Sudden Stop and Sudden Flood of Foreign Direct Investment: Inverse Bank Run, Output, and Welfare Distribution

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Abstract

In this paper, I focus on a phenomenon that has not received much attention in the literature, namely that the mere expectation of foreign direct investment (FDI) incentivizes long-maturity investment projects by domestic residents, and a Sudden Stop when expectations are frustrated. Long-maturity investment projects enhance productivity but increase the economy's vulnerability to Sudden Stop. The discussion is framed in a context in which a Sudden Stop follows a surge of capital inflows (Sudden Flood), and FDI is concentrated on ongoing projects. A Sudden Stop episode can trigger a fire sale of long-term assets, output collapse, and welfare redistribution, which is another ignored phenomenon.

Keywords: Capital flows; financial crisis; speculative bubbles

JEL classification: *F*32; *F*34

I. Introduction

Despite the financial debacle in advanced economies, there is a set of emerging market economies (EMs) that have proved to be highly resilient to the subprime crisis and that are receiving sizable external capital flows. This is good news, given that prior to the subprime crisis, capital tended to flow towards advanced economies, a phenomenon labeled the global imbalance. However, EM policy-makers view capital inflows with some unease, because there have been a number of episodes in which such flows have dried up and caused major domestic problems. Large and unexpected drops in capital flows are labeled Sudden Stops in the literature, and there is ample evidence that they are accompanied by large falls in output and employment (see Calvo, 1998; Calvo and Reinhart, 2000; Calvo *et al*., 2008).

A common assumption in the body of literature on Sudden Stop is the existence of incomplete markets (e.g., credit contracts that are not

state-contingent) and collateral constraints. Under these conditions, debt deflation-type effects (Fisher, 1933) arise, and could help to magnify the impact of a Sudden Stop. Moreover, because incomplete capital markets might give rise to pecuniary externalities, market outcomes could be Pareto-dominated by government intervention (e.g., controls on capital inflows; see Mendoza, 2010; Bianchi, 2011; Korinek, 2011). This body of literature further justifies the concerns of policy-makers and offers some policy options.

Sudden Stops have received much attention in the literature because of the tumultuous events with which they are typically associated. However, the obverse phenomenon, in which there is a sudden unexpected rise in capital inflows (a Sudden Flood, hereafter), has also been studied and singled out as a possible cause of Sudden Stops (e.g., Reinhart and Reinhart, 2009; Korinek, 2011; Agosin and Huaita, 2012; Forbes and Warnock, 2012).

In this paper, I examine the impact of Sudden Stops and Sudden Floods in terms of a familiar finance model that is free from the assumption of collateral constraints and other principal-agent problems. The focus is on foreign direct investment (FDI), which makes the analysis independent and complementary to the dominant theoretical literature in this field, which focuses on credit and portfolio flows. Focusing on FDI helps to illustrate that problems associated with sudden changes in capital inflows are not necessarily remedied by imposing controls that induce changes in the composition of capital flows in favor of FDI. This belief stems from erroneously thinking that a Sudden Stop is equivalent to a reversal of capital flows, and that capital-flow reversals are unlikely if capital inflows take the form of FDI; however, by definition, a Sudden Stop is a large unanticipated fall in capital inflows. It does not necessarily entail a reversal.

The basic model is a non-monetary three-period model in which domestic residents are endowed with one unit of homogeneous output in period 0, which they can invest in two types of investment projects: a one-period or short-term project/asset (maturing in period 1), which exhibits a zero rate of return in terms of output, and a two-period or long-term project/asset (maturing in period 2), which yields a positive return. Short-term assets are valuable for individuals who need to consume in period 1 ("early consumers" or "impatient consumers"), who are hit by what might be called a liquidity shock, requiring immediate access to output, while long-term assets are welcome for more patient consumers who are prepared to wait until period 2 to consume (i.e., "late consumers" or "patient consumers"). Individuals do not know their types when they make investment decisions in period 0. An excellent exposition of this model has been presented by Allen and Gale (2007, Section 3.2), who, in addition, have assumed that in period 1 (when long-term projects have not yet matured) their output price is determined in a perfect spot (non-state-contingent) market. This assumption is also adopted here.

