

Sudden Stops of Capital Flows: Do Foreign Assets Behave Differently from Foreign Liabilities?

Autores:

Manuel R. Agosin
Juan Díaz-Maureira
Mohit Karnani

Santiago, Junio de 2017

Sudden stops of capital flows: Do foreign assets behave differently from foreign liabilities?

Manuel R. Agosin^{*1}, Juan Díaz-Maureira^{†2} and Mohit Karnani^{‡1}

¹Department of Economics, University of Chile

²Harvard University

This Version: May 2017

Abstract

We study the determinants of sudden stops in capital flows to emerging markets. Using gross international asset and liability flows (from the point of view of domestic residents), we identify three types of situations: (1) countries that do not experience any type of sudden stops; (2) those who experience a sudden stop in inflows (liabilities), but no sudden stop in their net financial account of the balance of payments; and (3) countries who suffer a sudden stop in inflows and in their net financial account. With these three events and a series of control variables, we estimate a *multinomial logit* model. The most important results are two. In the first place, we find that developed countries have about the same probability of experiencing sudden stops in gross capital inflows as emerging economies. Secondly, the probability of experiencing a sudden stop in gross inflows that winds up becoming a sudden stop in the financial account is affected by the behavior of a country's international assets: countries whose agents possess assets abroad tend to repatriate them during periods of sudden stops in inflows, while countries whose agents invest domestically are much more sensitive to the behavior of foreign investors and their humors. We also show that the correlation coefficient between changes in inflows and outflows is itself highly correlated with a whole variety of indicators of domestic financial depth, allowing us to interpret it as a proxy for financial development.

Keywords: Sudden Stop, Capital Flows, Financial Deepening

JEL Codes: E44, F32, F36, G15

*Corresponding Author. Email: managosin@fen.uchile.cl. Address: Diagonal Paraguay 205, 4th Floor, Santiago, Chile. Phone: (+56) 22 978 3984.

†Email: juadiaz@fen.uchile.cl.

‡Email: mkarnani@fen.uchile.cl.

1 Introduction

The world economy has experienced a growing process of financial liberalization and integration during the past 30 years. While foreign capital flows generate clear benefits for the recipient economies, it is also true that the sudden interruption of inflows, or outright outflows of foreign capital (which have been labeled *sudden stops* in the literature on the subject), generally have very adverse consequences for the real sector of an economy experiencing these phenomena (Mendoza, 2010; Bordo, Cavallo, and Meissner, 2010). Therefore, understanding the behavior of capital flows has become an urgent need for policymakers and has attracted considerable academic interest.

The objective of this paper is to contribute to the international literature on the subject by identifying the variables that affect the probability of a country experiencing a sudden stop in its financial account. While this question has been studied fairly exhaustively in the literature on the subject (see Agosin and Huaita (2012), and the references cited therein), the original contribution of this paper is to examine separately the behavior of changes in foreign liabilities of residents (gross capital inflows and repatriations by foreign investors) and in foreign assets of residents (gross capital outflows and repatriations by residents). We distinguish between two observations. First, a sudden stop in the capital belonging to international investors (*in-flow sudden stops*, ISS) may not translate into a sudden stop in the entire financial account (*financial account sudden stops*, FASS), since it could be accompanied by a largely simultaneous repatriation of assets held abroad by domestic investors (which are reversals of past outflows by residents), thus counteracting the sudden interruption of inflows by foreigners or outright declines in net foreign capital in the domestic economy. Second, some ISS end up becoming FASS, because the repatriation of capital held abroad by residents does not counteract the ISS.

Besides characterizing these two types of events, we identify with an econometric model, using a discrete dependent variable, which explanatory variables are relevant in the explanation of the probability of experiencing a sudden stop in inflows that winds up affecting adversely the entire financial account.

We arrive at two important results. In the first place, being an advanced economy does not make a difference with respect to the probability of experiencing an ISS; in fact, if one analyzes ISS, one finds that, on average, during the sample period, advanced economies and emerging ones have the same number of ISS episodes (two). Second, the probability of an ISS that ends up becoming a FASS is explained by the behavior of the foreign assets of residents. Generally, advanced economies have more foreign assets

than emerging economies; however, agents from some emerging economies have amassed significant foreign assets. Some of these are public (sovereign wealth funds belonging to Ministries of Finance or Central Banks) and others are private (pension funds and insurance companies). When we speak of these foreign assets we are not referring only to the stock of such assets, but rather to the correlation (or comovement) between the change in foreign liabilities and foreign assets of an economy.

In fact, we find that the larger is that correlation, the lower is the probability that an abrupt decline in foreign capital inflows (ISS) will wind up becoming a sudden stop in the financial account (FASS). The intuition behind this result is that a higher correlation between gross outflows and gross inflows implies that there is a likelihood that when foreign liabilities rise, so will foreign assets; and when there is a retrenchment of foreign capital, this is likely to be compensated by a repatriation of foreign assets, protecting the country from the adverse consequences of an ISS. For small and financially open economies, this may be crucial to avoid a domestic recession whenever international financial markets are in a risk-off mode.

In order to fix ideas with respect to the mechanism or economic rationality behind the correlation that may exist between changes in international assets and liabilities, one might think of the following hypothesis. When a country suffers, for exogenous reasons, an ISS, it will experience two impacts that are relevant for this discussion: if the country is on a flexible exchange rate regime, it will experience exchange rate depreciation; and domestic asset prices will fall in both domestic and foreign currency. If the domestic investors of the country experiencing the ISS have previously invested in foreign assets, the currency-depreciation-cum-domestic-asset price declines could create large incentives for capital repatriation¹. This mechanism can be set in motion only when two conditions pertain: domestic agents have sufficient foreign assets, and foreign assets and foreign liabilities move, in a meaningful interval of time, in the same direction (e.g., declining liabilities lead to, or are accompanied by, declining assets)². This will particularly

¹The causality between foreign liability declines and foreign asset depletion is difficult to test. However, if ISS leads and foreign asset depletion follows, one would expect the sequence to involve falling foreign liabilities, leading to currency depreciation and domestic asset price declines, which encourages domestic agents with assets abroad to sell some of those assets and repatriate capital. Such repatriations would be followed in turn by some reversal in the original currency depreciation and asset price declines.

²If domestic wealth holders behave the same way as foreign investors, the ability of domestic investors to invest abroad would exacerbate ISS rather than moderate them. If, on the other hand, the horizons and objectives of domestic investors are centered on the domestic economy, then the hypothesized effects of holding assets abroad would hold. Think of a pension fund in an emerging economy that has to accumulate assets to pay pensions in the domestic currency. Its objectives and horizons are quite different from

be the case with institutional investors with high contingent liabilities in domestic currency.

This mechanism is possible if agents in the recipient economy possess international assets and these tend to move in a compensating direction (e.g., when foreign liabilities decline, so do foreign assets). This means that, at the end of the day, a necessary condition for the depletion of foreign assets by domestic agents to counteract an ISS is the existence of a sufficiently developed domestic financial sector that can sustain foreign investment by large financial intermediaries. If this is the case, it would mean that domestic institutional investors such as pension funds, insurance companies and the like have an important role in the domestic financial market and also invest abroad. Individual investors may tend to act in a similar fashion as institutional investors, taking the opportunity to repatriate capital when the exchange rate depreciates and financial asset prices are depressed by their liquidation by foreign investors in the domestic economy. In the absence of stock and bond markets of a significant size and of large institutional investors, ISS are likely to result in FASS.

In this context, there is a large difference between advanced economies, on the one hand, and emerging and developing economies, on the other. The former exhibit a high correlation between changes in international liabilities and changes in international assets, while in the latter this correlation is generally much lower.

