Global Financial Risk, Equity Returns, and Economic Activity in Emerging Countries *

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Abstract

International financial integration exposes countries to external shocks. This paper identifies the impact and transmission of global financial risk (GFR) shocks to emerging market economies (EMEs). Heightened GFR significantly raises EME borrowing costs and lowers equity returns, reducing domestic economic activity. We show that GFR transmits to EMEs via international capital flows. Countries experiencing larger capital inflows are more impacted by GFR fluctuations. Further exploring the transmission through capital flows, we document that GFR shocks affect EMEs mainly through their effect on equity returns, instead of country spreads. Innovations in equity returns contribute considerably more to macroeconomic fluctuations in EMEs, compared to sovereign and corporate bond spreads.

JEL classification: E32, E37, F34, F37, G15

Keywords: global financial risk, equity returns, economic activity, emerging economies

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1 Introduction

Increases in global capital flows have led to an ever larger integration of international financial markets, further exposing countries to external shocks (Bekaert, Hodrick, and Zhang, 2009; Cerutti, Claessens, and Puy, 2019). Given their small size and vulnerable domestic markets, emerging market economies' (EMEs) business cycles may greatly depend on global financial conditions (Akıncı, 2013; Maćkowiak, 2007; Rey, 2015). Hence, identifying the significance of international financial risk and its spillovers to EMEs provides crucial implications for strategic decision-making in investment and policy.[1] Studies, however, lack consensus on the effects of global financial risk on EMEs.[2]

This paper quantifies the impact of global financial risk (GFR) on EMEs' economic activity and establishes a novel channel of transmission. Our results demonstrate that GFR shocks strongly perturb output, investment, and financial markets in EMEs. Importantly, we provide evidence that GFR propagates to EMEs mainly via an international equity channel, instead of country spreads. The effects of GFR are carried over to domestic economic activity through a country's exposure to capital flows and the responsiveness of equity markets.

We assemble a sample of twelve countries from 1999Q1 to 2019Q4, and measure GFR using the US Baa credit spread.[3] We identify the impact of GFR, equity return, and bond spread shocks through a panel structural vector augoregressive (SVAR) model, augmented from Akıncı (2013) and Caballero et al. (2019). Our block of domestic financial variables includes equity returns, in addition to country spreads. Figure 1 shows that the first principal component of equity returns comoves more closely with GFR and the common factor of output growth, compared to the common factor of country spreads.[4]

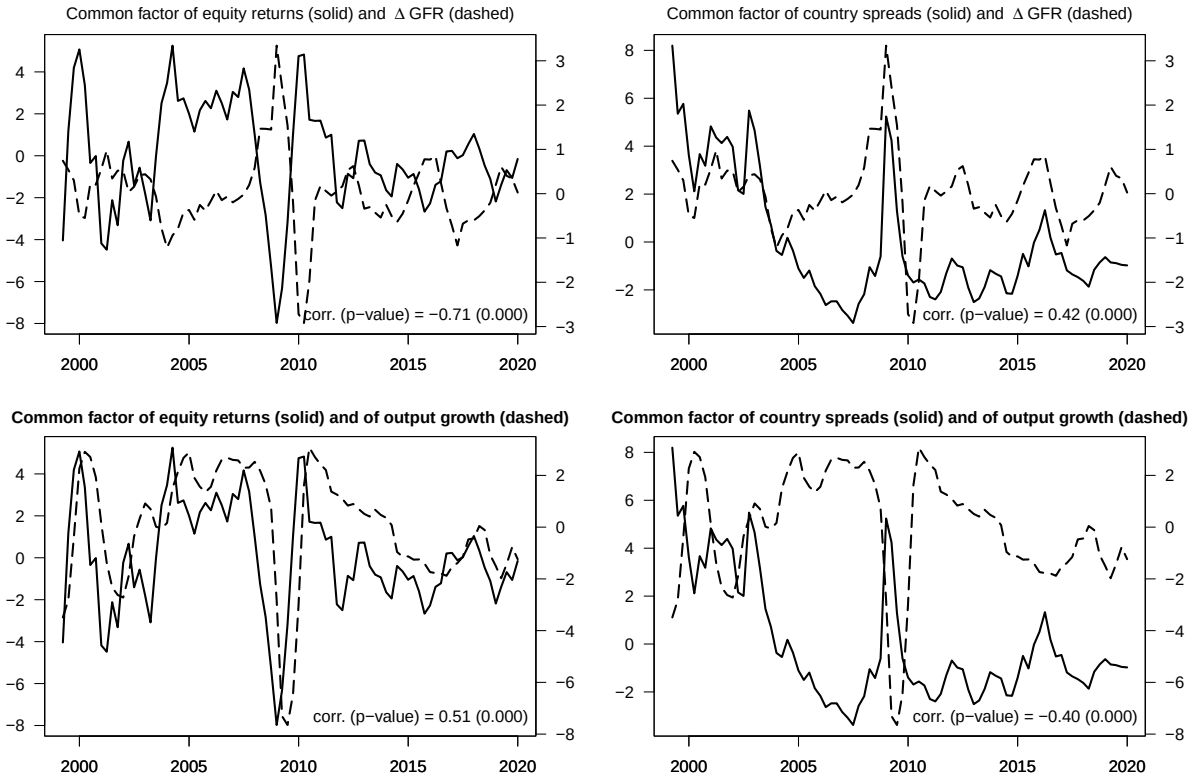
[1] Aizenman, Cheung, and Qian (2021) show, for example, that country's international reserves shield EME firms' investment from global financial shocks.

[2] Akıncı (2013) and Caballero, Fernández, and Park (2019) show that global financial risk shocks explain a significant portion of EME macroeconomic volatility, while Epstein, Shapiro, and Gómez (2019) and Fink and Schüler (2015) document only a minor role of global financial risk for EMEs.

[3] In our robustness section, we proxy GFR with the VIX index, a measure of the US option-implied stock market volatility.

[4] The first principal component explains about two thirds, a half, and two thirds of the variation in equity returns, output growth, and country spreads over the 1999Q1-2019Q4 period in the balanced panel of ten

Figure 1: Global financial risk, equity returns, country spreads, and economic activity



Notes: The figure displays comovement between the common factor (first principal component) of EME equity returns, country spreads, output growth, and year-on-year changes in global financial risk (GFR), proxied by the US Baa corporate spread. The first principal component explains about two thirds, a half, and two thirds of the variation in equity returns, output growth, and country spreads over the 1999Q1-2019Q4 period in the sample of ten EMEs (Brazil, Chile, Colombia, Malaysia, Mexico, Peru, Philippines, Russia, South Africa, and Turkey).

