dividend yield mentioned above. Nevertheless, the first three autocorrelations (not shown in Table 2) of the simulated dividend yield are equal to 0.599, 0.3593 and 0.2156, which very close to the ones reported by Gomes, Kogan & Zhang (2003). Finally, note that the standard deviation of IF_t/P_t is less than 2% that of IF_t.

	Mean	Std.Dev.
P_t	64.704	0.182
R_t	1.046	0.004
IF_t	0.002	3.741
IF_t/P_t	0	0.058
D_t/P_t	0.046	0.002
D_t	3.001	0.125
χ_t	0.7	0.058
$\Delta\chi_t$	0	0.058

Table 2: Statistics from Simulations

It is worth highlighting several important results from Table 3.[6] First, the correlation between gross equity inflows and total returns is close to the actual one reported in Table 7. In line with a previous assumption, the correlation between the two types of shocks is close to zero. An important

[6] These results are not dependent on the specific values of the parameters shown in Table 1 (except for the correlation between gross equity inflows and total returns), they hold for different combinations of parameters.

	P_t	R_t	IF_t	IF_t/P_t	D_t/P_t	D_t	χ_t	$\Delta\chi_t$	$\epsilon_{D,t}$	$\epsilon_{\chi,t}$
P_t	1									
R_t	0.764	1								
IF_t	0.168	0.259	1							
IF_t/P_t	0.168	0.259	1	1						
D_t/P_t	0.929	0.765	-0.019	-0.019	1					
D_t	0.938	0.768	-0.006	-0.006	1	1				
χ_t	-0.347	-0.125	-0.499	-0.499	0.026	0.001	1			
$\Delta\chi_t$	-0.168	-0.259	-1	-1	0.019	0.006	0.499	1		
$\epsilon_{D,t}$	0.751	0.965	-0.005	-0.005	0.8	0.8	-0.002	0.005	1	
$\epsilon_{\chi,t}$	-0.297	-0.222	-0.866	-0.866	0.026	0.004	0.866	0.866	0.002	1

Table 3: Correlations from Simulations

result is the perfect correlation between IF_t and IF_t/P_t. Relatedly, the correlations of IF_t (and IF_t/P_t) with D_t and, most importantly, with $\epsilon_{D,t}$ are close to zero. All these results suggest that IF_t can also be considered as contemporaneously exogenous to dividend shocks.

3 Empirical Methodology

The VAR analysis is based on two models: a recursive VAR and a panel VAR. Both models are explained in the next two subsections.

3.1 Recursive VAR Model

Consider the following structural VAR model for n variables with p lags and sample size T,

$$B_0 y_t = b + B_1 y_{t-1} + \ldots + B_p y_{t-p} + w_t, \quad t = 1, \ldots, T, \tag{6}$$

where y_t is a $(n \times 1)$ vector of endogenous variables, b is a $(n \times 1)$ vector of structural parameters, B_i is a $(n \times n)$ matrix of structural parameters for $i = 0, 1, \ldots, p$; in particular, B_0 is an invertible matrix governing the contemporaneous interactions between the variables in the structural model (Kilian & Lütkepohl 2017). Finally, w_t is a $(n \times 1)$ vector of structural shocks that, conditional on past information and the initial conditions $y_0, \ldots, y_{1-p}$, is normally distributed with mean zero and covariance matrix equal to the identity matrix I_n.

The reduced-form representation of the structural model in (6) is given by

$$y_t = c + A_1 y_{t-1} + \ldots + A_p y_{t-p} + u_t, \quad t = 1, \ldots, T, \tag{7}$$

where $A_j = B_0^{-1} B_j$ for $j = 1, \ldots, p$, $c = B_0^{-1} b$, $u_t = B_0^{-1} w_t$ and $E_t [u_t u_t'] = \Sigma = (B_0' B_0)^{-1}$. That is, A_j, c and Σ contain structural parameters and the reduced-form innovations u_t are a weighted average of the structural shocks w_t.

A common way to identify w_t from u_t is to impose a recursive structure on the contemporaneous relations between the variables. In this way, the innovations in the reduced-form model (7) are orthogonalized using a Cholesky decomposition of the covariance matrix Σ. The ordering of the variables in the VAR is thus relevant. This approach implicitly assumes that the first variable is exogenous to the other variables, the second variable is exogenous to the third up to the last one, and so on.

3.1.1 A Simple Strategy to Identify Push and Pull Factors

Let y_t contain gross equity inflows net of valuation effects and stock market returns (so $n = 2$). According to the model in section 2, R_t is affected by both types of shocks but IF_t/P_t is contemporaneously exogenous to dividend shocks, so the model suggests the ordering of the two variables. Namely, the model suggests that IF_t/P_t should precede stock returns.

Moreover, the results from section 2.4 suggest that IF_t can be used instead of IF_t/P_t. Therefore, in the absence of IF_t/P_t, the identification strategy relies on the variables IF_t and R_t, in that order.

3.2 Panel VAR Model

Panel VAR models are useful to study the interactions between different units (e.g. firms, countries). A panel VAR model consists of N units each one having n endogenous variables, with p lags, over T periods.

A standard way to estimate panel VAR models is to use the mean-group estimator described in Pesaran & Smith (1995). This framework assumes that both the VAR coefficients and the covariance matrix are heterogeneous across units but share a common mean.

If each unit responds to itself, the model for each unit i is

$$y_{i,t} = A_i^1 y_{i,t-1} + \ldots + A_i^p y_{i,t-p} + \varepsilon_{i,t}, \quad t = 1, \ldots, T,$$

where $y_{i,t}$ is a $(n \times 1)$ vector containing the endogenous variables of unit i, A_i^k is a $(n \times n)$ matrix of coefficients for $k = 1, \ldots, p$, and $\varepsilon_{i,t}$ is a $(n \times 1)$ vector of residuals with $\varepsilon_{i,t} \sim N(0, \Sigma_i)$.

Stacking over the T sample periods, the model for unit i can be re-written as (see Dieppe, Legrand & van Roye 2016)

$$y_i = \bar{X}_i \beta_i + \varepsilon_i, \tag{8}$$

where y_i is a $(nT \times 1)$ vector, $\bar{X}_i$ is a $(nT \times q)$ matrix with $q = n^2 p$, β_i is a $(q \times 1)$ vector, and ε_i is a $(nT \times 1)$ vector with $\varepsilon_i \sim N(0, \Sigma_i \otimes I_T)$.

The mean-group estimator assumes that the vector β_i for each unit i can be decomposed into a common element and an idiosyncratic one, so that

$$\beta_i = b + b_i,$$

where b is the mean or average effect and $b_i \sim N(0, \Sigma_b)$.

To obtain an estimate of b, one first estimates β_i for each unit i by OLS. The mean-group estimator for b is then obtained as their average,

$$\hat{b} = \frac{1}{N} \sum_{i=1}^{N} \hat{\beta}_i.$$

The standard error for the mean-group estimator is given by

$$\hat{\Sigma}_b = \frac{1}{N(N-1)} \sum_{i=1}^{N} \left(\hat{\beta}_i - \hat{b}\right) \left(\hat{\beta}_i - \hat{b}\right).$$

4 Data

The analysis is conducted for 16 emerging markets: Argentina, Chile, China, Colombia, Czech Republic, Hungary, Indonesia, Korea, Mexico, Peru, Philippines, Russia, South Africa, Taiwan, Thailand, and Turkey.[7] The data used has a quarterly frequency. The sample starts in the second quarter of 1999 and ends in the third quarter of 2015.

Portfolio equity flows are taken from the IMF Financial Flows Analytics database, which is based on the Balance of Payments Statistics database. The type of flows used are gross flows, measured in current USD and scaled by each country's nominal GDP (also in current USD).

[7] Countries were selected based on data availability for the sample period in order to have a balanced panel. Some countries originally considered include Brazil, India, Malaysia, and Poland. However, data on total returns for Brazil and India is available from 2001 Q1 onwards. Data on portfolio equity flows for Malaysia is available from 2002 Q1 to 2009 Q4 and for Poland is available from 2000 Q1 onwards.

To account for *both* capital and dividend gains when investing in emerging markets, I use the MSCI total return index in USD net of taxes for the stock market of each emerging economy in the sample.[8] The total return for a country is obtained as the log difference of the index. Unfortunately, the decomposition of the index into indexes for P_t and D_t is not publicly available, which restricts constructing the variable IF_t/P_t. Fortunately, the identification strategy described in section 3.1.1 can still be applied using IF_t instead of IF_t/P_t.

Data on real GDP growth and the nominal exchange rate (domestic currency per USD) is taken from the IMF International Financial Statistics database. Given the variability in domestic currencies relative to the USD, the standardized nominal exchange rate is used for each country.

To measure risk aversion and economic uncertainty, the Volatility Index of the Chicago Board Options Exchange, or VIX, is used. To measure the stance of monetary policy in the U.S., the effective federal funds rate (EFFR) calculated by the New York Fed is used. Both the VIX and the EFFR are available daily; their average over the quarter is used as their quarterly values.