Our study, while resembling other recent work, has three novel characteristics that are worth highlighting. The first one is that, while the majority of existing studies identify only two events (experiencing or not experiencing a sudden stop in the financial account), our paper attempts to go farther, by identifying three types of events: (i) experiencing neither an inflow sudden stop (ISS) nor a financial account sudden stop (FASS); (ii) experiencing an ISS, but not a FASS; and (iii) experiencing simultaneously an ISS and a FASS.

The second innovation with respect to recent literature on the subject is that we carry out a multinomial logit econometric study (with the three events described in the preceding paragraph as endogenous variables), incorporating to the list of explanatory variables a new variable that we have not seen in previous studies: the historical correlation between the annual variation in international assets and liabilities of a country's residents, which

those of a foreign investor in the country's stock market: pensions are paid in domestic currency; moreover, if the pension fund has reasonable (not to say, rational) expectations, it will expect an eventual bounce back in domestic financial asset prices and in the domestic currency.

can be interpreted as a proxy for the degree of development of a country's domestic capital market.

The third innovation is a verification that cross country differences in the correlation between changes in international liabilities and international assets can indeed be explained by the depth of domestic financial markets: a wide array of indicators of domestic financial depth are significantly correlated with the correlation coefficient between changes in international liabilities and international assets.

Our study intends to be an addition to what we know from recent contributions to the analysis of sudden stops in the financial account. Rothenberg and Warnock (2011) differentiate between types of sudden stops. In effect, they argue that a sudden stop in the financial account can be due to a sudden stop or a reversal in foreign capital inflows by foreign investors. This is what they call a *true sudden stop*. However, a FASS can also be the consequence of a sudden and significant outflow of capital by residents (*sudden flight* or *sudden start*). These authors find that almost one half of FASS are really sudden starts and that true sudden stops are much more damaging in terms of lost output and cause larger depreciations in the real exchange rate³. This study differs from Rothenberg and Warnock's in that we focus attention on the abrupt and significant interruption of foreign capital inflows (ISS) and ask the question of why some of these events are counteracted by the behavior of foreign assets owned by residents and why others are not. While the former do not wind up as FASS, the latter definitely do.

Forbes and Warnock (2012) also distinguish between changes in foreign liabilities and foreign assets. They find that, generally sudden stops in foreign liabilities (what we call ISS) tend to be correlated with compensating capital repatriations by domestic asset owners. The coefficient they find, while significant, is much lower than the ones we report for developed countries and higher than the one we estimate for emerging economies, perhaps because they do not differentiate between them. At the same time, capital inflow surges by foreigners are also correlated with domestic capital outflows. The econometric analysis they perform suggests that the major cause behind capital flow changes is perceived international risk and that domestic factors play a much less important role.

Another study (Cowan, De Gregorio, et al., 2007) is closer in spirit to ours. They also differentiate between sudden stops that are caused by the behavior of foreign investors (*inflows*) and those that are the conse-

³Cavallo, Powell, et al. (2015) reach a similar conclusion and further provide a much more specific taxonomy of sudden stops in order to identify which ones are more disruptive.

quence of the saving and investment decision of a country's residents (*outflows*). In this study, the authors also show that, in emerging economies, the former are the most damaging in terms of production and investment. They also show that *inflow sudden stops* are as likely to occur in emerging as in developed economies, arguing that the difference between these two groups of countries lies in the behavior of *outflows*. Finally, with the use of linear regressions, these authors show that the covariance between inflows and outflows is larger the higher is a country's income level and the greater are its stocks of foreign assets.

The paper is organized in the following manner. Section 2 describes the data used and the stylized facts that can be coaxed from them. Section 3 identifies the episodes that constitute the centerpiece of the study: *sudden stops* in foreign capital inflows that do not wind up being *sudden stops* in the financial account; and ISS that effectively end up being a FASS. Section 4 carries out a multinomial logit exercise in order to test the paper's hypotheses. Section 5 shows that the correlation coefficient between changes in foreign assets and liabilities is well explained by a large array of measures of domestic financial depth. Section 6 concludes.

2 Data and Some Stylized Facts

In this study we use data for 59 countries, of which 22 are developed economies and the rest emerging economies. The frequency of the information is annual, and covers from 1976 through 2010. The complete list of countries is shown in Appendix A.

We define *inflows* as the as the net change in international liabilities of residents (inflows into country i in period t are denoted by I_{it}). Note that this variable can be positive or negative. If it is positive it means, that in net terms, the international debt of residents (or the net level of foreign direct investment (FDI) stocks owned by foreign companies, or the stock of shares in domestic firms owned by foreigners in the country) has risen; while a negative value implies a decline in the levels of such debt (or in FDI or share).

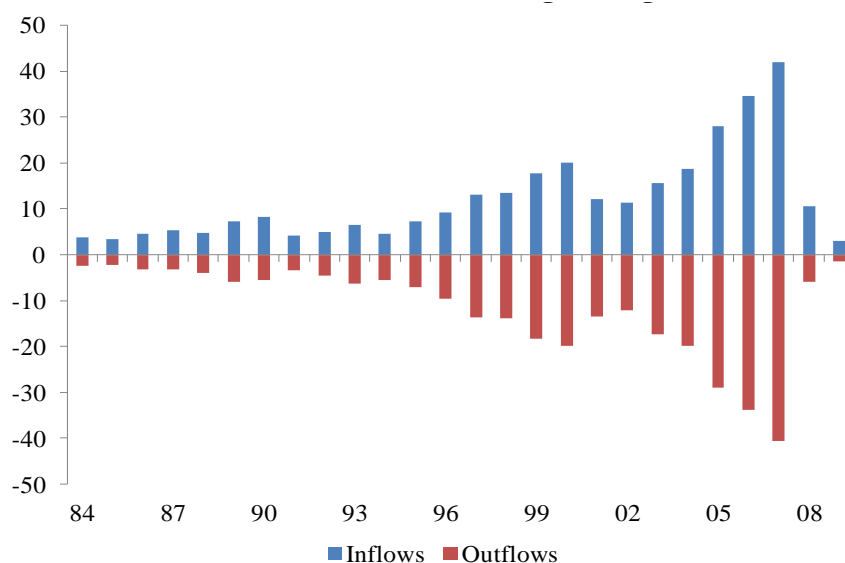
On the other hand, *outflows* correspond to changes in the assets of residents abroad. These assets can take the form of FDI by domestic firms, stock or bond purchases by residents, or debt of foreigners to residents. They can also be positive or negative. If international assets increase, *outflows* are positive; if they decline, they are negative. The outflows from country i in period t are denominated O_{it} . Combining inflows and outflows, we obtain

country i 's financial account in period t : $FA_{it} = I_{it} - O_{it}$.

We use data from International Financial Statistics (IFS) of the International Monetary Fund and the World Bank's World Development Indicators (WDI). Most of the variables we use are scaled to GDP, constructing the latter as a quadratic trend of actual GDP. Details on the specific source of the data are shown in Appendix B.

When one looks at a graphic presentation of the changes in international assets and liabilities, the first thing that draws one's attention is the clear difference that exists between advanced and other economies as regards the evolution of outflows. In Figure 1, the behavior of outflows looks like a mirror image of inflows (symmetry), while for emerging economies (Figure 2) there is no such mirror image. In the latter, the behavior of outflows is more asymmetric, especially in the 1980s and 1990s. On the other hand, while there are great differences with regard to their levels, the evolution over time in inflows is quite similar between advanced and other economies.