This paper extends the basic model to account for capital inflows. I assume that capital inflows take place in period 1, after domestic residents have chosen their portfolio compositions. These flows are aimed at purchasing long-maturity assets that have already started (i.e., projects that mature in period 2) in exchange for output. Thus, these flows are conventionally classified as non-greenfield FDI. This is arguably a realistic assumption in the context of a Sudden Flood, which is mostly driven by external financial conditions (e.g., the search for yield), which has been a dominant feature in recent capital inflow episodes. Under these circumstances, even if the information held by external investors is the same as that of domestic residents, the sheer size of the externally pushed capital inflows – not prompted by, for example, the discovery of oil wells or mineral mines – makes it unlikely that they would mostly take the form of greenfield projects, for which fresh new ideas are necessary.

Given that domestic agents make portfolio decisions at time 0 before capital inflows materialize in period 1, they have every incentive to accurately anticipate, in period 0, the size of these flows. This highlights the importance of expectations. In particular, the model implies that in equilibrium, when expected capital inflows become larger, domestic agents will increase investment in long-maturity projects. Because long-maturity projects are more productive than short-maturity projects (i.e., those that mature in period 1), it follows that larger expected capital flows have a positive effect on output and, beyond a critical point, might give rise to a boom in long-maturity asset prices. However, as the following analysis shows, if expectations do not materialize (i.e., a Sudden Stop), there will be overinvestment in long-maturity projects, possibly leading to a price meltdown.

Therefore, contrary to the outstanding body of literature, in the present model, capital inflows do not lead to overborrowing (because borrowing is ruled out by definition). Instead, they lead to overinvestment in long-term investment projects, the liquidation of which might involve capital loss. Furthermore, a Sudden Stop militates against impatient consumers whose consumption takes place in the short run (i.e., period 1). This is intuitively clear, because a Sudden Stop implies that the supply of output in period 1 (i.e., the staple that helps to feed impatient consumers) will be lower than expected. More specifically, the analysis shows that a Sudden Stop lowers the welfare of impatient consumers, while raising that of patient consumers. Thus, the effect of a Sudden Stop is not uniformly distributed across economic agents, even though this is an economy of *ex ante* identical individuals. The differential effects stem from liquidity needs, which are not uniformly distributed *ex post* (i.e., when the state of nature is revealed in period 1).

An alternative way of portraying capital inflows that are expected to materialize in period 1 (from the perspective of period 0) is as a "queue of potential investors", where, for example, each investor is endowed with one unit of output. The queue would look like an "inverse bank run". The typical image of a bank run is a queue of customers waiting in line outside a bank, attempting to withdraw their deposits. In contrast, in a capital-inflow episode, as pictured here, the queue is composed of individuals who are intent on depositing their output endowments (e.g., foreign exchange, in a realistic EM example) in the bank. The expectation of this occurring incentivizes investment by domestic residents in longer maturity, relatively illiquid, projects. However, it just takes the realization that the queue can become shorter or disappear for such incentives to decline, possibly generating a Sudden Stop.

The queue analogy is especially useful to picture a situation in which (1) potential investors, like domestic residents, are also subject to liquidity shocks (which prompts them to exchange long-maturity assets for current output), and (2) some potential investors are unable to purchase long-term assets (because of quotas, adjustment costs, etc.), but are ready to do so if the opportunity arises. This case is sketched out at the end of Section II. The presence of these rationed-out investors makes the expression "inverse bank run" more adequate because, in a typical bank run, not all customers can reach the bank tellers at the same time. Moreover, the existence of replacement investors offers an implicit insurance to potential investors, which could be subject to a liquidity shock that would prompt them to sell their long-term projects. Therefore, the existence of rationed-out investors increases the attractiveness of long-maturity projects, illustrating the possibility that this externality might give rise to a capital-inflow episode, which takes place as a result of the expectation that a capital-inflow episode is likely to occur. The resulting equilibrium is fragile and subject to global liquidity shocks, such as a rise on the rate of return of highly liquid global assets (e.g., US Treasury bills). Actually, just the expectation that international short-term interest rates will increase might trigger a Sudden Stop.[1]