As a measure of financial openness, the Chinn-Ito index (Chinn & Ito 2008) is used. Since the Chinn-Ito index is available on an annual frequency, linear interpolation is used to get the index on a quarterly frequency.[9]

4.1 Summary Statistics

Table 6 in the Annex presents summary statistics for the variables mentioned above. Note that EFFR is relatively stable. As is well known, although the average growth of GDP is higher than the average total return, total returns are much more volatile. Portfolio equity outflows relative to GDP are slightly larger than equity inflows, but the latter are slightly more volatile. Also note that the percentage change of the VIX, calculated as the log difference, is close to zero on average but is very volatile. Finally, on average the countries in the sample are mid-way regarding financial openness according to the Chinn-Ito index.

The correlation between the variables is shown in Table 7 in the Annex. Note that total returns and portfolio equity flows co-vary negatively with the VIX. The correlation between equity outflows and the VIX is lower than that using equity inflows. Note also that the correlation between the same variables and the *percentage change* of the VIX is still negative but stronger. Finally, the correlations of EFFR and the exchange rate with the rest of the variables are generally low.

[8]The results are robust to using the *gross* total return index instead.

[9]The Chinn-Ito index is standardized between 0 and 1, a higher value means a more financially-open country.

	Dep. Variable: Net Total Returns in USD					
	(1)	(2)	(3)	(4)	(5)	(6)
$Log(VIX_t)$	-38.611***	-38.63***	-38.627***	-38.292***	-38.363***	-38.048***
	(2.284)	(2.29)	(2.292)	(2.294)	(2.297)	(2.298)
$Log(VIX_{t-1})$	33.598***	33.64***	33.55***	34.381***	33.408***	34.26***
	(2.277)	(2.302)	(2.355)	(2.334)	(2.355)	(2.334)
Eff. Fed Funds Rate		0.028	0.025	-0.048	0.021	-0.052
		(0.224)	(0.23)	(0.229)	(0.23)	(0.229)
Lagged GDP Growth			-0.017		-0.026	
			(0.144)		(0.144)	
Lagged Chinn-Ito I.			-0.97		-1.132	
			(3.68)		(3.678)	
GDP Growth				0.295**		0.288*
				(0.147)		(0.147)
Chinn-Ito Index				0.576		0.546
				(3.814)		(3.812)
Std. FX (LC per USD)					-0.785	-0.75
					(0.499)	(0.498)
Constant	16.592***	16.465***	17.304***	11.856**	17.051***	11.528**
	(4.418)	(4.533)	(5.448)	(5.622)	(5.446)	(5.622)
R-squared	0.2209	0.2209	0.2202	0.223	0.222	0.2248
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1040	1040	1040	1040	1040	1040
N	16	16	16	16	16	16

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Correlates of Total Returns

4.2 Conditional Correlations

The portfolio allocation model predicts that gross equity inflows IF_t decrease with χ_t but increase with χ_{t-1}, while the total return R_t increases with P_t and decreases with P_{t-1}. Since P_t is negatively related to χ_t, the total return R_t decreases with χ_t and increases with χ_{t-1}. Therefore, the reactions of IF_t and R_t to χ_t and χ_{t-1} have the same direction (see Figure 2). Assuming that the (log of the) VIX is a measure of the re-scaled foreign risk aversion χ_t, these implications of the model can be tested using a country fixed-effects panel data model.

Tables 4 and 5 report the correlation of total returns and gross equity inflows with $\log(VIX_t)$ and $\log(VIX_{t-1})$, conditioning on different variables.[10] As can be seen, the implications of the

[10] Table 5 is similar in spirit to Eichengreen, Gupta & Masetti (2017), and is consistent with their Table 12. However, they do not consider the effect of $\log(VIX_{t-1})$.

	Dep. Variable: Gross Equity Inflows %GDP USD					
	(1)	(2)	(3)	(4)	(5)	(6)
$Log(VIX_t)$	-2.23***	-2.281***	-2.278***	-2.258***	-2.319***	-2.299***
	(0.265)	(0.265)	(0.265)	(0.266)	(0.265)	(0.266)
$Log(VIX_{t-1})$	1.65***	1.762***	1.738***	1.82***	1.76***	1.841***
	(0.264)	(0.266)	(0.272)	(0.27)	(0.272)	(0.27)
Eff. Fed Funds Rate		0.075***	0.079***	0.071***	0.079***	0.072***
		(0.026)	(0.027)	(0.027)	(0.027)	(0.026)
Lagged GDP Growth			-0.009		-0.008	
			(0.017)		(0.017)	
Lagged Chinn-Ito I.			0.172		0.197	
			(0.426)		(0.425)	
GDP Growth				0.02		0.021
				(0.017)		(0.017)
Chinn-Ito Index				0.297		0.302
				(0.442)		(0.441)
Std. FX (LC per USD)					0.123**	0.125**
					(0.058)	(0.058)
Constant	2.211***	1.877***	1.882***	1.405**	1.922***	1.46**
	(0.513)	(0.524)	(0.63)	(0.651)	(0.629)	(0.65)
R-squared	0.0569	0.0634	0.0572	0.054	0.06	0.0576
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1040	1040	1040	1040	1040	1040
N	16	16	16	16	16	16

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Correlates of Equity Inflows

model hold in both cases under the different specifications. Both variables react negatively to an increase in $\log(VIX_t)$ and positively to an increase in $\log(VIX_{t-1})$.

Alternatively, the portfolio allocation model predicts a negative correlation between IF_t and $\Delta\chi_t$. In fact, gross equity inflows are determined by minus the difference in the re-scaled foreign risk aversion (see equation (5)). It can be shown that the same is true for R_t. Tables 8 and 9 in the Annex present equivalent results to those in Tables 4 and 5 but using the percentage change of the VIX instead of $\log(VIX_t)$ and $\log(VIX_{t-1})$. The results are robust to this specification. There is a negative reaction of both variables to an increase in the percentage change of the VIX.

In summary, the empirical results using panel data models are consistent with the portfolio allocation model of section 2.

5 VAR Analysis

The empirical results using VAR models are reported in three stages. The impulse response functions to the two shocks are analyzed first, a variance decomposition analysis is then performed to see the relative importance of the shocks. Finally, the correlations between the estimated structural shocks and the VIX are reported.

5.1 Impulse Responses

The model in (7) is estimated for each of the 16 emerging markets. The endogenous variables are gross equity inflows and the total return on the stock market, in that order. This implements the strategy described in section 3.1.1 and thus allows to identify the structural shocks, henceforth called push and pull shocks, respectively.

The optimal lag for the reduced-form model is obtained by estimating the model in (7) by OLS with different lags and using the Bayes information criterion to choose among them. For all the countries in the sample the optimal lag is $p = 1$, which is not surprising given the nature of the endogenous variables: portfolio flows and stock returns.

Figures 5-8 in the Annex present the impulse responses (with 95% confidence intervals) for all the countries in the sample. Since the model in (7) is estimated individually, it is possible to estimate it for some countries not included in the panel due to data availability; this is done for four countries (Brazil, India, Malaysia, and Poland) and only as a robustness check, the resulting impulse responses are shown in Figure 9.

The pattern observed in the impulse responses of most countries is that a positive push shock increases both gross equity inflows and total returns contemporaneously. In some cases, the confidence intervals (and even the mean value) show a response after the shock in the opposite direction like, for example, China and Russia; it is also observed in countries not in the panel such as Brazil and India. That behavior is in line with the theoretical impulse responses in Figure 2. Note that a positive push shock here is equivalent to a *negative* (re-scaled) foreign risk aversion shock in the portfolio model. Meanwhile, a positive pull shock increases total returns and (by construction) has no contemporaneous effect on gross equity inflows; after the shock, the effect on gross equity inflows, however, is ambiguous.

Exceptions to the pattern just described include Chile and Colombia where total returns *decrease* after a positive push shock, and Brazil and India where equity inflows *increase* after a positive pull shock.

The panel VAR model described in section 3.2 is estimated using the same endogenous variables and also with lag $p = 1$. The model is estimated for four groups of countries in the sample: all 16 countries, Asia[11], Latin America[12], and Europe & Middle East[13]. The impulse response functions (with 95% confidence intervals) are shown in Figures 10 and 11.

In general, the impulse responses from the panel VAR conforms with the same pattern described above with a few caveats. First, in three of the groups there is clearly an upward reaction of gross equity inflows after a positive pull shock. Quantitatively, however, the effect is small; compare, for example, the reaction of gross equity inflows to a push shock. Second, although the reaction of the total returns of Chile and Colombia to a push shock were an exception to the pattern (because they *decrease* contemporaneously to the shock), total returns for Latin America as a region do not decline contemporaneously to a positive push shock but *after* the shock (see Figure 11a). This is consistent with Figure 2 and reflects the corresponding reaction observed for Colombia and Peru under the recursive VAR model (see Figures 5 and 7).

In summary, all these results are in line with the portfolio allocation model of section 2.

5.2 Variance Decomposition

The estimation of recursive and panel VAR models produces an estimate for the structural shocks every period. Since the results using the estimated shocks from the panel VAR models are similar, due to space limitations this subsection and the next make use of the estimated shocks from the individual recursive VAR models.

Figure 3 shows the historical shock decomposition for gross equity inflows. As can be seen, they are mainly driven by push shocks. In addition to the results discussed in section 2.4, this finding also supports using IF_t in the absence of IF_t/P_t to implement the identification strategy described in section 3.1.1.