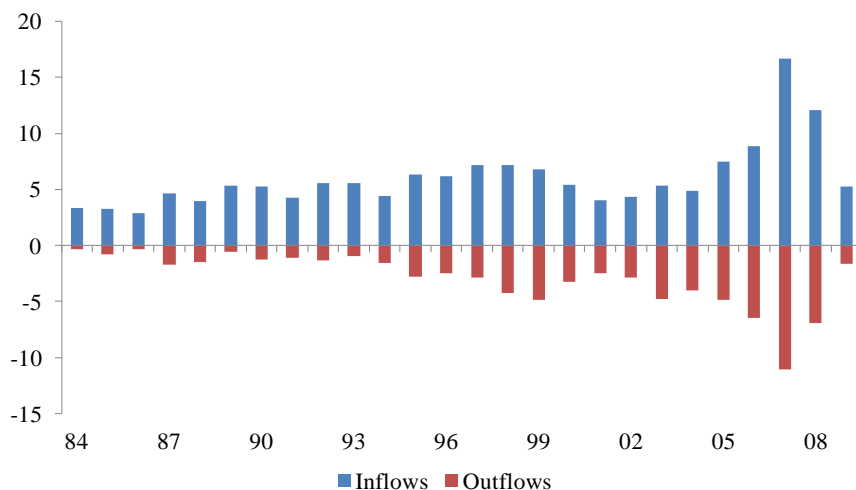
Figure 1: Average of Inflows and Outflows (as % of GDP) in Advanced Economies (Outflows are shown with negative sign)



Source: Authors' calculations based on IMF's data.

Moreover, as shown in Table 1, if one compares the volatility of the annual change in inflows as between these two kinds of countries, one finds that such volatility is not greater for emerging and developing countries than for advanced countries, which is line with one of the findings of Cowan, De

Figure 2: Average of Inflows and Outflows (as % of GDP) in Emerging Economies (Outflows are shown with negative sign)



Source: Authors' calculations based on IMF's data.

Gregorio, et al. (2007). Where one does find a significant difference between these two groups of countries is with regard to the annual changes in the financial account as a whole. This reinforces the idea that the key difference lies in the behavior of international assets owned by residents. Broner and Rigobon (2005) have already noted the greater volatility in the financial account of emerging economies, as compared to that of developed countries.

Table 1: Average and median of the standard deviation of ΔFA and ΔI per type of economy

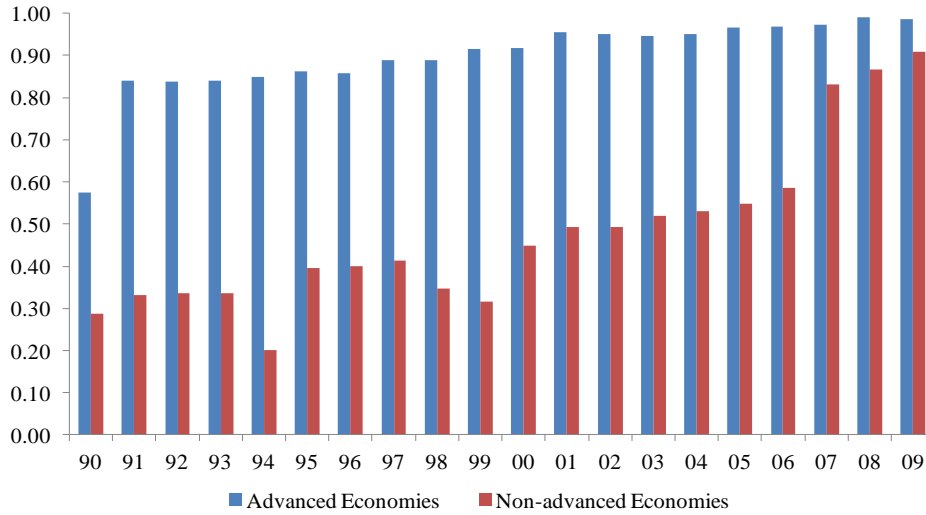
	$\sigma_{\Delta FA}$		$\sigma_{\Delta I}$	
	Mean	Median	Mean	Median
Advanced Economies (22)	3.58	3.14	10.49	5.99
Non-Advanced Economies (37)	5.45	4.94	7.04	5.53

Source: Authors' calculations based on IMF's data.

Finally, if one analyzes the correlation coefficient between the annual change in international assets and liabilities⁴, one can verify that it has been much higher in advanced rather than in emerging economies. It should also be noted that this correlation rose during the decade of the 2000s for emerging economies (Figure 3 and Figure 4).

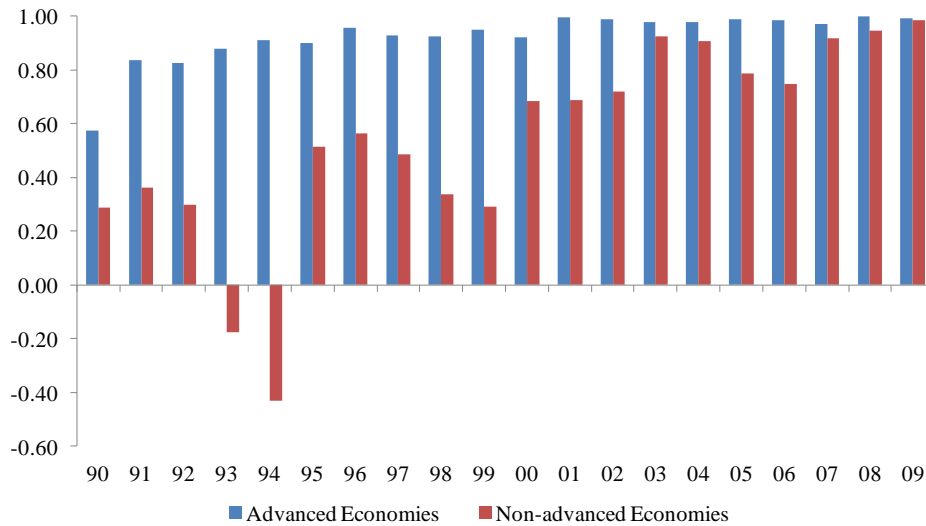
⁴Calculated with moving windows of five years, as well as with windows with a fixed initial year.

Figure 3: Correlation Coefficient between the average of ΔI_t and ΔO_t (as a % of GDP) using a recursive window (variable end and fixed beginning)



Source: Authors' calculations based on IMF's data.

Figure 4: Correlation Coefficient between the average of ΔI_t and ΔO_t (as a % of GDP) using rolling windows of 5 years



Source: Authors' calculations based on IMF's data.

3 Identifying Booms and Sudden Stops

3.1 Boom Episodes

Following Agosin and Huaita (2012) and the references to be found therein, we define a capital boom in the financial account of country i period t if the following condition can be verified:

$$BA_{it}^{FA} = \begin{cases} 1 & \text{if } FA_{it} > \bar{FA}_i + \sigma_{FA_i} \text{ and } \frac{FA_{it}}{GDP_{it}} > 5\% \\ 0 & \text{otherwise} \end{cases}$$

where FA_{it} is the value of the financial account of country i in period t , \bar{FA}_i is its mean in the whole sample period and σ_{FA_i} is its standard deviation. Note that both the mean and the standard deviation are country-specific parameters. Applying this rule, we identify 177 financial-account boom episodes (12 percent of the observations in the sample), where 42 took place in advanced economies and 135 in non-advanced economies. The detailed list of episodes is shown in Appendix A.

In the same fashion, we can identify the inflow boom episodes for country i in year t , if the following pertains:

$$BA_{it}^I = \begin{cases} 1 & \text{if } I_{it} > \bar{I}_i + \sigma_{I_i} \text{ and } \frac{I_{it}}{GDP_{it}} > 5\% \\ 0 & \text{otherwise} \end{cases}$$

where I_{it} the inflows (increases in foreign liabilities) of country i in year t , \bar{I}_i is its mean in the sample period and σ_{I_i} its standard deviation.