We find that a one standard deviation increase in GFR leads to over a half percentage point decline in output growth and more than one percentage point decline in investment growth. In response to the shock, EMEs experience a sudden capital outflow, an increase of capital borrowing costs, and a depreciation of equity prices. Overall, GFR shocks explain about 20% of EMEs' output variance and 10% of investment variance, and contribute to over 15% of country spread fluctuations and 20% of equity return fluctuations.

Our analysis reveals that capital flows serve as a transmission channel of GFR to domestic economy. A heightened GFR brings about capital outflows, depreciating equity returns and raising borrowing costs. The resulted equity return fluctuations play a more dominant role

EMEs (Brazil, Chile, Colombia, Malaysia, Mexico, Peru, Philippines, Russia, South Africa, and Turkey).

in propagating GFR than country spread fluctuations. In a counterfactual experiment, the contribution of GFR to domestic output volatility drops from 20% to 5% and to investment volatility from 10% to near zero, when equity returns do not directly respond to variations in GFR. However, in a similar counterfactual experiment in which we shut down country spread response to GFR, the contribution of GFR to the variance of output and investment growth remains virtually unchanged.

Moreover, we show that innovations in equity returns account for a considerably larger fraction of output and investment variance, compared to innovations in sovereign and corporate bond spreads. This contrasts with the literature that focuses on the role of country spreads in propagating GFR shocks and contributing to EME economic fluctuations (Akıncı, 2013; Bhattarai, Chatterjee, and Park, 2020; Caballero et al., 2019; Epstein, Finkelstein Shapiro, and Gonzalez Gomez, 2017; Uribe and Yue, 2006). Our work suggests that equity returns carry information about EME macroeconomic volatility in addition to that contained in corporate and sovereign bond spreads. This finding points to some degree of market segmentation between EME equity and debt markets (Pitkäjärvi, Suominen, and Vaittinen, 2020).

We provide empirical evidence for several theoretical frameworks highlighting the key role of financial frictions for EME macroeconomic fluctuations (Cesa-Bianchi, Ferrero, and Rebucci, 2018; Chang, Fernández, and Gulan, 2017; Garcia-Cicco, Pancrazi, and Uribe, 2010; Mendoza and Smith, 2006). Our mechanism most closely relates to the work of Mendoza and Smith (2006), in which domestic consumers trade equity and bonds with the rest of the world. Households are subject to a collateral constraint, which limits their holdings of foreign bonds relative to domestic assets. Exogenous changes in the collateral value can be interpreted as disturbances in global financial conditions (Epstein et al., 2017). An adverse GFR shock tightens the collateral constraint, prompting EMEs to reduce their foreign debt and deleverage by fire-selling their equity and reducing domestic aggregate demand. The fire-sale of assets triggers Fisher's debt-deflation mechanism through additional equity

price declines, eventually lowering investment, consumption, and overall economic activity. Consistent with this mechanism, we show that an increase in GFR leads to a sudden capital reversal, decreases equity prices and increases country spreads, lowering investment and output growth.

Our paper is nested in the fast-growing literature examining the impact of external shocks on EMEs. Anaya, Hachula, and Offermanns (2017), Bowman, Londono, and Sapriza (2015), and Tillmann (2016) identify the spillovers of US unconventional monetary policy to EMEs. Maćkowiak (2007) and Uribe and Yue (2006) document how unexpected changes in US interest rates affect EMEs' domestic activities. We also relate to the work assessing the impact of global financial conditions on EMEs (Akıncı, 2013; Bhattarai et al., 2020; Cesa-Bianchi et al., 2018; Céspedes, Chang, and Velasco, 2017; Horvath and Rothman, 2021). We focus on quantifying the importance of GFR shocks for EME economic activity and provide evidence on a novel transmission channel via international capital flows and equity markets.

Further, this paper identifies heterogeneous explanatory power for different asset classes in transmitting external shocks to EMEs. While acknowledging the role of country spreads, our work provides empirical evidence that equity markets play a more important role than bond markets in passing GFR to domestic economy. This contrasts the literature focused only on the role of bond spreads propagating GFR shocks (Akıncı, 2013; Caballero et al., 2019; Epstein et al., 2019). We also relate to theoretical studies revealing the explanatory power of interest rate shocks for unique business cycle features of EMEs (Boz, Durdu, and Li, 2015; Fernández-Villaverde, Guerrón-Quintana, Rubio-Ramírez, and Uribe, 2011; Neumeyer and Perri, 2005; Rothert, 2020; Uribe and Yue, 2006). Our empirical evidence highlights the importance of simultaneously accounting for changes in EMEs' international borrowing costs and domestic equity financing.

The rest of the paper proceeds as follows. Section 2 describes data and their sources. Section 3 outlines our panel structural vector autoregressive model. Section 4 documents the impact and transmission of global financial risk shocks to EMEs. Section 5 provides

robustness checks and Section 6 concludes.

2 Data

This section describes data sources and variables used in our main analysis. The availability of uninterrupted quarterly data, especially of country spreads, dictates the set of countries and the sample window length. Our sample of EMEs consists of twelve countries: Brazil, Chile, Colombia, Indonesia, Malaysia, Mexico, Peru, Philippines, Russia, South Africa, Thailand, and Turkey, in line with the literature (e.g. Bhattarai et al., 2020; Caballero et al., 2019; Epstein et al., 2019). The sample window starts in 1999Q1 and ends in 2019Q4.[5]

Our analysis uses EME-specific macroeconomic and financial variables, as well as measures of global financial risk (GFR). National accounts data, including output, investment, and the trade balance, are sourced from the IMF's *International Financial Statistics* Database. Output and investment are expressed in real terms, obtained by deflating their nominal values with country's GDP deflator.

The financial variables consist of quarterly bond spreads, stock prices, and capital flows.[6] Consistent with the literature (Fernández-Villaverde et al., 2011; Neumeyer and Perri, 2005; Uribe and Yue, 2006), we measure country spreads using a country's sovereign bond-based J.P. Morgan Emerging Market Global Bond Index (EMBIG), obtained from the World Bank's *Global Economic Monitor* Database.