II. Model and Results

In this simple example, expectations of capital inflows play a key role in enhancing domestic liquidity and inducing domestic residents to invest in

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[1] This is in line with Calvo *et al*. (1993), who have shown that capital flows in Latin America are highly sensitive to short-term US interest rates. Note that the situation would be quite different if external investors did not care about macro liquidity shocks and, for example, were prone to follow a buy-and-hold investment strategy. In that case, capital inflows would be guided mostly by long-term interest rates (e.g., US 10-year Treasury bond).

Table 1. *Pay-off of investment projects*

	Period 1	Period 2
Short-maturity project	1, or	1
Long-maturity project (or tilled land)	q, or	R

long-maturity projects. If the flows are large enough, they enhance expected welfare and give rise to a boom in asset prices and consumption. However, a Sudden Stop reverses all of this and can cause a meltdown in asset prices and significant welfare loss in some sectors of the economy.

Consider a three-period economy: periods 0, 1, and 2. In period 0, investors are endowed with one unit of output, which they must allocate to a short-maturity or long-maturity project. Short-maturity (or "liquid") projects yield one unit of output (= consumption goods) in period 1 or in period 2. However, a long-maturity project yields no units in period 1, but $R > 1$ units of output in period 2. Moreover, there is a market for long-maturity projects in period 1 where those projects can be sold at price q in terms of output or consumption goods in period 1 (see Table 1). The long-maturity project can be thought of as "tilled land". Land is tilled in period 0 and harvested in period 2. One unit of land yields R units of consumption in period 2 (i.e., R is the interest factor associated with investing in land).

Following Allen and Gale (2009, Section 3.2), I assume that the population consists of a one-unit mass of atomistic local investors, who are uniformly distributed on the [0,1] interval, and who can be either early consumers (deriving utility from consumption in period 1, exclusively) or late consumers (whose utility depends on consumption in period 2, only). Investors do not know their types until period 1. The probability of becoming an early consumer is denoted by λ, $0 < \lambda < 1$. The preference shocks are stochastically independent across investors. By the law of large numbers, this implies that the share of early consumers is non-random and equal to λ.

For simplicity, the von Neumann−Morgenstern period utility index is assumed to be the same across time; it is denoted by an increasing and strictly concave differentiable function, u, defined on the non-negative real line. The discount factor is assumed to be equal to 1. Therefore, expected utility at time 0, w, is given by

$$w = \lambda u(c_1) + (1 - \lambda) u(c_2), \tag{1}$$

where c_1 and c_2 denote consumption in periods 1 and 2, respectively. This is a perfectly competitive economy and investors take the price of

the long-maturity project in period 1 as given.[2] Let x denote the share of an investor's portfolio allocated to long-maturity projects. The budget constraint is given by the following equations:

$$c_1 = (1 - x) + qx, \tag{2a}$$

$$c_2 = \left(\frac{1 - x}{q} + x \right) R. \tag{2b}$$

Therefore, if $q > 1$, it is optimal to set $x = 1$ (i.e., to allocate the entire portfolio to long-maturity projects). However, in period 1, early consumers will try to sell their land, but there will be no takers because no one invests in the short-maturity project, which is inconsistent with market equilibrium. Similarly, if $q < 1$, the portfolio will be entirely allocated to short-maturity projects, causing excess supply of those projects in period 1. Thus, as shown by Allen and Gale (2007), a competitive equilibrium calls for setting $q = 1$. Using equations (2a) and (2b), in equilibrium $c_1 = 1$ and $c_2 = R$. Hence, in equilibrium, expected utility w satisfies

$$w = \lambda u(1) + (1 - \lambda)u(R). \tag{3}$$

Assuming that all investors choose the same x, it follows that in equilibrium $x = 1 - \lambda$.[3]

Extending the model for the case in which there is a flow of new market participants, n, each endowed with one unit of output, n can be interpreted as capital inflows. If the new participants arrive in period 0 and have the same characteristics as the locals, then the number of investors and the investment in long-maturity projects increase to $1 + n$ and $(1 + n)x$, respectively. However, the expected utility and the price and share of long-maturity projects (w, q, and x, respectively) remain the same as when $n = 0$. Moreover, once the n investors are in, they would be indistinguishable from the others. Whether they enter the economy or not makes no difference to the locals. Therefore, an episode resembling a Sudden Stop, in which at time 0 the n investors choose to invest somewhere else, has no welfare effects on the locals. This helps to highlight the central role played by expectations.

