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Ricardo J. Caballero
Alp Simsek

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ABSTRACT

In Caballero and Simsek (2018), we develop a model of fickle capital flows and show that, when countries are similar, international flows create global liquidity and mitigate crises despite their fickleness. In this paper, we focus on the asymmetric situation of Emerging Markets (EM) exchanging flows with Developed Markets (DM) that feature lower returns but less frequent crises. Relatively high DM returns help to mitigate EM crises, by reducing fickle inflows, and by providing greater liquidity. The situation dramatically changes as the DM returns fall, as this increases the fickle inflows driven by reach for yield and exacerbates EM crises.

Ricardo J. Caballero
Department of Economics, E52-528
MIT
77 Massachusetts Avenue
Cambridge, MA 02139
and NBER
caball@mit.edu

Alp Simsek
Department of Economics, E52-552
MIT
77 Massachusetts Avenue
Cambridge, Ma. 02139
and NBER
asimsek@mit.edu

Reach for yield has a bad connotation. It is often associated to investments perceived to be motivated not by the investor's deep conviction or knowledge of the receiving market but by the depressed returns in the investor's natural market. The main concern with investment flows supported by this motivation is that they tend to be fickle and exit at the first sight of trouble in local markets. Nowhere is this concern more prevalent than with the capital inflows experienced by Emerging Markets (EM) in response to very accommodative monetary policy in Developed Markets (DM).[1]

In Caballero and Simsek (2018) we develop a model of fickle capital flows and show that as long as countries are sufficiently similar, gross capital flows create global liquidity despite their fickleness, but that local policymakers underestimate the value of this global liquidity. However we also show that when returns are higher in an (infinitesimal) EM country than in other countries, then fickle inflows can be destabilizing. In this paper we follow on the latter lead and analyze the situation of a block of EM economies facing fickle foreign flows.

1 The EM Block

Consider a model with three periods, $t \in \{0, 1, 2\}$. There is a mass one of EM countries denoted by j each of which produces the same consumption good. Each country is associated with a new investment technology—a risky asset that is supplied elastically in period 0. This asset always pays R units of the consumption good, but the timing of the payoff depends on the local state $\omega^j \in \{g, b\}$ that is realized in period 1. State $\omega^j = g$ represents the case without a liquidity shock in which the asset pays off early in period 1. State $\omega^j = b$ represents the case with a liquidity shock in which the payoff is delayed to period 2. In the latter case, the asset is traded in period 1 at a price p^j that will be endogenously determined. The liquidity shocks are i.i.d. across countries with $\Pr(\omega^j = b) = \pi$, where $\pi \in (0, 1)$ denotes the probability of the shock.

[1] See, e.g., Broner et al. (2013) for widespread evidence that foreigners tend to exit during domestic turmoil (while domestic investors often retrench into domestic markets), and IMF (2012) for a summary of the domestic financial instability concerns caused by these fickle flows.

In each country j, there are two types of agents, "distressed sellers" and "banks." There is a mass one of distressed sellers that are born in period 1 with preferences given by $E[\tilde{c}_2]$. They are endowed with e units of the risky asset in period 1, and they have access to an infinitely profitable project that delivers (nonpledgeable) payoffs in period 2. Thus, they sell their endowment in period 1 to invest in the project. These distressed sellers are largely passive: their main role is to capture asset sales driven by liquidity needs.

The main agents are banks (with mass one), which are denoted by the superscript j of their locality. They are endowed with 1 unit of the consumption good in period 0. They have preferences given by $E[c_1 + c_2]$. In period 0, banks in each country j choose how much to invest in the local risky asset, $x^{loc,j}$, and how much to invest in foreign risky assets, $\left[x^{j',j}\right]_{j'}$ for $j' \neq j$. When they invest in foreign assets, these (foreign) banks are fickle as in Caballero and Simsek (2018): If the foreign country $j' \neq j$ is hit by a liquidity shock in period 1, then these banks sell all of their risky asset holdings in this country regardless of the price. In contrast, local banks in country j' are willing to increase their position in local risky assets.