Country-specific stock price data come from the FINAEON *Global Financial Data* database. We use capitalization-weighted stock market indexes: IBXD (Brazil), IGPAD (Chile), IGBCD (Colombia), JKSED (Indonesia), KLSED (Malaysia), MXXD (Mexico), SPBLPGPT (Peru), PSID (Philippines), MCXD (Russia), JALSHD (South Africa), SETID (Thailand), and XU100D (Turkey). These are deflated with the corresponding country's consumer price index. Following Bhattarai et al. (2020), the capital flow data is obtained from the *Treasury*

[5]The sample for Indonesia starts in 2004Q2, while the sample for Thailand ends in 2006Q1.
[6]The quarterly values are the average of monthly values.

International Capital (TIC) System and measures net capital inflows to EMEs vis-à-vis the US.[7]

Following the literature, we approximate GFR using the US Baa credit spread (e.g., Akıncı, 2013; Epstein et al., 2019). It is calculated as the difference between the US Baa corporate and 10-year Treasury interest rates. In our sensitivity analysis, we use the VIX index as an alternative proxy. VIX is the US stock market option-implied volatility on the S&P 500 index, another measure of GFR. Both GFR measures are sourced from the St. Louis *FRED* Database.

3 Empirical Methodology

Our empirical approach follows the work of Akıncı (2013); Caballero et al. (2019); Uribe and Yue (2006). We use a panel structural vector autoregressive (SVAR) model, characterized by the following equation:

$$AY_{k,t} = c_k + \sum_{j=1}^{p} B_j Y_{k,t-j} + \epsilon_{k,t}, \tag{1}$$

where c_k denotes a country fixed effect, p is the number of lags, A and B denote coefficient matrices, Y_k represents a vector of variables of interest, and ϵ_k represents the corresponding structural shocks. The vector $Y_{k,t} = [\triangle y_{k,t}, \triangle inv_{k,t}, tby, \triangle GFR_t, Kflows_{k,t}, CS_{k,t}, EqR_{k,t}]$ consists of annual changes in the log of real GDP, annual changes in the log of real investment, the trade balance-to-output ratio, annual changes in the global financial risk proxied by the US Baa spread, net capital inflows relative to GDP, country spread measured by the J.P. Morgan's EMBIG spread, and equity returns, i.e., annual log differences in real stock prices. The corresponding shock vector $\epsilon_{k,t} = \left[\epsilon_{k,t}^{\triangle y}, \epsilon_{k,t}^{\triangle inv}, \epsilon_{k,t}^{tby}, \epsilon_{t}^{GFR}, \epsilon_{k,t}^{Kflows}, \epsilon_{k,t}^{CS}, \epsilon_{k,t}^{EqR}\right]$ and we focus on identifying the perturbations to the global financial risk, country spreads,

[7]Specifically, a country's capital flows are calculated as the difference between gross sales of foreign bonds and stocks by foreigners to US residents, and gross purchases of foreign bonds and stocks by foreigners from US residents, relative to country's GDP.

and equity returns. Compared to Akıncı (2013) and Caballero et al. (2019), we augment the Y_k with capital flows and equity returns, in order to document the transmission of global financial risk shocks to EMEs.

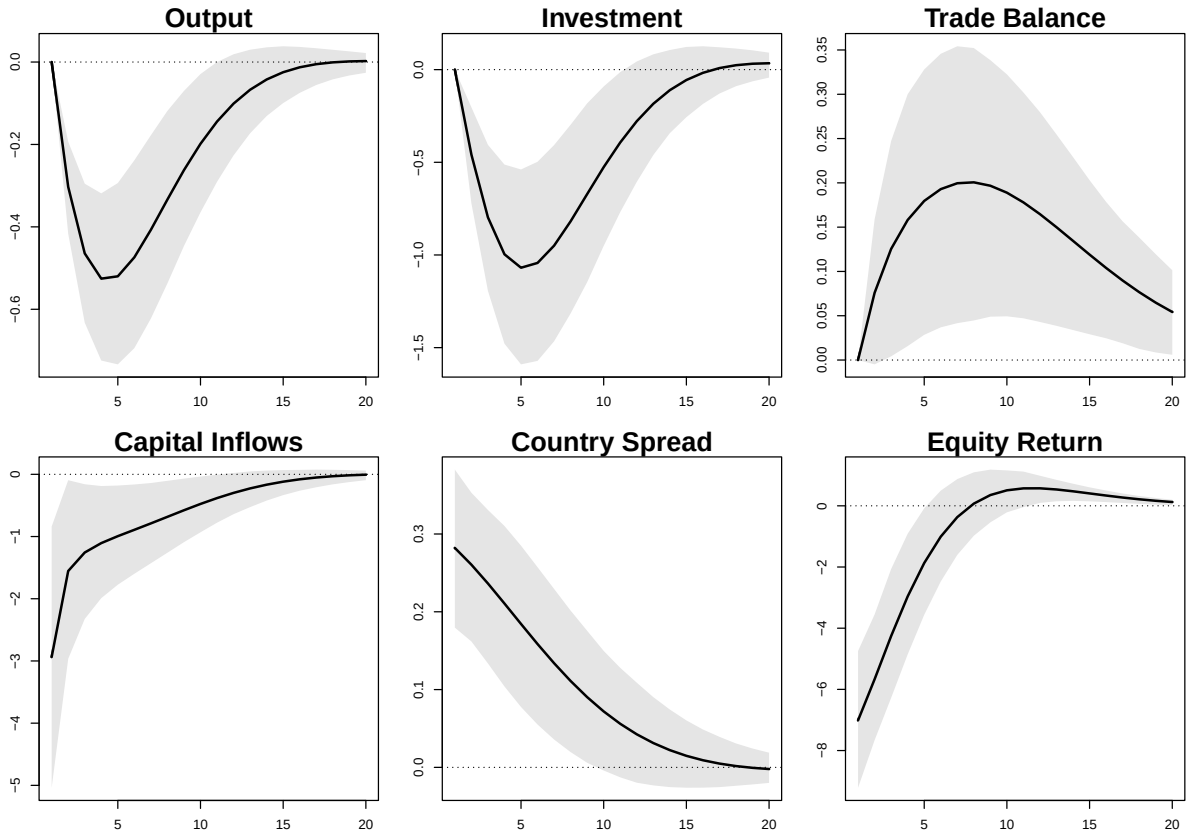
To identify our shocks of interest, we assume that the matrix A is lower triangular with diagonal elements equal to unity. We rely on two additional assumptions imposed by the literature (e.g. Caballero et al., 2019; Uribe and Yue, 2006). First, we assume that the global financial risk is unaffected by changes in EME economic activity and financial conditions, because EMEs are considered to be small open economies. This implies that the equation for GFR can be estimated in an independent, exogenous block.