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[2] For most of the paper, the price of the long-maturity asset is non-stochastic. The only exception is the subsection *Randomness of Capital Flows*, in which capital flows are perceived as stochastic by domestic residents.

[3] The model is silent about the mechanism for achieving the correct x. The government might help by introducing small taxes. Alternatively, because this is a world of identical individuals, it is natural to assume that they expect everybody to choose the same x, implying that equilibrium $x = 1 - \lambda$. This case is the most interesting for present purposes because it helps to show that welfare redistribution associated with Sudden Floods and Sudden Stops holds even when individuals make identical portfolio decisions *ex ante*.

The situation would be quite different if the new entrants are expected to arrive in period 1 and are late consumers. Assume that the new entrants are not familiar with local conditions and would not be able to till the land in period 0. This is consistent with a plausible scenario in which newcomers do not know the technical characteristics of the land and/or associated institutional, legal, and political aspects, but are ready to commit their funds on projects that have previously been started (tilled land in our interpretation). As pointed out in Section I, this is also consistent with a situation in which domestic and external investors share the same information, and capital inflows are large; this is the case that new empirical evidence shows is relevant for episodes ending in a Sudden Stop. Hence, external investors are constrained to enter the local market in period 1 when long-term projects are already in progress, and will join the ranks of domestic late consumers. Note that the expectation that new investors will be arriving in period 1 is in line with the view, highlighted in Section I, that there is a queue of potential investors willing to purchase the illiquid asset (tilled land; i.e., an inverse bank run).

The budget constraint for the locals is the same as in the case $n = 0$, and is given by equations (2a) and (2b). First, note that equilibrium $q \geq 1$ because if, contrariwise, $q < 1$, then equations (2) imply that $x = 0$. In equilibrium, there would be no tilled land and, hence, no new entrants, which implies that the economy boils down to the initial model with no capital inflows, a case for which I have already shown that $q < 1$ is not an equilibrium outcome.

Consider now the case in which $q = 1$. Recalling equation (2a), and the fact that the mass of locals is equal to 1, the total consumption of the locals in period 1 is λ. However, the supply of consumables in period 1 equals short-maturity investment by locals, $(1 - x)$, plus the inflow of period-1 consumables from new entrants, n. By equating the supply and demand of period-1 consumables, we obtain

$$(1 - x) + n = \lambda, \qquad (4)$$

which implies that

$$1 - x = \lambda - n. \qquad (5)$$

Hence, as expected, when there are no new entrants (i.e., $n = 0$), $x = 1 - \lambda$, as in the previous case. Equation (5) holds at equilibrium if the right-hand side is non-negative. Moreover, if it is positive, the larger the number of new entrants is, the higher the share that locals will devote to long-maturity projects. The reason for this is that the new entrants provide liquid assets necessary to satisfy the demand for period-1 consumables by local early consumers. Thus, the expectation of new entrants increases the liquidity of long-term projects from the perspective of period 0, in the sense

that early consumers can exchange a larger stock of long-term projects for short-term, perfectly liquid, projects at price $q = 1$. This situation can also be expressed by saying that a "larger queue" of external investors increases the liquidity of otherwise illiquid investment projects.

Note that the gross domestic product (GDP) in period 2, Y_2, satisfies

$$Y_2 = xR. \tag{6}$$

Thus, GDP rises even though new entrants do not engage in new investment projects; they just acquire them from locals. The rise in output can be fully attributed to a liquidity effect. However, from equation (2), c_1 and c_2 remain the same. Another way of proving this is to note that, using equations (5) and (6), the GDP net of transfers to external investors, $Y_2 - nR = (1 - \lambda)R$, is independent of n. Therefore, GDP rises but the welfare of locals remains the same.