We focus on a symmetric equilibrium in which all EMs invest the same amount in other EMs, $x^{j',j} = x$ for each j and $j' \neq j$ (this is without loss of generality). This also leads to symmetric asset prices, $p^j = p$ for each j country that experiences a liquidity shock in period 1. In view of linear utility, the equilibrium price in period 1 cannot exceed the risky asset payoff in period 2, $p \leq R$. However, the price can fall below this level, $p < R$, which we refer to as *fire sales*. As we will see, this situation is brought about by liquidity-driven sales by local distressed sellers and fickleness-driven sales by foreign banks, and a shortage of liquidity in the hands of local banks that could arbitrage these fire sales. We assume $e > 1$, which will ensure that there will be fire sales in equilibrium in all the scenarios we will consider.

With these assumptions, in period 0, local banks solve the following problem,

$$\max_{x^{loc},x} x^{loc}R + x\overline{R}M, \tag{1}$$

$$\overline{R} = (1-\pi)R + \pi p$$

$$M = 1 - \pi + \frac{R}{p}\pi$$

$$1 = x^{loc} + x$$

If they invest in the local asset, they hold it until maturity, which yields R units of consumption (either in period 1 or period 2). If instead they invest in foreign assets, they obtain consumption goods in period 1, either because there is no shock in the foreign market, or there is a shock and they sell in view of fickleness. The variable, $\overline{R}$, denotes the (certain) payoff in period 1 from investing abroad in a fully diversified manner. The final return from foreign investment also depends on whether there is a local shock, as the domestic shock generates a reinvestment opportunity to purchase local assets at fire-sale prices, $p < R$. The variable, M, denotes the bank's expected marginal utility from reinvestment, which combines a marginal utility of 1 in case there is no domestic shock and a marginal utility of R/p in case there is a shock.

Problem (1) illustrates that foreign investment represents a trade-off. On the one hand, the prevalence of foreign crises, combined with fickleness, reduces banks' one-period return, $\overline{R} < R$. On the other hand, the prevalence of local crises increases the expected marginal utility, $M > 1$. We resolve this tension in Caballero and Simsek (2018) and show that $\overline{R}M > R$ (when $p < R$). Thus, in period 0, banks prefer to invest in foreign assets as opposed to the local asset, $x^{loc} = 0$ and $x = 1$. Hence, the model features international capital flows (despite fickleness) because foreign assets provide liquidity during local crises to retrenching local banks.

In period 1, the market clearing condition for the risky asset in a country experiencing a liquidity shock can be written as,

$$p = \frac{\overline{R} x^{out}}{e + x^{in}}, \text{ where } x^{in} = x^{out} = x. \tag{2}$$

The denominator captures the (fire) sales from distressed sellers and fickle foreign banks. The numerator captures the total amount of cash in the market, which comes from the local banks' foreign asset positions that are determined by the past outflows. Eq. (2) illustrates that fickleness of inflows is indeed destabilizing (p drops as x^{in} rises). However, past outflows provide a stabilizing counterforce (p increases as x^{out} rises) due to retrenchment by local banks. In Caballero and Simsek (2018), we show that p rises with x. That is, gross capital flows are on net stabilizing (in a symmetric environment) since the retrenchment effect dominates the fickleness effect.

Substituting $x = 1$ and $\overline{R} = (1 - \pi) R + \pi p$ into Eq. (2), we solve for the equilibrium price:

$$p^{EM} \equiv p = \frac{1 - \pi}{e + 1 - \pi} R.$$

It is useful to contrast this with the autarky equilibrium in which banks are allowed to hold only local risky assets, $x^{loc} = 1, x = 0$. This would lead to zero fire-sale prices, $p^{autarky} = 0$, because local risky assets do not provide any liquidity during a domestic liquidity shock (as their price also falls to the fire-sale level). Hence, relative to autarky, equilibrium with capital flows features greater global liquidity and higher fire-sale prices. This raises local investment by distressed sellers in countries that experience liquidity shocks.

Finally, we find the EM block equilibrium payoff from investing abroad, which will serve as an important reference for the next section:

$$\overline{R}^{EM} \equiv (1 - \pi) R + \pi p^{EM} = \frac{(e + 1)(1 - \pi)}{e + 1 - \pi} R. \tag{3}$$

2 Reach for Yield

Suppose now that we add a large DM block to the model, with two differences from the EM block. First, the countries in the DM block do not experience a liquidity shock. Second, the payoff from the assets is lower and given by $R^f < R$. Specifically, investing one unit in DM countries' assets in period 0 delivers R^f units of the consumption good in period 1 with certainty.

