Managing Sudden Stops[1]

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October 2016

Abstract

This paper analyzes sudden stops in capital flows to emerging markets since 1991. It shows that the frequency and duration of sudden stops have remained largely unchanged, but that the relative importance of different factors in their incidence has changed. In particular, global factors appear to have become more important relative to country-specific characteristics and policies. Sudden stops now tend to affect different parts of the world simultaneously rather than bunching regionally. Stronger macroeconomic and financial frameworks have allowed policy makers to respond more flexibly, but these more flexible responses have not guaranteed insulation or mitigated the impact of the phenomenon. These findings suggest that the challenge of understanding and coping with capital-flow volatility is far from fully met.

JEL Classification: F31, F32, F41, F62

Keywords: Sudden Stops, Capital Flows, Emerging Markets, Exchange Rate

[1] We thank Serhat Solmaz and Rama Yanamandra for excellent research assistance. Comments are welcome at eichengr@berkeley.edu; and pgupta5@worldbank.org .

1. Introduction

Sudden stops are when capital inflows dry up abruptly. The banker's aphorism – "it's not speed that kills but the sudden stop" – has been popularly invoked since at least the Mexican crisis in 1994. Awareness then rose with impetus from the Argentine crisis (1995), the Asian crisis (1997), the Russian crisis (1998), and the Brazilian crisis (1999), among others. Google's Ngram Viewer shows a sharp increase after 2000 in references to the phrase.[2]

The question is whether this increase reflects the growing incidence of the problem or simply the growing currency of the term. The gradual diffusion of scholarly terminology suggests that the observed trend may simply reflect the latter. At the same time, however, there is heightened awareness in the policy community of capital-flow volatility and reversals, as reflected in the decision of the International Monetary Fund to adopt a new, more sympathetic view of capital controls and international capital market interventions generally (IMF 2012), indicative perhaps of a growing problem. Episodes like the "taper tantrum" in 2013, when talk that the Federal Reserve might taper its purchases of securities, leading emerging-market currencies to crash, and the "normalization" episode in 2015, when expectations that the Fed would soon start raising U.S. interest rates, leading to an outflow of funds from emerging markets – suggest that sudden stops may in fact be growing more frequent or, perhaps, more disruptive.

In this paper we update and extend previous analyses of sudden stops, contrasting their incidence and severity before and after 2002, the end of the period covered by most of the classic contributions to the literature.[3] Focusing on emerging markets, we show that the frequency and duration of sudden stops have remained largely unchanged since 2002. Casual impression gleaned from the tapering episode in 2013 might suggest otherwise. But excitable press coverage notwithstanding, we find that interruptions to capital flows during the Fed's discussion and implementation of its policy of "tapering" security purchases were milder than the sudden stops of prior years. These episodes were shorter, entailed smaller reversals of capital flows, and had a milder impact on financial and real variables.[4] We might call them "sudden pauses" rather than "sudden stops."

At the same time, global factors, in particular global risk aversion as captured by the VIX, appear to have become more important for the incidence of sudden stops. Similarly, when we consider a measure of contagion or concurrence such as the number of sudden stops occurring simultaneously in other countries, we find that it is sudden stops globally that matter after 2002, whereas in the preceding period it had been sudden stops in the same region as the

[2] See https://books.google.com/ngrams/graph?content=sudden+stop&year_start=1970&year_end=2008&corpus=15&smoothing=0&share=&direct_url=t1%3B%2Csudden%20stop%3B%2Cc0.

[3] The five most widely cited empirical papers on sudden stops according to Google Scholar are Calvo, Izquierdo and Mejia (2004), Calvo, Izquierdo and Talvi (2003), Cavallo and Frankel (2008), Edwards (2004a) and Edwards (2004b). None uses data for the period after 2002.

[4] The picture may look different once we have enough data to analyze the 2015 normalization episode. But the partial data available at the time of writing suggest that for only a few countries did capital flow shifts in 2015 qualify as sudden stops.

country in question that had the most statistical power. Again, we are inclined to interpret this in terms of the growing importance of global factors.