On the other hand, Figure 4 shows the historical shock decomposition for total returns. In general, they are mainly influenced by pull shocks. However, push shocks play an important role in some regions, especially in Asia, and over some periods of time, like in Korea, Thailand and Turkey during the global financial crisis.

[11] China, Indonesia, Korea, Philippines, Taiwan, and Thailand.
[12] Argentina, Chile, Colombia, Mexico, and Peru.
[13] Czech Republic, Hungary, Russia, and Turkey.

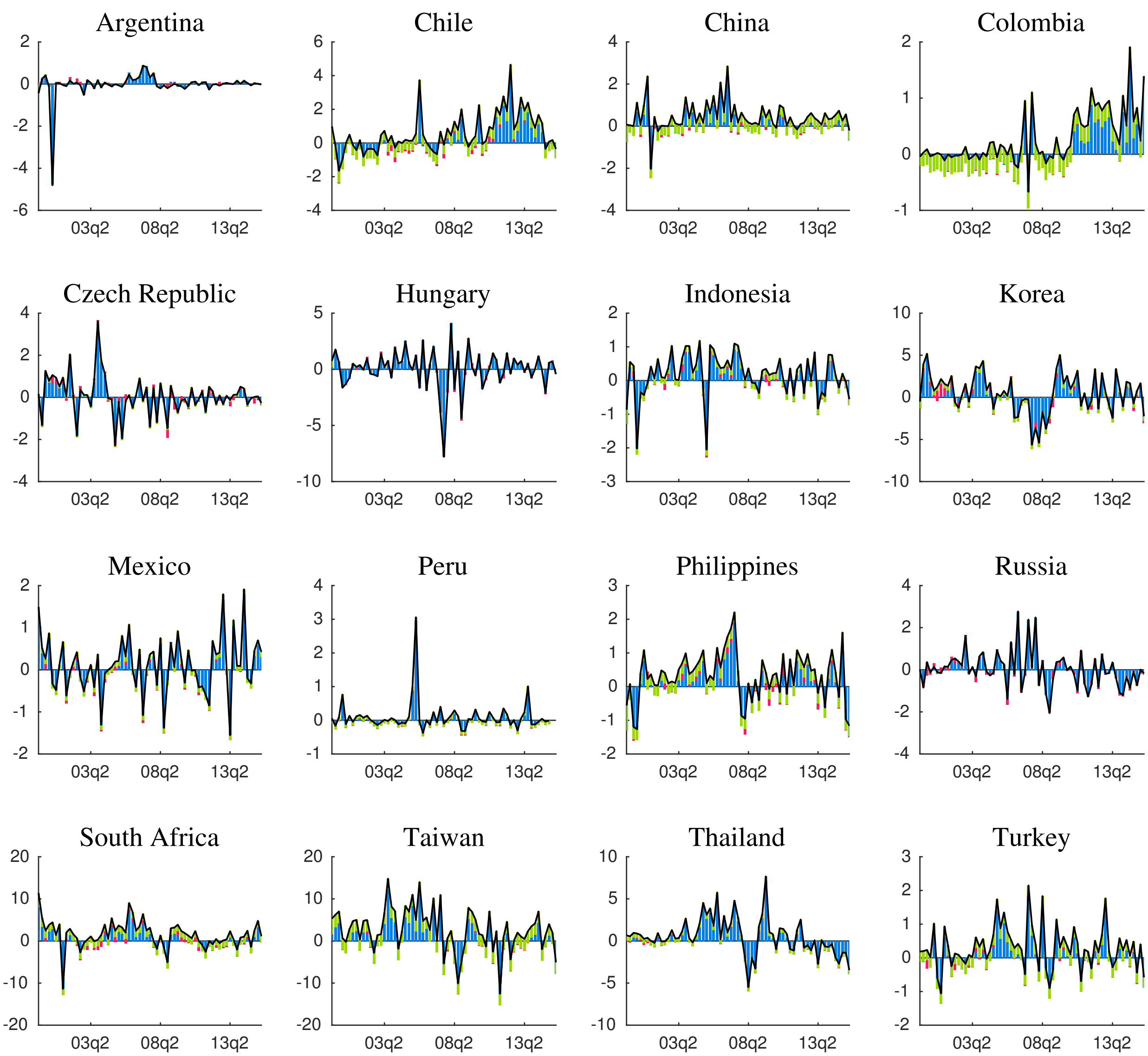


Figure 3: Historical Shock Decomposition for Gross Equity Inflows (as %GDP)
The contribution of push shocks is shown in blue, the contribution of pull shocks is shown in red and the contribution of the deterministic part is shown in green. The solid line represents the total. The x-axis displays the date in quarters, while the y-axis is measured in percent of GDP.

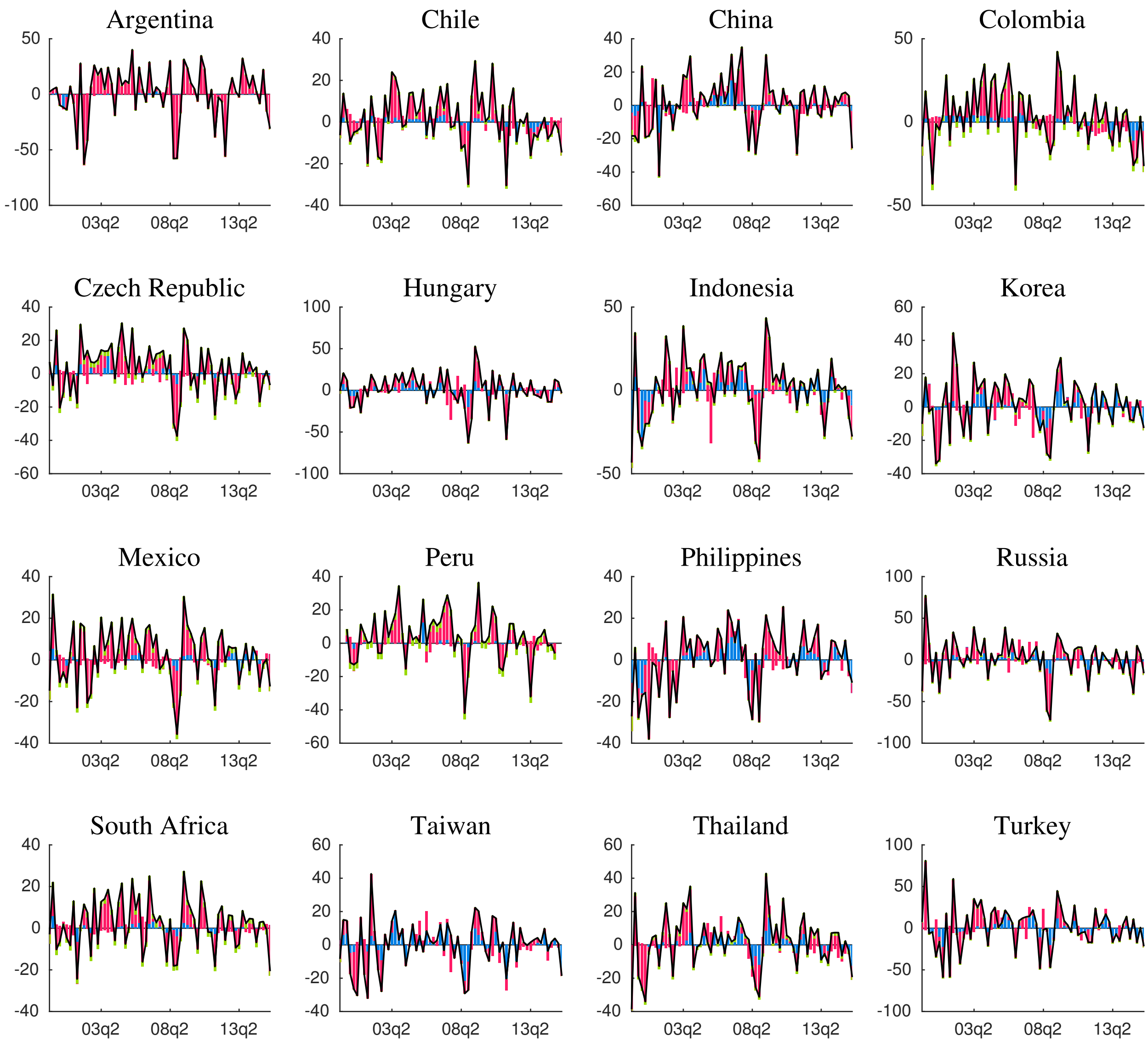


Figure 4: Historical Shock Decomposition for Total Returns

The contribution of push shocks is shown in blue, the contribution of pull shocks is shown in red and the contribution of the deterministic part is shown in green. The solid line represents the total. The x-axis displays the date in quarters, while the y-axis is measured in percentage points.

5.3 Correlations

Table 10 shows the correlations among the estimated push shocks in gross equity inflows for the countries in the sample and among those shocks and the VIX.[14] The region in which a significant correlation among push shocks is most common is Asia, the shocks in the region also exhibit significant correlation with those in Europe. Note that given the restrictions to capital flows in China, its push shock only has a significant correlation with those of Taiwan and South Africa. It is worth mentioning that Chile and Colombia are the only countries in which the correlations of their push shocks with those in other regions are mostly negative. Finally, the push shocks of seven countries in the sample have a significant correlation with the VIX and is always positive.

