Capital Flows to Emerging Markets: Disentangling Quantities from Prices[☆]

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Abstract

This paper analyzes the joint dynamics of net capital flows (quantities) and sovereign spreads (prices) in Emerging Economies. We use a Dynamic Factor Model and a two-country small open economy model to quantify the role of idiosyncratic/common and demand/supply credit shocks in explaining credit market fluctuations. The canonical small open economy model augmented with an estimated process for the country interest rate and correlated productivity and interest rate shocks matches the comovement between prices and quantities as well as business cycle moments. While common credit supply shocks are the main driver of prices, idiosyncratic credit demand and supply shocks account for most of the variation in quantities. Correlated TFP shocks (common credit demand) account for around half of the observed comovement in quantities but they are not a significant driver of price comovement. Fundamentals matter significantly more for capital flows than for country spreads.

Keywords: capital flows, sovereign spread, small open economy, credit supply, credit demand, external factors.

JEL Codes: E31, E32, E43, E52, E58.

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1 Introduction

Fluctuations in international capital markets as well as changes in the access to these markets, have first order macroeconomic effects on Emerging Economies (EMEs). However, the transmission channels of shifts in international capital markets remain to be fully understood. On one hand, a large body of work has studied prices in these markets, i.e. comovement in yields, identifying a Global Financial Cycle linked to changes in the US monetary policy stance. Another strand of literature has looked at quantities, i.e. capital flows. Fewer analyses have studied the two forces jointly, which is key to determine the role of credit demand and credit supply shocks. Even fewer analyses have assessed the ability of current structural small open economy models to reproduce the dynamics of spreads and net capital flows.

This paper analyzes jointly the drivers of quantities (net capital flows) and prices (country spreads) in the access of EMEs to world capital markets. These two dimensions allow us to identify common/idiosyncratic demand/supply credit shocks. First, we quantify the contribution of these four shocks in explaining the dynamics between capital flows and country spreads. The shocks are identified by combining sign and zero restrictions in a Dynamic Factor Model. Second, we calibrate a two-country small open economy model to assess its performance in accounting for the empirical patterns and to quantify the role of different frictions and shocks in explaining the empirical patterns.

We identify and quantify the different drivers of credit market fluctuations in EMEs. First, we estimate a Dynamic Factor Model (DFM) that includes measures of net capital flows and country spreads for twelve EMEs. We recover two common factors: one that affects all the country spreads and another one that moves all the net capital flows. While the common factor in country spreads explains 64% of credit spread fluctuations, the common factor in net capital flows accounts for only 16% of the variability in net capital flows. Then, we identify four type of structural shocks in the DFM that drive credit market dynamics in EMEs. First, common credit supply shocks are the innovations that affect contemporaneously country spreads and capital flows in opposite directions in all EMEs. Second, common credit demand shocks are the innovations that affect contemporaneously country spreads and capital flows in the same direction in all EMEs. Third, idiosyncratic credit supply shocks are the innovations that affect contemporaneously country spreads and capital flows in opposite directions in one EMEs. Fourth, idiosyncratic credit demand shocks are the innovations that affect contemporaneously country spreads and capital flows in the same direction in one EME. These shocks are identified by combining zero and sign restrictions in the DFM based on the definition of each shock. Both credit demand and supply shocks are relevant in understanding capital flows to EMEs, though credit supply shocks account for a relatively larger share of credit market dynamics. However, the origins are quite distinct across country spreads and net capital flows. While common credit supply shocks are the main driver of country spread fluctuations, idiosyncratic credit supply and demand shocks account for most of the variation in net capital flows.

A two-country small open economy model can account for the joint dynamics of capital flows and country spreads. The model is an augmented version of the canonical small open economy model (see, for example, Schmitt-Grohe and Uribe, 2003) to match the macroeconomic and credit market moments in EMEs. First, we include an estimated interest rate processes for the international and country-specific interest rates, similar to Uribe and Yue (2006), to capture the dynamics between country interest rate and the business cycle. Second, we allow for correlated TFP shocks (a source of common credit demand shock) and country interest rate shocks (a source of common credit supply shocks). We calibrate the model to match the business cycle moments of Brazil and Mexico, two representative EMEs. Once we match the observed correlation between country spreads, the model reproduces the lower correlation between net capital flows and the low and negative correlation between country spreads and capital flows at the country level. However, the model underpredicts the volatility in net capital flows. Common credit supply shocks, captured via the estimated interest rate processes, are key to explain credit market dynamics. Macroeconomic fundamentals matter more for net capital flows than for country spreads. Business cycle synchronization accounts for around half of the correlation between capital flows across countries while common shocks to the country spread display a minor role in explaining the comovement of capital flows.

Global variables are key drivers of country spreads (see, for example, González-Rozada and Yeyati, 2008; Hilscher and Nosbusch, 2010; Longstaff et al., 2011; Csonto and Ivaschenko, 2013; Gilchrist et al., 2022) and also of capital flows (see, for example, Calvo et al., 1993; Fernandez-Arias, 1996; Bekaert et al., 2002; Davis et al., 2021). The literature emphasizes the role of push factors (i.e. common factor in global financial markets that affect all the countries) relative to pull factors (i.e. domestic factors that explain capital flows to some particular country). We enrich this analysis by disentangling between credit supply and credit demand. While push factors are usually associated with common credit supply, we show that common credit demand is also an important driver of credit market variables.

While country spreads are highly correlated across EMEs, the correlation between capital flows is significantly lower (see, for example, Rey, 2013; Rey, 2015; Kaminsky, 2019; Cerutti et al., 2019a). U.S monetary policy and fluctuations in global risk are important divers of the observed country spread synchronization (see, for example, Akinci, 2013; Rey, 2013; Rey, 2015; Vicondoa, 2019; Caballero et al., 2019; Miranda-Agrippino and Rey, 2020; Gilchrist et al., 2022). Financial shocks induce a large impact on asset prices contributing to explain the large comovement between sovereign spreads relative to capital flows (see, for example, Bacchetta et al. (2022) and references therein). Calvo and Mendoza (2000a) and Calvo and Mendoza (2000b) show that uninformed investors may contribute to explain the large comovement in sovereign spreads. Our findings are consistent with this explanation since correlated country spread shocks are key to explain the comovement in country spreads but they do not influence capital flows comovement across EMEs significantly.

Few works have analyzed capital flows and country spreads together (see, for example, Cerutti et al., 2019b; Scheubel et al., 2019; Miranda-Agrippino et al., 2020; Augustin et al., 2022) which is key to disentangle credit supply and demand shocks. Even fewer works have analyzed spreads and capital flows in theoretical models (see, for example, Bai et al., 2019; Davis et al., 2021; Morelli et al., 2022). We analyze country spreads and capital flows together to determine the role of different frictions and types of shocks in explaining credit market fluctuations. While Bai et al. (2019) focus on understanding the high correlation between sovereign spreads in EMEs, we match the correlation of sovereign spreads by calibrating the correlation between interest rate shocks. We focus on characterizing the determinants of both the correlation between net capital flows across EMEs and the negative correlation between country spreads and net capital flows at the country level.

The remaining of the paper is structured as follows. Section 2 presents a simple theoretical framework to analyze capital flows and country spread. Section 3 documents the empirical facts associated with credit markets in EMEs. Section 4 presents the two-country small open economies model to quantify the role of different characteristics in explaining the empirical facts. Section 5 concludes.

2 Drivers of Capital Flows to EMEs: A Simple Analytical Framework

This section builds the simplest theoretical model to analytically characterize the drivers of capital flows to EMEs. The goal is to fix ideas on the propagation channels through which demand and supply factors, of idiosyncratic and common nature, may determine capital flows to these economies. This will pave the road for the empirical analysis in Section 3 and the more realistic DSGE model in Section 4.[1]

Consider a textbook two-period small open economy "i" with access to a one period,

[1] The setup follows the textbook models in Vegh (2013) and Schmitt-Grohé and Uribe (2017). A detailed description and derivation of the model is presented in Appendix C.1.

non state-contingent bond in international financial markets. The economy receives an endowment each period ($\{y_1^i, y_2^i\}$) that can be either consumed or saved. Assuming that the discount factor by households (β^i) equals the gross interest rate faced by this economy in international financial markets ($1 + r^i$), and the economy starts without external debt (i.e. $d_0^i = 0$), the demand for capital flows (i.e. the change in desired net external debt in the first period, d_1) is:

$$d_1^i = \frac{y_2^i - y_1^i}{2 + r^i} \tag{1}$$

Two distinctive drivers highlighted in (1) that would raise the demand for capital flows in this economy are increases in the endowment over time and decreases of the interest rate.

In turn, this interest rate will be affected by the determinants in the supply of credit from international markets, which we assume takes the form:

$$r^i = r^* + \phi^i \left(\tilde{d}_1^i\right)^2 + \varepsilon^i, \phi^i > 0 \tag{2}$$

where r^* denotes the world interest rate, ϕ^i is a parameter that captures the sensitivity of interest rate to net external debt, and ε^i is a country-specific spread shock.[2] As shown in Appendix C.1, this supply of international credit can be rationalized within an extension of the model with no-commitment to repay the debt and uncertainty on the endowment of period 2, where risk-neutral investors can choose between buying this external bond or a risk-free one.

The equilibrium level of capital flows (d_1^i) will therefore be driven by exogenous variations in the endowment process and in interest rates $\{y_1^i, y_2^i, r^i, r^*, \varepsilon^i\}$ characterized by equations (1) and (2).

[2]As in Schmitt-Grohe and Uribe (2003), households consider only r^i when deciding the demand for external debt, without considering the effects of their decisions on the cross-sectional average stock of debt ($\tilde{d}_1^i$). In equilibrium, it must be the case that $\tilde{d}_1^i = d_1^i$.

In order to illustrate the role of demand and supply drivers in shaping capital flows, consider a first small open economy ("$i = 1$") under two distinct shocks. First, consider an idiosyncratic increase in future endowment $\{y_2^1\}$. As depicted in the left panel of Figure 1a, this induces an outward shift in credit demand (see equation (1)) in order to front load part of the future increase in income and smooth lifetime's consumption path. The increase in the level of equilibrium capital flows ($\Delta d_1^1 > 0$) occurs at a relatively higher country interest rate (r_1^1) associated to the increase in the total debt stock. Second, consider now a shock that affects the international interest rate (r^*). As depicted in the left panel of Figure 1b, this induces an upward shift in the supply curve of credit (see equation (2)), pushing up to a new higher level the equilibrium country interest rate (r^1) and decreases total capital inflows ($\Delta d_1^1 < 0$).

Another crucial distinction to make when identifying drivers of capital flows is their idiosyncratic or common origins. Indeed, changes in capital flows can be traced back to shocks that are specific to a country or common across countries. A textbook example of the latter is movement in world interest rates, as illustrated in the previous example that considered changes in r^*. Furthermore, common shocks can propagate differently across countries and hence have differential impacts on capital flows.

In order to illustrate these additional distinctions, consider now a second small open economy "$i = 2$" that is subject to the same kind of shocks that perturb Economy 1. We assume that the two small open economies differ only in the credit supply they face: they share the same parametrization but Economy 2 faces a less elastic credit supply curve ($\phi^1 < \phi^2$). The latter can come from assuming that investors perceive Economy 2 as having less commitment to repay its debt and/or face higher uncertainty on its endowment (Appendix C.1).

Assume now that the increase in the second period endowment is common across the two economies ($\Delta y_2^1 = \Delta y_2^2$). This can be motivated from e.g. increases in commodity prices across commodity exporters EMEs (see, for example, Fernández et al., 2018). As depicted in the right panel of Figure 1a, similar to what happened to Economy 1, this shock will drive a larger capital inflows together with higher interest rates. However, the shock will not propagate uniformly across the two economies because of the higher debt elasticity in Economy 2, which materializes in a relatively milder increase in capital flows and higher levels of interest rates ($\Delta d_1^1 > \Delta d_1^2; r^1 < r^2$). Similarly, the response to an increase in the world interest rate will have an asymmetric response across economies, as depicted in the right panel in Figure 1b. For illustration purposes, we assume that, in addition to this shock, Economy 2 is impacted by an idiosyncratic shock to the spread ($\varepsilon_1^2 > 0$). The latter can be motivated with world rate increases amid episodes of risk-off in international markets, where some EMEs are viewed as relatively riskier than other. This exerts further upward pressure on domestic rates in Economy 2 and reduces capital inflows to it.

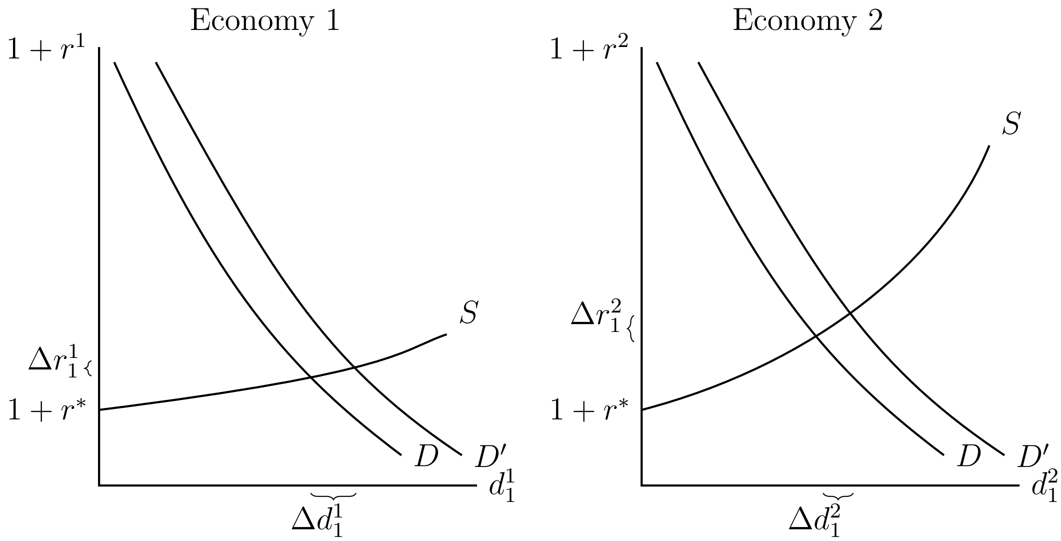
To sum up, we have described the key drivers of capital flows through the lens of the simplest version of the workhorse small open economy model. A key message is that two overlapping dimensions are crucial when studying the forces that shape capital flows to EMEs: the role of demand and supply factors, as well as their idiosyncratic or common origins. Equally relevant is the basic observation that, in order to identify these various drivers, it is crucial to *jointly* observe volumes and prices of capital flows across *various* EMEs. The next section will carry out this task more formally through descriptive statistics and an econometric framework.