Sudden stops have both financial and real effects. The financial effects show up first: the exchange rate depreciates, reserves decline, and equity prices fall. GDP growth then decelerates, investment slows, and the current account strengthens. The growth of GDP falls by roughly 4 percent year on year in the first four quarters of a sudden stop. The decline in GDP is somewhat larger in the second subperiod, reflecting a larger global shock (larger increase in the VIX, in particular), something whose effects were offset only partially by stronger macroeconomic positions.

In terms of policy responses, countries responded in the 1990s by stepping down the exchange rate, sometimes floating the currency, and then supporting that new exchange rate or float with a tighter monetary policy. In the worst-hit cases there was also resort to an IMF program, extension of which typically entailed trade reforms, fiscal tightening, and privatization of public enterprises. In the second subperiod, there was less of a tendency to tighten both monetary and fiscal policies. Indeed some countries were actually able to reduce policy interest rates as a way of supporting economic activity and financial markets. Less monetary stringency and some currency depreciation were feasible because countries had reduced foreign currency mismatches in the interim, limiting balance-sheet damage from depreciation. Budgets already being closer to balance (fiscal positions being stronger), countries were able to respond with less fiscal consolidation. Recourse to IMF programs was less frequent in the 2000s, partly because countries had accumulated international reserves and moved to more flexible exchange rates in the interim.

This is progress after a fashion. At the same time, it is clear that the recipe of stronger fiscal positions, more flexible exchange rates, deeper financial markets and less foreign currency mismatch has not insulated emerging markets from sudden stops; the frequency of the event has not declined over time. Any benefit from stronger country fundamentals has been offset by larger external shocks emanating from the rest of the world. Nor has progress on the policy front limited the negative output effects. As we show below, the drop in output in the first four quarters is no smaller in the second subperiod than the first; if anything it is slightly larger.[5] It would appear with the continued growth of international financial markets and transactions, countries are now exposed to larger capital flow reversals when foreign lending stops, and those larger reversals have more disruptive output effects. It is troubling that neither national officials, with the increased policy space, nor the international financial institutions, with their proliferation of new financing facilities, have succeeded in cushioning emerging markets from these effects.

2. Basics

Our country sample is all emerging markets with their own currencies for which capital flow data are available for at least 24 consecutive quarters between 1991 and 2014. Our primary source of quarterly gross capital flow data is the International Monetary Fund's International

[5] Although the difference is not statistically significant at standard confidence levels.

Financial Statistics (accessed through Haver Analytics). We have data for 20 emerging markets in 1991, 28 in 1995, and 34 from 2000 onwards, resulting in an unbalanced panel. In robustness checks we work with a smaller, balanced sample for which data are available for the entire period.[6]

Sudden stops are periods when inflows are a certain number of standard deviations below their average in a specified number of prior years. Most studies only classify episodes as such when they last more than one quarter. While some papers focus on net capital inflows by nonresidents, others add net capital outflows by residents.[7] Some papers use data for all capital flows, while others use data for only items other than FDI on the grounds that FDI flows are relatively stable.[8]

We focus on portfolio flows and "other flows" (consisting in practice primarily of loans and trade credits) by nonresidents, on the grounds that these are the volatile component (see Figure 1).[9] We classify an episode as a sudden stop when portfolio and other inflows by nonresidents decline below the average in the previous 20 quarters by at least one standard deviation, when the decline lasts for more than one quarter, and when flows are two standard deviations below their prior average in at least in one quarter. Episodes end when capital flows recover to the prior mean minus one standard deviation. When two sudden stops occur in close proximity (which is the case in only a few instances), we treat them as a single episode.[10]

The resulting dates are listed in Appendix Table 1. We double-checked the list for consistency against country details provided in IMF Article IV reports.[11] Episodes identified by an alternative criterion where the sudden stop ends when capital flows recover to the average of the past 20 quarters are listed in the Appendix as well.