With this criterion, as shown in Table 2, we find 206 inflow boom episodes (13 percent of the total number of observations), of which 68 took place in advanced economies and 138 in non-advanced economies. Of the 206 inflow boom episodes, 101 ended up as financial account booms, while in the other 105 episodes there was a compensation coming from a contraction in outflows (declines in assets held abroad by residents). Most of the booms in inflows that became a boom in the financial account (about 90%) took place in non-advanced economies.

Table 2: Number of episodes of boom in I and FA and coincidences per type of economy (22 advanced and 37 non-advanced countries)

Type of event	Number of episodes		
	Total	Advanced economies	Non-advanced economies
Boom of inflows	206	68	138
Boom of financial account	177	42	135
Coincidences	101	11	90

Source: Authors' calculations based on IMF's data.

3.2 Sudden Stop Episodes

In order to identify a sudden stop in the financial account (FASS), we follow Guidotti, Sturzenegger, and Villar (2004) and Agosin and Huaita (2012), who define an FASS as a year in which the annual decline in the financial account is at least one standard deviation larger than its average and, at the same time, this decline is at larger than 5 percent of GDP. In other words, the following conditions must obtain:

$$SS_{it}^{FA} = \begin{cases} 1 & \text{if } \Delta FA_{it} < \Delta \bar{FA}_i - \sigma_{\Delta FA_i} \text{ and } \frac{\Delta FA_{it}}{GDP_{it}} < -5\% \\ 0 & \text{otherwise} \end{cases}$$

where $\Delta FA_{it} = FA_{it} - FA_{it-1}$ is the annual change in the financial account. We found 96 FASS episodes (6.5 percent of the sample).

Using the same metric, we attempted to find the years in which an ISS had taken place:

$$SS_{it}^I = \begin{cases} 1 & \text{if } \Delta I_{it} < \Delta \bar{I}_i - \sigma_{\Delta I_i} \text{ and } \frac{\Delta I_{it}}{GDP_{it}} < -5\% \\ 0 & \text{otherwise} \end{cases}$$

where $\Delta I_{it} = I_{it} - I_{it-1}$ (the annual variation in inflows). We found 121 episodes of ISS, corresponding to 8.2 percent of the sample (see Table 3).

Table 3 shows that more than 80 percent of the coincidences between episodes of ISS and FASS took place in non-advanced economies. On average, we find that both, advanced economy and non-advanced economies, experienced approximately two episodes of ISS during the period considered. However, the numbers are quite different when we examine the ISS that coincided with FASS (row of "coincidences" in Table 3). In effect, the

Table 3: Number of episodes of sudden stop in I and FA and coincidences per type of economy (22 advanced and 37 non-advanced countries)

Type of event	Number of episodes		
	Total	Advanced economies	Non-advanced economies
Sudden stops in inflows	121	43	78
Sudden stops in financial account	96	22	74
Coincidences	49	9	40

Source: Authors' calculations based on IMF's data.

average advanced economy suffered only 0.4 episodes of this nature during the period. By contrast, the average non-advanced economy (emerging or developing) suffered one full episode of sudden stops in inflows and financial account during the period.

4 Econometric Analysis

In this section, we carry out a simple econometric analysis to allow us to determine which variables are important in preventing a sudden stop in inflows from becoming a sudden stop in the financial account. For this purpose, and using the episodes identified in the previous section, we define a discrete variable that takes three values:

$$D_{it} = \begin{cases} 0 & \text{if } SS_{it}^I = 0 \\ 1 & \text{if } SS_{it}^I = 0 \text{ and } SS_{it}^{FA} = 0 \\ 2 & \text{if } SS_{it}^I = 0 \text{ and } SS_{it}^{FA} = 1 \end{cases}$$

The intuition behind this variable is evident: it allows us to differentiate between an ISS that does not become a FASS ($D_{it} = 1$) from an ISS that does end up as a FASS ($D_{it} = 2$). Clearly, the difference between $D_{it} = 1$ and $D_{it} = 2$ is determined by the behavior of *outflows*. We consider that the base scenario is that there is no ISS ($D_{it} = 0$). This is the endogenous variable in all the econometric estimates that follow, and also what distinguishes this study from others that have preceded it.

The model we estimate is a multinomial logit, in which the probabilities of the three states that the endogenous variable can take are given by the following expressions:

$$\Pr(D_{it} = k) = \frac{\exp(X'_{it}\beta_k)}{1 + \sum_{j=1}^2 \exp(X'_{it}\beta_j)}, \quad \forall k \in \{0, 1, 2\},$$

where X_{it} is a vector of explanatory variables (detailed below), and β_j ($j = 1, 2$) are parameter vectors to be estimated. Note that in this methodology each value taken by the endogenous variable is associated with a parameter vector (except for the base case of $D_{it} = 0$, where the parameters are set to zero). With the probabilities so defined, we construct a likelihood function, and the estimation is carried out by maximum likelihood.

Vector X_{it} includes a series of economic variables that one might *a priori* think affect the probability of experiencing an ISS without at the same time suffering a FASS. It also includes variables that one might expect would cause both an ISS and a FASS. The following variables are included: (i) terms of trade (annual percentage change, lagged one period); (ii) lagged fiscal deficit as a percentage of GDP; (iii) having experienced an inflow boom the year before⁵; (iv) a dummy variable equal to one for advanced economies; (v) the lagged level of international assets and liabilities (as a share of GDP); and (vi) the lagged change in international assets and liabilities (as a percentage of GDP). Most of these variables are entered as potential explanatory variables in previous studies that attempt to study the determinants in FASS.

In addition to the variables mentioned above, in this study we add a novel explanatory variable that we have not seen in previous studies. This is the correlation between I_{it} and O_{it} (correlation between changes in international assets and liabilities) over the past five years. In other words, if we label this variable as $corr_{it}$, then $corr_{it}$ would be defined as the correlation coefficient between $\{I_{it-1}, \dots, I_{it-5}\}$ and $\{O_{it-1}, \dots, O_{it-5}\}$ ⁶.

In order to grasp the intuition behind the inclusion of this variable, one could argue that a higher $corr_{it}$ would not affect the probability that a country underwent a *sudden stop* only in *inflows*, since this event would be explained to a larger extent by other factors (terms-of-trade deterioration, having experienced a preceding *boom* in *inflows*, among others); however, it should affect the probability of a *sudden stop* in inflows not winding up being a *sudden stop* in the *financial account* as a whole.

In other words, if this variable is statistically significant, a country's international financial assets would be playing an important role in counteracting the abrupt exit of capital during an *inflow sudden stop* (falls in the

⁵Note that Agosin and Huaita (2012) find that previous booms in the financial account are the most significant variables explaining FASS in non-advanced economies.

⁶There is obviously an element of arbitrariness in defining the length of the window use to estimate the correlation coefficient (five years in our case). We did carry out a sensitivity exercise with a window of seven years, but the results are practically the same.

changes in international liabilities)⁷ and in preventing the financial account from deteriorating⁸.

Before presenting the results, a technical comment is in order. There have not been methodological advances allowing the estimation of a fixed-effects panel with a discrete endogenous variable. As regards this paper, while the database and the episodes we identify do generate a panel (several countries observed at various points in time), the non-linearity of the probabilities does not allow us to explore entirely the wealth of the panel.

In order to understand well this argument, note that in a panel one incorporates fixed effects for countries or time periods. However, estimating each one of these fixed effects is infeasible: asymptotically, when the number of countries increases and tends to infinity, we would have to estimate an infinite number of parameters. On the other hand, omitting them yields inconsistency in the remainder of the parameters one is estimating. Therefore, when the functional form to be estimated is linear in the parameters, they are estimated using the variables after correcting by their time-period averages (or their lags), which leads to the disappearance of the fixed effect in the estimation (its average is the fixed effect of each country), generating consistent estimates for the remaining parameters.