3 Capital Flows to Emerging Economies: Stylized Facts

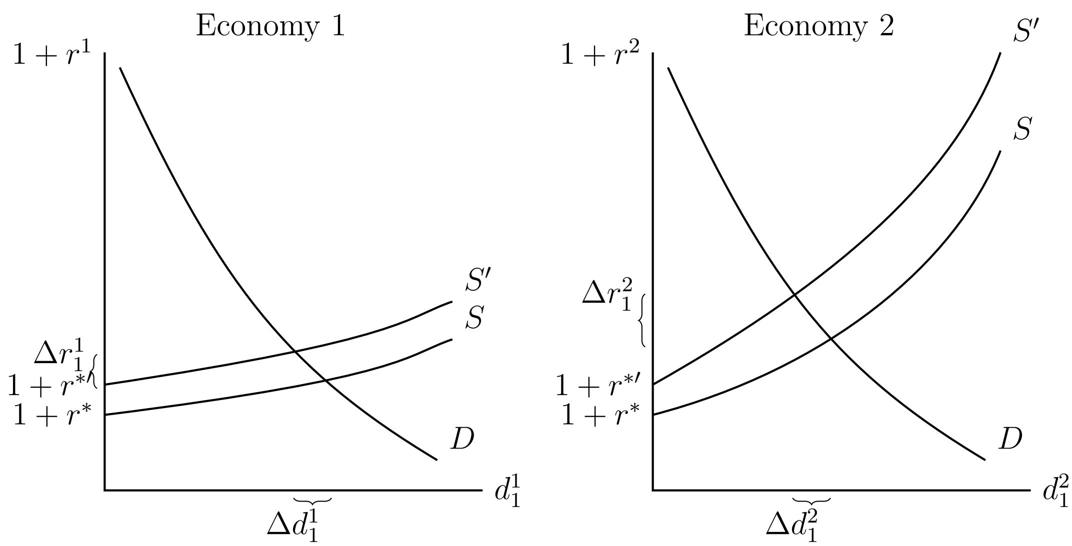
This section presents the empirical results related to capital flows in EMEs. We begin by describing the measure of capital flows (volumes) and country spreads (prices) we use in our empirical analysis, together with the sample of countries that we study (Subsection 3.1). Next, we take a first look at the data by means of simple correlations between spreads and capital flows both within and across countries (Subsections 3.2 and 3.3). A

Figure 1 Equilibrium in International Credit Markets

(a) Response to an increase in y_2^1 and y_2^2



(b) Response to an increase in r^* and an increase in ε^2



Note. Example on the effects of a common credit demand shock due to the increase in y_2^1 and y_2^2 (first row) and an increase in the international interest rate r^* plus a country spread shock to economy 2 ε^2 (second row) in two economies that face different credit supplies.

formal identifications of supply-demand and common-idiosyncratic drivers behind these correlations is done next in Subsection 3.4 and contains the main results of the section. Finally, Section 3.6 presents different robustness exercises.

3.1 Data

To properly analyze the relationship between capital flows and country spreads accurately, it is paramount to use the highest frequency available, for lower frequencies may blur the identification of credit demand and supply drivers. This is particularly problematic for capital flows data since balance of payments data is typically only available at quarterly frequency.

Given this, and considering that monthly data is available for the trade balance and the stock of foreign reserves across emerging markets, we use the following proxy for net capital inflows computed by Calvo et al. (2008):

$$KI_t = M_t - X_t + R_t - R_{t-1} \tag{3}$$

where KI_t denotes capital inflows received by the country in period t, X_t denotes exports, M_t denotes imports, and R_t is the stock of international reserves held by the country. The proxy for net capital inflows is thus computed by netting out the trade balance from changes in foreign reserves. While this proxy for net capital inflows does not include net factor income and current transfers, these accounts represent mostly interest payments on long-term debt which should not display substantial variation so as to introduce significant spurious volatility into our capital flows measure (Calvo et al., 2008). To remove seasonal movements, we use the cumulative annual flows for each month and then take the first difference of this measure (ΔKI_t).

$$\Delta KI_t = \sum_{k=0}^{11} KI_{t-k} - \sum_{k=0}^{11} KI_{t-k-1} \tag{4}$$

We focus on country spreads instead of country interest rates as our main variable for analysis because spreads reflect specific issues of Emerging Economies as opposed to interest rates which also capture characteristics of Advanced Economies, e.g monetary policy or expected growth.[3] We use the J.P. Morgan Emerging Market Bond Index Global (EMBI Global) for each country.[4] This measure is a good proxy to track the evolution of financial conditions -including those for corporates- in EMEs that has been used extensively by previous works (see, for example, Uribe and Yue, 2006; Akinci, 2013; Fernández et al., 2018; Vicondoa, 2019). In further robustness analysis presented in section 3.6 we use more disaggregated proxies of spreads in EMEs.

Our sample for the empirical analysis is solely based on data availability, it consists of the largest balanced panel of EMEs we could construct with continuous capital flows and country spreads monthly data since the mid 1990s. Our sample begins in 1997:2 and ends in 2019:12, right before COVID-19. The following twelve countries are included in our sample: Argentina, Brazil, China, Colombia, Ecuador, Malaysia, Mexico, Panama, Philippines, Poland, South Africa and Turkey.

Figure 2 displays the evolution of capital flows to this set of EMEs and the median of EMBI for the same set of countries.[5] The Asian and Russian crises in the late 90s induced a significant increase in country spreads in EMEs as well as capital outflows. Country spreads declined significantly after that period coupled with capital inflows to EMEs amid a significant increase in commodity prices.[6] The Global Financial Crisis induced a sharp yet transitory increase in country spreads and a fall in net capital flows, which resumed vigorously in 2010. In the last years of the sample we see a decline a capital flows that starts in 2012, which coincides with the peak in commodity prices. The slow down in capital flows also took place amid volatility in world capital markets, captured by the Taper

[3]Evidently, our measure of spreads can be indirectly influenced by developments in advanced economies, e.g. episodes of "risk on" or "risk off" triggered by U.S monetary policy. These would be captured as common drivers in the model developed later on.

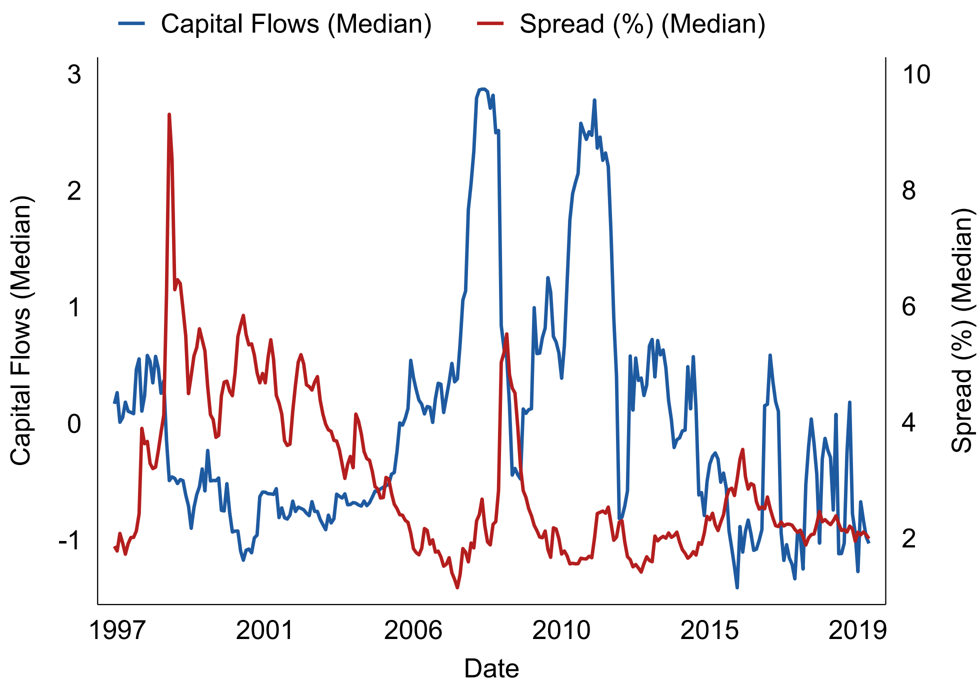
[4]This spread is computed as an arithmetic, market-capitalization weighted average of US-dollar denominated bond spreads issued by sovereign and quasi-sovereign entities over U.S. Treasury bonds of similar duration.

[5]Figure A.1 presented in the Appendix displays the evolution of capital flows and country spread for each country.

[6]Further evidence of the strong link between capital flows and commodity prices is presented in the Appendix.

Tantrum in 2013 and expectations of increase in interest rates in the U.S. In the following two Sections we take a closer look at the correlations between spreads and capital flows both within and across EMEs.

Figure 2 Capital Flows and Country Spreads in EMEs



NOTE. Median net capital flows of Argentina, Brazil, China, Colombia, Ecuador, Malaysia, Mexico, Panama, Philippines, Poland, South Africa and Turkey for the period 1997:2-2019:12. Capital flows for each country is defined as the cumulative trade deficit plus the change in international reserves at monthly frequency as defined in equation (4). The aggregate series of capital flows of EMEs is computed as the monthly median of the capital flow series for all the countries. Country spread is computed as the monthly median of the EMBI for the same countries.

3.2 Correlation between Spreads and Capital Flows within EMEs

In this section we explore the relation between country spreads and capital flows within each of the EMEs in our sample. Table 1 displays the contemporaneous correlation between country spreads and capital flows at the country level.

The correlation between country spreads and capital flows at the country level is neg-

Table 1 Correlation between Capital Flows and Sovereign Spreads at the Country Level

	ARG	BRZ	CHN	COL	ECU	MEX	MLY	PAN	PHL	POL	SWF	TUR	Median
$\rho(s, f)$	0.01	-0.13^{**}	-0.19^{***}	-0.14^{**}	-0.11^{*}	-0.03	-0.08	-0.06	-0.14^{***}	-0.17^{***}	-0.19^{***}	-0.18^{***}	-0.14
$\rho(s, f)$ no SS	0.12^{*}	-0.13^{**}	-0.02	-0.06	-0.08	-0.03	-0.03	-0.06	-0.14^{**}	-0.11^{*}	-0.21^{***}	-0.14^{**}	-0.07

Note. Contemporaneous correlation between capital flows (f) and EMBI (s) of Argentina, Brazil, China, Colombia, Ecuador, Malaysia, Mexico, Panama, Philippines, Poland, South Africa and Turkey for the period 1997:2-2019:12. Capital flows is defined as the cumulative trade deficit plus the change in international reserves at monthly frequency (see equation (3)). The first row shows the correlation using the full sample while the second row included the correlation without considering Sudden Stop episodes. Significance level: $^{***}p < 0.01$, $^{**}p < 0.05$ and $^{*}p < 0.1$.

ative and relatively low: the median is -0.14 for our baseline measure (see Section ADD). This finding is robust if we compute the correlation excluding the periods of Sudden Stops and using different measures for capital flows (see Section 3.6).[7] Through the lens of the simple theoretical framework presented in Section 2, these results suggest a predominance of credit supply shocks in driving the negative correlation between the two variables for most of the countries in the sample. This will be more formally explored in the next subsections.

3.3 Correlation between Spreads and Capital Flows across EMEs

As illustrated in Section 2, capital flows to EMEs may be impacted by credit shocks of common nature. This section aims at providing a first assessment of the relevance of these common drivers. We do so by analyzing the comovement across country spreads and, separately, capital flows, for the sample of EMEs in our dataset. If the main drivers are common, they would be manifest in the form of high correlations across EMEs.

To determine the degree of comovement between these variables across EMEs, we follow Croux et al. (2001) and compute a cohesion measure, interpreted as the 5-year rolling

[7] We define periods of Sudden Stops following Calvo et al. (2008) as: periods when: i) there is at least one observation where the year-on-year decline in capital flows lies at least two standard deviations below its sample mean; this condition fulfills the 'unpredicted' prerequisite of a sudden stop, ii) the period of sudden stop phase ends when the annual change in capital flows surmounts one standard deviation below its sample mean. This commonly suggests persistence which is a common fact of sudden stops, iii) additionally, in order to ensure symmetry, the onset of a sudden stop phase is ascertained by the first time the annual change in capital flows drops one standard deviation below the mean. Both the first and second moments of the capital flow series are calculated each period using an expanding window with a minimum of 24 (months of) observations and a start date fixed at January 1997, which intends to capture the evolving behavior of the series.

correlation for each of these variables across countries and at different frequencies. This methodology allows us to complement earlier analysis of the comovememt in volumes and prices in the access of EMEs to international capital markets (Rey, 2013; Cerutti et al., 2019b) by documenting changes in this comovement through time and across business cycle frequencies.