[6] The full list of countries and the periods for which their data are available is in Appendix A.

[7] Cavallo et al (2013) show that the sudden stops in flows from non-residents tend to be larger and have larger impacts on economies than those which are driven by outflows by residents.

[8] Calvo et al (2004), in an early influential study, use monthly data for 20 advanced and emerging markets over the period 1990-2001. Since capital flow data are unavailable monthly, they instead use the change in reserves and the trade balance. According to their definition, a sudden stop begins when capital flows so measured fall one standard deviation below the mean for the past 24 months; the episode continues until flows recover to above the earlier mean. In addition they require that in at least one month during the duration of the episode capital flows fall 2 standard deviations below their earlier mean. Forbes and Warnock (2012) define sudden stops similarly but use data on actual capital flows available at a quarterly frequency. A sudden stop is said to occur when the year-on-year change in capital flows over four quarters is at least one standard deviation below the average in previous five years and when in at least one quarter flows are two standard deviations below that prior average. They discard episodes lasting only one quarter.

[9] In addition, we provide some limited comparisons with other categories of capital movements (FDI flows and portfolio flows by residents), which reinforce the contrast and help to justify the focus.

[10] In some cases where the criterion of capital flows declining by 2 standard deviations below mean was missed by a whisker, we still identified that episode as a sudden stop. One could of course measure capital flows and their volatility in a number of different ways. In focusing on gross inflows by nonresidents, we follow Efremidze et al. (2015), who show that sharp reductions in gross flows from abroad tend to be most strongly associated with sudden stops as defined here (and are more informative for understanding the latter than, inter alia, net flows).

[11] In a very few cases where we noted discrepancies, we took the qualitative discussion in the Article IV reports as definitive.

3. Updating the Stylized Facts

We identify 44 sudden stops in our sample of 34 countries since 1991. These are listed in Appendix A. These episodes last on average for four quarters. Capital outflows during sudden stops average about 1.5 percent of GDP per quarter (cumulatively 6 percent of GDP for the duration of the sudden stop) compared to inflows of about 1.7 percent of GDP a quarter over the preceding year. This implies a swing in capital flows of some 3 percent of GDP in a quarter, which is a large amount.

The average frequency of sudden stops in any one quarter is about 2 percent, or 8 percent in a year. The frequency and duration of these episodes and the magnitude of the associated capital outflows are all similar across subperiods. While the duration of sudden stops is slightly less in the second subperiod, the difference is not statistically significant. In other words, none of the statistics in the first five rows of Table 1 differs significantly across columns at standard confidence levels. The significant difference between the two subperiods is in the magnitude of the capital flow turnaround, defined as average capital flows during the sudden stop (either the first four quarters of the event or all quarters of the event) minus average capital flows in the four preceding quarters (all scaled by GDP). The turnaround so measured is significantly larger in the second subperiod than the first.

Table 1 also shows that capital inflows in the four quarters preceding sudden stops were larger as a share of recipient-country GDP in the second period. (What is true of four quarters is true also of the preceding eight and 12 quarters, both here and in the remainder of this paragraph.) That increase in the volume of inflows in the preceding period does not reflect an increase in portfolio capital (equity and bond-market related) flows. Rather, it is more than fully accounted for by an increase in "other" inflows (interbank borrowing, suppliers' credits, trade credit and other more difficult to classify items). Figure 1 confirms that those other flows have become larger and more volatile. One suspects that as the authorities have tightened oversight and regulation of short-term portfolio debt and equity flows in response to earlier problems, these other flows have become a more important conduit for short-term capital movements.[12] Figure 2 shows that it is still the case, as before 2003, that FDI flows are less volatile than portfolio and other flows.

As before, sudden stops continue to bunch in certain years. While in the 1990s they were concentrated around the Asian and Russian crises, in the last decade the most prominent cluster of sudden stops was in 2008-2009, at the time of the turmoil triggered by the collapse of the Lehman Brothers. This suggests that in accounting for incidence it will be important to consider the role of global factors.