This correction cannot be used when the functional form to be estimated is non-linear. Therefore, in order to avoid omitting the fixed effects from the estimation, some solutions have been proposed (Wooldridge, 2010). For example, one may use random effects rather than fixed effects (even when it may not be correct to do so). In other words, one has to assume a probability distribution that follows random effects, which reduces considerably the dimension of the problem (by having to estimate less parameters). Nonetheless, this approach is not exempt from criticism. Unfortunately, the up-to-date advances in the study of a multinomial logit with panel data and fixed effects do not allow us to use a better procedure. For this reason, the results we show below are those that emerge from the estimation of a pooled multinomial logit study (omitting fixed effects).

In Table 4 we present the results of the estimations. We report the marginal effects of each variable on the probabilities of the events: in other words, how much does the probability of an event increase when an exoge-

⁷When the sudden stop in inflows is acute, the level of international liabilities could shrink.

⁸Conventionally, a sudden stop is defined as the second derivative with respect to time of the relevant stock variable – either the net international financial position (with a negative sign), when referring to the financial account as a whole, or international liabilities, when the concept is applied to inflows.

nous variable increases in one unit.

We highlight three results. First, a country that experiences an inflow boom in year $t - 1$ is highly likely to experience a sudden stop in inflows in year t (which may or may not end up as a sudden stop in the financial account). This result is in line with those of Agosin and Huaita (2012), who find that a boom in the net inflows (the financial account as a whole) is the variable that most strongly explains later sudden stops. Note that the difference in our findings from those of Agosin and Huaita (2012) is that ours relate to gross inflows (increases in foreign liabilities). Sula (2010) also finds that surges in capital inflows precede sudden stops, especially when accompanied by a high current account deficit or an appreciated real exchange rate.

Secondly, as we earlier sensed from the descriptive analysis on boom and sudden stop episodes, the advanced economy dummy shows no statistical relevance on the probability of undergoing an ISS. Nevertheless, as Reinhart and Calvo (2000) explain, the odds of experiencing a FASS are lower for advanced than for non-advanced economies. Indeed, an investor shouldn't worry much if the recipient economy is an advanced one or not when she is in immediate need of her funds. Being an advanced economy will play a key role when analyzing the behavior of international assets held abroad, as they may offset the any abrupt stop of external funding when being repatriated.

Lastly, the historical correlation between the change in inflows and outflows also plays a fundamental role in explaining the probability of turning an ISS into a FASS. When this correlation is higher, the chances of an ISS turning into a FASS drop significantly. The mechanism is straightforward: when international assets and liabilities vary in a similar fashion, a sudden reduction of foreign assets on domestic soil is countervailed with a return of domestic assets that had been held abroad. As discussed earlier, this is more often the case in advanced economies, as they exhibit higher correlations between inflows and outflows variations than non-advanced economies.

When interpreting the result, one might think that when a country suffers an unexpected flight of foreign capital, among other consequences, an exchange rate depreciation is to be expected along with a decline in the prices of domestic financial assets. If domestic agents (be they public or private) hold international assets abroad, the incentives to repatriate them rise, as the domestic currency depreciates and asset prices generally fall, often overshooting any reasonable measure of their fundamentals.

Table 4: Marginal Effects of Estimated Pooled Multinomial Logit Model

Explanatory variables	Marginal Effects							
	(1)		(2)		(3)		(4)	
	Pr($D_{it}=1$)	Pr($D_{it}=2$)	Pr($D_{it}=1$)	Pr($D_{it}=2$)	Pr($D_{it}=1$)	Pr($D_{it}=2$)	Pr($D_{it}=1$)	Pr($D_{it}=2$)
A. Boom in inflows (dummy variable, 1=boom, 0=otherwise, lagged)	0.133 (0.028)***	0.107 (0.026)***	0.139 (0.029)***	0.090 (0.024)***	0.130 (0.029)***	0.082 (0.025)***	0.133 (0.031)***	0.074 (0.025)***
B. International Assets (as % of GDP, lagged)	0.000 (0.000)***	-0.001 (0.000)***	0.000 (0.000)***	0.000 (0.000)	0.000 (0.000)***	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
C. Type of economy (dummy variable, 1=advanced, 0=otherwise)	-	-	0.010 (0.009)	-0.018 (0.008)***	-	-	-	-
D. Correlation between inflows and outflows (rolling window of 5 years, lagged)	-	-	-	-	0.033 (0.012)***	-0.016 (0.009)*	0.032 (0.014)**	-0.021 (0.009)**
E. Terms of trade (annual growth)	-	-	-	-	-	-	-	-
F. Fiscal deficit (as % of GDP, lagged)	-	-	-	-	-	-	0.000 (0.001)	0.000 (0.001)
G. Change in International Assets (annual change, as % of GDP, lagged)	-	-	-	-	-	-	-	-
Pseudo R ²	0.12		0.13		0.12		0.12	

Note: The endogenous variable differentiates a sudden stop in inflows that does not end in a sudden stop in the financial account ($D_{it} = 1$) from a sudden stop in inflows that does end in a sudden stop in the financial account ($D_{it} = 2$). The base scenario is no sudden stop in inflows ($D_{it} = 0$).

Table 4: Marginal Effects of Estimated Pooled Multinomial Logit Model (continued)

Explanatory variables	Marginal Effects					
	(5)		(6)		(7)	
	Pr($D_{it}=1$)	Pr($D_{it}=2$)	Pr($D_{it}=1$)	Pr($D_{it}=2$)	Pr($D_{it}=1$)	Pr($D_{it}=2$)
A. Boom in inflows (dummy variable, 1=boom, 0=otherwise, lagged)	0.153 (0.049)***	0.034 (0.026)	0.16 (0.052)***	0.033 (0.026)	0.163 (0.053)***	0.032 (0.025)
B. International Assets (as % of GDP, lagged)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
C. Type of economy (dummy variable, 1=advanced, 0=otherwise)	-	-	-	-	-	-
D. Correlation between inflows and outflows (rolling window of 5 years, lagged)	0.034 (0.021)	-0.015 (0.009)*	0.03 (0.027)	-0.021 (0.009)**	0.029 (0.026)	-0.021 (0.009)**
E. Terms of trade (annual growth)	0.002 (0.001)**	0.000 (0.000)	0.003 (0.001)*	0.000 (0.000)	0.003 (0.001)**	0.000 (0.000)
F. Fiscal deficit (as % of GDP, lagged)	-	-	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
G. Change in International Assets (annual change, as % of GDP, lagged)	-	-	-	-	0.000 (0.000)	0.000 (0.000)***
Pseudo R ²	0.17		0.16		0.181	

Note: The endogenous variable differentiates a sudden stop in inflows that does not end in a sudden stop in the financial account ($D_{it} = 1$) from a sudden stop in inflows that does end in a sudden stop in the financial account ($D_{it} = 2$). The base scenario is no sudden stop in inflows ($D_{it} = 0$).

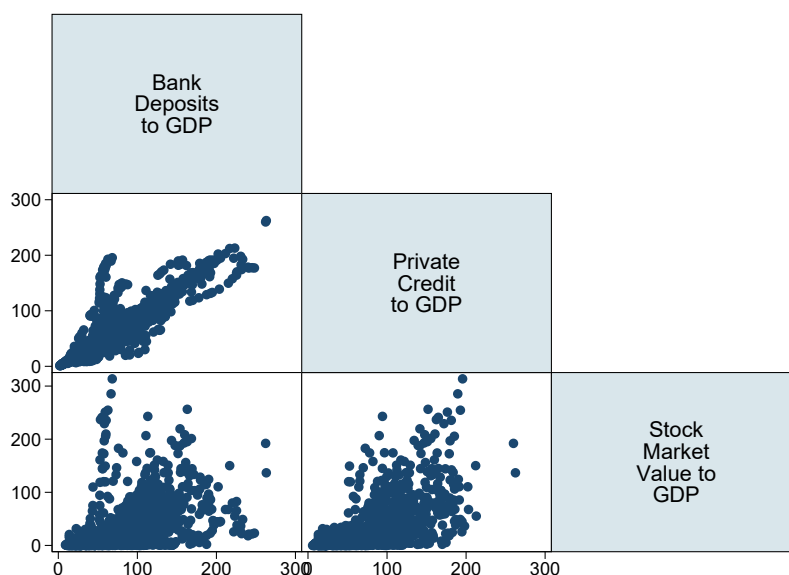
5 Flow Correlation and Financial Development

In order to assess whether the historical correlation of flows can be interpreted as a proxy for financial development, we carry out a simple robustness exercise. Using different indicators of financial development introduced by Beck, Demirgüç-Kunt, and Levine (2000)⁹, we study the comovement between our historical correlation variable and these financial-deepening measures.