Like EM banks, DM banks have preferences $E[c_1 + c_2]$. In period 0, they choose to invest locally (in DM assets) or in EM risky assets. As before, DM banks are fickle with respect to EM investments: that is, in period 1 they sell their risky asset holdings in countries that experience liquidity shocks. To simplify the analysis, we also assume that DM banks have infinite wealth.

In this setting, we need to consider the possibility of additional (fickle) inflows into EM economies from DM, as well as the possibility of outflows from EM to DM. We assume that DM banks invest an equal amount in each EM country denoted by $x^{D\to E}$. We also assume that banks in each EM country invest an equal amount into DM assets denoted by $x^{E\to D}$. As before, we use x to denote the symmetric inflows and outflows within the EM block. We also use $x^{in} = x + x^{D\to E}$ and $x^{out} = x + x^{E\to D}$ to denote, respectively, the total amount of inflows into and outflows from an EM country.

EM banks solve a version of problem (1) with the difference that they can also invest in DM assets. At an optimum, they invest their one unit of endowment in the assets that yield the highest one-period payoff. Likewise, DM banks optimally invest their wealth in the assets with the highest return. Combining the two optimality conditions, we obtain,

$$\begin{cases} x = 0, x^{E\to D} = 1 \text{ and } & x^{D\to E} = 0 & \text{if } R^f > \overline{R} \\ x, x^{E\to D} \in [0,1] \text{ and } & x^{D\to E} \in [0,\infty) & \text{if } R^f = \overline{R} \\ x = 1, x^{E\to D} = 0 \text{ and } & x^{D\to E} = \infty & \text{if } R^f < \overline{R} \end{cases} . \tag{4}$$

We also have the following market clearing condition for an EM country that experiences a liquidity shock,

$$p = \frac{\overline{R}x + R^f x^{E\to D}}{e + x + x^{D\to E}} = \frac{\max\left(\overline{R}, R^f\right)}{e + x^{in}}. \tag{5}$$

The second equality substitutes the definition of inflows, $x^{in} = x + x^{D\to E}$. It also uses the observation that outflows are equal to one, $x^{out} = x + x^{E\to D} = 1$, and they are invested in the asset with the highest return. The equilibrium prices and flows are characterized by Eqs. (4) and (5). Depending on the return on DM assets, R^f, one of four different types of equilibria can obtain.

Region I. First consider a scenario where the return in DM is relatively high, with

$$R^f > \frac{1-\pi}{1-\pi/e} R \tag{6}$$

In this region, it can be checked that all foreign investment is directed to the DM: $x = 0, x^{E\to D} = 1, x^{D\to E} = 0$, which also implies $x^{in} = 0$. Thus, EM to EM flows stop and all the liquidity hoarding by EM banks is done in DM assets. This reduces period 0 investment in EM (as highlighted by Caballero and Krishnamurthy 2006) but significantly reduces the severity of fire sales. Specifically, we have,

$$\begin{aligned} p^I &= \frac{R^f}{e} \\ &> \frac{\overline{R}^{EM}}{e} \\ &> \frac{\overline{R}^{EM}}{e+1} = p^{EM}. \end{aligned}$$

Here, the first line uses Eq. (5), the second line uses $R^f > \overline{R}^{EM}$ (in view of condition (6) and Eq. (3)), and the last line uses the observation that p^{EM} is determined by Eq. (2) after setting inflows and outflows equal to one.

In this region, trading flows with DM is a stabilizing force for the EM block, both because it mitigates fickle inflows (the third line), and because it enables EM countries to obtain greater liquidity to arbitrage local fire sales (the second line). Note that a decline in R^f reduces fire-sale prices in this region, however the reason is not fickleness but a decline in the return on the local banks' savings abroad.