It is easy to note that none of the sudden stops in the first column of Appendix A occur during the "taper tantrum" of mid-2013, when Federal Reserve officials mooted the possibility of curtailing the institution's security purchases, provoking volatility in emerging financial markets. A decline in capital inflows into emerging markets and in some cases a capital-flow reversal occurred in this period, but it lasted only one quarter, as opposed to more than four quarters on

[12] This pattern is especially striking in light of official efforts in the second half of the period, in Asia and elsewhere, to develop bond markets as a "spare tire" for intermediation in emerging markets. The data show that, such initiatives notwithstanding, it is bank lending and related flows that have grown most rapidly on average between the two subperiods.

average in our sudden stops cases. The decline thus was not of the duration required to qualify as a sudden stop according to our algorithm. In addition, the magnitude of the capital flow reversal was not comparable. Capital inflows in the prior four quarters averaged less than 1 percent of GDP in the tapering episode, as opposed to more than 1½ percent in sudden stops. The swing from inflow to outflow was 1½ percent of GDP a quarter, as opposed to more than 3 percent of GDP in our sudden stop episodes. Depreciation of the exchange rate was more than three times as large in sudden stop episodes. The decline in equity prices was five times as large.[13] We do pick up two sudden stops in early 2014, in the Russian Federation and Ukraine, but these are plausibly attributable to factors other than the Fed's tapering talk, given the time lag and concurrent geopolitical developments.

In Table 2 we regress different types of capital flows on a dummy variable for the first four quarters of a sudden stop.[14] The results indicate that while both portfolio and other inflows by nonresidents decline significantly during sudden stops, the shift is larger for other flows than for portfolio flows. Consistent with previous studies, we see that residents respond in stabilizing fashion, reducing capital outflows during sudden stops (more so in the 2000s than previously), although the decline in outflows by residents is not sufficient in magnitude to offset the impact of flight by nonresidents.

Overall, then, the frequency and duration of sudden stops has remained largely unchanged since the period covered by earlier studies, although the countries concerned have changed over time, the reversal in portfolio flows is arguably larger, and so-called "other" flows have become more important.

Turning to effects, Tables 3 and 4 show that, when a sudden stops occurs, the exchange rate depreciates and reserves decline (not unexpectedly). Because the fall in investment is proportionally larger than the fall in GDP and, by implication, than the fall in saving, the current account strengthens. While the impact on financial variables peaks in the first two quarters, the impact on real variables like the current account, GDP growth and investment peaks later.[15] The fall in growth is significant: GDP growth is roughly 4 percentage points slower year over year in the first four quarters of the sudden stop. There is no significant difference in magnitude of that growth slowdown between the first and second subperiods—the drop in output is larger in the second subperiod, but the difference is not significant at conventional confidence levels. Interestingly, the one variable for which the impact is significantly greater in the second subperiod is equity prices, presumably reflecting the greater attention paid to emerging equity

[13] It might be objected that our criteria for defining sudden stops include that the capital flow interruption last at least two quarters, whereas these tapering events typically lasted only one, meaning that we are comparing apples and oranges. If we relax the requirement that sudden stops last at least two quarters and include also one quarter interruptions, the reversal in capital flows is still 50 percent larger in this expanded sample of sudden stops. Depreciation of the exchange rate in the quarter in question is still more than twice as large. The decline in equity prices is still three times as large.

[14] We drop subsequent quarters of sudden stop episodes, if any, from the regressions. Regressions are estimated using country fixed effects, with robust standard errors.

[15] In the spirit of Eichengreen, Rose and Wyplosz (1995), we also construct a composite index of the impact of sudden stops on the foreign exchange market, consisting of the rate of exchange rate depreciation and decline in reserves as well as in some cases the decline in equity prices. We normalize the series by subtracting the average values of the respective variables in the previous 20 quarters and dividing by standard deviation over that period. These indices, without and with equity prices, show similar patterns (results not reported for brevity).

markets in the second period by international investors. Another variable for which the impact differs across subperiods is real effective exchange rate (and to a lesser extent nominal effective exchange rate), which shows a smaller depreciation in the second subperiod, perhaps reflecting greater bunching of sudden stops in the second period.