Table 11 also shows the correlations among the estimated push shocks but this time in total returns. Again, Asia is the region in which significant correlations are more common. Significant bilateral connections across regions that remain here from those observed in the previous Table are: Chile-Colombia, Chile-Russia, Chile-South Africa, Mexico-Turkey, Czech R.-Korea, Hungary-Korea, Russia-Thailand, and China-South Africa. Regarding the correlation of the shocks with the VIX, it stands out that of Colombia because it is the only one with a negative sign.

Tables 12 and 13 present the correlations among the estimated pull shocks in gross equity inflows and in total returns, respectively. The immediate result is that pull shocks seem to be highly correlated, as high as 0.75 and 0.77, respectively. This is not surprising since total returns among emerging markets tend to be highly correlated.[15] Pull shocks in gross equity inflows can be positively and negatively correlated, while those in total returns are always positively correlated. Finally, although it is also common for pull shocks to be correlated with the VIX, the correlation is more common and stronger with pull shocks in gross equity inflows than with those in total returns.

6 Conclusions

The push-pull framework has proven to be a useful approach to study the drivers of capital flows. This paper proposes a simple methodology to identify push and pull factors using gross equity inflows and stock market returns.

A portfolio allocation model provides useful insights which are then used to guide the iden-

[14]As noted above, a positive push shock in the VAR models is equivalent to a negative risk aversion shock in the portfolio model. Thus, to compare them with the VIX, the estimated push shocks were multiplied by -1.

[15]A Table with the correlations among the total returns of the countries in the sample is not reported but looks similar to Tables 12 and 13.

tification strategy. In the model, gross equity inflows and total returns are endogenous and are driven by two types of shocks, dividend and risk aversion shocks. It is found, however, that the first variable can be assumed to be exogenous to dividend shocks. Therefore, in order to identify the structural shocks using recursive VAR models, the portfolio model suggests that gross financial inflows should precede stock market returns.

The strategy is implemented using data from 16 emerging markets. The results are consistent with the predictions of the portfolio allocation model. The impulse response functions show that a positive push shock increases both gross equity inflows and total returns contemporaneously, while a positive pull shock increases total returns at the time of the shock. In addition, a positive pull shock has no contemporaneous effect on gross equity inflows but its effect after the shock is ambiguous. These results are obtained using individual VAR as well as panel VAR models.

Historical decompositions of the shocks show that gross equity inflows are mainly driven by push shocks. In contrast, total returns are mainly influenced by pull shocks. Push shocks in gross equity inflows and total returns are correlated among some countries and with the VIX. However, the correlations among pull shocks and with the VIX are both more common and stronger.

More sophisticated VAR models can be used to further test these results. For example, the portfolio allocation model not only suggests the order of the variables for the recursive VAR but it gives the direction of the effects. Future research can then make use of sign-identified VAR models.

The analysis can also be extended to include gross debt inflows along with total returns on debt instruments in emerging markets. The portfolio allocation model can also be extended so that it is able to determine gross capital outflows, which can help to further refine a sign-identified model. Therefore, although the results in this paper provide a useful benchmark, more work remains to be done in this regard.

References

Broner, F., Didier, T., Erce, A. & Schmukler, S. L. (2013), 'Gross capital flows: Dynamics and crises', *Journal of Monetary Economics* **60**(1), 113 – 133.

Chinn, M. D. & Ito, H. (2008), 'A new measure of financial openness', *Journal of Comparative Policy Analysis* **10**(3), 309 – 322.

Conover, C. M., Jensen, G. R. & Simpson, M. W. (2016), 'What difference do dividends make?', *Financial Analysts Journal* **72**(6), 28–40.

Dieppe, A., Legrand, R. & van Roye, B. (2016), The BEAR toolbox, Working Paper 1934, European Central Bank.

Eichengreen, B., Gupta, P. & Masetti, O. (2017), Are capital flows fickle? Increasingly? And does the answer still depend on type?, Policy Research Working Paper 7972, World Bank.

Forbes, K. J. & Warnock, F. E. (2012), 'Capital flow waves: Surges, stops, flight, and retrenchment', *Journal of International Economics* **88**(2), 235 – 251.

Fratzscher, M. (2012), 'Capital flows, push versus pull factors and the global financial crisis', *Journal of International Economics* **88**(2), 341 – 356.

Gomes, J., Kogan, L. & Zhang, L. (2003), 'Equilibrium cross section of returns', *Journal of Political Economy* **111**(4), 693–732.

Kilian, L. & Lütkepohl, H. (2017), *Structural Vector Autoregressive Analysis*, Cambridge University Press, Cambridge.

Koepke, R. (2015), What drives capital flows to emerging markets? A survey of the empirical literature, Working Paper, Institute of International Finance.

Miranda-Agrippino, S. & Rey, H. (2015), World asset markets and the global financial cycle, Working Paper 21722, NBER.

Obstfeld, M. (2012), 'Financial flows, financial crises, and global imbalances', *Journal of International Money and Finance* **31**(3), 469 – 480.

Pesaran, H. & Smith, R. (1995), 'Estimating long-run relationships from dynamic heterogeneous panels', *Journal of Econometrics* pp. 79–113.

Reinhart, C., Reinhart, V. & Trebesch, C. (2016), 'Global cycles: Capital flows, commodities, and sovereign defaults, 1815-2015', *American Economic Review: Papers and Proceedings* **106**(5), 574–580.

Rey, H. (2015), Dilemma not trilemma: The global financial cycle and monetary policy independence, Working Paper 21162, NBER.

Variable	Obs	Mean	Std. Dev.	Min	Max
Net Total Return in USD	1056	2.17	17.53	-71.96	81.07
Equity Inflows %GDP USD	1056	0.50	2.01	-14.60	14.79
Equity Outflows %GDP USD	1030	0.70	1.96	-14.68	16.53
VIX Index	1056	20.85	8.07	11.03	58.60
% Change in VIX	1040	-0.36	21.95	-49.75	84.89
Effective Fed Funds Rate	1056	2.07	2.15	0.07	6.51
Stand. FX (Local per USD)	1056	-0.03	0.96	-2.14	3.73
GDP Growth	1056	4.23	3.90	-16.34	16.24
Chinn-Ito Index	1056	0.51	0.30	0.00	1.00

Table 6: Summary Statistics

	VIX	%VIX	TR	IF	OF	FED	ZFX	%Y	C-I
VIX Index	1								
% Change in VIX	0.38	1							
Net Total Returns in USD	-0.26	-0.46	1						
Equity Inflows %GDP USD	-0.16	-0.22	0.21	1					
Equity Outflows %GDP USD	-0.07	-0.11	0.12	0.17	1				
Effective Fed Funds Rate	-0.11	0.11	-0.03	0.08	0.06	1			
Stand. FX	0.09	0.05	-0.07	0.04	-0.05	-0.01	1		
GDP Growth	-0.3	0.06	0.04	0.06	-0.02	0.19	-0.04	1	
Chinn-Ito Index	-0.02	0.01	0.02	-0.1	0.14	-0.06	0	-0.15	1

Table 7: Correlations

	Dep. Variable: Net Total Returns in USD					
	(1)	(2)	(3)	(4)	(5)	(6)
$Log(VIX_t/VIX_{t-1})$	-0.361***	-0.362***	-0.364***	-0.365***	-0.362***	-0.363***
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
Eff. Fed Funds Rate		0.122	0.085	-0.01	0.079	-0.015
		(0.224)	(0.23)	(0.229)	(0.23)	(0.229)
Lagged GDP Growth			0.112		0.099	
			(0.139)		(0.139)	
Lagged Chinn-Ito I.			0.227		0.016	
			(3.678)		(3.677)	
GDP Growth				0.417***		0.407***
				(0.139)		(0.139)
Chinn-Ito Index				1.611		1.543
				(3.8)		(3.797)
Std. FX (LC per USD)					-0.865*	-0.811
					(0.501)	(0.498)
Constant	1.678***	1.431**	0.912	-0.914	1.072	-0.835
	(0.476)	(0.658)	(2.113)	(2.178)	(2.113)	(2.177)
R-squared	0.2122	0.2124	0.2127	0.2179	0.2149	0.22
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1040	1040	1040	1040	1040	1040
N	16	16	16	16	16	16

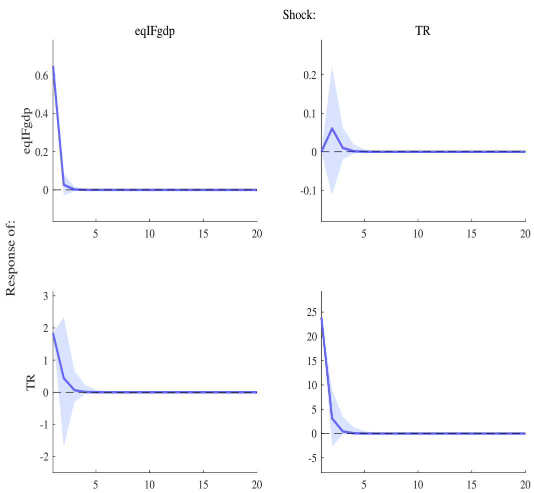
Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Correlates of Total Returns using the Percentage Change in VIX