Region II. Next suppose R^f continues to fall and enters the region [cf. Eq. (3)]:

$$\overline{R}^{EM} \leq R^f < \frac{1-\pi}{1-\pi/e} R. \tag{7}$$

In this region, there are inflows into the EM, $x^{in} > 0$. Thus, the returns from investing in a diversified EM portfolio are equated to R^f,

$$(1-\pi) R + \pi p^{II} = R^f. \tag{8}$$

Note that this equation implicitly defines p^{II}. The inflows can then be solved from the market clearing condition (5),[2]

$$p^{II} = \frac{R^f}{e + x^{in}}. \tag{9}$$

In this region, fickleness reemerges as captured by the positive inflows into the EM. These fickle inflows represent reach for yield since they are driven by relatively low returns in the DM block. To see this, consider a further decline in R^f. This would temporarily violate Eq. (8) and induce banks to direct foreign flows into the EM. This increases x^{in}, which in turn reduces the fire-sale price according to Eq. (9). This process continues until the fire-sale price is sufficiently low so that the indifference condition (8) is reestablished. In particular, a decline in R^f reduces the fire-sale price at a faster rate than the previous case, since in addition to reducing the local banks' savings, it also increases the fickle inflows into the country. The flip side of the increasingly severe fire sales is the rise in investment in period

[2] Using condition (7), it can be verified that the solution satisfies $x^{in} > 0$. In this equilibrium, $x, x^{D\to E}, x^{E\to D}$ are not uniquely determined (although the total inflows and outflows, x^{in}, x^{out}, are determined) since banks are indifferent between EM and DM assets.

0 (which raises one to one with x^{in}).

Nonetheless, in this region, the fire-sale prices are still higher than in the isolated EM environment of the previous section. Specifically, combining the lower bound on R^f in (7) with Eq. (8), we have $p^{II} \geq p^{EM}$.

Region III. This benign conclusion changes once R^f continues to drop and enters the region,

$$(1-\pi)\, R \leq R^f < \overline{R}^{EM}. \tag{10}$$

Here, the equilibrium is the same as in the previous case with the difference that the resulting fire-sale price satisfies, $p^{III} < p^{EM}$. Intuitively, inflows from DM are large enough that they begin to drag the price below that of the EM block in isolation. In fact, using condition (10), it can be checked that the solution also satisfies $x^{in} > 1$ and $\overline{R}^{III} = R^f < \overline{R}^{EM}$. Hence, trading flows with DM increases the fickle inflows into the EM (which used to be one), which in turn exacerbates the fire sales in EMs, and reduces the expected return below the level which the EMs could obtain in isolation.

Region IV. Finally, suppose R^f falls further so that, $R^f < (1-\pi)\, R$. In this region, all foreign flows are directed to the EM: that is, $x = 1, x^{E \to D} = 0$, and $x^{D \to E} = \infty$ (which also implies $x^{in} = \infty$). Eq. (5) then implies $p^{IV} = 0$. In particular, inflows from DM into EM are so massive that the price is the same as the autarky price. Figure 1 portrays all of these regions.

3 Taxing Capital Inflows

Since it is hard for the authorities to determine ex-ante whether capital inflows will be steady or fickle, barriers to capital flows often take the form of a tax on capital outflows (if these happen too soon or suddenly). We capture the core element of this policy by imposing a tax τ on outflows during a liquidity shock. We assume the revenues from taxes are spent on