We analyze the probability of a country experiencing a sudden stop by estimating:

$$Prob\ (SS_{it} = 1) = F(X_t^{Global}\alpha + Z_{i\ avg\ (t-1..t-8)}^{Domestic}\gamma\ ) \qquad (1)$$

where SS_{it} is a dummy variable that takes the value of 1 if country *i* is experiencing an episode of sudden stop in quarter *t*.[16]

As global or external factors we consider the log of the VIX as a proxy for global risk aversion; G4 money supplies (calculated as the percent change in the sum of M2 in the US, Eurozone, Japan and UK, or in percent of their combined GDP) as a proxy for global liquidity; world GDP growth (to account for the strength of the global economy, perhaps another reflection of the investment appetite of the investors), and the Federal Reserve's policy interest rate (to account for the special role of the dollar as a source of liquidity to the global financial system).[17] In addition we count the number of sudden stops starting elsewhere in the region or world in the same quarter.

As country-specific factors we consider GDP growth, public debt, budget deficit, and the increase in capital flows in previous period (portfolio and other inflows by nonresidents in percent of GDP to account for the possibility that sudden stops are preceded by large capital inflows). We include variables intended to capture overheating and increased leverage during episodes of large capital inflows, such as the current account balance, bank credit, and real exchange rate appreciation. We also consider reserves (as percent of GDP) as a measure of the ability to withstand the impact of sudden stop and thus lowering the probability of sudden stop itself. To account for the possibility that more financially open economies are more susceptible to a sudden stop in response to external shocks or domestic vulnerabilities, we include the de facto financial openness of the economy, calculated as the international investment position for portfolio and other flows in percent of GDP For these domestic variables, endogeneity is a concern, so we enter their average over eight prior quarters.[18] Variables are normalized around zero mean and standard deviation equal to one.

In Table 5 we report marginal effects from probit regressions. The results indicate that an increase in the VIX significantly raises the probability of a sudden stop. The effect is not just

[16] We estimate the equation by a probit, as well as other limited dependent variable models such as logit and complementary logarithmic framework, cloglog (following Forbes and Warnock (2012), since the distribution of F is likely to be asymmetric, owing to the fact that episodes occur irregularly).

[17] Variables within each category are correlated with one another; hence we include them parsimoniously in the regressions. When using quarterly data for World GDP, we aggregate data for the largest countries for which it is available. These account for approximately two-thirds of global GDP.

[18] This should also help to attenuate problems of noise in the quarterly data. Results do not change when we average the domestic variables over somewhat shorter or longer periods. In addition, we drop crisis observations after the first quarter. If capital flows reverse, real exchange rate depreciates, or credit growth slows when the sudden stop hits an economy, including all subsequent quarters might lead one to erroneously conclude that lower capital flows real exchange rate deprecation or slower credit growth increases the probability of a sudden stop (see e.g. Demirgüç-Kunt and Detragiache 2000 and Gourinchas and Obstfeld 2012).

statistically significant but numerically large. A one standard deviation increase in VIX raises the probability of a sudden stop in the same quarter by 1.2%. This is a 60 percent increase over the unconditional probability of 2 percent. In terms of magnitudes, the impact of the VIX dominates that of other variables, as is evident from the size of the marginal effects.

The significance and magnitude of the two "sudden stops in other countries" variables similarly point to the importance of the external environment and global factors.

Domestic factors associated with the increase in the probability of a sudden stop are capital flows in prior years and domestic credit as a share of GDP; both are positively associated with the probability of a country experiencing a sudden stop. International reserves and the real exchange rate do not show up as significant, perhaps because of their correlation with the capital-flow and credit variables.