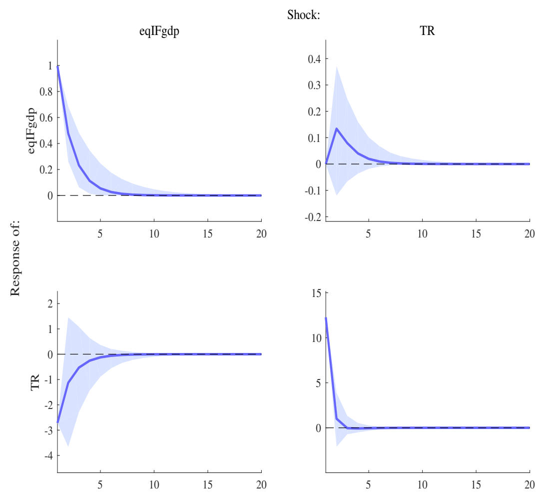
	Dep. Variable: Gross Equity Inflows %GDP USD					
	(1)	(2)	(3)	(4)	(5)	(6)
$Log(VIX_t/VIX_{t-1})$	-0.019***	-0.02***	-0.02***	-0.021***	-0.021***	-0.021***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Eff. Fed Funds Rate		0.084***	0.085***	0.076***	0.086***	0.076***
		(0.026)	(0.027)	(0.027)	(0.027)	(0.026)
Lagged GDP Growth			0.004		0.006	
			(0.016)		(0.016)	
Lagged Chinn-Ito I.			0.299		0.327	
			(0.425)		(0.425)	
GDP Growth				0.033**		0.035**
				(0.016)		(0.016)
Chinn-Ito Index				0.413		0.423
				(0.44)		(0.439)
Std. FX (LC per USD)					0.114**	0.118**
					(0.058)	(0.058)
Constant	0.485***	0.314***	0.14	-0.023	0.119	-0.035
	(0.055)	(0.076)	(0.244)	(0.252)	(0.244)	(0.252)
R-squared	0.0477	0.0562	0.0458	0.0451	0.0479	0.0481
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1040	1040	1040	1040	1040	1040
N	16	16	16	16	16	16

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

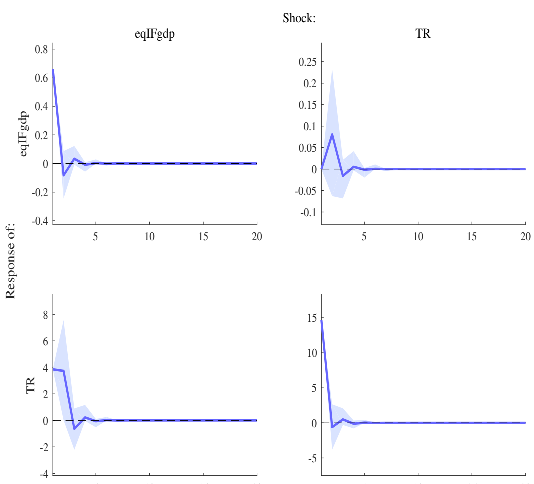
Table 9: Correlates of Equity Inflows using the Percentage Change in VIX



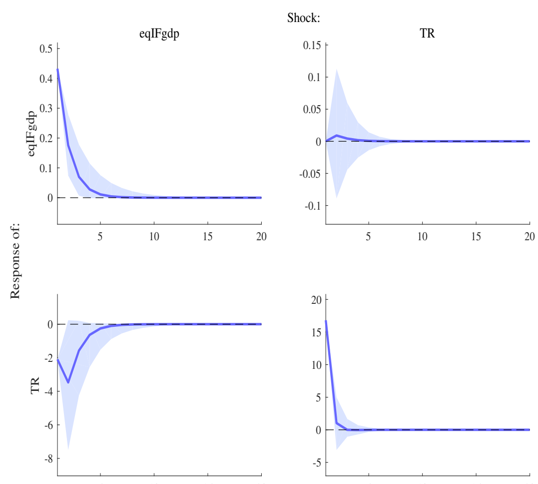
(a) Argentina



(b) Chile

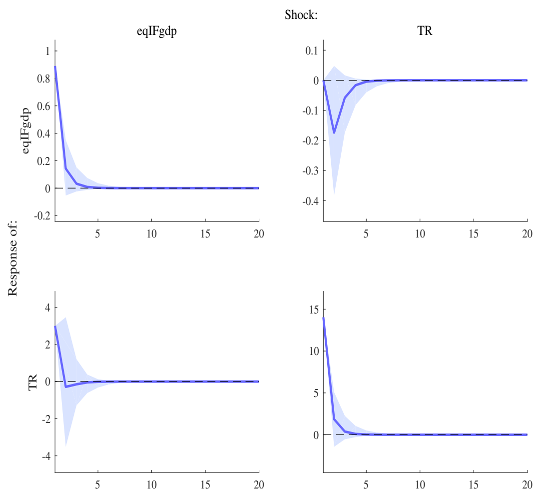


(c) China

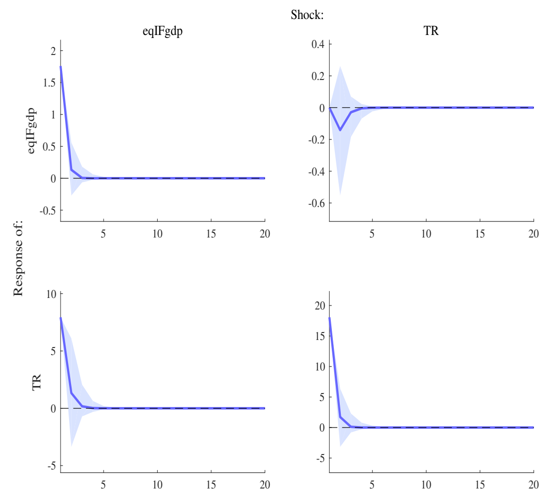


(d) Colombia

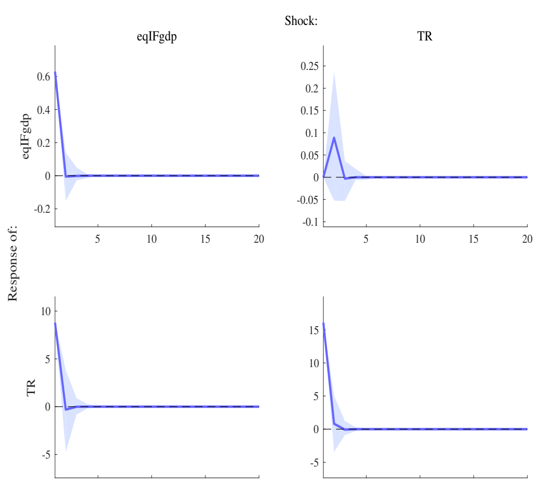
Figure 5: Impulse Response Functions to Push and Pull Shocks - A