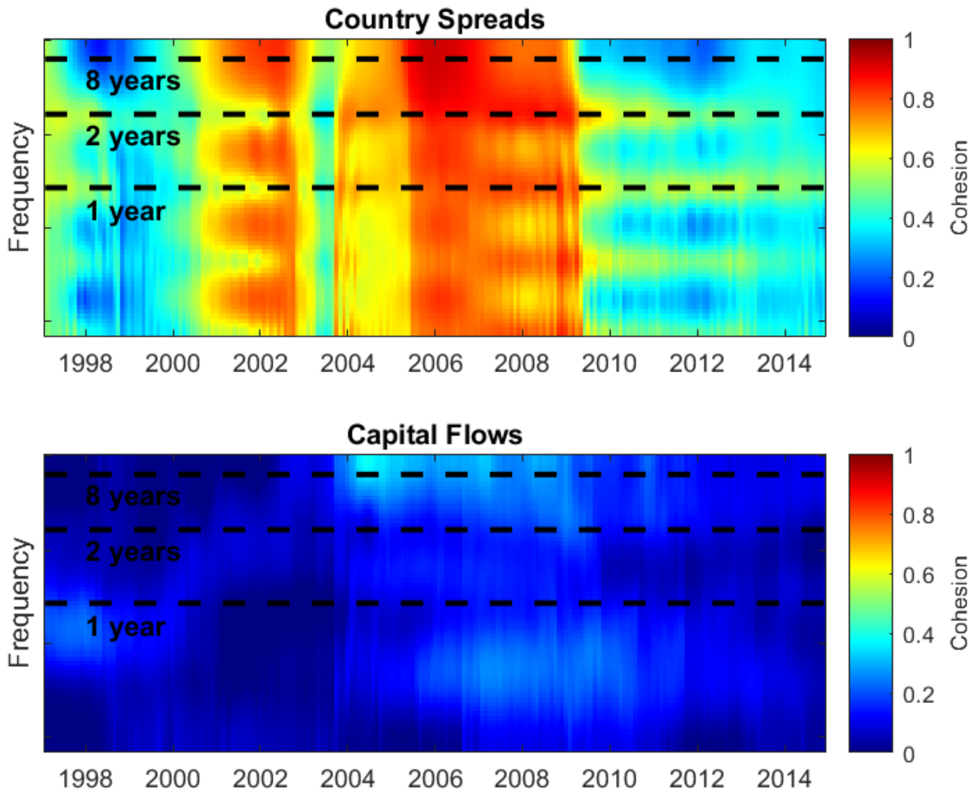
Figure 3 displays the Cohesion measure for the sample of our analysis and the two variables we investigate: spreads (upper panel) and capital flows (lower panel). Colors denote the magnitude of the correlation at every point in time (x-axis) and frequency considered (y-axis).

There are three findings from Figure 3 that stand out. First, the stark contrast between the dark colored lower panel and the bright upper panel provides a powerful visual illustration that the degree of comovement in prices is much stronger than that of volumes. This result echoes that of Cerutti et al. (2019b). Indeed, country spreads are exhibit a high correlation of 0.6 across EMEs, close to double that of capital flows.

Second, the comovement is time varying, particularly for spreads, and coincides with times of financial stress in world capital markets. This correlation increased from around 0.4 in the early 2000s to above 0.9 during the Global Financial Crisis. This stands in contrast with the comovement in capital flows for which no meaningful time variation is found. Lastly, both correlations are stable across business cycle frequencies, confirming that the kind of relationships that we have uncovered are not only explained by high frequency determinants that are transient.

Taking stock, the descriptive statistics presented thus far point to an important role of supply shocks in the access of EMEs to world capital markets, with common drivers affecting relatively more spreads than capital flows. We turn next to a more formal econometric approach to disentangle these drivers. In doing so we follow the conceptual framework in Section 2 by jointly observing volumes and prices of capital flows across the various EMEs

Figure 3 Dynamic Correlation of Country Spreads and Capital Flows Across EMEs



Note. Cohesion measure (Croux et al., 2001) between Country Spread and Net Capital Flows of Argentina, Brazil, China, Colombia, Ecuador, Malaysia, Mexico, Panama, Philippines, Poland, South Africa and Turkey for the period 1997:2-2019:12. Net Capital flows is defined as the cumulative trade deficit plus the change in international reserves at monthly frequency as defined in Equation (4). We use EMBI as a proxy for the country spread. Each point in time denotes the cohesion measure for each frequency computed with 5-year forward window.

in our sample.

3.4 Disentangling the Drivers of Capital Flows to EMEs

This section quantifies the contribution of common/idiosyncratic and demand/supply shocks in explaining the dynamics of capital flows and country spreads in EMEs. We start by pinning down the common drivers in these variables by estimating a Dynamic Factor Model (DFM). Then we identify supply and demand drivers behind common and idiosyncratic drivers.

Estimating Common Factors

We identify the contribution of common/idiosyncratic and demand/supply shocks in explaining the dynamics of capital flows and country spreads by estimating a Dynamic Factor Model (DFM). First, we recover a common factor for capital flows and one for country spreads with the following model:

$$
\begin{aligned}
X_t &= \beta F_t + \epsilon_t \\
F_t &= \gamma F_{t-1} + \eta_t
\end{aligned}
\tag{5}
$$

where X_t is the $(2 \times N) \times 1$ matrix that contains series of capital flows and country spreads for the N countries analyzed, β is the $(2 \times N) \times 2$ matrix with factor loadings, F_t is a 2×1 matrix with two common factors (one for capital flows F_t^k and another one for country spreads F_t^s) which are assumed to follow an AR(1) process, ϵ_t is $(2 \times N) \times 1$ matrix of idiosyncratic shocks to capital flows and country spreads, γ is a 2×2 vector denotes the persistence of each factor, and η_t is a $(2 \times N) \times 1$ vector of disturbances that affect the common factors.

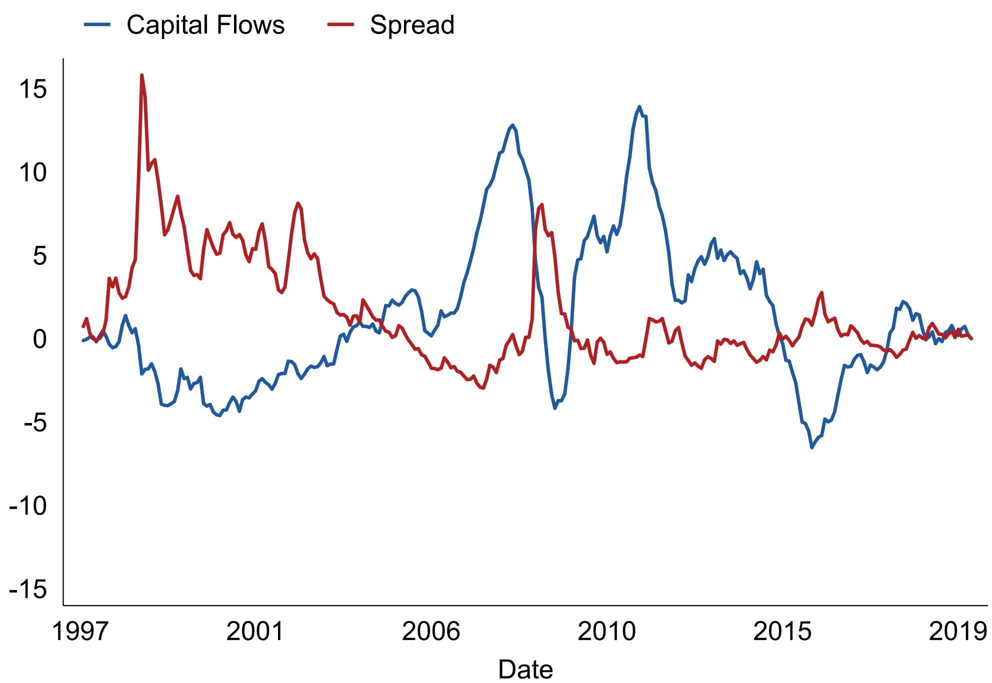
We identify a common factor of capital flows (country spreads) imposing that the loading of country spreads (capital flows) is 0. In particular, all the series of capital flows are included first in X_t (i.e. from rows 1 to N) and all the spread series are included next (i.e from rows $N+1$ to $2 \times N$). Then, we impose the restriction that $\beta_{N+1:2\times N,1} = 0$ and that $\beta_{1:N,2} = 0$, which implies that the first (second) factor is only identified using only series of capital flows (country spreads).

Figure 4 displays the estimated common factors of capital flows (dashed/blue line) and country spreads (solid/red line).[8] The common factor in country spreads displays three clear spikes that coincides with known periods of turmoil in world capital markets. It

[8]Both factors are presented as cumulated to enhance interpretation and following Rey (2013). The figure of non-cumulated factors is presented in Appendix B.1.

increases significantly during the Russian Crisis of the late 90s and remains high with another spike in late 2001 that coincides with the Argentinian sovereign default, followed afterwards by several years of relatively low levels of the factor. The third spike of this factor coincides with the Global Financial Crisis, which was nonetheless relatively brief and followed by a subsequent decline. A last brief and milder spike is observed around 2015, overlapping with the lift off the the FED's Funds Rate from the zero lower bound.

Figure 4 Common Factor for Country Spreads and Capital Flows



NOTE. Cumulated dynamic factors between capital flows and EMBI of Argentina, Brazil, China, Colombia, Ecuador, Malaysia, Mexico, Panama, Philippines, Poland, South Africa and Turkey for the period 1997:2-2019:12. Capital flows is defined as the cumulative trade deficit plus the change in international reserves at monthly frequency.

The factor capturing the common movement of capital flows displays a different pattern from that in credit spreads. It initially fell following the crises in the late 90s, until the early 2000s when its downward trend reversed to gradually increase throughout the 2000s. It displays then an increase in its volatility with a clear acceleration in the two years preceding the Global Financial Crisis during which it fell abruptly, only to recover vigorously with a spike in 2012. The factor remains high until late 2014 after which it displays a sharp decrease amid the normalization of US monetary policy, until 2016, when it reverts back, although at lower levels than in the volatile years after the GFC.

The common factors on capital flows and country spreads exhibit a strong negative correlation (-0.53). Following the conceptual framework in Section 2, this would suggest that supply drivers are preponderant behind the common drivers that shape access to world capital markets by EMEs. At the same time, the fact that the correlation is not perfect also suggests that the two may have been impacted by supply and demand factors in different ways, with idiosyncratic shocks playing an important role too. We turn next to a formal approach to disentangle these drivers.

The Role of Supply and Demand Drivers

We turn now to a formal approach to disentangle supply from demand shocks behind common and idiosyncratic drivers in spreads and capital flows to EMEs. To do so we impose sign and zero restrictions and zero restrictions in order to identify structural shocks to the DFM estimated in the previous subsection. Formally, the restrictions we impose are:

- Common supply shocks ($\varepsilon_t^{S,G}$) are identified by assuming that they trigger movements in the factors of spreads (F_t^s) and of capital flows (F_t^k) in opposite directions.

- Common demand shocks ($\varepsilon_t^{D,G}$) are identified by assuming that they trigger movements in F_t^s and F_t^k in the same direction.

- Idiosyncratic supply shocks in country i ($\varepsilon_t^{S,i}$) are identified by assuming that they trigger movements the country i's spreads and capital flows in opposite directions, without affecting F_t^s and F_t^k.

- Idiosyncratic demand shocks in country i ($\varepsilon_t^{D,i}$) are identified by assuming that they trigger movements in country i's spreads and capital flows in the same direction, without affecting F_t^s and F_t^k.

Since the matrices of idiosyncratic disturbances (ε_t) and common disturbances (η_t) in (5) can be rotated to identify the role of demand/supply and common/idiosyncratic credit shocks, we can implement the identifying restrictions above through the following relation between the innovations of system (5) and the underlying four structural shocks:

$$\begin{bmatrix} \eta_t^S \\ \eta_t^K \\ \epsilon_t^S \\ \epsilon_t^K \end{bmatrix} = \begin{bmatrix} + & + & 0 & 0 \\ - & + & 0 & 0 \\ . & . & + & + \\ . & . & - & + \end{bmatrix} \begin{bmatrix} \varepsilon_t^{S,G} \\ \varepsilon_t^{D,G} \\ \varepsilon_t^{S,I} \\ \varepsilon_t^{D,I} \end{bmatrix}$$

where "." denotes that we are leaving the coefficient unrestricted. With the estimated structural disturbances, we do a variance decomposition to measure the importance of each shock in accounting for the variance of country spreads and capital flows. Tables 2 and 3 display the fraction of the variance of country spreads and capital flows that is explained by each structural shock, respectively. The upper (lower) panel of each table documents the role of common (idiosyncratic) supply and demand shocks.