Consider now the case in which the right-hand side of equation (5) is negative. This implies that equilibrium $q > 1$. To prove this, note that, using equation (2), optimal $x = 1$: locals are fully invested in long-maturity projects (i.e., land). The supply of land in period 1 would thus be equal to λ (= land liquidation in period 1 by early consumers). However, the only participants on the demand side are new entrants, whose demand for land equals n/q. Equating the demand and supply of land, we obtain

$$q = \frac{n}{\lambda}. \tag{7}$$

Therefore, if the right-hand side of equation (5) is negative, equation (7) implies that $q > 1$. Moreover, from equations (2) and (3), the expected utility satisfies

$$w = \lambda u \left(\frac{n}{\lambda} \right) + (1 - \lambda)u(R). \tag{8}$$

Thus, as in the previous case, $c_2 = R$, irrespective of n; however, welfare w rises as n goes up, because of the higher price of land, with the benefits accruing to early consumers. As capital inflows materialize (in period 1), the price of land and period-1 consumption rise, a phenomenon that we could characterize as a boom in consumption and real estate prices.[4] Moreover, the price boom and welfare gain increase with the level of capital inflows n, even though, if $q > 1$, locals are fully invested in long-term projects and output remains the same as n increases.

Note that the decision by locals to invest in land is governed by the expectation that capital flows will take place in period 1. Thus, boom conditions associated with capital inflows are not a reflection of accumulated

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[4] In the context of an open economy, the rise in q could be interpreted as the appreciation of real currency.

flows. They result from the expectation that those flows will continue. Thus, it is the length of the queue, if you will, not the accumulated flows that play a key role here. This is the central phenomenon stressed in this paper.

Sudden Stop and Sudden Flood

What if capital inflows do not materialize and $n = 0$? This can be interpreted as a Sudden Stop episode. Incidentally, note that a Sudden Stop does not entail a capital flow reversal.[5] Suppose, for the sake of concreteness, that expected $n > 0$ implies that the equilibrium price of land $q = 1$. I call this the *ex ante* equilibrium. In the *ex ante* equilibrium, equation (5) holds, and it can be written more explicitly as

$$1 - x + n = \lambda\left[(1 - x) + qx\right], \tag{9}$$

which reduces to equation (5) if $q = 1$. The expression in square brackets is consumption by early consumers (recall equation (2a)). Long-maturity investment x is predetermined *ex post* when period 1 is reached. Hence, if n drops to $n = 0$, the price of land q must fall below 1 for equation (5') to hold, or, more intuitively, for equilibrium in period 1 to hold. This implies that early consumers will be worse off. In turn, from equation (2b), the surprise fall in q improves the welfare of late consumers. This might seem to be paradoxical, because late consumers can purchase more land from early consumers, even though total land supply is unchanged. However, the observation that the absence of capital inflow increases the supply of land available for locals quickly dispels the mystery.

This example illustrates two key features associated with Sudden Stop in practice. It can result in (1) a meltdown in real-estate prices, and (2) a drastic change in wealth and welfare distribution. Moreover, the example is especially interesting because, as noted, if n is expected to be positive and equilibrium $q = 1$, the welfare of locals will be the same that prevails under zero expected capital inflows (i.e., $n = 0$). In other words, expected capital inflows have no impact on the welfare of domestic residents if expectations are validated. However, a Sudden Stop changes wealth distribution and, in particular, hurts early consumers. Another relevant implication is that the redistribution effect of a Sudden Stop will be larger if the expected capital flows are larger.