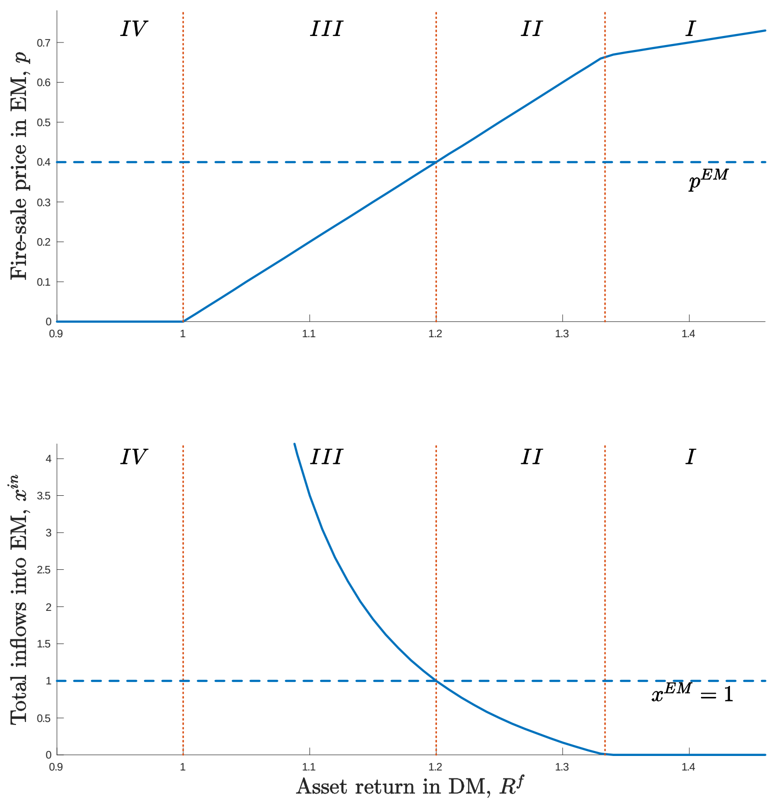

Figure 1: The solid lines plot the equilibrium fire-sale price and inflows in the EM, (p, x^{in}), as a function of the return in the DM, R^f. The dashed lines illustrate the price and inflows that would obtain in the EM block isolation (without any DM-EM flows).

unmodeled government projects (in particular, they do not contribute to liquidity in the risky asset markets). The tension is that while taxation discourages destabilizing reach-for-yield flows, in symmetric equilibrium it also discourages liquidity-creation flows.

In this context, the expected return from investing in a foreign EM country for a fickle bank is:

$$\overline{R}^{\tau} = (1-\pi) R + \pi p (1-\tau).$$

First consider the case without DM, in which all flows are for liquidity purposes. Suppose taxes are low enough that banks still prefer to invest in foreign assets. Then, following similar steps as in Section 1, the fire-sale price can be calculated as:

$$p^{EM,\tau} = \frac{1-\pi}{e+1-\pi(1-\tau)} R < p^{EM}.$$

Hence, absent any interaction with DM, taxing capital inflows is counterproductive for the EM block as a whole. However, as we show in Caballero and Simsek (2018), a single EM country with the objective of raising its fire-sale prices might still find it useful to restrict capital inflows. The reason for this discrepancy is that inflows into a country are part of global liquidity that provides financial stability benefits in other countries. A local policymaker fully internalizes the negative fickleness effect of inflows but does not internalize the positive effects on global liquidity.

Next consider the case with DM, so that there is also reach for yield. Consider regions II or III in which the returns in EM and DM are equated. With positive but sufficiently small taxes, the equilibrium is determined by [cf. Eqs. (8) and (9)]:

$$\begin{aligned} (1-\pi) R + \pi (1-\tau) p^{II,\tau} &= R^f \\ p^{II,\tau} &= \frac{R^f}{e + x^{in,\tau}}. \end{aligned}$$

The first equality implies that taxes increase fire-sale prices in the EM block, $p^{II,\tau} > p^{II}$. The second equality shows that they do so by reducing fickle inflows, $x^{in,\tau} < x^{in}$. Hence, unlike the case without DM, taxes are potentially beneficial for the EM block as a whole. Intuitively, taxes discourage fickle inflows driven by reach for yield, without having an adverse impact on the liquidity available to local banks. In our model with DM, the latter (liquidity) effect is in fact zero due to the extreme feature that there is an infinitely elastic supply of liquid assets at return R^f. This suggests that taxing capital flows can be effective in equilibrium, when the reach for yield is strong and the global liquidity supply is relatively elastic, so that the loss of liquidity from capital taxation is relatively small.

4 References

- Broner, Fernando, Tatiana Didier, Aitor Erce, and Sergio L. Schmukler (2013), "Gross Capital Flows: Dynamics and Crises," *Journal of Monetary Economics*, 60(1), p.113-133.

- Caballero Ricardo J. and Arvind Krishnamurthy (2006), "Bubbles and Capital Flow Volatility," *Journal of Monetary Economics* 53(1), p.35-53.

- Caballero Ricardo J. and Alp Simsek (2018), "A Model of Fickle Capital Flows and Retrenchment," *NBER Working Paper*, no. 22751.

- IMF (2012), "The Liberalization and Management of Capital Flows: An Institutional View," Technical Report, *IMF Staff Review.*