Second, the variables are ordered as depicted in the Y_k vector. Domestic macroeconomic variables (output, investment, and trade balance) are ordered first, followed by the exogenous block featuring global financial risk. Ordering the domestic macroeconomic variables before GFR captures the relatively slow-moving nature of these variables and implies that they respond to changes in GFR with a one period lag. The domestic financial variables (capital flows, country spreads, equity returns) are ordered last due to their fast-moving nature, reflecting the fact that these variables react to fluctuations in GFR within the same period. To be conservative, we place equity returns last in the Y_k vector, after the country spreads. This ensures that any common contemporaneous variation in country spreads and equity returns that is orthogonal to contemporaneous fluctuations in domestic macroeconomic variables and GFR will be attributed to country spread shocks. Only the remaining variation in equity returns independent of the same period changes in the country spread will be identified as innovations in equity returns.[8]

We estimate our empirical model using the least-square dummy variable (LSDV) approach, which pools data across countries. As in Caballero et al. (2019), we set the number of lags in our baseline estimation to one, but provide sensitivity analysis for a lag length of two, another commonly considered value in the literature (e.g., Akıncı, 2013; Epstein et al.,

[8]Note that the ordering of country spreads and equity returns does not affect the impact of GFR shocks on EME economic activity, since GFR is ordered before the two financial variables.

Figure 2: EME impulse response functions to an increase in global financial risk



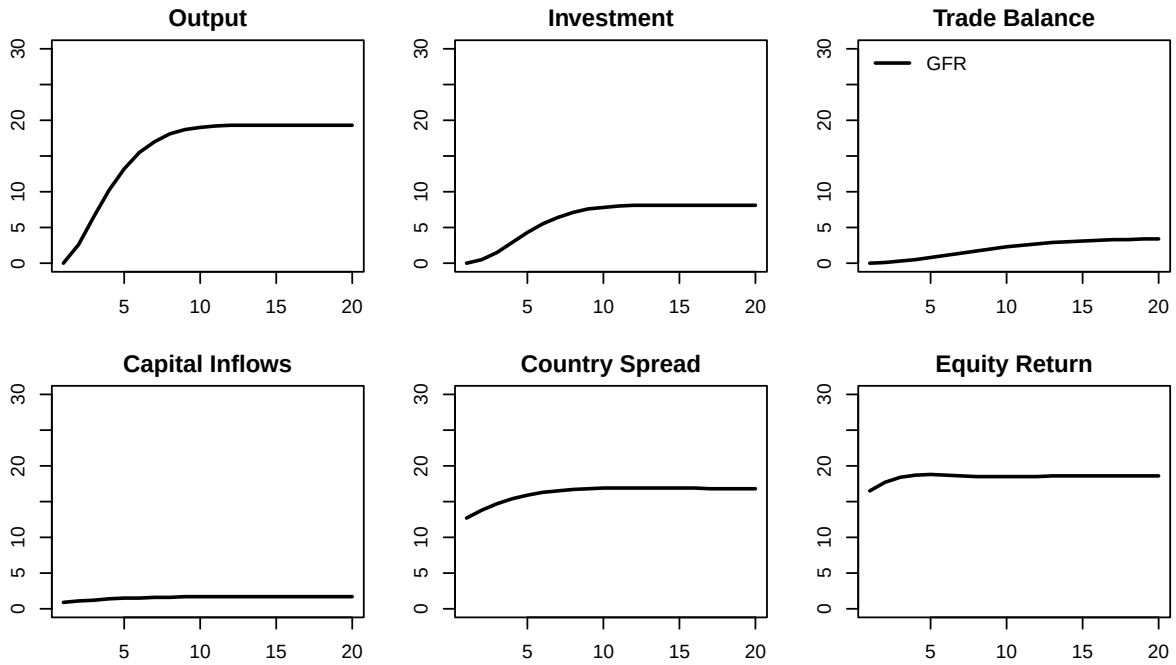
Notes: The black line represents the point estimates of the impulse response functions of output growth, investment growth, the trade balance to output ratio, net capital inflows to GDP, country spread, and equity return to a one standard deviation increase in global financial risk over a horizon of 20 quarters. All responses are in percentage points. The shaded areas represent the corresponding 95% bootstrapped confidence bands.

2019).

4 Main Results

This section documents a large negative impact of global financial risk shocks on macroeconomic activity in EMEs via impulse response functions and variance decompositions. It also provides empirical evidence and a theoretical background on the transmission of these shocks to EMEs through international capital flows and equity returns.

Figure 3: Variance decomposition for global financial risk



Notes: The figure displays the percent fraction of variance of output growth, investment growth, the trade balance to output ratio, net capital inflows to GDP, country spread, and equity return accounted for by global financial risk innovations over a forecast horizon of 20 quarters.

4.1 The effects of global financial risk on EMEs

Figure 2 presents the impulse response functions of EME variables—output growth, investment growth, the trade balance to output ratio, net capital inflows to GDP, country spread, and equity returns—to a one standard deviation increase in GFR over a 20-quarter horizon. All variables are expressed in percentage points. A positive global financial risk shock leads to a significantly lower output and investment growth. Both output and investment exhibit a gradual decline, reaching their trough five quarters after the shock. Output growth decreases by over 0.5 percentage point, and investment growth declines by more than 1 percentage point. The trade balance-to-output ratio improves, and countries experience a sudden capital outflow as international investors pull their capital out of EMEs. In response to the deterioration in global financial conditions, EMEs incur higher borrowing costs in international capital markets via increasing country spreads and a large depreciation of equity prices.

Figure 3 shows the contribution of global financial risk shocks to the variance of EME variables over a 20-quarter forecast horizon. The figure reveals that global financial risk is an important driver of macroeconomic volatility in EMEs. It explains about 20% of output variance, close to 10% of investment variance, more than 15% of country spread fluctuations and roughly 20% of equity return fluctuations. The contribution of global financial risk innovations to the trade balance and capital inflows is less than 5%, in line with results reported in Akıncı (2013) and Epstein et al. (2019).

4.2 Transmission of global financial risk

We propose that GFR shocks are transmitted to EMEs through the flow of capital in and out of a country. International investors withdraw capital from EMEs in an event of a deterioration of global financial conditions. Capital tightening disrupts domestic equity financing and depreciates equity values. As a result, domestic firms reduce their investment and production. This section provides theoretical underpinnings and empirical evidence for the proposed mechanism. We show that countries with higher capital inflows are more susceptible to GFR shocks. Importantly, equity markets play a more prominent role in propagating GFR than bond markets.