As pointed out above, a Sudden Flood helps to motivate the assumption that FDI is aimed at projects that have already started. It is easy to verify in the model that a Sudden Flood implies an unexpected increase in the price

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[5] Here, we assume that $n = 0$, for concreteness and to save on notation. The reader can easily verify that the same qualitative results hold if the actual n is less than the expected n.
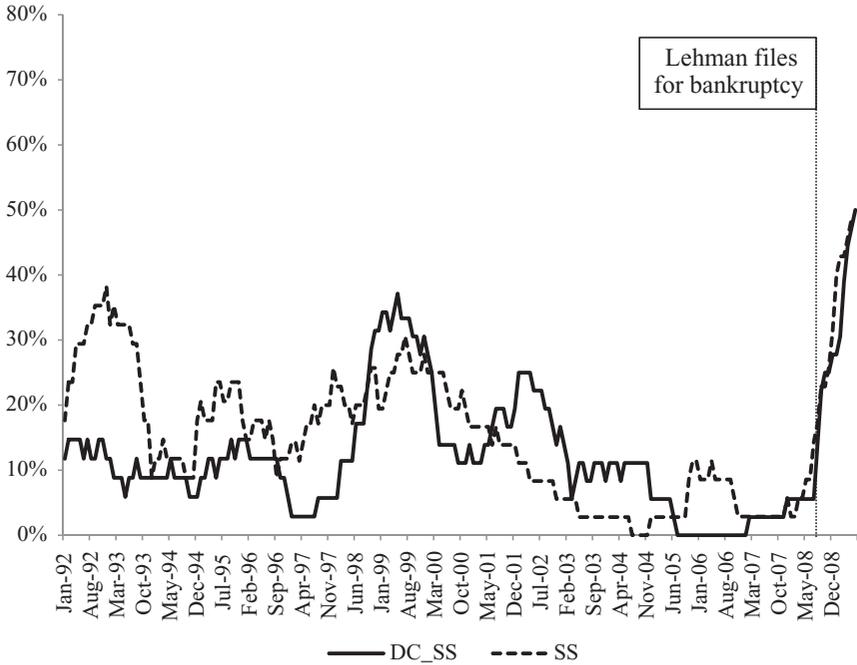
Fig. 1. Percentage of EMs exhibiting SS and DC_SS, where SS denotes Sudden Stop, involving capital flows, as defined by Calvo *et al*. (2008), and DC_SS denotes the sudden stop of domestic credit to the private sector, employing the same criterion but focusing on domestic banks' credit to the private sector. The countries included are Argentina, Bolivia, Brazil, Chile, Colombia, Czech Republic, Dominican Republic, Ecuador, Egypt, El Salvador, India, Indonesia, Korea, Malaysia, Mexico, Peru, the Philippines, Russia, South Africa, Thailand, Turkey, Uruguay, and Venezuela
Source: International Financial Statistics.

of long-term assets, *q*, and a rise (fall) in the welfare of early consumers (late consumers). Thus, once again in this instance, a sudden change in capital inflows has an effect on welfare. The model is too simple to extract policy lessons from this, but the example shows that even a shock, which under complete markets would have decidedly positive effects on welfare, might entail unwanted welfare implications, absent price stickiness, and *ex ante* income inequality.

Randomness of Capital Flows

Recent experience has clearly shown that capital flows can be highly volatile. For example, Figure 1 shows that the numbers of Sudden Stops (both external and domestic) in EMs reached unprecedented levels around

the Lehman 2008 episode, even though the epicenter of the crisis was elsewhere. Therefore, from the perspective of EMs, it is a good first approximation to take capital inflows, n, as highly idiosyncratic, capable of displaying large and whimsical swings, which are somewhat independent of the conditions of individual economies. In other words, severe financial contagion cannot be discounted, even in well-run economies.

In the previous subsection, the assumption was that Sudden Stops and Sudden Floods take individuals entirely by surprise. This assumption is likely to be realistic for the Tequila and Asian crises of the mid-1990s, but it is arguably less so going forward. A simple extension to account for the realization by individuals that the economy can undergo a Sudden Stop (which is in line with the outstanding body of literature in this field; e.g., Mendoza, 2010; Bianchi, 2011) would be to assume that capital inflows n could take two values, 0 and $N > 0$, with probabilities s and $1 - s$, respectively. Thus, the case $n = 0$ could be identified with Sudden Stop. Individuals choose x in order to maximize expected utility. The price of tilled land in period 1 will now be contingent on a Sudden Stop. By using the same reasoning as in the simpler example above, it can easily be shown that the outcome is a combination of Sudden Flood and Sudden Stop effects: $q^{ns} > 1$ and $q^s < 1$, where q^{ns} and q^s denote the price of land in the absence of a Sudden Stop and during a Sudden Stop, respectively. Note that if a Sudden Stop does not materialize (which could be interpreted as a Sudden Flood situation), the price of land would exceed 1, even though equilibrium x is interior (i.e., $0 < x < 1$).