Table 2 Share of Variance of Country Spreads explained by each Shock

	F_t^s	ARG	BRZ	CHN	COL	ECU	MEX	MSY	PAN	PHL	POL	SWF	TUR	Median
$\varepsilon_t^{S,G}$	64	3	38	24	49	14	58	42	49	51	39	39	33	39
$\varepsilon_t^{D,G}$	36	2	21	14	27	8	33	24	28	29	22	22	19	22
$\varepsilon_t^{S,G} + \varepsilon_t^{D,G}$	100	5	59	38	76	22	91	66	77	80	61	61	52	61
$\varepsilon_t^{S,I}$	0	52	27	31	15	38	6	18	12	11	22	22	30	22
$\varepsilon_t^{D,I}$	0	43	14	31	9	40	3	16	11	9	17	17	18	17
$\varepsilon_t^{S,I} + \varepsilon_t^{D,I}$	0	95	41	62	24	78	9	34	23	20	39	39	48	39

Note. Variance decomposition of country-specific and common (Factor) spreads due explained by common credit supply shocks $\varepsilon_t^{S,G}$, common credit demand shocks $\varepsilon_t^{D,G}$, country-specific credit supply shocks $\varepsilon_t^{S,I}$, and country-specific credit demand shocks $\varepsilon_t^{D,I}$.

Two results stand out from a comparison of Tables 2 and 3. First, global drivers are more relevant in accounting for spreads in EMEs, with a 61 percent of their median variance traced back to these disturbances. The remaining 39 percent is accounted for idiosyncratic

Table 3 Share of Variance of Net Capital Flows explained by each Shock

	F_t^k	ARG	BRZ	CHN	COL	ECU	MEX	MSY	PAN	PHL	POL	SWF	TUR	Median
$\varepsilon_t^{S,G}$	64	1	26	27	1	1	9	33	1	7	23	10	13	9
$\varepsilon_t^{D,G}$	36	0	15	15	1	1	5	18	0	4	13	5	8	5
$\varepsilon_t^{S,G} + \varepsilon_t^{D,G}$	100	1	41	42	2	2	14	51	1	11	36	15	21	14
$\varepsilon_t^{S,I}$	0	55	22	30	54	52	44	25	51	45	38	45	41	44
$\varepsilon_t^{D,I}$	0	44	37	28	44	46	42	24	48	44	26	40	38	41
$\varepsilon_t^{S,I} + \varepsilon_t^{D,I}$	0	99	59	58	98	98	86	49	99	89	64	85	79	85

NOTE. Variance decomposition of country-specific and common (Factor) capital flows due explained by common credit supply shocks $\varepsilon_t^{S,G}$, common credit demand shocks $\varepsilon_t^{D,G}$, country-specific credit supply shocks $\varepsilon_t^{S,I}$, and country-specific credit demand shocks $\varepsilon_t^{D,I}$.

forces. This result echoes the Global Financial Cycle identified in Rey (2013). In contrast, the lion's share of the volatility in capital flows can be traced back to idiosyncratic disturbances, which account for 85 percent of the median variance in the data. This also echoes results by Cerutti et al. (2019b) who cast doubts of a Global Financial Cycle in capital flows.

Second, supply shocks are preponderant when explaining common drivers in spreads, accounting for roughly 2/3 of the 61 percent median variance in spreads that comes from common shocks. In contrast, supply and demand disturbances are equally important when explaining idiosyncratic shocks to capital flows.

In the theoretical model developed in Section 4 we will assume an estimated process for the country spread that matches the empirical one and analyze why capital flows are significantly less correlated.

The predominant role of supply shocks in explaining both variables is key to understand the negative correlation between country spreads and capital flows at the country level. While common credit supply shocks are the main drivers of country spreads, country-specific supply and demand shocks are the main drivers of net capital flows. Common shocks account for only 14% of the fluctuations in capital flows. This fact helps to explain why capital flows are not so correlated across countries why sovereign spreads are. Calvo and Mendoza (2000a) and Calvo and Mendoza (2000b) show, in a context of financial globalization with informational frictions, that uninformed investors may mimic the behavior of informed investors. This setting may contribute to explain the importance of common shocks for country spreads. The predominance of idiosyncratic shocks in explaining capital flows in this context may be rationalized by the demand due to domestic macroeconomic conditions. In the theoretical model developed in Section 4 we will assume an estimated process for the country spread that matches the empirical one and analyze why capital flows are significantly less correlated.

3.5 Extensions

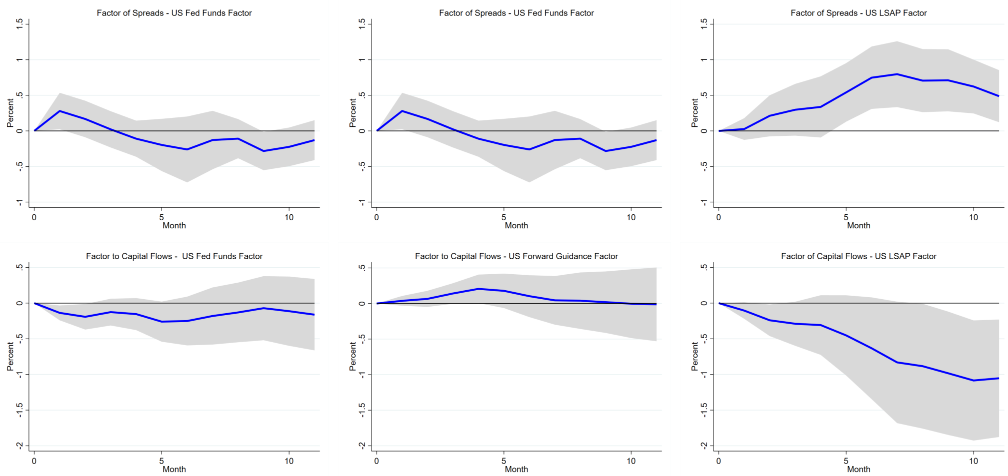
The Effects of US Monetary Policy Shocks on Both Factors

US monetary policy is one of the drivers of the Global Financial Cycle (see, for example, Miranda-Agrippino and Rey, 2020). We estimate the effects US monetary policy shocks on both factors to see if both spreads and capital flows are affected. This sample period is characterized by the Zero Lower Bound and the implementation of Quantitative Easing, which may induce different effects on both factors. Thus, to estimate the effects of both types of shocks, we use the series of US monetary shocks and Quantitative Easing shocks computed by Swanson (2021). We estimate the effects of both shocks by estimating the following local projection specification:

$$F^i_{t+h} - F^i_t = \alpha_h + \sum_{k=1}^{12} F^i_{t-k} + \sum_{z=0}^{12} S_{t-z} + \sum_{z=0}^{12} X_{t-z} + \varepsilon_{t+h} \qquad \forall 0 < h < 12$$

where F^i_{t+h} denotes the value of each factor i (spreads or capital flows) h periods ahead, S_t denotes the policy shock (Federal Funds rate shock or Quantitative Easing), and X_t denotes controls that in this case is the CBOE VIX index. We consider the effects 12 periods ahead. Figure 5 displays the IRFs of each factor to each contractionary policy shock.

Figure 5 IRFs of both Factors to Contractionary US Monetary Policy Shocks



Note. Impulse response functions of the factors of country spreads and capital flows in response to a one standard deviation US Fed Funds rate shock (Fed Funds Factor), Forward Guidance shock and to a Quantitative Easing (LSAP Factor) shock. The series of shocks are computed by Swanson (2021). Continuous blue line denotes the median response and shaded areas denote 90% confidence intervals. Horizon is in months.

Both contractionary Fed Funds rate and Quantitative Easing shocks induce an increase in the common factor of country spreads and net capital flows. Forward guidance shocks do not induce significant effects on capital flows and country spreads. While the effects of the shock in the short term interest rate are more immediate, the responses to the change in asset purchases are more delayed. These results are in line with the findings that US Monetary Policy shocks are an important driver of the Global Financial Cycle (see, for example, Miranda-Agrippino and Rey, 2020).

Importance of Regional Factors

The relatively low correlation between capital flows across EMEs may be due to the fact that net capital flows are more correlated at regional level, due for example to the higher synchronization of business cycles. To analyze if this is the case, we have extended the DFM presented in 5 to extract two region-specific factor: Asian and Latin American. These factors affect only by construction the countries that belong to that region and have no effect on the remaining ones. Figure A.3 included in the Appendix displays the two regional factors for capital flows and country spreads. These additional regional factors explain 29 (11) of the observed variability of capital flow (country spreads). The predominant role of regional factors relative to the global factor in explaining capital flows is consistent with Kaminsky et al. (2020). All in all, the fact that capital flows are less correlated across countries that the country spread is not fully explained by the existence of a common component at the regional level.

Table 4 Importance of Global and Regional Factors by Country

	ARG	BRZ	CHN	COL	ECU	MLY	MEX	PAN	PHL	POL	SWF	TUR	Median
Capital Flows - Global	0.01	0.40	0.34	0.06	0.12	0.11	0.23	0.03	0.09	0.21	0.21	0.54	0.16
Capital Flows - Global y Regional	0.25	0.44	0.87	0.71	0.14	0.12	0.46	0.06	0.51	–	–	0.55	0.45
Spread - Global	0.06	0.70	0.06	0.81	0.45	0.66	0.79	0.85	0.63	0.55	0.55	0.68	0.64
Spread - Global y Regional	0.43	0.99	0.29	0.88	0.48	0.66	0.82	0.85	0.97	–	–	0.68	0.75

Note. Share of the country-specific capital flows and country spreads variance explained by the global and regional factors. We report the Adjusted R^2 of the regression of country spread and net capital flows on the global and the global plus regional factors.

3.6 Robustness

In this section we assess the robustness of the previous empirical facts. First, we redo the previous analysis with alternative measures of capital flows and country spreads. Second, we extend the DFM model to consider regional factors (i.e. factors that are common only for the countries that belong to that region).

Economies with Open Financial Account

We consider the subsample of economies with an open financial account as all the economies from the sample that coincide with the ones used by Fernández et al. (2018): Brazil, Colombia, Mexico, Malaysia, Philippines, South Africa, and Turkey. The second row (Open) of Table 5 displays the correlation between spreads and capital flows only for this subsebt of countries. The median correlation between capital flows and spreads remains unchanged relative to the baseline sample. Thus, the low correlation and negative correlation between spreads and capital flows is not driven by economies with closed financial account.

Alternative Measures of Capital Flows and Country Spreads

In our baseline analysis, we consider a measure of sovereign spread based on public bonds while our proxy for capital flows includes both public and private flows. Sovereign spreads are highly correlated with corporate spreads in the same economy but they do not coincide (see, for example, Caballero et al., 2019). However, using a more disaggregated proxy for capital flows and country spreads, where both of them are computed based on the same assets, implies loosing country coverage or working with lower frequency data (quarterly), which may blur identification of demand and supply shocks. In this subsection, we show that the previous empirical facts are robust to alternative measures of capital flows and country spreads at monthly and quarterly frequencies. Additional tables are included in Appendix B.2.

Table 5 Correlation between alternative measures of capital flows and country spread

	ARG	BRZ	CHN	COL	ECU	MEX	MLY	PAN	PHL	POL	SWF	TUR	Median
Baseline	0.01	-0.13^{**}	-0.19^{***}	-0.14^{**}	-0.11^{*}	-0.03	-0.08	-0.06	-0.14^{***}	-0.17^{***}	-0.19^{***}	-0.18^{***}	-0.14
Open		-0.13^{**}		-0.14^{**}		-0.03	-0.08		-0.14^{***}		-0.19^{***}	-0.18^{***}	-0.14
BoP M		-0.25^{***}											-0.25
CFP		-0.60^{*}		-0.23^{***}		-0.26^{**}	0.15		-0.10		0.04	-0.2	-0.2
D Issuance		-0.13		-0.54^{*}		-0.05						-0.37^{*}	-0.25
BoP Q	-0.3	-0.26			-0.35	-0.11			-0.08	0.21	-0.44	-0.5	-0.28
KS Total		-0.27^{***}	0.11			-0.39^{**}			0.01	0.17^{**}	-0.32	-0.31^{***}	-0.27
KS Debt		-0.22^{***}	0.00			-0.26^{***}	-0.14		0.01	0.16^{**}	-0.17^{***}	-0.29^{***}	-0.16

Note. Contemporaneous correlation between capital flows (f) and EMBI (s) of Argentina, Brazil, China, Colombia, Ecuador, Malaysia, Mexico, Panama, Philippines, Poland, South Africa and Turkey using alternative definitions of both variables. CFP refer to the definition of net capital flows and spread as defined by Caballero et al., 2019, D Issuance refers to the definition of capital flows and spreads using the issuance of corporate bonds in foreign currency, BoP Q refer to the case where capital flows are computed using quarterly balance of payments data, and KS refer to the database of capital flows as computed by Koepke and Schneider (2020). Significance level: $^{***}p < 0.01$, $^{**}p < 0.05$ and $^{*}p < 0.1$.

First, we consider disaggregated balance of payments monthly data for Brazil.[9] Brazil is one of the few countries with balance of payments data available at monthly frequency. We compute a proxy for capital flows using two disaggregated accounts of the balance

[9]This data is available at `https://www.bcb.gov.br/content/statistics/specialseriestables/BalPayM.xlsx`.

of payments and sovereign spread (EMBI) as a proxy for country spread. The correlation between capital flows and country spread is comparable with the one computed our baseline sample (see Table A.2).

Second, we exploit the quarterly database used by Caballero et al. (2019). We define net corporate debt flows as the difference in the stock of corporate debt for some EMEs together with the External Financial Index computed by Caballero et al. (2019). The advantage of this analysis is that the measure of country spread is computed using the same set of bonds used to compute capital flows. Another advantage is that this database covers a representative set of EMEs. The main drawback is that this database is only available at quarterly frequency. Table A.3 in the Appendix presents the results from this analysis. The correlation between capital flows and country spread is also similar to the one presented in Table 1, with a median correlation between capital flows and country spreads of -0.14.