4.2.1 Theoretical Underpinnings

Financial markets have been shown to be a key element of understanding the transmission of external shocks to EMEs (Cesa-Bianchi et al., 2018; Chang et al., 2017; Mendoza and Smith, 2006). Our proposed transmission channel can be derived from a portfolio-choice model with financial frictions in Mendoza and Smith (2006). The model introduces a collateral constraint into a standard small open economy real business cycle framework. The collateral constraint serves as a margin requirement faced by domestic agents.

The environment consists of domestic consumers that trade equity at price q and international bonds at world interest rate R, with the rest of the world. The interest rate is taken

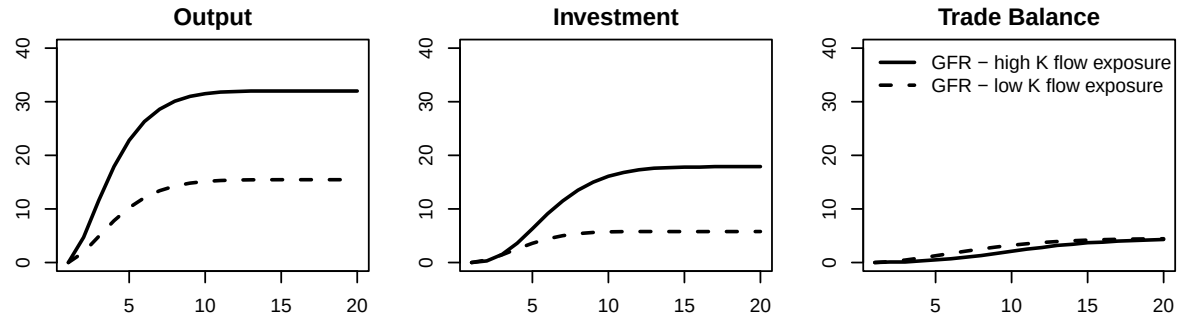
as given, while the equity price is determined by domestic and international equity holders. Importantly, households face a margin requirement, $b' \geq -\kappa q \alpha' K$, and a short-selling constraint, $\alpha \geq \chi$. b' represents the amount of debt that households can issue internationally, α' describes the holdings of the domestic asset K at equity price q. κ implies that households can only borrow up to a κ portion of the value of their equity holdings. χ determines the minimum quantity of domestic equity holdings by households or, in other words, the fraction of the domestic capital stock that can be traded internationally. Mendoza and Smith (2006) focus on the role of domestic productivity shocks and assume that κ is constant. We argue that exogenous changes in κ can reflect fluctuations in global financial conditions, as in Epstein et al. (2017). An adverse GFR shock lowers κ, and tightens the collateral constraint.

This theoretical framework gives rise to the following transmission mechanism of GFR shocks to EMEs. During an adverse global financial shock, an EME faces a tighter margin requirement, and hence, the country is forced to reduce its international bond holdings. This can be done by deleveraging through reducing domestic consumption and fire-selling assets to foreign lenders, eventually leading to a capital outflow. Should liquidating assets be enough to cover the excess bond holdings, the country would not need to adjust consumption and domestic economic activities. However, the short-selling constraint may prevent a large enough equity holding adjustment. The fire-sale of assets lowers equity prices q and triggers Fisher's debt-deflation mechanism via further asset price declines, decreasing consumption, investment, and aggregate economic activity.

4.2.2 The role of capital flows

Next, we provide empirical evidence for the propagation channel. We start by demonstrating that a country's exposure to capital flows affects the transmission of GFR shocks for EME macroeconomic activity. We divide our sample of countries into two groups: high capital flow exposure and low capital flow exposure. For each country, we find the average level of its net capital inflows from the US relative to country's GDP. Then, a country is classified as having

Figure 4: Variance decomposition for global financial risk: High vs. low exposure to capital inflows

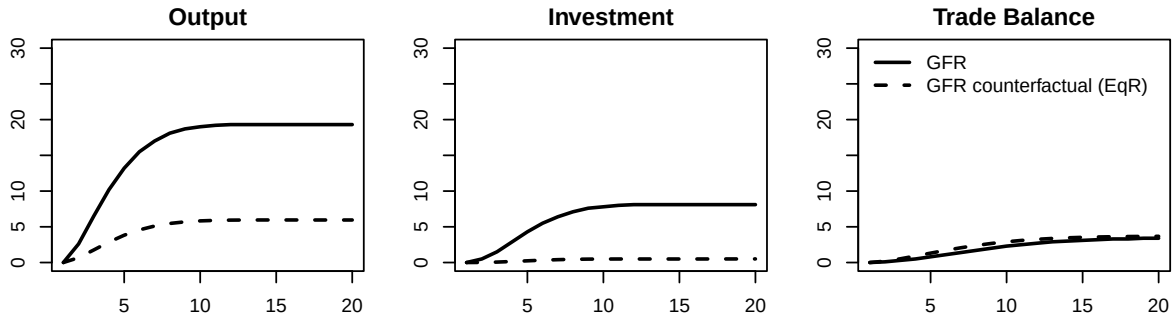


Notes: The solid line displays the percent fraction of variance of output growth, investment growth, and the trade balance to output ratio accounted for by global financial risk innovations over a forecast horizon of 20 quarters for countries in the sample with a higher exposure to capital flows, i.e., their net capital inflows to GDP ratio is larger than the country median. The dashed line shows the contribution of GFR for countries with low exposure to capital flows.

a high exposure to capital flows, if its average net capital inflows from the US is larger than the median value of net capital inflows across all countries. Otherwise, a country is classified as having a low exposure to capital inflows. High capital flow exposure countries include Brazil, Chile, Mexico, Philippines, South Africa and Thailand. Low exposure countries are comprised of Colombia, Indonesia, Malaysia, Peru, Russia, and Turkey.

Figure 4 reports the contribution of GFR shocks to the variance of output growth, investment growth, and the trade balance-to-output ratio for high (solid line) and low (dashed) capital flow exposure countries. It is evident that the impact of GFR innovations on EME macroeconomic fluctuations is much larger for countries that are more exposed to capital flows than those with lower exposure. In particular, GFR shocks explain over 30% of output and over 15% of investment growth volatility in countries more reliant on capital inflows. The contribution of GFR shocks for output and investment growth is only about 15% and 5% for countries that rely less heavily on capital flows. The explanatory power of GFR for the trade-balance to output ratio is comparable between the two country groups. This result is in line with Fink and Schüler (2015), who find that international financial linkages are more important than trade linkages for the propagation of external shocks to EMEs.