Thus, the model can rationalize a boom in land prices based on the expectation of capital inflows, even though individuals invest in both liquid and illiquid assets (i.e., land). This makes the model undoubtedly more realistic than the simpler model above.[6] The intuition behind this result is that as individuals become aware that the economy could undergo a Sudden Stop, they have greater incentives to invest in liquid assets than if a Sudden Stop can be ruled out. This props up the price of land if a Sudden Stop does not occur (or if a Sudden Flood occurs). A parallel result, based on the same intuition, is that the meltdown of land price, in the case of a Sudden Stop if $s > 0$, is less pronounced than if $s = 0$.

Consider the case in which equilibrium x is interior (i.e., $0 < x < 1$). If the probability of a Sudden Stop is zero (i.e., $s = 0$), then n has no effect on welfare. However, if $s > 0$, then there will be wealth redistribution whether or not a Sudden Stop takes place. The beneficiaries will be early consumers if there is no Sudden Stop, and late consumers otherwise. The associated welfare volatility is unlikely to be welcome to policy-makers,

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[6] Recall that if $s = 0$ (the case studied in the previous sections) and x is interior, then equilibrium $q = 1$.

and they might want to accumulate international reserves (i.e., highly liquid assets) to make it less pronounced. This offers another rationale for the large accumulation of international reserves in EMs after the Asian 1997 crisis, even though FDI is the only capital-inflow type involved.[7]

External Liquidity Shocks

Until now, the model has assumed that capital inflows are exogenous, without providing a rationale for their volatility. However, capital flows might be affected by global financial-market conditions. A case in point is short-term nominal interest rates in the US. Empirical research has shown that these have played a prominent role in the volatility of Latin American capital inflows (e.g., Calvo *et al.*, 1993). This is not the place to discuss extensions of the model to account for these facts. However, an informal discussion in a non-monetary context might help to clarify the main picture.

   Suppose a set-up similar to the basic model above, except that the horizon extends for three more periods (i.e., periods 3, 4, and 5), which are a replica of periods 0, 1, and 2 in the basic model. In period 3, individuals start from scratch and, as in the simple model, they are endowed with one unit of output that they can allocate to land and (local) liquid asset. External investors, who entered the local market in period 1, are forced to stay in for the entire second cycle (i.e., periods 3−5); in other words, they face a repatriation friction, which turns them into locals for an additional three-period spell. Afterwards, external investors can transfer their funds abroad without cost. Let the interest-rate factor on the external liquid asset be denoted by i. Therefore, the expectation that i will rise in the next cycle might induce external investors to stay out of the local market, staging a Sudden Stop. Segmentation of liquid-asset markets might be the result of transaction costs or just expected policy actions on the part of local policy-makers, such as controls on capital outflows. The latter, in particular, could be perceived to be more likely because i is expected to rise.

   An alternative, and possibly more interesting, way to introduce the frictions of fund repatriation is to assume – in the context of the three-period model at the start of this section – that external investors are also subject to liquidity shocks after they purchase long-maturity assets in period 1. Consider the case in which, because of frictions, total FDI cannot exceed an upper bound, N. Each external investor is endowed with one unit of output, and their place in the queue is determined by a random process. If the length of the queue is less than or equal to N, then equilibrium is

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[7] See Calvo *et al.* (2013) for a framework designed to determine optimal accumulation of international reserves, which, however, abstracts from welfare loss associated with capital-flow volatility.