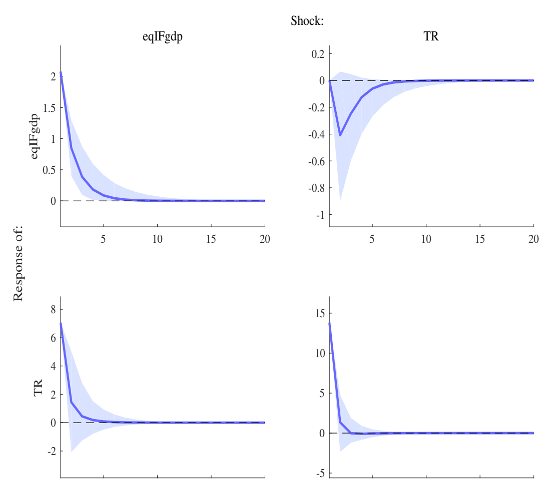
(a) Czech Republic



(b) Hungary

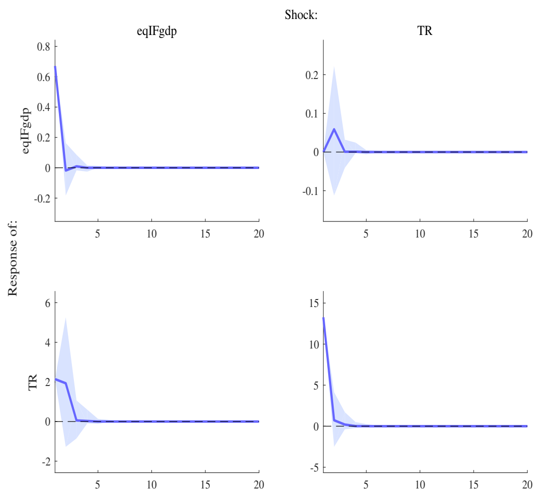


(c) Indonesia

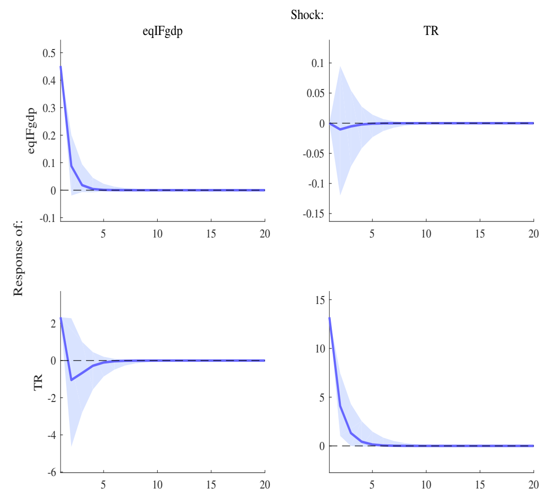


(d) Korea

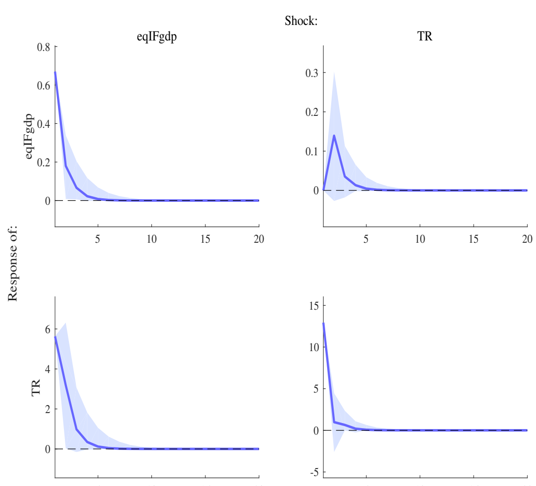
Figure 6: Impulse Response Functions to Push and Pull Shocks - B



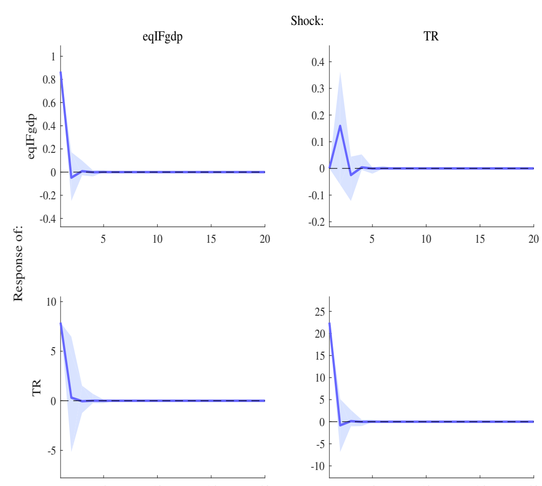
(a) Mexico



(b) Peru

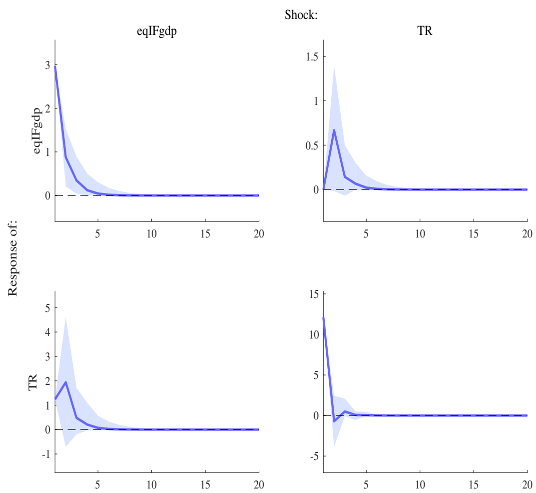


(c) Philippines

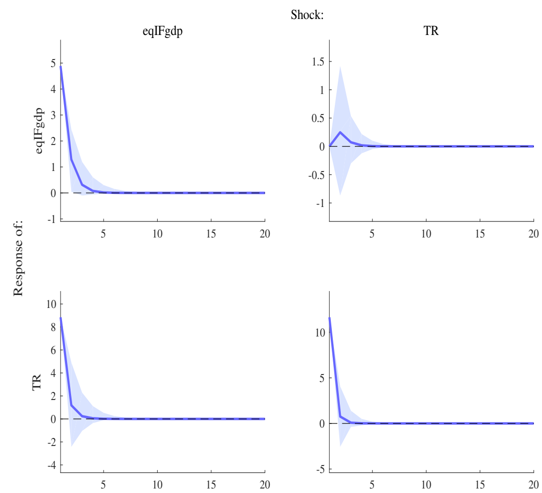


(d) Russia

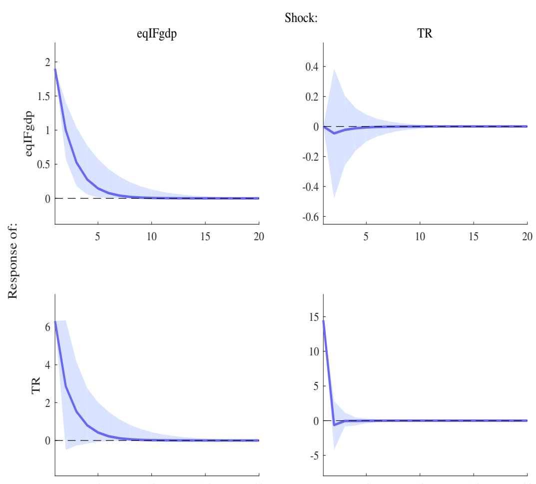
Figure 7: Impulse Response Functions to Push and Pull Shocks - C



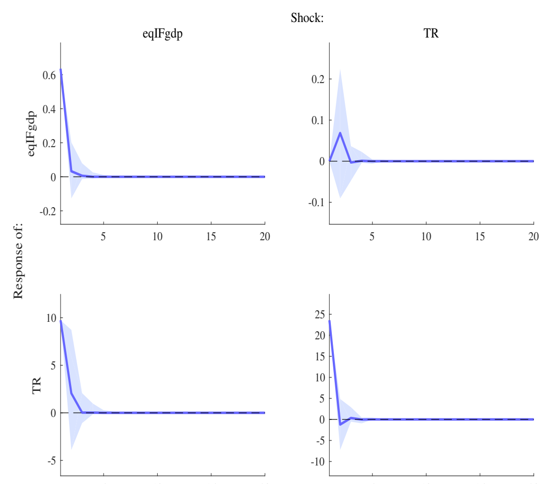
(a) South Africa



(b) Taiwan

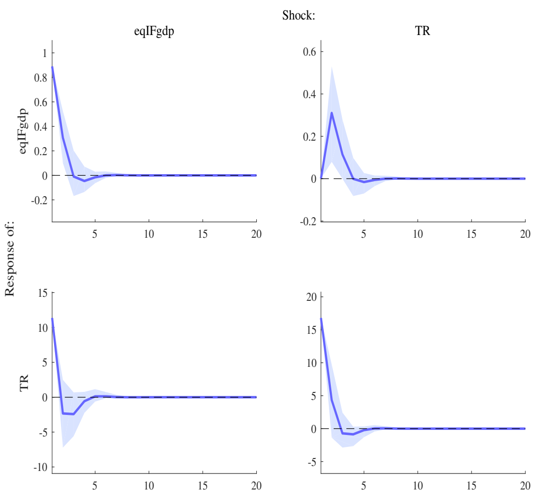


(c) Thailand

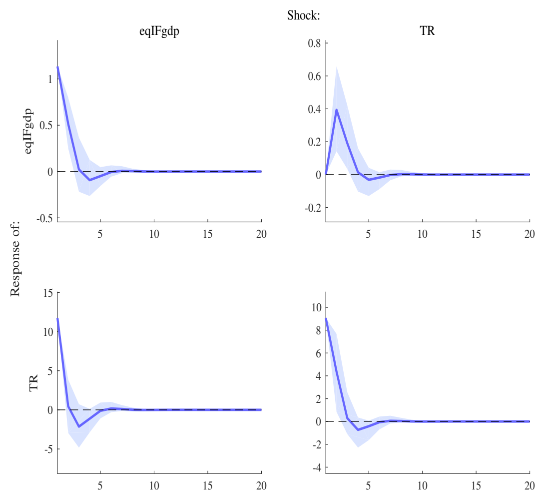


(d) Turkey

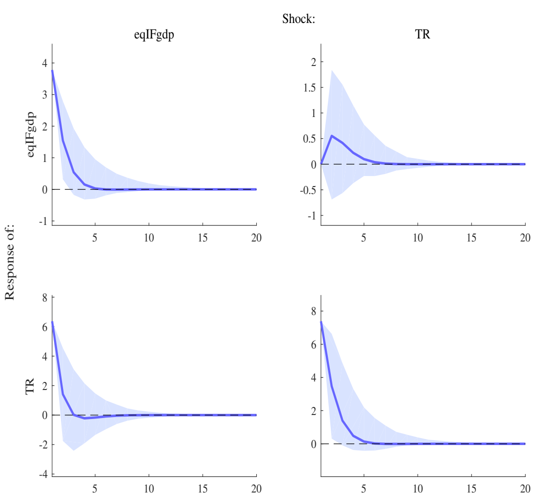
Figure 8: Impulse Response Functions to Push and Pull Shocks - D