For the sake of simplicity, we focus on three variables¹⁰ that proxy financial development in different ways: (i) Bank Deposits to GDP, (ii) Private Credit to GDP and (iii) Stock Market Value to GDP. For details on the exact definition and source of these variables, see Appendix C.

Firstly, we compute a simple correlation matrix of these three indicators. It's easy to see how all of them are positively correlated by looking at Figure 5, which shows three scatter plots, one for each pair of variables. The axes show the values for each corresponding variable in percentage points.

Figure 5: Matrix scatter plot of three financial development variables



The linear correlation coefficient between bank deposits and private credit is 0.87, between bank deposits and stock market value is 0.45 and

⁹These were further expanded and updated by Beck, Demirgüç-Kunt, and Levine (2009) and Cihak et al. (2012).

¹⁰It's worth clarifying that the following exercises were held with over twenty different variables that proxy financial development. We obtained similar results with each of them.

between private credit and stock market value is 0.63; all of them significant at the 1% level. The latter confirms that we will compare our correlation variable with indicators that do not differ substantially and that similarly proxy financial development.

Secondly, we compare the 5-year correlation of inflows and outflows against these three measures. We do this by estimating a simple linear model of the form

$$\rho_{it} = \alpha + \beta x_{it} + \varepsilon_{it},$$

where x_{it} is one of the three measures of financial development and ρ_{it} is the 5-year inflow-outflow correlation described earlier.

The results of these three estimations are shown in Table 5 and are also (inversely) plotted in Figure 6. Note how in all cases the inflow-outflow correlation importantly accounts for the variance of the dependent variable. Indeed, the relation is always positive and significant at the 1% level, with an R^2 over 10% in each estimation.

Table 5: Linear estimation of ρ with three financial development measures

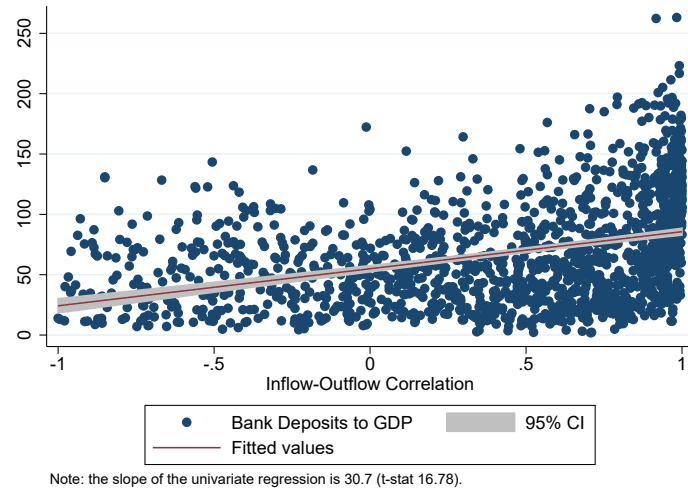
	(1)	(2)	(3)
Bank Deposits to GDP	0.00456*** (18.87)		
Private Credit to GDP		0.00483*** (20.89)	
Stock Market Value to GDP			0.00368*** (15.20)
Constant	0.141*** (6.03)	0.151*** (6.97)	0.447*** (23.81)
R^2	0.140	0.161	0.117
N	1551	1552	1100

t statistics in parentheses

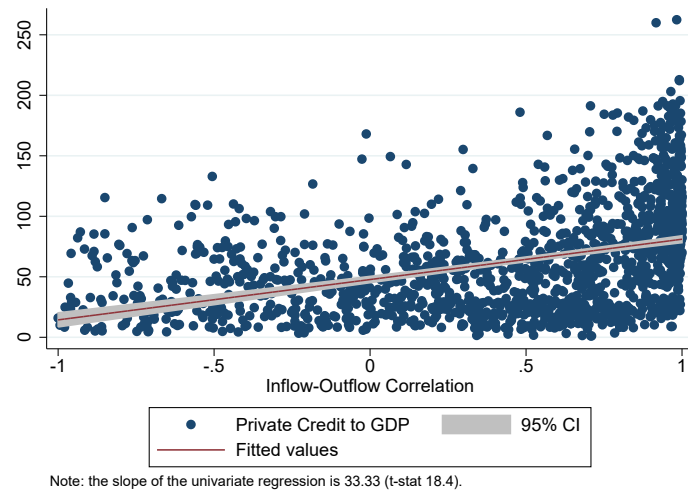
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

We can tentatively conclude that countries that have deep financial markets and large institutional investors (think of pension funds, insurance companies, sovereign wealth funds) tend to have foreign assets, which allows them to counteract the ill effects of sudden withdrawals of funds by international investors when the world financial economy is in a risk-off mood.

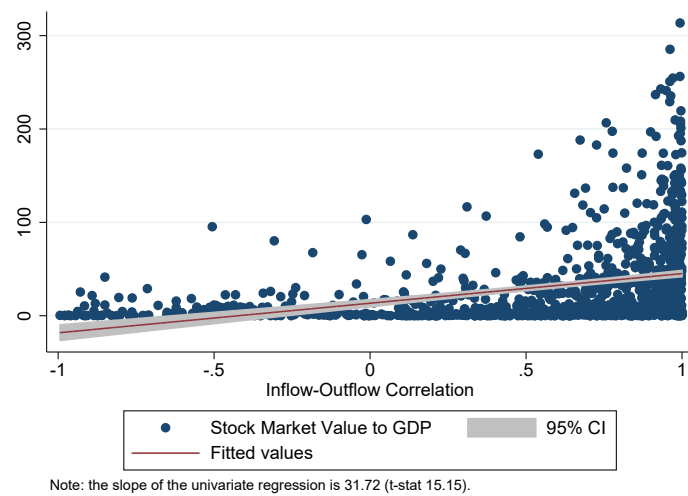
Figure 6: Scatter plot and linear fit of inflow-outflow correlation and...



(a) ... Bank Deposits to GDP



(b) ... Private Credit to GDP



(c) ... Stock Market Value to GDP

6 Concluding Remarks

We have studied the determinants of sudden stops in capital flows, particularly differentiating situations in which sudden stops in inflows don't translate into sudden stops in the financial account from those in which they do. Our findings were based on a multinomial logit framework that allows us to evaluate the effects of these determinants on the probabilities of facing different types of sudden stop scenarios.

We find that developed countries have about the same chances of experiencing sudden stops in inflows when compared to developing economies. Nevertheless, the latter face financial account sudden stops much more often than the former. This result is consistent with what has been found in past literature.

As a second result that matches earlier findings, booms in inflows precede future sudden stops in inflows. But the increase in the odds of a sudden stop after a boom is higher for inflow sudden stops than for financial account sudden stops.

A novel conclusion from our exercise is that the correlation between inflows and outflows is a good predictor of future sudden stop events in the financial account. Indeed, a higher correlation is consistently associated with a lower probability of experiencing a financial account sudden stop.