Figure 5: Variance decomposition for global financial risk: Baseline vs. equity return counterfactual



Notes: The solid line displays the percent fraction of variance of output growth, investment growth, and the trade balance to output ratio accounted for by global financial risk innovations over a forecast horizon of 20 quarters when equity returns are allowed to respond to changes in GFR. The dashed line shows the contribution of GFR when equity returns are assumed not to respond to GFR changes.

4.2.3 The role of equity returns

We conjecture that the responsiveness of equity returns to GFR may amplify the impact of GFR on EMEs. To quantify the role of equity returns in propagating GFR shocks to EMEs, we perform a counterfactual exercise, in which we mute the response of equity returns to fluctuations in GFR. Specifically, after estimating our baseline SVAR system of equations, we set the coefficients pertinent to GFR to zero in the equation where equity return serves as the dependent variable.[9]

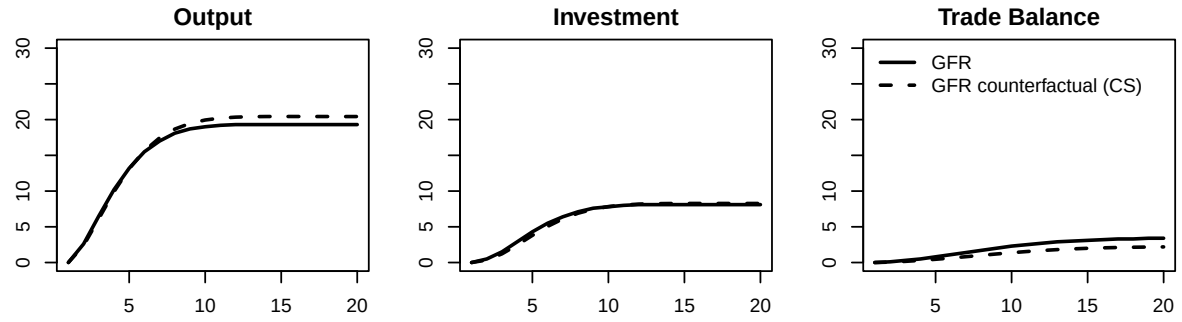
Figure 5 compares the variance decomposition between the baseline model and the counterfactual exercise. The contribution of GFR to EME output and investment growth fluctuations decreases considerably under the counterfactual scenario. The GFR contribution to output volatility decreases from about 20% to 5%. For investment, the contribution of GFR goes down from almost 10% to near zero.

4.2.4 The role of country spreads

The literature documents that GFR shocks are transmitted to EMEs mainly via their effects on country interest rates. Akıncı (2013) and Caballero et al. (2019) show that the contribu-

[9]This implies that $A_{7,4} = B_{j,7,4} = 0$ for $j = 1, 2, ..., p$.

Figure 6: Variance decomposition for global financial risk: Baseline vs. country spread counterfactual



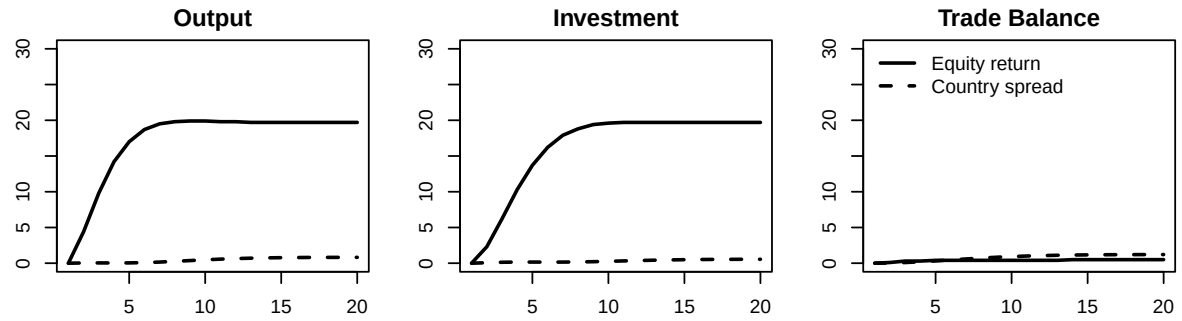
Notes: The solid line displays the percent fraction of variance of output growth, investment growth, and the trade balance to output ratio accounted for by global financial risk innovations over a forecast horizon of 20 quarters when country spread is allowed to respond to changes in GFR. The dashed line shows the contribution of GFR when country spread is assumed not to respond to GFR changes.

tion of global financial risk shocks to EME macroeconomic activity decreases significantly when sovereign and corporate bond spreads do not respond to changes in global financial conditions. Epstein et al. (2019) argue that the responsiveness of country interest rates is key in accounting for the differential response of EME macroeconomic variables to increases in GFR, compared to small open advanced economies. Motivated by this literature, this section examines the role of country spreads in transmitting GFR to EMEs.

We conduct a counterfactual experiment, in which we shut down the responsiveness of country spreads, instead of equity returns, to fluctuations in GFR.[10] Figure 6 contrasts the contribution of GFR shocks to the variance of EME variables under the baseline scenario (solid line) when country spreads are allowed to respond to changes in GFR, and under a counterfactual scenario (dashed line) when the responsiveness of country spreads to GFR is shut down. The figure shows that the explanatory power of GFR shocks for EME macroeconomic volatility (output growth, investment growth, and the trade balance-to-output ratio) remains virtually unchanged, suggesting that country spreads do not play a central role in the propagation of GFR shocks to EMEs. This is in stark contrast to the counterfactual experiment when equity returns do not respond to GFR, and provides complementary evidence that the international equity channel serves as a powerful transmission mechanism of

[10]We set $A_{6,4} = B_{j,6,4} = 0$ for $j = 1, 2, ..., p$.

Figure 7: Variance decomposition for equity returns and country spreads



Notes: The solid line displays the percent fraction of variance of output growth, investment growth, and the trade balance to output ratio accounted for by equity return innovations over a forecast horizon of 20 quarters. The dashed line shows the contribution of country spreads to EME macroeconomic variables.

GFR shocks to EME macroeconomic activity.