Third, we use issuance of corporate debt and their corresponding yields for Brazil, Colombia, Mexico and Turkey available at quarterly frequency from Thomson Reuters for the period 1994:1-2019:1. In this case, we compute a yield as a weighted average of all the individual bond yields of that country and compute the sum of bond issued for every quarter.[10] The key advantage of this exercise is that we can track the yields associated to each bond, private and public. The main drawback is that the data only covers total issuance in primary markets and we cannot distinguish between domestic and international bond issuance, which is key for computing capital flows. To partially address this issue, we consider only bond issued in international currency. The results using this database are presented in Table A.4. The main conclusions remain unchanged, with a median correlation between capital flows and country spreads of -0.25.

Fourth, we compute capital flows using balance of payments data published by the IMF. In particular, we define capital flows as the sum of net direct investment, net portfolio

[10]The weights are defined as the share of every bond on the total bond issued by that country in that quarter.

investment, and net other investment.[11] The country spread is the quarterly EMBI average. The key advantage of this database is that is available and comparable for a wide range of countries. The drawback is that it is only available at quarterly frequency and that we do not have a country spread measure based on these capital flows. The results using this database are presented in Table A.5. The main conclusions remain unchanged, with a median correlation between capital flows and country spreads of -0.28.

Finally, we use the series of capital flows at monthly frequency computed by Koepke and Schneider (2020) together with the EMBI as a proxy for capital flows. The advantage of this database is that it contains a comparable measure of capital flows for a wide range of EMEs. The results using this database are presented Table A.6. The main conclusions remain unchanged, with a median correlation between capital flows and country spreads of -0.27.

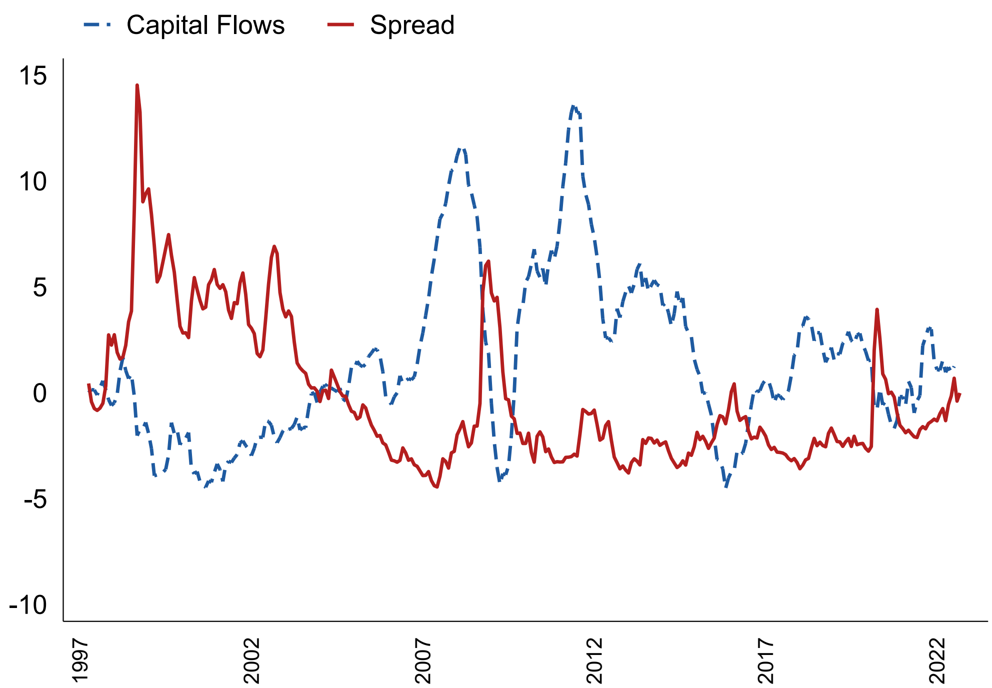
Covid Period

The baseline sample ends in 2019:12, right before the pandemic. In this section we extend our baseline sample to include the Covid period. This extension enables us to determine the role of different shocks in driving fluctuations in credit markets during the pandemic. Figure 6 displays the dynamics of the capital flows and country spread factors including the Covid period.

Including this recent period does not affect the estimated factors in the baseline sample. The Covid period is characterized by a sharp common increase in country spreads and capital outflows during 2020. While the common component of country spread recovers faster, the one of capital flows recover only in 2021. Tables 6 and 7 display the variance decomposition of country spread and capital flows explained by each shock using the extended sample. The results are comparable to those of the baseline sample.

[11] Other investment comprises loans, trade credit, bank deposits, and cash.

Figure 6 Common Factor for Country Spreads and Capital Flows including Covid



Note. Cumulated dynamic factors between capital flows and EMBI of Argentina, Brazil, China, Colombia, Ecuador, Malaysia, Mexico, Panama, Philippines, Poland, South Africa and Turkey for the period 1997:2-2022:7. Capital flows is defined as the cumulative trade deficit plus the change in international reserves at monthly frequency.

Table 6 Share of Variance of Country Spreads explained by each Shock extended Sample

	F_t^s	ARG	BRZ	CHN	COL	ECU	MEX	MSY	PAN	PHL	POL	SWF	TUR	Median
$\varepsilon_t^{S,G}$	57	18	38	30	41	27	47	38	42	41	35	38	35	38
$\varepsilon_t^{D,G}$	43	13	28	23	30	20	35	28	31	30	26	28	26	28
$\varepsilon_t^{S,G} + \varepsilon_t^{D,G}$	100	31	66	53	71	47	81	66	73	71	61	65	61	65
$\varepsilon_t^{S,I}$	0	36	17	23	15	27	9	17	14	15	20	17	21	17
$\varepsilon_t^{D,I}$	0	32	17	24	14	26	9	17	14	14	19	18	18	17
$\varepsilon_t^{S,I} + \varepsilon_t^{D,I}$	0	69	34	47	29	53	19	34	27	29	39	35	39	35

Note. 1-year ahead variance decomposition of country-specific and common (Factor) spreads due explained by common credit supply shocks $\varepsilon_t^{S,G}$, common credit demand shocks $\varepsilon_t^{D,G}$, country-specific credit supply shocks $\varepsilon_t^{S,I}$, and country-specific credit demand shocks $\varepsilon_t^{D,I}$. The variance decomposition is computed with the sample 1997:2-2022:7.

4 Capital Flows and Country Spread Dynamics in a Two-Country Small Open Economy Model

In this section, we extend the two-period model presented in Section 2 to an infinite-horizon general equilibrium model to assess if the model can replicate the empirical findings

Table 7 Share of Variance of Net Capital Flows explained by each Shock extended Sample

	F_t^k	ARG	BRZ	CHN	COL	ECU	MEX	MSY	PAN	PHL	POL	SWF	TUR	Median
$\varepsilon_t^{S,G}$	57	6	35	25	13	12	18	28	0	16	26	17	22	18
$\varepsilon_t^{D,G}$	43	4	26	19	9	9	13	21	0	12	19	13	17	13
$\varepsilon_t^{S,G} + \varepsilon_t^{D,G}$	100	10	61	44	22	22	32	49	0	28	45	30	39	31
$\varepsilon_t^{S,I}$	0	48	19	28	40	39	33	26	50	37	28	34	33	34
$\varepsilon_t^{D,I}$	0	42	19	28	37	39	35	25	50	36	27	36	29	35
$\varepsilon_t^{S,I} + \varepsilon_t^{D,I}$	0	90	39	56	78	78	68	51	100	72	55	70	61	69

NOTE. 1-year ahead variance decomposition of country-specific and common (Factor) capital flows due explained by common credit supply shocks $\varepsilon_t^{S,G}$, common credit demand shocks $\varepsilon_t^{D,G}$, country-specific credit supply shocks $\varepsilon_t^{S,I}$, and country-specific credit demand shocks $\varepsilon_t^{D,I}$. The variance decomposition is computed with the sample 1997:2-2022:7.

described in the previous section, something that has not been analyzed by previous works. In particular, we focus our analysis on understanding three empirical facts. First, the high observed comovement between country spreads across EMEs. Second, the relatively low comovement of net capital flows across EMEs. Third, the observed correlation of -0.14 between capital flows and country spreads at the country level. Bai et al. (2019) show that the presence of long-run risk is key to explain why sovereign spreads are significantly more correlated than business cycles in EMEs. They show that 2/3 of the fluctuations in spreads are explained by long-run risk. In this section we do not focus on explaining this high correlation of sovereign spreads. We calibrate the model to match the observed correlation of country spreads and assess if the model can match the other two empirical findings. We also use this model to quantify the role of different country-specific characteristics and frictions in explaining these empirical facts.

The model is a two-country version of the small open economy model developed by Mendoza (1991) and extended by Schmitt-Grohe and Uribe (2003). The model considers only one good which can be traded in international markets, abstracting from terms of trade or real exchange rate dynamics. Considering that we focus on common drivers, we abstract from the role of fluctuations in relative prices in driving capital flows and country spreads. We choose to use a two-country model instead of modeling the twelve EMEs together to keep the model tractable and also to simplify the calibration exercise.[12][13] Based on the empirical facts, we depart from the baseline model used by Schmitt-Grohe and Uribe (2003) in two important dimensions. First, each economy faces three shocks to: the international risk-free interest rate, the country spread, and to productivity. Considering the previous empirical findings, we allow productivity and country spread shocks to be correlated across two countries. Correlated TFP shocks contribute to match the observed business cycle syncronization between the two economies, capturing common credit demand shocks. Correlated country spread shocks account for the comovement of spreads that are not explained by business cycle comovement. Second, to better understand the behavior of capital flows, we estimate the country-specific country spread as a function of macroeconomic fundamentals and plug in these estimated equations in the model, following the strategy and specification proposed by Uribe and Yue (2006). While in the simplified model presented in Section 2 the country spread depends on the stock of net external debt, in this version we model the interest rate process as a function of the determinants of changes in the stock of debt to capture more accurately the dynamics between country interest rate and business cycle conditions. Stationarity of the net external position is induced by assuming Portfolio Adjustment Costs (PAC) as defined by Schmitt-Grohe and Uribe (2003).

In the next subsections we present the model for each small open economy. To simplify notation, we omit the country index and we only use it when common and idiosyncratic variables interact. The full set of equilibrium conditions are presented in Appendix C.

[12]The model could be extended to include the twelve economies considered in our baseline sample. However, we would have to calibrate the model for each economy separately. We prefer to keep the model tractable and focus on understanding the determinants of capital flows and country spreads and on the role of different frictions in explaining the results.

[13]We abstract from trade linkages across the EMEs in the model for tractability. We conjecture that, should trade linkages be added to our framework, we would need a lower correlation between country spread shocks to match the observed correlation between country spreads.

4.1 The Model

Each small open economy is populated by a larger number of identical households with GHH preferences described by the following utility function:

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \frac{\left[c_t - \omega^{-1} h_t^{\omega}\right]^{1-\gamma} - 1}{1-\gamma} \tag{6}$$

where β is the discount factor, c_t denotes consumption, h_t denotes hours worked, γ is the constant relative risk aversion coefficient, and ω is the inverse of the Frisch labor supply elasticity. These preferences, which have been widely used in international macroeconomic models, do not display an income effect that affects the labor supply decision. The budget constraint is given by:

$$c_t + i_t + \frac{\phi}{2}\left(k_{t+1} - k_t\right)^2 + (1 + r_{t-1}) d_{t-1} = y_t + d_t + \frac{\psi}{2}(d_t - \overline{d})^2 \tag{7}$$

where i_t denotes investment, ϕ is a parameter that determines the strength of capital adjustment costs, d_t is the net external debt position, and ψ is a parameter that determines the strength of the Portfolio Adjustment Costs (PAC). PAC are necessary to induce determinacy in the model (see, for example, Schmitt-Grohe and Uribe, 2003). The representative household is subject to the following no-Ponzi constraint:

$$\lim_{j \to \infty} \mathbb{E}_t \frac{d_{t+j}}{\prod_{s=0}^{j}(1 + r_s)} \leq 0 \tag{8}$$

Output is produced by using capital k_t and labor services h_t as inputs according to the following production function:

$$y_t = A_t k_t^{\alpha} h_t^{1-\alpha}; \quad \alpha \in (0, 1) \tag{9}$$

where A_t represents the productivity of the economy. The capital shocks evolves according to:

$$k_{t+1} = (1 - \delta)k_t + i_t \tag{10}$$

where $\delta \in [0, 1]$ denotes the rate of capital depreciation.

Households choose a process for $\{c_t, h_t, y_t, i_t, k_{t+1}, d_t\}$ to maximize the utility function (6) subject to constraints ((7) to (10)).

4.2 Driving Forces

Each economy is affected by shocks to the following variables: international interest rate (R_t^*), domestic interest rate (R_t), and productivity (A_t). In our empirical model, we extracted a common factor of capital flows and another one of country spreads using a baseline sample of 12 economies. To keep the model in line with the countries used for the calibration (Brazil and Mexico), we introduce the comovement between these variables as correlated shocks instead of modelling a factor that includes all the countries considered in our baseline sample.[14]

The law of motion of the productivity process is described by:

$$\ln A_t = \rho_A \ln A_{t-1} + \varepsilon_t^A$$

where ρ_A captures the persistence of the productivity process and ε_t^A is the shock to productivity. We assume that productivity shocks for each country are drawn jointly from a Normal distribution with the following variance-covariance matrix:

$$\Sigma^A = \begin{bmatrix} {\sigma_{11}^A}^2 & \sigma_{12}^A \\ \sigma_{21}^A & {\sigma_{22}^A}^2 \end{bmatrix}$$

[14] Another alternative could be to estimate a common factor for the two economies. However, estimated of TFP for these countries are not available at quarterly frequency. Modelling the observed correlation as correlated shocks is more direct and helps to keep the model tractable.

where ${\sigma_{i,i}^{A}}^2$ is the variance of country $i = \{1, 2\}$ productivity shock and $\sigma_{i,j}^{A}$ is the covariance between the productivity shocks where $\sigma_{12}^{A} = \sigma_{21}^{A} \neq 0$. This assumption of correlated TFP shocks is a reduced form way of modelling the business cycle synchronization between these economies, which can explain common demand for credit. Business cycle synchronization may be explained by common shocks to TFP, commodity prices, among others. The correlated TFP shocks capture these potential explanations.