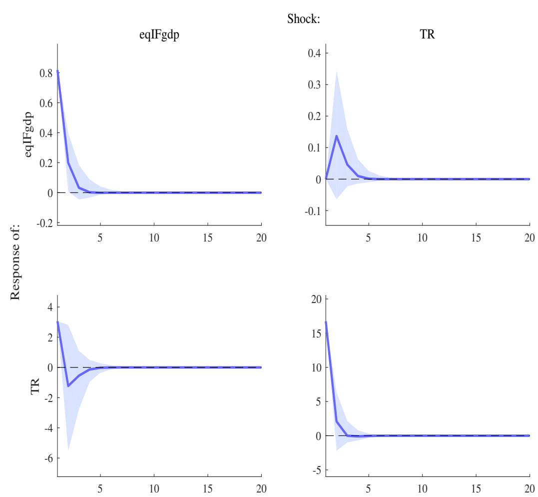
(a) Brazil



(b) India

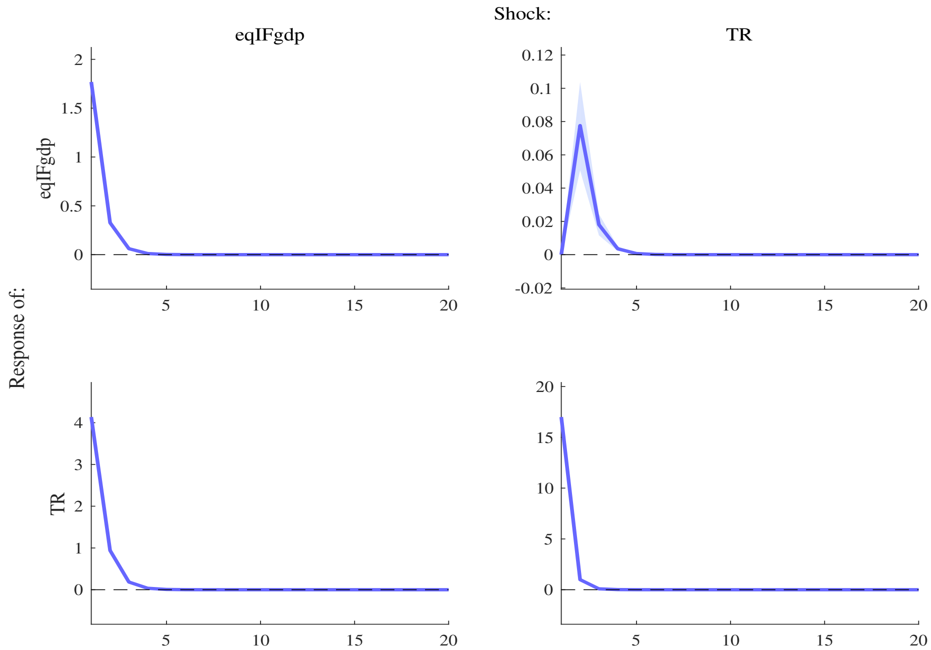


(c) Malaysia

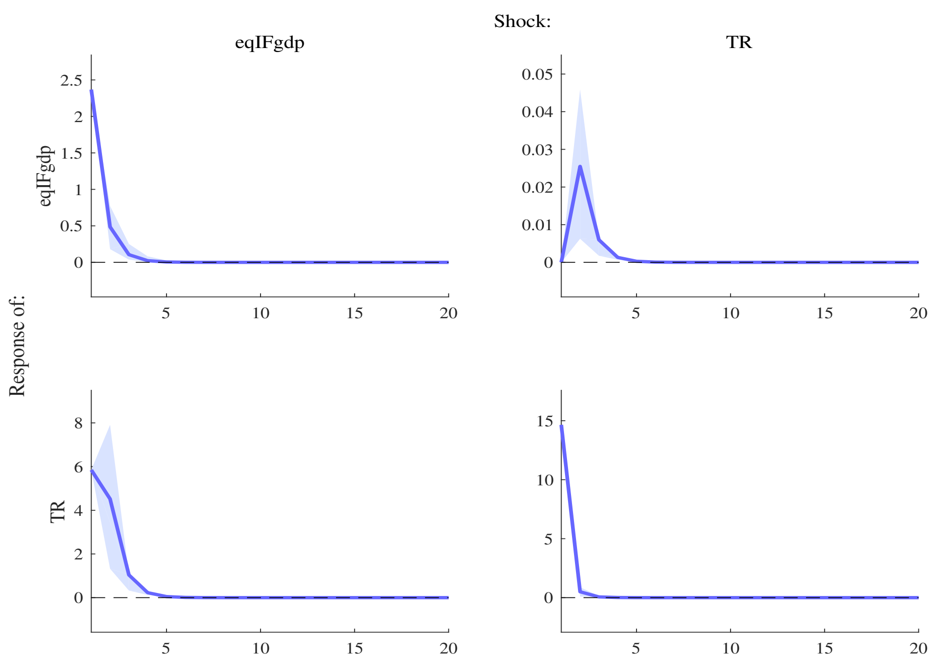


(d) Poland

Figure 9: Impulse Response Functions to Push and Pull Shocks - E
The countries in this figure are not included in the panel. The span of data used for these countries is explained in footnote 7.