Finally, we show that measurements of financial depth are good explanatory variables for the correlation of changes in net foreign inflows and outflows. Countries with large institutional investors tend to repatriate funds when their home country is struck by a sudden stop in inflows. This mechanism is not available to countries with small domestic financial sectors or with a paucity of institutional investors.

The correlation between capital inflows and outflows may be unwittingly affected by policy decisions. For instance, some countries try to lock in pension fund assets by limiting foreign investments. While limiting outflows, as an unwanted byproduct, this may inhibit the stabilizing impact of repatriation during times of sudden stops in inflows.

Sovereign wealth funds in countries with abundant natural resources also have a role to play in protecting the domestic economy from inflow sudden stops. When natural resource prices and exports are high, it is a good policy to save a large proportion of the increase in rents into a sovereign wealth fund, which later can be used not only when prices decline but also when foreigners' capital dries up.

As a last policy comment, note that reserve accumulations by central banks may play a similar role in moderating inflow sudden stops. Indeed, if a central bank identifies an inflow sudden stop, as long as it has some range of action on, say, the nominal exchange rate, it may use its reserves to counteract it.

References

- Agosin, Manuel R. and Franklin Huaita (2011). “Capital flows to emerging economies: Minsky in the tropics”. In: *Cambridge Journal of Economics* 35.4, pp. 663–683.
- (2012). “Overreaction in capital flows to emerging markets: Booms and sudden stops”. In: *Journal of International Money and Finance* 31.5, pp. 1140–1155.
- Beck, Thorsten, Asli Demirgüç-Kunt, and R Levine (2009). “Financial institutions and markets across countries and over time-data and analysis”.
- Beck, Thorsten, Asli Demirgüç-Kunt, and Ross Levine (2000). “A New Database on the Structure and Development of the Financial Sector”. In: *The World Bank Economic Review* 14.3, pp. 597–605.
- Bordo, Michael D., Alberto F. Cavallo, and Christopher M. Meissner (2010). “Sudden stops: Determinants and output effects in the first era of globalization, 1880-1913”. In: *Journal of Development Economics* 91.2, pp. 227–241.
- Broner, Fernando A and Roberto Rigobon (2005). “Why Are Capital Flows So Much More Volatile In Emerging Than In Developed Countries?” In: *Central Bank of Chile Working Paper*, p. 328.
- Calderón, César and Megumi Kubota (2013). “Sudden stops: Are global and local investors alike?” In: *Journal of International Economics* 89.1, pp. 122–142.
- Calvo, Guillermo A. (1998). “Capital Flows and Capital-Market Crises”. In: *Journal of Applied Economics* 1.1, pp. 35–54.
- Calvo, Guillermo A., Alejandro Izquierdo, and Luis-Fernando Mejia (2004). “On the Empirics of Sudden Stops: The Relevance of Balance-Sheet Effects”. In: *NBER Working Papers* 2004 May.10520.
- Cavallo, Eduardo A. and Jeffrey A. Frankel (2008). “Does openness to trade make countries more vulnerable to sudden stops, or less? Using gravity to establish causality”. In: *Journal of International Money and Finance* 27.8, pp. 1430–1452.
- Cavallo, Eduardo, Andrew Powell, et al. (2015). “A new taxonomy of Sudden Stops: Which Sudden Stops should countries be most concerned about?” In: *Journal of International Money and Finance* 51, pp. 47–70.

- Cihak, Martin et al. (2012). “Benchmarking Financial Systems around the World”. In: *World Bank Policy Research Working Papers* 6175, pp. 1–58.
- Cowan, Kevin, José De Gregorio, et al. (2007). “Diversificación financiera e interrupción repentina del flujo de capitales”. In: *Economía Chilena* 10.3, pp. 45–65.
- Cowan, Kevin, José De Gregorio, et al. (2008). “Financial Diversification, Sudden Stops, and Sudden Starts”. In: *Current Account and External Financing*. Vol. 12, pp. 159–194.
- Edwards, Sebastian (2004). “Financial Openness, Sudden Stops, and Current-Account Reversals”. In: *The American Economic Review* 94.2, pp. 59–64.
- (2007). “Capital controls, capital flow contractions, and macroeconomic vulnerability”. In: *Journal of International Money and Finance* 26.5, pp. 814–840.
- Forbes, Kristin J. and Francis E. Warnock (2012). “Capital flow waves: Surges, stops, flight, and retrenchment”. In: *Journal of International Economics* 88.2, pp. 235–251.
- Guidotti, Pablo E, Federico Sturzenegger, and Agustín Villar (2004). “On the Consequences of Sudden Stops”. In: *Economía* 4.2, pp. 171–214.
- Mendoza, Enrique G. (2010). “Sudden Stops, financial crises, and leverage”. In: *American Economic Review* 100.5, pp. 1941–1966.
- Reinhart, C and G Calvo (2000). “When Capital Inflows Come to a Sudden Stop: Consequences and Policy Options”. In: *Reforming the International Monetary and Financial System* 6982, pp. 175–201.
- Rothenberg, Alexander D. and Francis E. Warnock (2011). “Sudden flight and true sudden stops”. In: *Review of International Economics* 19.3, pp. 509–524.
- Sula, Ozan (2010). “Surges and Sudden Stops of Capital Flows to Emerging Markets”. In: *Open Economies Review* 21.4, pp. 589–605.
- Wooldridge, Jeffrey M (2010). *Econometric Analysis of Cross Section and Panel Data*.

A Additional Tables

The countries employed in this research are shown in Table 6.

Table 6: Employed Countries

Non-advanced Economies (1)		Non-advanced Economies (2)		Advanced Economies	
WB Code	Country	WB Code	Country	WB Code	Country
ATG	Antigua and Barbuda	MOZ	Mozambique	AUS	Australia
ARG	Argentina	NIC	Nicaragua	AUT	Austria
BRB	Barbados	PHL	Philippines	CAN	Canada
BOL	Bolivia	RWA	Rwanda	DNK	Denmark
BWA	Botswana	SYC	Seychelles	FIN	Finland
BRA	Brazil	SLB	Solomon Islands	FRA	France
CMR	Cameroon	ZAF	South Africa	DEU	Germany
CHL	Chile	LKA	Sri Lanka	ISL	Iceland
CHN	China	KNA	St. Kitts and Nevis	IRL	Ireland
COL	Colombia	LCA	St. Lucia	ISR	Israel
CIV	Cote d'Ivoire	SWZ	Swaziland	ITA	Italy
DMA	Dominica	TUN	Tunisia	JPN	Japan
SLV	El Salvador	UGA	Uganda	NLD	Netherlands
FJI	Fiji	URY	Uruguay	NZL	New Zealand
GRD	Grenada	VEN	Venezuela, RB	NOR	Norway
HUN	Hungary			PRT	Portugal
JAM	Jamaica			SGP	Singapore
KEN	Kenya			ESP	Spain
MYS	Malaysia			SWE	Sweden
MDV	Maldives			CHE	Switzerland
MLT	Malta			GBR	United Kingdom
MUS	Mauritius			USA	United States

Table 7: Episodes of boom in the financial account

Year	Country (WB code)
1984	BWA DMA ISR JAM SGP TUN
1985	BWA DNK NIC
1986	ATG IRL NZL
1987	ATG CMR DNK FIN NOR
1988	AUS MUS NOR SLB
1989	ATG AUS DMA KEN LKA KNA LCA SWE
1990	ATG AUS CHL DMA FIN MUS SGP KNA LCA SWE
1991	DMA MYS SGP ESP LKA LCA VEN
1992	BWA CHL DMA MYS MDV MOZ LCA TUN VEN
1993	ARG CHN HUN MYS MDV NOR LKA SWE TUN VEN
1994	ARG CHL CHN COL MLT MOZ PHL LKA TUN
1995	BRA CHN COL HUN MYS MDV MOZ PHL
1996	BOL BRA CHL CHN COL MYS PHL
1997	ARG BOL CHL COL DNK SLV GRD ISR PHL ZAF
1998	ARG BOL SLV SWZ
1999	BOL MLT NIC
2000	BRB IRL
2001	BRB JAM
2002	GRD
2003	SLV GRD
2004	FJI HUN
2005	AUS BRB HUN MLT NZL ZAF
2006	FJI ISL NZL SYC ZAF ESP SWZ TUN URY
2007	BRB BRA FJI IRL KEN MDV MLT MUS NZL PRT SYC ZAF ESP SWZ UGA URY
2008	BRB BWA SLV HUN ISL IRL ISR JAM MDV MUS PRT SYC SLB ESP SWZ SWE TUN UGA URY
2009	AUS BRA DNK KEN MUS PRT SYC SLB ZAF SWZ CHE UGA

Source: Authors' calculations based on IMF's data.