Following Uribe and Yue (2006), the interest rate faced by each economy in international financial markets evolves according to:

$$\begin{aligned}
\hat{R}_t &= \rho_R \hat{R}_{t-1} + \rho_{R^*} \hat{R}_t^* + \rho_{R1^*} \hat{R}_{t-1}^* + \rho_y \hat{y}_t \\
&+ \rho_{y1} \hat{y}_{t-1} + \rho_i \hat{\imath}_t + \rho_{i1} \hat{\imath}_{t-1} + \rho_{tby} tby_t \\
&+ \rho_{tby1} tby_{t-1} + \epsilon_t^r
\end{aligned}$$

where variables with $\hat{x}$ denote log-deviations with respect to the steady state, $tby_{i,t}$ is the trade balance-to-output ratio, and ϵ_t^r denotes the shock to the country interest rate. We assume that country interest rate shocks are drawn jointly from a Normal distribution with the following variance-covariance matrix:

$$\Sigma^R = \begin{bmatrix} \sigma_{11}^2 & \sigma_{12} \\ \sigma_{21} & \sigma_{22}^2 \end{bmatrix}$$

where $\sigma_{i,i}^2$ is the variance of country $i = \{1, 2\}$ interest rate shock and $\sigma_{i,j}$ is the covariance between the country interest rate shocks where $\sigma_{12} = \sigma_{21} \neq 0$. This is a direct way of modelling the correlation between sovereign spreads that is not driven by business cycle synchronization.

Finally, the international interest rate R_t^* dynamics is characterized by the following process:

$$\hat{R}_t^* = \zeta \hat{R}_{t-1}^* + \epsilon_t^*$$

where $\hat{R}_t^*$ denotes the log-deviation of the international interest rate with respect to the steady state, ζ denotes the persistence of the process, and ϵ_t^* is a shock to the international interest rate drawn from a Normal distribution with variance γ_t^{*2}.

4.3 Calibration

The model is calibrated using quarterly data for Brazil and Mexico from 1997:Q1-2019:4, which coincides with the sample period of the empirical analysis. We pick two representative EMEs, from the sample of twelve countries used in the empirical analysis, that are open to capital flows and that have experienced significant shifts during the sample under analysis.

A subset of the parameters in the model is calibrated following Schmitt-Grohe and Uribe (2003), adjusted to quarterly frequency. We assume that households in both economies share the same risk aversion coefficient, which equals 2, and the same inverse Frisch elasticity, which equals 1.455. We assume an annual capital depreciation rate of 10% and we calibrate the share of capital in the production function to be equal to 32%.

Another subset of parameters is calibrated to match some long-run ratios in the data. β is calibrated to match the mean international interest rate faced by both economies of 4% annual, considering that $\beta R^* = 1$. $\overline{d}$ is calibrated to match the trade balance-to-output ratio in steady state. Capital and portfolio adjustment costs are calibrated to match the observed investment and trade balance-to- output ratio volatility in each country, respectively.

The standard deviation of the TFP shock is calibrated to match the observed output volatility in each country. The persistence of the TFP process (p_A) is set to match the persistence of output in each country. The covariance between TFP shocks ($\sigma_{i,j}^A$) is set to match the observed output correlation between Brazil and Mexico.

Finally, the international and country interest rate processes for each country are estimated using quarterly data for the U.S., Brazil and Mexico from 1997:Q1-2019:Q4. Following Uribe and Yue (2006), the real interest rate for the U.S. is proxied by the Real TBILL which is computed as the 3-month gross Treasury bill rate divided by the average gross inflation based on the GDP Deflator over the past four quarters, as a proxy for expected inflation. Table 8 displays the value of the estimated parameters for the international interest rate process. The country interest rate for Brazil and Mexico is defined as the gross real interest rate for the U.S. times the gross country spread, proxied with the EMBI Global. Table 9 displays the values of the estimated coefficients for each country. The first column of the table reports the estimated values from Uribe and Yue (2006) as a reference.

Table 8 Calibrated Parameters

Parameter	Description	Target	Brazil	Mexico
γ	CRRA parameter	Schmitt-Grohe and Uribe (2003)	2	
ω	Inverse Frisch elasticity	Schmitt-Grohe and Uribe (2003)	1.455	
δ	Depreciation rate	Schmitt-Grohe and Uribe (2003)	0.025	
α	Capital share	Schmitt-Grohe and Uribe (2003)	0.32	
β	Discount factor	$\beta R^* = 1$	0.99	
ζ	Persistence R_t^*	Estimated	0.97	
σ_{R^*}	Std. Dev. of R^* shock	Estimated	0.00183	
$\overline{d}$	Debt in steady state	Average TBY	0.38	3.9
ϕ	Capital adjustment cost	Investment volatility	0.00398	0.00781
ψ	Portfolio adjustment costs	TBY volatility	0.00000001	0.00000001
ρ_A	Persistence TFP	Output persistence	0.6355	0.765
σ_{ii}^A	Std. Dev. TFP Shock	Output volatility	0.00641	0.00505
σ_{ij}^A	Covariance TFP Shocks	Output correlation	0.3	0.3
σ_{ii}^R	Std. Dev. Spread Shocks	Spread Volatility	0.00485	0.0014
σ_{ij}^R	Covariance Spread Shocks	Spread Correlation	0.707	0.707

The estimated coefficients are consistent with the original estimations of Uribe and Yue (2006) but less precise since our sample uses only one country instead of a panel. While the coefficients associated with output are lower and less statistically significant, the ones associated with trade balance-to-output ratio are larger for Brazil.

4.4 Model Evaluation

Table 10 reports the unconditional theoretical moments for each economy together with their empirical counterpart. Values in bold denote moments which are particularly impor-

Table 9 Estimated Interest Rate Processes

	UY (2006)	Brazil	Mexico
r_{t-1}	0.63^{***}	0.75^{***}	0.77^{***}
	[0.146]	[0.067]	[0.077]
y_t	-0.79^{***}	-0.22	-0.28^{***}
	[0.212]	[0.153]	[0.097]
y_{t-1}	0.62^{***}	-0.14	0.26^{***}
	[0.213]	[0.163]	[0.089]
i_t	0.11^{*}	0.11^{*}	0.09^{***}
	[0.065]	[0.058]	[0.029]
i_{t-1}	-0.12^{*}	0.03	-0.08^{**}
	[0.071]	[0.060]	[0.031]
tby_t	0.29^{*}	0.80^{***}	0.10
	[0.155]	[0.236]	[0.072]
tby_{t-1}	-0.19	-0.72^{***}	0.01
	[0.148]	[0.230]	[0.075]
R^*_t	0.50	0.71^{*}	0.73^{***}
	[0.323]	[0.409]	[0.171]
R^*_{t-1}	0.36	-0.21	-0.41^{**}
	[0.487]	[0.416]	[0.194]
Obs	160	90	90
R^2	0.62	0.92	0.97

NOTE. Estimated interest rate processes. The first column presents the original estimates from Uribe and Yue (2006) using a panel of EMEs. Second and third columns present the estimated interest rate processes for Brazil and Mexico, respectively, using data from 1997:1-2019:4. The processes were estimated using instrumental variables, where r_{t-1} was instrumented with r_{t-2}. Standard errors are presented in brackets. ***, **, and * denote 1%, 5% and 10% confidence level.

tant for credit markets. The objective of this exercise is to assess if the model can reproduce the empirical facts related with capital flows and country spreads within and across countries. In particular, considering that the model matches the correlation of country spreads across countries and output comovement, we assess whether it can match the negative and low correlation between capital flows and country spreads and the low correlation of capital flows across countries. These moments, which have not been analyzed by previous works, are key to determine if the model can capture the observed dynamics in credit markets.

The model matches quite accurately not only the business cycle dynamics but also the correlation between net capital flows and country spread for both countries and the comovement of capital flows across countries. Moreover, the model also captures the autocoerralation of capital flows and country spreads. The implied Portfolio Adjustment Costs

Table 10 Model Evaluation

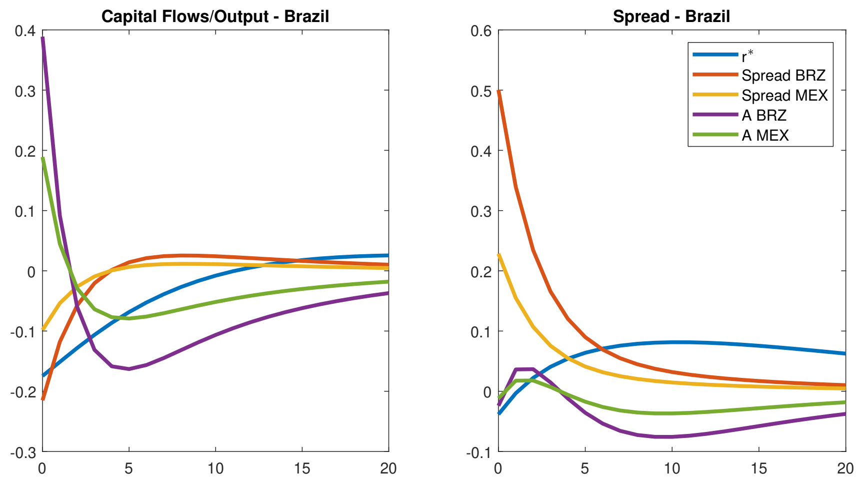
	Brazil		Mexico	
	Data	Model	Data	Model
std(y)	1.73	1.73	1.68	1.68
std(i)	5.49	5.50	4.4	4.40
std(tby)	2.5	1.26	1.63	1.25
std(kflows/y)	3.16	0.74	1.14	0.6
std(r*)	0.45	0.45	0.45	0.45
std(spread)	0.83	0.83	0.32	0.32
corr(spread,kflows/y)	**-0.21**	**-0.10**	**-0.03**	**-0.11**
corr(spread,y)	-0.18	-0.12	-0.11	-0.08
corr(kflows/y,kflows/y(-1))	-0.16	0.67	0.25	0.85
corr(spread,spread(-1))	0.9	0.78	0.9	0.87
corr(y,y(-1))	0.72	0.72	0.83	0.83
corr(y_{BR},y_{MEX})	0.3	0.3	0.3	0.3
corr(spread$_{BR}$,spread$_{MEX}$)	**0.65**	**0.65**	**0.65**	**0.65**
corr((kflows/y)$_{BR}$,(kflows/y)$_{MEX}$)	**0.35**	**0.39**	**0.35**	**0.39**

are very low, the minimum to induce stationarity. Thus, the model does a good job in replicating the Global Financial Cycle in EMEs, replicating the high (low) comovement between country spreads (net capital flows). However, the model does not match the observed volatility of net capital flows. This fact could be explained by portfolio decisions which are not captured by the standard small open economy (see, for example, Devereux and Sutherland, 2011). Extending the standard model to include portfolio decisions is important to characterize capital flows and asset prices (see, for example, Bacchetta et al., 2022). All in all, we conclude that the model matches the empirical facts once we assume a process for country spreads that resembles the empirical counterpart. In the next subsections we assess the role of different features in explaining the empirical facts.

4.5 Impulse Responses and Variance Decomposition

Figure 7 displays the response of capital flows and country spreads in Brazil to all the shocks considered in the model. The IRFs of both variables for Mexico to all the shocks are presented in Appendix C.2.

Figure 7 IRFs of Capital Flows and Country Spread in Brazil



NOTE. Response of capital flows-to-output ratio and country spreads in Brazil to a one standard deviation shock in the model. Spread BRZ (Spread MEX) denotes the IRFs to a shock to the interest rate in Brazil (Mexico). A BRZ (A MEX) denotes the IRFs to a TFP shock in Brazil (Mexico). r^* denotes the IRFs to a shock to the international interest rate.

An exogenous increase in productivity induces an immediate increase followed by a lagged decrease in capital flows to the economy that can be explained the transitory nature of the shock. Thus, this shock induces a shift in the demand for credit. The dynamics of capital flows can be explained by the increase in investment due to the observed increase in the marginal productivity of capital and by the increase in savings to smooth consumption due to the transitory nature of the shock. The sovereign spread initially decreases and increases following business cycle dynamics.

An exogenous increase in the sovereign spread increases the country interest rate inducing an improvement in the current account associated with capital outflows from the economy. Thus, this shock induces a tightening in the slope of international credit supply to this economy. The improvement in the current account can be explained both the fall in investment, due to the increase in the marginal cost of capital, and also to the increase in savings, due to the increase in returns. An increase in the international interest rate induces a shift upwards in the international credit supply, keeping the slope unchanged. In this case, the country spread increases due to the negative effect of the international interest rate on business cycle conditions which then feed into the estimated country spread process. The shock also induces capital outflows from the economy due to the increase in the country interest rate which reduce investment and increases savings.

Table 11 displays the 2-year ahead variance decomposition of capital flows-to-output ratio and country spreads in each country.