determined, as in the previous model. However, if the number of external investors exceeds N, only N are allowed to enter the local economy, and equilibrium is again determined as in the previous model, under the assumption that $n = N$.[8] However, under these circumstances, there will be a queue of potential external investors outside the economy in question. Suppose that between periods 1 and 2, external investors learn about their liquidity needs. If there is no queue, external investors run the risk of illiquidity because, by assumption, there is no local market where they can sell their long-term assets for output, and this lowers the expected utility from their FDI projects. However, if the queue has a positive length, external investors eager to disinvest can sell their assets that mature in period 2 for output in a spot market involving queue participants. The reader can fill in the details, but it should be clear that the existence of a queue of rationed-out investors of positive length will increase the appeal of FDI projects. However, the length of the queue might shorten if, for example, the interest rate on US Treasury bills goes up, possibly giving rise to a Sudden Stop episode.

III. Final Words

The simplicity of this paper helps to highlight the possibility that the effects of capital inflows and outflows strongly depend on asymmetry between external and domestic investors. In the model, external investors are only interested in acquiring relatively illiquid assets. In contrast, if they were indistinguishable from domestic investors, capital flows would have no effect on the welfare of domestic residents or on relative prices. At first sight, this might impress the reader as a cheap subterfuge to obtain effects that are in line with observations. However, I would claim that flows that are involved in Sudden Floods or Sudden Stops are prone to be lopsided. I have provided some rationale in this paper, but the topic is of extreme importance and deserves further discussion, which follows here.

Consider the case of Shadow Banking, which played a prominent role in the subprime crisis. Shadow banking thrives on securitization (i.e., the creation of financial assets backed by random income streams that, under normal circumstances, are not highly mutually correlated). Securitization is costly, and the cost is not the same across income streams (e.g., because of legal and information factors). Therefore, as a general rule, capital flows generated in that fashion do not benefit all sectors and income streams alike and, hence, are prone to spawn possibly large changes in relative prices. This is illustrated by the case of mortgage backed securities (MBS),

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[8] For simplicity, I assume that potential investors are not allowed to haggle over a place in the queue.

which played a prominent role in the current crisis and in sparking the real-estate boom. A worrisome difficulty with securitization is that the associated bonds are subject to what is now called a "run on repos", which is a variety of the old-fashioned bank run (Diamond and Dybvig, 1983), and therefore these are open to wild systemic swings uncorrelated with standard fundamentals (e.g., Gorton and Metrick, 2012; Calvo, 2013). A run on repos freezes up capital flows and provokes a typically dramatic change in relative prices (e.g., a real-estate meltdown).

The above considerations show that the large volatility of capital inflows in EMs could be linked to financial innovation in advanced economies, a phenomenon made evident in the 2008 Lehman crisis. This further justifies my assumptions that capital flows are largely exogenous and that they are channeled to a subset of the assets' spectrum. It is interesting to note that changes in relative prices during a business cycle have been a central concern of authors such as Hayek (2008) and Mises (1952), major representatives of the Austrian School of Economics. They have focused on credit booms but their reasoning equally applies to cycles involving capital inflows and Sudden Stops. Their concern is that credit booms might provoke large changes in relative prices, which will be costly to roll back when credit returns to normal. The mechanism they had in mind appears to involve miscalculation on the part of economic agents, who, as a result of the credit boom, mistake artificial conditions for real conditions. The model in the present paper does not contradict that view, even though agents are assumed to be fully rational. Rationality does not shield them from making mistakes when shocks are large and have a highly unanticipated component (e.g., the Lehman crisis), and markets are incomplete.

To summarize, in this paper, I have shown that the surprise component of capital inflows and outflows plays a key role in the impact that these flows have on relative prices, output, and welfare distribution. This holds in a context in which FDI cannot be rolled back, and credit flows are absent, contrary to the mainstream theoretical literature. I have also shown that capital inflows can be triggered by external financial shocks, and further stimulated by an inverse bank run. The latter is a phenomenon in which the presence of actual and potential external investors increases the liquidity of investment projects in the receiving economy. Hence, an inverse bank run amplifies the effects of external factors and makes the economy more sensitive to liquidity, as opposed to solvency or fundamental shocks.

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