Table 8: Episodes of boom in inflows

Year	Country (WB code)
1984	CMR JAM
1985	CMR NIC
1986	ATG NZL
1987	ATG CMR DMA
1988	
1989	ATG DMA KEN LKA KNA SWZ
1990	LKA KNA LCA SWE
1991	DMA LKA LCA VEN
1992	DMA MYS MOZ LCA SWZ TUN VEN
1993	ARG CHN MYS LKA TUN VEN
1994	ARG CHL CHN COL MOZ PHL LKA TUN
1995	BRA CHN DMA MOZ PHL
1996	ARG BOL BRA COL PHL TUN
1997	ARG BOL CHL CHN COL SLV GRD SGP ZAF LCA VEN
1998	ARG BOL SLV KEN NLD ZAF SWZ VEN
1999	BOL CHL DNK DMA SLV ISR ITA KEN NLD NIC ZAF SWZ SWE CHE
2000	CAN DNK FIN ISR NLD PRT ESP SWE CHE
2001	SLV NLD PRT KNA URY
2002	BWA CMR SLV GRD
2003	SLV IRL PRT
2004	BWA IRL JAM MYS
2005	AUT BRB DNK ISL IRL ITA JAM MDV MLT NLD NOR ZAF ESP
2006	ATG AUS AUT BWA CAN FJI FIN ISL IRL ISR ITA MDV MLT NLD NZL NOR PRT SYC SGP ZAF ESP SWE
2007	AUS AUT BRB BRA CAN CHN DNK FJI HUN ISL IRL ISR ITA JAM KEN MYS MDV MLT MUS NLD NZL NIC
2007	NOR PRT SYC SGP SLB ZAF ESP SWE CHE UGA URY
2008	AUS BRB CHL FJI HUN JAM MDV MLT NIC SYC SLB SWZ UGA URY
2009	AUS BRA CAN FIN KEN MDV MUS PRT SLB UGA URY

Source: Authors' calculations based on IMF's data.

Table 9: Episodes of sudden stop in the financial account

Year	Country (WB code)
1985	BOL JAM
1986	JAM NIC
1987	BWA NZL SWZ
1988	ATG CMR FIN ISR
1989	ARG DNK FJI NIC SLB
1990	CMR HUN
1991	ATG CHL DNK FIN NZL KNA SWE
1992	BRB PRT SYC ESP
1993	BWA DNK DMA MOZ
1994	HUN MYS MDV NOR VEN
1995	CHL FIN KEN MLT
1996	CMR DMA HUN
1997	MYS PHL
1998	CHL DNK GRD NZL PHL SLB LCA
1999	FJI IRL SLB KNA SWZ
2000	BOL DNK DMA NIC
2001	ARG MUS
2002	BRB URY
2003	BOL GRD PRT SYC
2004	SLV KNA
2005	FJI MYS
2006	BOL BWA MOZ
2007	SLV ISL URY
2008	ATG ARG FJI NZL SYC LCA
2009	BWA CHL SLV GRD HUN ISL IRL JAM URY

Source: Authors' calculations based on IMF's data.

Table 10: Episodes of sudden stop in inflows

Year	Country (WB code)
1985	JAM MDV
1986	CMR JAM NIC
1987	FJI NZL
1988	ATG BWA ISR JAM NZL
1989	NIC VEN
1990	CMR KEN SWZ
1991	CHL FJI FIN NZL KNA SWE
1992	PRT SYC
1993	BWA DMA MOZ
1994	DNK MYS ESP
1995	CHL FIN VEN
1996	CMR CIV DMA
1997	PHL
1998	COL PHL SGP SLB
1999	FJI SLB KNA
2000	BOL CHL DMA NIC PHL ZAF
2001	ARG AUT DNK FIN ISR MLT NOR SLB ESP LKA SWZ SWE CHE
2002	MOZ NLD PRT URY
2003	GRD SYC SLB SWZ
2004	DNK SLV GRD KNA LCA
2005	AUS MYS
2006	AUT BOL JAM MOZ VEN
2007	
2008	ATG AUT BRB DNK ISL IRL ITA MYS MUS NLD NZL NOR PHL PRT SGP ZAF ESP LCA SWE CHE
2009	AUT BRB BWA DNK DMA SLV FJI HUN IRL JAM MLT NOR SYC ESP KNA SWZ SWE

Source: Authors' calculations based on IMF's data.

B Source of Data

As stated on Section 2, we use the International Monetary Fund’s (IMF) International Financial Statistics (IFS) database to generate the series of inflows and outflows. Before continuing, we must note that the IMF presents the outflow-related series with a negative sign, while we switch their sign. To construct the series, we performed the following operations:

Inflows = Inflows of FDI (IFS line 78bed) + Portfolio Debt and Equity Inflows (IFS line 78bgd) + Other Investment Inflows (IFS line 78bid)

Outflows = -[Outflows of FDI (IFS line 78bdd) + Portfolio Debt and Equity Outflows (IFS line 78bfd) + Other Investment Outflows (IFS line 78bhd)]

Financial Account = Inflows - Outflows

C Details on Financial Development Measures

The description and sources of the employed financial deepening measures are summarized in Table 11.

Table 11: Financial Development Measures

Variable	Description	Source
Bank Deposits to GDP	Claims on domestic real nonfinancial sector by deposit money banks as a share of GDP, calculated using the following deflation method: $\frac{1}{2} \cdot \left(\frac{F_t}{P_{et}} + \frac{F_{t-1}}{P_{et-1}} \right) / \frac{GDP_t}{P_{at}}$ where F is deposit money bank claims, P_e is end-of period CPI, and P_a is average annual CPI.	IMF’s IFS, March 2016. Deposit money bank assets (lines 22, a-d, FOSAG, FOSAOG, FOSAON, FOSAOP); Private credit by deposit money banks and other financial institutions (lines 22d, FOSAOP and 42d, FF-SAP); GDP in local currency (line 99B..ZF, NGDP or, if not available, line 99B.CZF); end-of period CPI (line 64M..ZF or, if not available, 64Q..ZF); and annual CPI (line 64..ZF, PCPI).
Private Credit to GDP	Private credit by deposit money banks and other financial institutions to GDP, calculated using the following deflation method: $\frac{1}{2} \cdot \left(\frac{F_t}{P_{et}} + \frac{F_{t-1}}{P_{et-1}} \right) / \frac{GDP_t}{P_{at}}$ where F is credit to the private sector, P_e is end-of period CPI, and P_a is average annual CPI.	
Stock Market Value to GDP	Total shares traded on the stock market exchange to GDP.	World Federation of Exchanges, and Standard and Poor’s Emerging Market Database (and Emerging Stock Markets Factbook). Data on GDP from World Development Indicators.

Source: Cihak et al. (2012).