Table 11 2-Year Ahead Variance Decomposition

	Credit Supply Shocks			Credit Demand Shocks	
	R*	Spread BRZ	Spread MEX	A BRZ	A MEX
Capital Flows/Output BR	19	12	3	53	13
Spread BR	4	78	16	2	0
Capital Flows/Output MX	15	3	1	22	59
Spread MX	7	66	26	0	0

NOTE. Percentage of the 2-Year ahead variance of capital flows-to-output ratio and country spreads in Brazil and Mexico explained by international interest rate shocks (R^*), shocks to the spread in Brazil (Spread BRZ) and Mexico (Spread MEX), and shocks to productivity shock in Brazil (A BRZ) and in Mexico (A MEX). The results are based on simulations from the theoretical model presented in this Section.

Common credit supply shocks are an important driver of country spread dynamics, explaining 20% in Brazil and 73% in Mexico. In both cases, common shocks to the country spread (i.e. shocks to the country spread in one country that affect country spread in the other country) are the predominant over shocks to the international interest rate, which do not affect country spreads significantly. The importance of common shocks to the country spread may be key to explain the high observed comovement between country spreads.

Credit demand shocks are key to understand capital flow dynamics, explaining up to 66% in Brazil and 81% in Mexico. The predominant credit demand shock is the idiosyncratic productivity shock, which explains 53% of capital flows fluctuations in Brazil and 59% of capital flows fluctuations in Mexico.

While country spread dynamics are explained mostly by credit supply shocks, credit demand shocks are key to explain capital flow dynamics. This difference in the source of fluctuations may help to explain the high comovement of country spreads coupled with a low comovement of capital flows. In the next subsection we assess the contribution of each feature in explaining these dynamics.

4.6 Assessing the Determinants of Synchronization

In this section we quantify the importance of different features of the model to explain previous findings. In particular, we simulate the model for two different scenarios and compute the moments associated with the main empirical facts for each case. First, we assume that there is no correlation of TFP shocks across countries (Exp. 1). This assumption eliminates the output correlation between both economies and is useful to gauge the importance of common credit demand in explaining the main results. Second, we set the correlation of country interest rate shocks to zero (Exp. 2). In this case, we eliminate the main source of common credit shocks and allow spreads to be correlated only due to business cycle synchronization. In all the experiments we only adjust the corresponding parameter, keeping the remaining ones unchanged. Table 12 displays the main theoretical moments related with credit markets in each of these cases together with their value in the baseline model.

Table 12 Unconditional Moments - Baseline and Counterfactual Experiments

	Data	Baseline	Exp. 1	Exp. 2
corr(y_{BR},y_{Mex})	0.3	0.3	**0**	0.3
corr(spread_{BR},spread_{MEX})	0.65	0.65	0.65	**0.24**
corr(kflowsy_{BR},kflowsy_{MEX})	0.35	0.39	**0.18**	0.37

NOTE. Unconditional moments computed using simulated data from the theoretical two-country small open economy model presented in this section. Baseline denote the moments computed the baseline calibration described in Section 4.3. Exp. 1 denotes the moments computed using the baseline calibration but assuming that $\sigma^A_{i,j} = 0$ (i.e. no correlation between productivity shocks). Exp. 2 denotes the moments computed using the baseline calibration but assuming $\sigma^R_{i,j} = 0$ (i.e. no correlation between country interest rate shocks).

Two important findings emerge from the analysis. First, business cycle synchronization is key for explaining capital flows comovement but has no effect on country spread comovement. This fact is consistent with the importance of common productivity shocks to explain capital flows dynamics presented in Table 11. Second, common shocks to the country spread, which captures the Global Financial Cycle in the model, does not affect the correlation between capital flows significantly. Thus, capital flows seem to be determined by demand shocks more than shifts in international credit supply, in line with the findings presented in Table 11. Thus, the high correlation between country spreads and the relatively low correlation between capital flows can be explained by the different shocks that determine both variables. While common credit supply shocks are an important source of country spread fluctuations, common TFP shocks are key to understand the synchronization of net capital flows to EMEs. While in the current model we take the dynamics of sovereign spread as given, the high correlation between credit spreads may be rationalized by the existence of uniformed investors that follow informed ones, exacerbating fluctuations in asset prices (see, for example, Calvo and Mendoza, 2000b). The high comovement of country spreads may be also explained by the importance of long-run risk shocks faced by EMEs, as shown by Bai et al. (2019).

5 Conclusions

Access to world capital markets by EMEs is characterized both by credit demand and supply shocks. Country spreads are predominantly determined by global supply forces, which can in turn be traced back to US monetary policy. At those prices, idiosyncratic factors (both credit demand and supply) play an important role in explaining fluctuations in capital flows. A calibrated two-country small open economy model augmented with an estimated process for the interest rate, and correlated productivity and country interest rate shocks matches the observed dynamics. The correlation between productivity shocks explains around half of capital flows comovement while it does not affect the correlation of sovereign spreads. The correlation between interest rate shocks explains around two thirds of sovereign spread fluctuations while they do not affect significantly the observed correlation of net capital flows. Further research is needed to understand how capital flows are significantly more volatile without further real effects.

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A Data Appendix

Capital flows series are computed using equation (3). The variables are obtained from:

- X: exports in current USD FOB at monthly frequency. Source: International Financial Statistics, IMF.
- M: imports in current USD CIF at monthly frequency. Source: International Financial Statistics, IMF.
- R: stock of foreign reserves in current usd at monthly frequency: Source: International Financial Statistics, IMF.

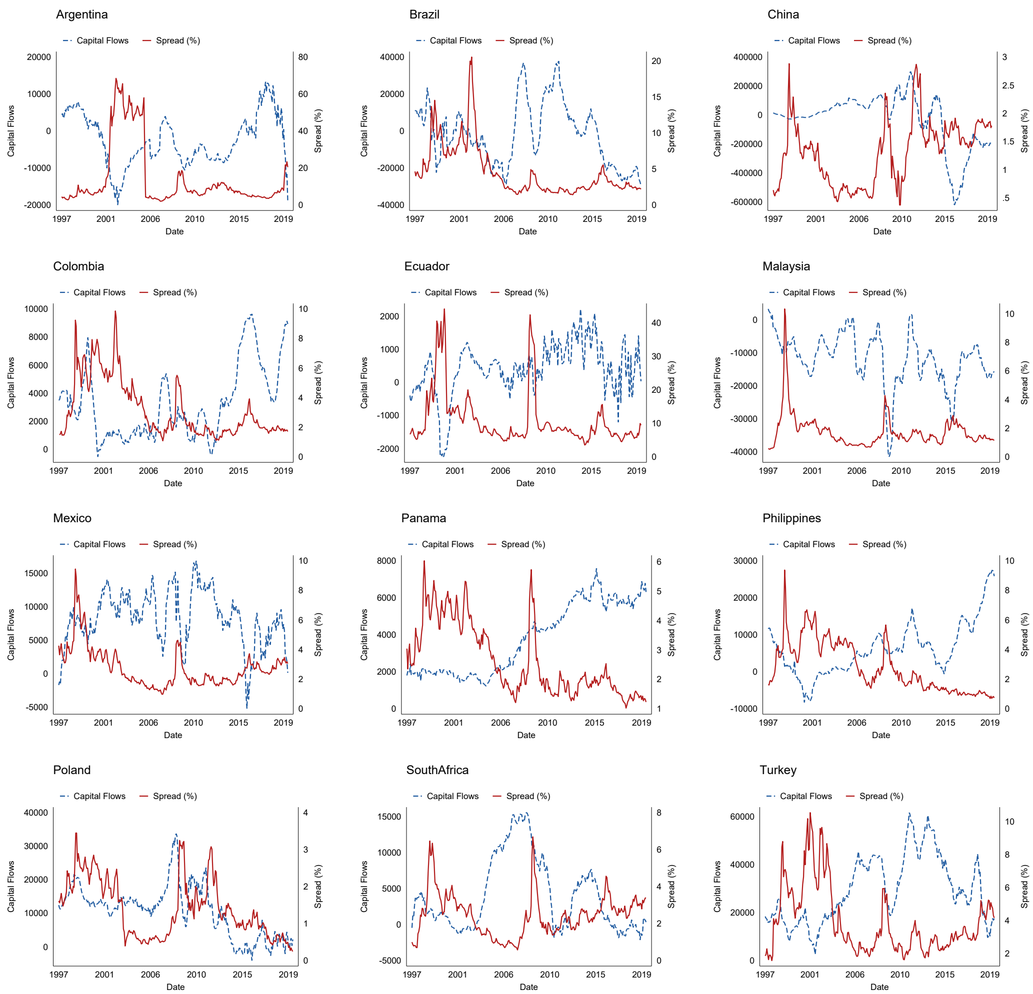
The series of capital flows is expressed in real terms using the series of U.S. Producer Price Index by Commodity: All Commodities (PPIACO) available at FRED.

Country spreads are proxied by the monthly average of the JP Morgan Emerging Market Bond Index Global (Stripped Spread).

Figure A.1 displays the evolution of capital flows and sovereign spread by country.

We compute moments for Brazil and Mexico to calibrate the two-country small open economy model and to estimate the interest rate equation. The data comes from the International Financial Statistics database compiled by the IMF. Output and investment were downloaded in domestic currency and nominal terms, and the trade balance was downloaded in domestic currency real terms. We deflate output and investment using the GDP deflator. We compute the trade balance-to-output ratio as the trade balance expressed in real terms divided by output expressed in real terms. In order to extract the cyclical components, we apply the Hodrick-Prescott filter with $\lambda = 1600$ to the series of real output, real investment, and trade balance-to-output expressed in logs. To estimate the interest rate processes, we follow Uribe and Yue (2006) and extract a log quadratic trend from the series of real output and real investment before estimating the process.

Figure A.1 Capital flows and country spreads



Note. Series of capital flows and country spreads used in the Empirical Analysis.

B Additional Empirical Results

B.1 Dynamics Factors

Figure A.2 displays the dynamic factors of country spreads and capital flows without cumulating them.

B.2 Alternative Datasets

In this section we present results described in Section 3.6.

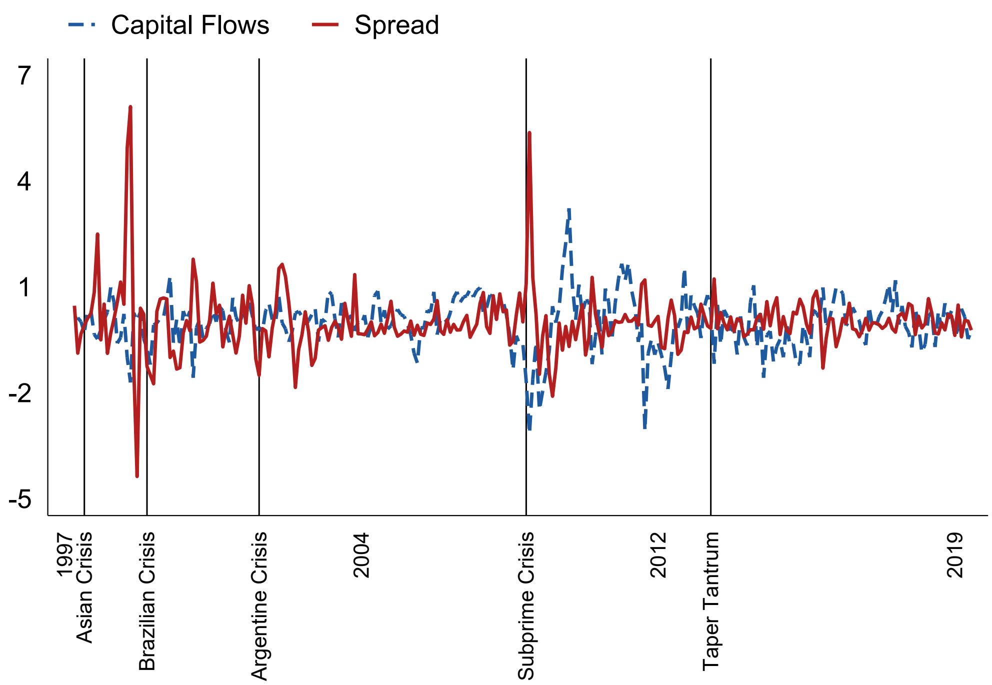
Table A.1 List of Systemic Sudden Stop Episodes (1997m1 to 2019m12)

Country	Begins	Ends
Argentina	2001m3	2002m10
Argentina	2018m11	2019m12
Brazil	2008m8	2009m7
China	2005m11	2007m1
China	2008m10	2009m8
China	2011m12	2013m3
China	2014m9	2016m5
Colombia	2000m7	2001m4
Ecuador	1999m12	2000m6
Ecuador	2016m3	2016m7
Malaysia	2005m11	2006m10
Malaysia	2008m9	2009m8
Mexico	2006m10	2007m9
Mexico	2009m1	2009m9
Mexico	2015m8	2016m3
Panama	2002m2	2002m6
Panama	2004m2	2004m9
Panama	2015m9	2016m8
Phillippines	2012m3	2012m11
Poland	2008m11	2009m9
Poland	2012m2	2012m8
South Africa	2008m8	2009m9
South Africa	2010m8	2011m9
Turkey	2001m6	2002m2
Turkey	2008m10	2009m12
Turkey	2018m10	2019m8

Note. Episodes of Systemic Sudden Stops in our baseline sample. These episodes are defined following the definition of Calvo et al. (2008).

Disaggregated BoP Monthly Data for Brazil. Table A.2 displays the correlation between country spread (EMBI) and two accounts from Brazilian Balance of Payments: Portfolio Investment (net incurrance of liabilities) and Loans (net incurrance of liabilities). The correlation at monthly or quarterly frequency is comparable with the one computed our baseline proxy for capital flows.