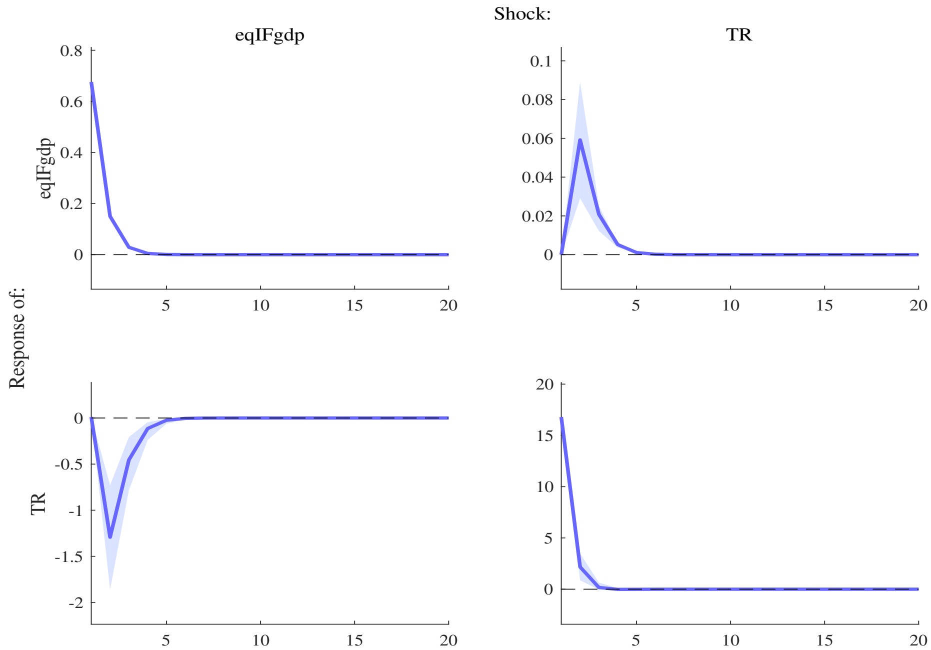


(a) All (16) Countries

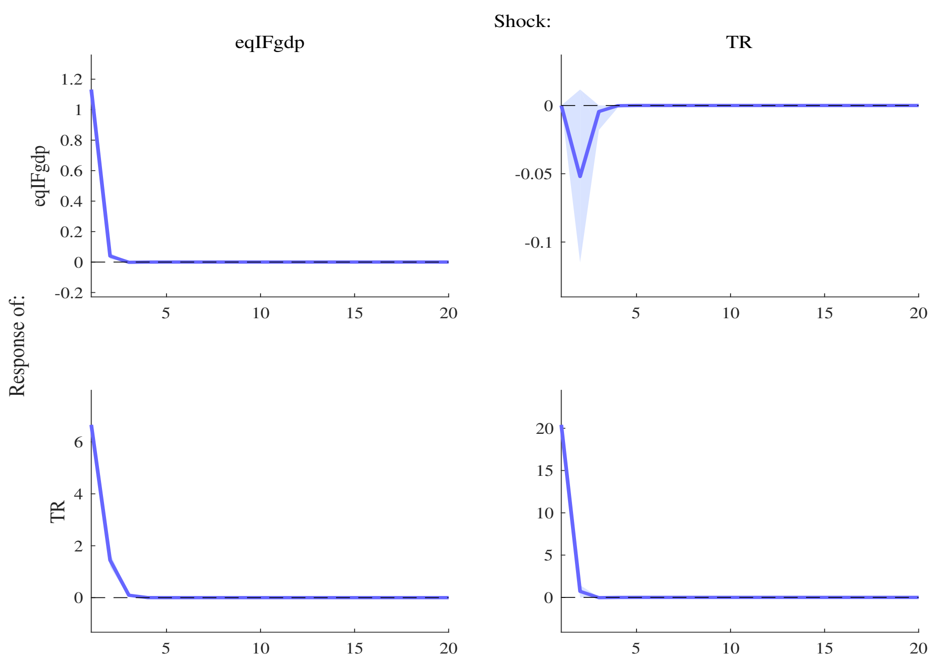


(b) Asia

Figure 10: Impulse Response Functions to Push and Pull Shocks - Panel VAR



(a) Latin America



(b) Europe and Middle East

Figure 11: Impulse Response Functions to Push and Pull Shocks - Panel VAR

	VIX	ARG	CHL	COL	MEX	PER	CZE	HUN	RUS	TUR	CHN	IDN	KOR	PHL	TWN	THA	ZAF
VIX	1																
Argentina	0.04	1															
Chile	0	-0.02	1														
Colombia	0.2	0.06	0.31**	1													
Mexico	0.1	0.1	0.04	0.02	1												
Peru	0.23*	0.01	-0.01	-0.08	0.11	1											
Czech R.	0.14	-0.06	-0.16	-0.18	-0.06	-0.16	1										
Hungary	0.25**	0.03	-0.07	-0.05	0	0.08	0.07	1									
Russia	0.16	0.04	-0.35***	-0.32**	0.03	0.08	0.16	-0.05	1								
Turkey	0.37***	-0.11	-0.01	-0.14	0.31**	0.24*	-0.03	-0.14	0.31**	1							
China	0.21*	0.15	-0.06	-0.15	0.01	0.11	0.18	-0.02	-0.02	0	1						
Indonesia	0.11	0.16	-0.01	0	-0.04	-0.12	0.15	0.01	0.17	0.22*	0.02	1					
Korea	0.15	-0.01	-0.19	-0.11	0.22*	0.09	0.33***	0.34***	0.06	0.14	0.02	0.13	1				
Philipp.	0.22*	0.09	0.1	0.01	-0.07	-0.03	0.07	-0.01	0.18	0.21	0.19	0.44***	0.13	1			
Taiwan	0.35***	0.09	-0.19	-0.35***	0.22*	0.16	0.26**	0.27**	0.15	0.29**	0.32**	0.22*	0.5***	0.29**	1		
Thailand	0.16	0.09	-0.22*	-0.25**	0.14	0.2	0.03	0.1	0.42***	0.29**	0.14	0.2	0.4***	0.37***	0.49***	1	
South A.	0.26**	-0.05	-0.25**	-0.04	0.19	0.09	-0.03	0.08	0.17	0.01	0.4***	-0.13	0.07	0.05	0.23*	0.32***	1

p-values are calculated for testing the null hypothesis of no correlation; *** p<0.01, ** p<0.05, * p<0.1.

Table 10: Correlations between Estimated Push Shocks in IF

	VIX	ARG	CHL	COL	MEX	PER	CZE	HUN	RUS	TUR	CHN	IDN	KOR	PHL	TWN	THA	ZAF
VIX	1																
Argentina	0.07	1															
Chile	0	0.04	1														
Colombia	-0.3**	-0.12	0.41***	1													
Mexico	0.24*	-0.01	0.01	-0.17	1												
Peru	0.08	0.1	0.22*	-0.04	-0.05	1											
Czech R.	0.1	-0.03	0.09	0.09	-0.08	-0.12	1										
Hungary	0.27**	0.02	0.07	0.01	0.13	0.16	0.03	1									
Russia	0.17	0.06	0.36***	0.18	-0.08	0.22*	0.16	-0.07	1								
Turkey	0.4***	-0.06	0	0.03	0.33***	0.12	-0.01	-0.14	0.3**	1							
China	0.35***	0.06	0.19	0.1	-0.03	0	0.09	0.03	0.09	0.04	1						
Indonesia	0.11	0.17	0.01	0.06	-0.03	-0.18	0.12	0	0.17	0.21*	0.1	1					
Korea	0.1	0.01	0.16	0.07	0.17	0.1	0.28**	0.37***	0.05	0.12	-0.05	0.16	1				
Philipp.	0.26**	0.14	-0.08	0	-0.26**	-0.01	0.01	-0.05	0.22*	0.22*	0.35***	0.44***	0.14	1			
Taiwan	0.3**	0.07	0.15	0.22*	0.13	0.04	0.28**	0.27**	0.15	0.25**	0.21*	0.22*	0.5***	0.28**	1		
Thailand	0.15	0.1	0.22*	0.27**	0.05	0.11	0.06	0.1	0.42***	0.31**	0.27**	0.2	0.39***	0.42***	0.44***	1	
South A.	0.35***	-0.02	0.35***	0.16	0.28**	0.08	-0.1	0.05	0.22*	0.13	0.46***	-0.04	0.08	0.07	0.29**	0.35***	1

p-values are calculated for testing the null hypothesis of no correlation; *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 11: Correlations between Estimated Push Shocks in TR

	VIX	ARG	CHL	COL	MEX	PER	CZE	HUN	RUS	TUR	CHN	IDN	KOR	PHL	TWN	THA	ZAF
VIX	1																
Argentina	-0.5***	1															
Chile	-0.46***	0.51***	1														
Colombia	-0.36***	0.38***	0.7***	1													
Mexico	-0.45***	0.53***	0.73***	0.66***	1												
Peru	0.42***	-0.42***	-0.59***	-0.48***	-0.52***	1											
Czech R.	0.39***	-0.52***	-0.51***	-0.6***	-0.54***	0.49***	1										
Hungary	0.33***	-0.47***	-0.54***	-0.5***	-0.58***	0.49***	0.71***	1									
Russia	-0.35***	0.53***	0.46***	0.43***	0.68***	-0.39***	-0.43***	-0.39***	1								
Turkey	-0.16	0.34***	0.5***	0.44***	0.59***	-0.27**	-0.35***	-0.46***	0.48***	1							
China	-0.28**	0.39***	0.44***	0.33***	0.38***	-0.36***	-0.36***	-0.54***	0.3**	0.43***	1						
Indonesia	-0.3**	0.11	0.45***	0.41***	0.47***	-0.33***	-0.29**	-0.34***	0.41***	0.29**	0.34***	1					
Korea	0.4***	-0.22*	-0.52***	-0.53***	-0.52***	0.5***	0.63***	0.54***	-0.38***	-0.34***	-0.47***	-0.46***	1				
Philipp.	-0.36***	0.2	0.61***	0.49***	0.48***	-0.3**	-0.17	-0.25**	0.34***	0.43***	0.32**	0.55***	-0.52***	1			
Taiwan	-0.22*	0.29**	0.42***	0.31**	0.45***	-0.33***	-0.31**	-0.32***	0.41***	0.47***	0.33***	0.29**	-0.52***	0.55***	1		
Thailand	0.23*	-0.19	-0.48***	-0.5***	-0.4***	0.35***	0.33***	0.35***	-0.31**	-0.34***	-0.37***	-0.43***	0.47***	-0.5***	-0.54***	1	
South A.	-0.36***	0.51***	0.68***	0.75***	0.66***	-0.57***	-0.59***	-0.61***	0.58***	0.53***	0.54***	0.43***	-0.48***	0.41***	0.3**	-0.52***	1

p-values are calculated for testing the null hypothesis of no correlation; *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Figure 12: Correlations between Estimated Pull Shocks in IF

	VIX	ARG	CHL	COL	MEX	PER	CZE	HUN	RUS	TUR	CHN	IDN	KOR	PHL	TWN	THA	ZAF
VIX	1																
Argentina	-0.3**	1															
Chile	-0.2	0.57***	1														
Colombia	-0.25**	0.42***	0.64***	1													
Mexico	-0.35***	0.53***	0.77***	0.72***	1												
Peru	-0.12	0.43***	0.51***	0.43***	0.51***	1											
Czech R.	-0.33***	0.55***	0.46***	0.58***	0.57***	0.45***	1										
Hungary	-0.33***	0.47***	0.5***	0.5***	0.58***	0.41***	0.71***	1									
Russia	-0.24*	0.53***	0.53***	0.51***	0.69***	0.41***	0.5***	0.43***	1								
Turkey	-0.07	0.34***	0.56***	0.51***	0.58***	0.26**	0.37***	0.46***	0.48***	1							
China	-0.14	0.41***	0.53***	0.41***	0.4***	0.39***	0.43***	0.58***	0.32***	0.43***	1						
Indonesia	-0.24*	0.15	0.44***	0.44***	0.5***	0.32***	0.31**	0.36***	0.43***	0.29**	0.4***	1					
Korea	-0.26**	0.32***	0.53***	0.48***	0.66***	0.48***	0.54***	0.54***	0.5***	0.51***	0.58***	0.46***	1				
Philipp.	-0.25**	0.16	0.53***	0.4***	0.46***	0.23*	0.1	0.21*	0.35***	0.44***	0.33***	0.51***	0.49***	1			
Taiwan	-0.05	0.34***	0.4***	0.3**	0.46***	0.33***	0.32***	0.3**	0.42***	0.49***	0.31**	0.24*	0.6***	0.48***	1		
Thailand	-0.13	0.23*	0.56***	0.5***	0.55***	0.37***	0.34***	0.38***	0.47***	0.44***	0.42***	0.55***	0.5***	0.44***	0.46***	1	
South A.	-0.21*	0.53***	0.67***	0.74***	0.68***	0.51***	0.55***	0.58***	0.6***	0.55***	0.64***	0.46***	0.5***	0.31**	0.29**	0.54***	1

p-values are calculated for testing the null hypothesis of no correlation; *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Figure 13: Correlations between Estimated Pull Shocks in TR