4.3 Equity returns, bond spreads, and economic activity

Given the role played by equity returns and bond spreads in propagating GFR shocks to EMEs, this section examines how innovations in these two financial variables affect macroeconomic fluctuations in EMEs.

4.3.1 Equity returns and sovereign bond spreads

We contrast the importance of equity returns with country spreads through a variance decomposition. It directly compares the contribution of innovations in equity returns and country spreads to aggregate economic activity in EMEs. Figure 7 shows that innovations in equity returns account for approximately 20% of variations in EME output and investment growth. Country spread innovations, however, account for a negligible fraction of output and investment growth volatility.

The exogenous movements in country spreads might reflect variations in country's default risk and changes in foreign investors' preferences for EME sovereign debt (Neumeyer and Perri, 2005; Uribe and Yue, 2006). Similarly, perturbations in equity returns may come from fluctuations in international investors' risk appetite for EME equity holdings and changes

in firm's financial distress. EME stock market returns are highly sensitive to cross-border capital flows (Bathia, Bouras, Demirer, and Gupta, 2020). Deteriorating global financial conditions can increase EME firms' exposure to rollover and currency risk, and hence, lead to an increase in firms' default probability (Asis, Chari, and Haas, 2021). In sum, the relevance of equity returns for EME economic activity, especially compared to country spreads, might be an additional reason why equity returns transmit GFR shocks more effectively than country spreads.

4.3.2 Equity returns and corporate bond spreads

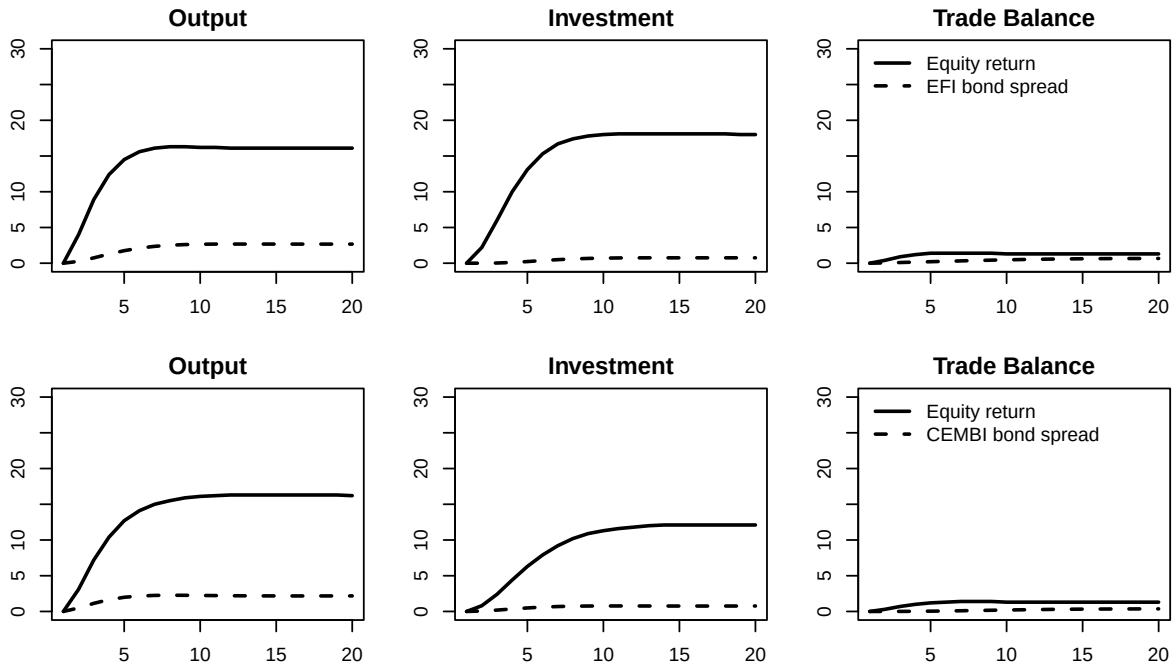
A growing literature has focused on the importance of corporate bond spreads for EME economic activities (Caballero et al., 2019; Chang et al., 2017; Fernández and Gulan, 2015). This section compares the contribution of equity returns to EME macroeconomic fluctuations with corporate, instead of sovereign, bond spreads.

We approximate corporate bond spreads using EFI and CEMBI. EFI is a micro-founded indicator of EME external financial conditions constructed by Caballero et al. (2019). The authors build EFI by using firm-level bond data on spreads from corporate bonds issued by EME firms in world capital markets. CEMBI, the Corporate Emerging Market Bond Index, is an aggregate measure of corporate bond spreads provided by J.P. Morgan. The consideration of these alternative proxies of EME bond spreads reduces the sample of countries to Brazil, Chile, Colombia, Malaysia, Mexico, Peru, Philippines, Russia, South Africa, and Turkey, and the sample length to an unbalanced panel spanning the 1999Q2-2017Q1 period.[11]

Figure 8 compares the contribution of innovations in equity returns (solid line) for macroeconomic volatility with the one of corporate bond spread (dashed line) shocks—EFI in the top panel and CEMBI in the bottom panel. Regardless of the bond spread measure chosen, perturbations in equity returns account for a considerably larger fraction of fluctuations in output and investment growth.

[11] See Caballero et al. (2019) for more details on the country-specific sample windows.