Figure A.2 Common Factor for Country Spreads and Capital Flows



NOTE. Dynamic factors between capital flows and EMBI of Argentina, Brazil, China, Colombia, Ecuador, Malaysia, Mexico, Panama, Philippines, Poland, South Africa and Turkey for the period 1997:2-2019:12 in levels (without acummulating). Capital flows is defined as the cumulative trade deficit plus the change in international reserves at monthly frequency.

Table A.2 Correlation between capital flows and EMBI for Brazil

	Portfolio Inv.	Loans
$\rho(s,f)M$	-0.25^3	-0.12^2
$\rho(s,f)Q$	-0.35^3	-0.22^2

Note.[1],[2],[3] *denote* $p < 0.01, p < 0.05, p < 0.1$, *respectively.*

Caballero et al. (2019) dataset. Table A.3 displays the correlation between the change in the stock of corporate debt and the External Financial Index (EFI) for each country, both using the data set of Caballero et al. (2019).

Table A.3 Correlation between EFI and capital flows computed from Caballero et al. (2019)

	BRZ	CHI	COL	MEX	MLY	PER	PHL	SWF	TUR	Median
$\rho(s,f)$	-0.60^1	0.32^1	-0.23^3	-0.26^2	0.15	-0.14	-0.10	0.04	-0.2	-0.14

Issuance of Debt. Table A.4 displays the contemporaneous correlation between issuance of debt in foreign currency and the corresponding yields. Unlike the other data sets, in this case we are looking at gross capital inflows.

Table A.4 Correlation between issuance of debt and yields

	BRZ	COL	MEX	TUR	Median
$\rho(s, f)$	-0.13	-0.54^{1}	-0.05	-0.37^{1}	-0.25

Quarterly BoP Data. Table A.5 displays the correlation between country spreads, proxied by EMBI, and capital flows computed from quarterly Balance of Payments data. Capital flows are defined as the sum of direct investment, portfolio investment and other investment.

Table A.5 Correlation between capital flows and country spread at quarterly frequency

	ARG	BRZ	CHN	COL	ECU	MEX	MLY	PAN	PHL	POL	SWF	TUR	Median
$\rho(s, f)$	-0.3	-0.26			-0.35	-0.11			-0.08	0.21	-0.44	-0.5	-0.28

Koepke and Schneider (2020) dataset. Table A.6 displays the correlation between spread and capital flows, using the series of capital flows computed by Koepke and Schneider (2020). Country spread is proxied with the EMBI as in our baseline sample.

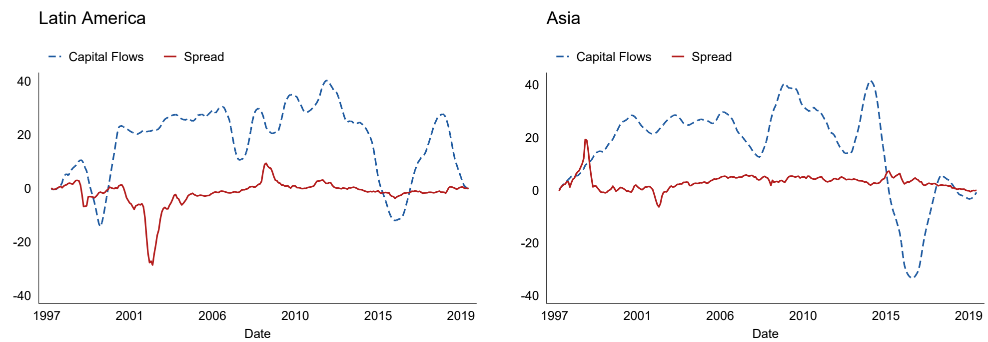
Table A.6 Correlation between country spread and capital flows computed by Koepke and Schneider (2020)

	BRZ	CHN	MLY	MEX	PHL	POL	SWF	TUR	Median
$\rho(s, fTotal)M$	-0.27^{3}	0.11	.	-0.39^{2}	0.01	0.17^{2}	-0.32	-0.31^{3}	-0.27
$\rho(s, fDebt)M$	-0.22^{3}	0.00	-0.14	-0.26^{3}	0.01	0.16^{2}	-0.17^{3}	-0.29^{3}	-0.16

B.3 Regional Factors

Figure A.3 displays the estimated regional factors of capital flows and country spreads for Asian and Latin American countries. Both factors are identified using a Dynamic Factor Model that considers a global factor, which affects all the economies, and regional factors, which affects only the countries of that region.

Figure A.3 Regional factors of country spreads and capital flows



Note. Series of regional factors of capital flows and country spreads estimated with a DFM that includes a global and regional factors for spreads and capital flows.

C Theoretical Model

C.1 Simple 2-Period Analytical Model

In this section we present the model presented in Section 2, which follows closely the model presented by Vegh (2013) (see Chapter 2).

Demand for Credit without Uncertainty

The representative household receives an endowment every period $\{y_1, y_2\}$ which can be either consumed or traded internationally. The economy has access to international financial markets. The representative household solves the following problem:

$$Max_{C_1,C_2} U(C_1) + \beta U(C_2)$$

subject to

$$C_1 + \frac{C_2}{1+r_1} = (1+r_0)B_0 + Y_1 + \frac{Y_2}{1+r_1}$$

where C_t denotes the consumption every period, B_0 is the net international asset position of the economy, and r_t is the interest rate that the country faces in international financial markets. The Euler equation is:

$$U'(C_1) = \beta\,(1+r)\,U'(C_2)$$

Let's assume that $B_0 = 0$, $r_0 = r_1 = r$ and that $\beta\,(1+r) = 1$. In this case, $C_1 = C_2$. Thus, using the budget constraint, the consumption every period equals:

$$\overline{C} = \left[Y_1 + \frac{Y_2}{1+r}\right]\frac{1+r}{2+r}$$

The associated demand for net international debt is:

$$D_1 = -B_1^f = C_1 - Y_1 = \frac{Y_2 - Y_1}{2+r}$$

Equilibrium in Credit Markets with Uncertainty

Let's assume that output is distributed following a Uniform distribution between 0 and $\overline{Y_2}$ ($Y_2 \sim U[0, \overline{Y_2}]$). If the country defaults in period 2, it does not pay its debt but it suffers an output loss of ϕY_2. Thus, the country decides to default in the second period if C_2^D, the consumption level with default, is larger than C_2^N, the consumption value without default, since these levels determine directly the level of utility. Thus, if the country pays its debt, consumption equals: $C_2^N = Y_2 + (1+r)\,B_1^f$. If the country does not pay its debt, consumption equals: $C_2^D = (1-\phi)\,Y_2$. The country decides to default if: $d_1 > \frac{\phi Y_2}{1+r}$. This condition can be expressed as a function of Y_2 as follows: $Y_2 < \frac{d_1(1+r)}{\phi}$. Then, the probability of default (π) is given by:

$$P(Y_2 < \frac{D_1^f\,(1+r)}{\phi}) \tag{11}$$

$$\pi = \frac{D_1^f\,(1+r)}{\phi}\frac{1}{\overline{Y_2}} \tag{12}$$

We assume that the international creditors are risk neutral and can either invest in a safe bond with a return r^* or in the domestic bond. Thus, the expected value of both investment have to equalize in equilibrium:

$$\begin{aligned}(1-\pi)(1+r) &= (1+r^*)\\ (1+r) &= \frac{1+r^*}{1-\pi}\end{aligned}$$

Replacing π with the value obtained in equation 11 yields:

$$1+r=\frac{1+r^*}{1-\frac{D_1^f(1+r)}{\phi\overline{Y_2}}}$$

Thus, the equilibrium value of $1+r$ is given by:

$$\begin{aligned}1+r &= \frac{(1+r^*)\,\phi\overline{Y_2}}{\phi\overline{Y_2}-D_1^f\,(1+r)}\\ 0 &= D_1^f\,(1+r)^2-\phi\overline{Y_2}\,(1+r)+(1+r^*)\,\phi\overline{Y_2}\end{aligned}$$

The solution to the last equation is given by:

$$r=\begin{cases} r^* & si\,D_1\leq 0\\ \frac{2(1+r^*)D_1^{max}}{D_1}\left(1-\sqrt{1-\frac{D_1}{D_1^{max}}}\right)-1 & si\,0<D_1\leq D_1^{max}\end{cases}$$

where $D_1^{max}=\frac{\phi Y_2^H}{4(1+r^*)}$. The supply of credit has a positive slope given by:

$$\frac{dr}{dD_1}=\frac{(1+r^*)D_1^{max}}{D_1^2\sqrt{1-\frac{D_1}{D_1^{max}}}}\left(2-\frac{D_1}{D_1^{max}}-2\sqrt{1-\frac{D_1}{D_1^{max}}}\right)>0 \qquad 0<D_1<D_1^{max}$$

The credit supply also has the property that if $D_1=0$, then $r=r^*$ since there is no default risk in this case. Thus, this credit supply for a country i can be approximated by the following expression that we use in section 2:

$$r^i = r^* + \phi^i \left(\tilde{d}_1^i\right)^2 + \varepsilon^i, \phi^i > 0$$

where ε^i is a random variable that captures credit supply shocks.

C.2 2-Country Small Open Economy Model

Equilibrium Conditions

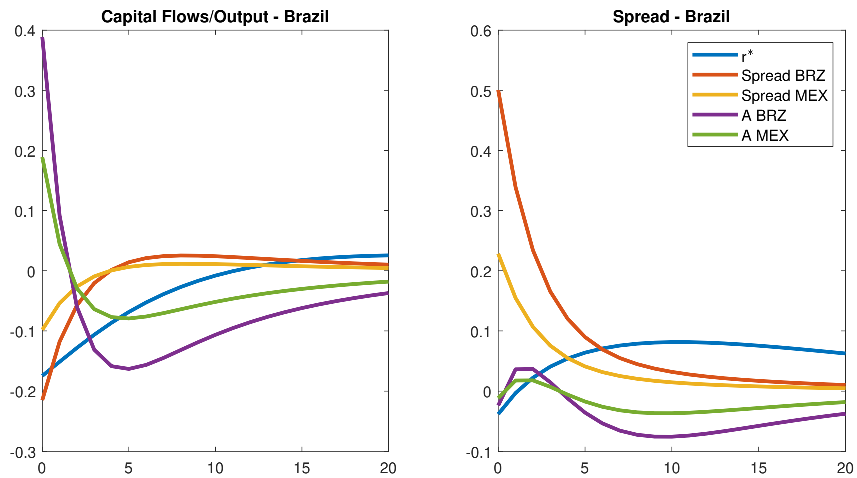
A competitive equilibrium of the model presented in Section 4 is a set of processes $\{d_t, c_t, h_t, y_t, i_t, k_{t+1}, r_t, \lambda_t\}_{t=0}^{\infty}$ that satisfies:

$$
\begin{aligned}
y_t &= A_t k_t^{\alpha} h_t^{1-\alpha} \\
k_{t+1} &= i_t + (1-\delta) k_t \\
\lim_{j\to\infty} E_t \frac{d_{t+j}}{\prod_{s=1}^{j}(1+r_s)} &\leq 0 \\
d_t &= (1+r_{t-1}) d_{t-1} - y_t + c_t + i_t + \frac{\Phi}{2}(k_{t+1}-k_t)^2 + \frac{\psi_3}{2}\left(d_t - \bar{d}\right)^2 \\
\lambda_t &= \beta (1+r_t) \mathbb{E}_t \lambda_{t+1} \\
\left[c_t - \omega^{-1} h_t^{\omega}\right]^{-\gamma} &= \lambda_t \\
\left[c_t - \omega^{-1} h_t^{\omega}\right]^{-\gamma} h_t^{\omega-1} &= \lambda_t A_t (1-\alpha) \left(\frac{k_t}{h_t}\right)^{\alpha} \\
\lambda_t \left[1 + \Phi (k_{t+1} - k_t)\right] &= \beta \mathbb{E}_t \lambda_{t+1} \left[A_{t+1} \alpha \left(\frac{h_{t+1}}{k_{t+1}}\right)^{1-\alpha} + 1 - \delta + \Phi (k_{t+2} - k_{t+1})\right] \\
\lambda_t \left[1 - \psi_3 \left(d_t - \bar{d}\right)\right] &= \beta (1+r_t) \mathbb{E}_t \lambda_{t+1} \\
\hat{R}_{i,t} &= \rho_R \hat{R}_{i,t-1} + \rho_{R^*} \hat{R}_t^* + \rho_{R1^*} \hat{R}_{t-1}^* + \rho_y \hat{y}_{i,t} + \rho_{y1} \hat{y}_{i,t-1} + \rho_i \hat{\imath}_{i,t} + \rho_{i1} \hat{\imath}_{i,t-1} + \rho_{tby} tby_{i,t} \\
&+ \rho_{tby1} tby_{i,t-1} + \gamma_{i,i} \epsilon_{i,t}^{r} + \gamma_{i,j} \epsilon_{j,t}^{r} \\
\hat{R}_t^* &= \zeta \hat{R}_{t-1}^* + \gamma_t^* \epsilon_t^* \\
\ln A_t &= \rho_A A_t + \eta \varepsilon_t^A
\end{aligned}
$$

Additional Results

Figure A.4 displays the IRFs of capital flows and country spreads in Mexico to all the shocks considered in the model.

Figure A.4 IRFs of Capital Flows and Country Spread in Brazil



Note. Response of capital flows-to-output ratio and country spreads in Brazil to a one standard deviation shock in the model. Spread BRZ (Spread MEX) denotes the IRFs to a shock to the interest rate in Brazil (Mexico). A BRZ (A MEX) denotes the IRFs to a TFP shock in Brazil (Mexico). r^* denotes the IRFs to a shock to the international interest rate.