Figure 8: Variance decomposition for equity returns and corporate bond spreads



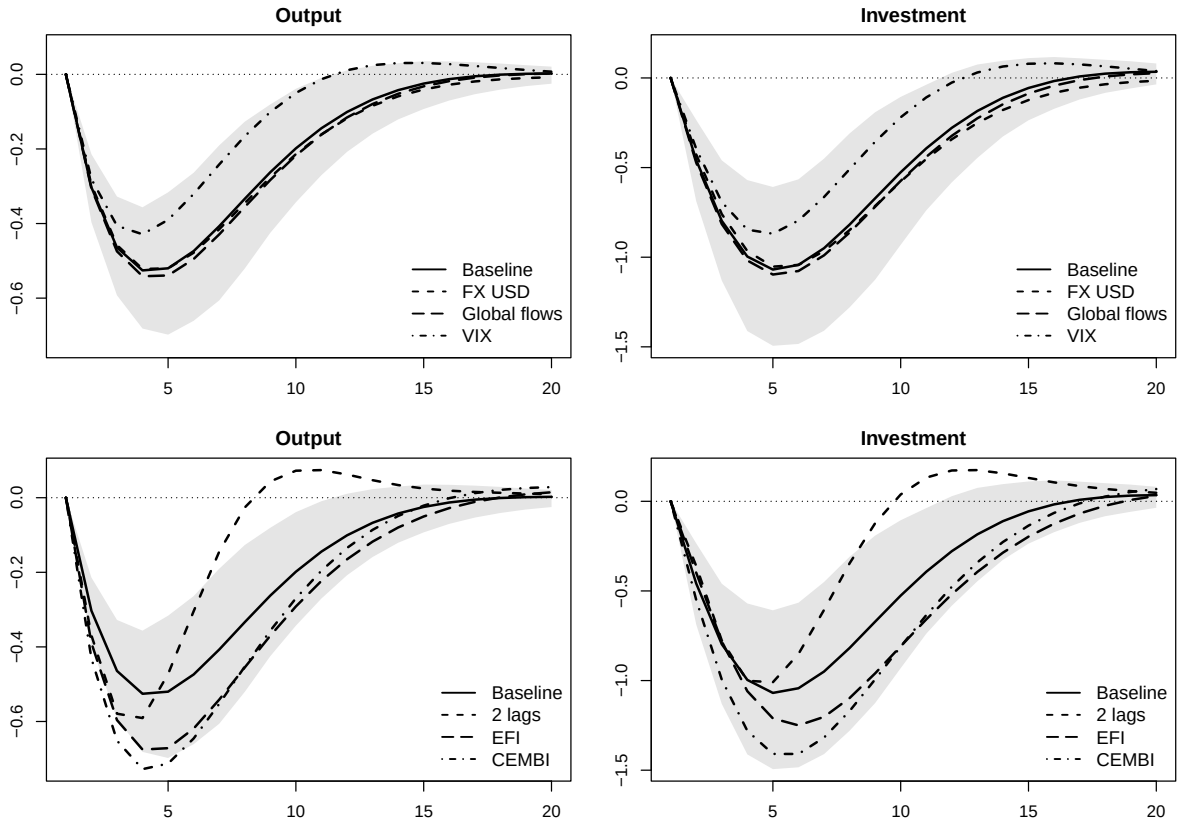
Notes: The solid line displays the percent fraction of variance of output growth, investment growth, and the trade balance to output ratio accounted for by equity return innovations over a forecast horizon of 20 quarters. The dashed line shows the contribution of corporate bonds spreads to EME macroeconomic variables. Corporate bond spreads are proxied by EFI (Caballero et al., 2019) in the top panel, and by CEMBI (Fernández and Gulan, 2015) in the bottom panel.

Overall, our analysis demonstrates that equity returns contain additional information about aggregate economic activity in EMEs beyond the informational content already embedded in corporate and sovereign bond spreads. This points to some degree of market segmentation between equity and bond markets in EMEs, consistent with the presence of a slow-moving capital in equity and debt markets, in line with the evidence presented in Pitkäjärvi et al. (2020).

5 Sensitivity analysis

In this section, we conduct sensitivity analysis of the impact of GFR shocks on EME macroeconomic activity. Figure 9 compares the responses of output and investment growth to a one standard deviation increase in GFR under the baseline model (solid line) with alternative

Figure 9: EME impulse response functions to an increase in global financial risk: robustness



Notes: The black line represents the baseline model point estimates of the impulse response functions of output and investment growth to a one standard deviation increase in global financial risk over a horizon of 20 quarters. All responses are in percentage points. The shaded areas represent the corresponding 95% bootstrapped baseline model confidence bands. In the top panel, 'FX USD' corresponds to trade balance-to-output ratio being replaced by the bilateral exchange rate with the US. 'Global flows' denotes a model that replaces EME capital inflows vis-à-vis the US with capital inflows vis-à-vis the rest of the world. 'VIX' model measures GFR with the VIX index, instead of the US Baa credit spread. In the bottom panel, '2 lags' denotes a model estimated using 2 lags. 'EFI' and 'CEMBI' specifications use EFI and CEMBI instead of country spread.

model specifications.

In the top panel, we compare the baseline model to 'FX USD', 'Global flows', and 'VIX' model specifications. 'FX USD' specification replaces the trade balance-to-output ratio with the bilateral EME exchange rate with the US (short-dashed line). 'Global flows' replaces capital inflows vis-à-vis the US with capital inflows vis-à-vis the rest of the world (long-dashed line). In 'VIX', we proxy GFR with the VIX index (dot-dashed line), instead of the US Baa credit spread. The data on global capital flows and the bilateral exchange rate with the US come from the BIS.

In the bottom panel, we compare the baseline results with '2 lags', 'EFI', and 'CEMBI' specifications. In '2 lags' we use two lags in our VAR model (short-dashed line) instead of one lag. 'EFI' specification uses EFI, the micro-founded measure of corporate spreads (long-dashed line), instead of country spreads proxied by EMBIG, and in 'CEMBI' we replace country spread with the aggregate measure of corporate spreads, CEMBI, (dot-dashed line). The data on EFI and CEMBI come from Caballero et al. (2019) and reduce the sample window to 1999Q2-2017Q1 and ten EMEs considered in their work.

Figure 9 shows that our baseline results are robust to various alternative model specifications. When measuring GFR by the VIX index, output and investment responses are less pronounced. The responses of output and investment revert back to the pre-shock levels more quickly when using two lags instead of one. When we approximate bond spreads by EFI and CEMBI, output and investment growth respond more to a GFR shock compared to the baseline model. These differences, nevertheless, remain largely within the 95% confidence bands pertinent to the baseline estimation. Overall, we find that GFR shocks significantly reduce output and investment growth in EMEs.

6 Conclusion

As emerging countries have been more tightly integrated in the global financial markets, their domestic economic activities are increasingly more susceptible to international shocks. This paper examines the impact and transmission of GFR to EMEs' domestic economies. We find that GFR shocks explain a significant portion of domestic volatility in investment and output. In the event of an adverse GFR shock, international investors pull their capital out of EMEs. As a result, domestic households face tighter borrowing constraints, equity depreciation, and lower economic activity. The contribution of GFR shocks to EME macroeconomic fluctuations increases with country's exposure to global capital inflows. While the literature focuses mainly on the importance of country spreads in propagating external shocks, we find

that equity returns not only have a more dominant role in transmitting GFR to EMEs, but also play a more important role for domestic economic fluctuations.

Declaration of Interest

All authors declare that they have no relevant information or potential conflicts of interest to disclose.

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