The two subperiods are compared in Tables 6 and 7. There appears to have been some change in the relative importance of different external factors over time. U.S. monetary policy was evidently more important in the 1990s, while global risk aversion as captured by the VIX mattered more subsequently. This may seem surprising in light of the attention paid to Federal Reserve policy in the second subperiod, first when quantitative easing by the U.S. central bank propelled capital flows to emerging markets (the "currency war" problem) and then when its tapering talk precipitated a reversal, but the pattern in question comes through in the data.

The level of the VIX, the percentage change in the VIX, the standard deviation of the VIX and the coefficient of variation of the VIX, all in the quarter of the sudden stops, are significantly larger in the second subperiod than the first; this is not true, in contrast of the change in the U.S. policy rate. The influence of country characteristics like the reserve-to-GDP ratio, real exchange rate appreciation, and a negative international investment position (as defined and calculated by Lane and Milesi-Feretti, 2007) seem to matter less consistently in the more recent period. This suggests that global (push) factors have been playing a larger role in sudden stops in the more recent decade. The changing nature of contagion effects (regional in the 1990s, global in the 2000s) similarly points to the growing influence of global factors.[19]

Finally, we can return to the determinants of the output drop following the sudden stop and ask how this is shaped by the magnitude and composition of the capital inflow in the immediately preceding period. Table 8 is consistent with the idea that the decline in GDP in the first four quarters of the sudden-stop episode is an increasing function of the total capital inflow (portfolio plus other, as a share of GDP) in the preceding eight quarters (the coefficient on capital flows in the preceding period is significant at the 5 percent confidence level). Subsequent columns show that the explanatory power in this relationship is concentrated in the second

[19] A battery of sensitivity tests supports the robustness of these results. We used the alternative sudden stop dates presented in the last column in Appendix A. We eliminated outliers by winsorizing observations at 1 percent on each end. We worked with a balanced panel. We re-estimated eq. 1 using fixed effect probit to control for time invariant characteristics of countries. We re-estimated eq. 1 using logit and clog log. We added back in the fifth and subsequent quarters of sudden stops where the baseline regressions included only the first four quarters. We shifted the partition between periods two years in each direction. We included additional measures of external conditions (G4 money supply growth, global economic growth) and country characteristics (presence of capital controls, per capita income, political stability, the exchange rate regime, trade openness, and incidence of sudden stops elsewhere in the preceding as opposed to the current quarter). Results are available on request.

subperiod. There is no evidence that the breakdown of those prior inflows into portfolio and other (bank-related) flows makes a difference for the magnitude of the output drop.

4. The Policy Response

We next consider how countries adjust policy in response to sudden stops. If there is a conventional wisdom, it is that they tighten monetary and fiscal policies to counter the drop in the exchange rate and in an effort to restore confidence. In extreme cases, they tighten controls on capital outflows and appeal to the International Monetary Fund for emergency assistance.

In fact, this conventional response is evident in only a minority of cases. In only 8 of the 43 cases considered here did countries in fact tighten both monetary and fiscal policies in response to sudden stops. Over the entire period, monetary policy was eased in response to sudden stops more often than it was tightened. Instead (or in addition), governments respond to sudden stops with a variety of other measures targeted at buttressing the stability of their domestic financial system and signaling to investors their commitment to sound and stable policies.

Moreover, there are differences in the nature of the typical response between the first and second subperiods. There was less of a tendency to tighten both monetary and fiscal policies in the second subperiod. In both subperiods countries experiencing sudden stops moved in the direction of a more flexible exchange rate, but that tendency was more pronounced in the first subperiod than the second. And, there is more recourse to the IMF and program finance in the first subperiod.

As measures of the stance of monetary and fiscal policies, we consider changes in policy interest rates and announcements of tax increases and expenditure changes. Information on IMF programs, fiscal and monetary policies, and structural reforms is gathered from IMF Article IV reports, program and other documents, and Haver Research and other market-oriented websites. We rely on IMF's AREAER to code changes in exchange rate arrangements, changes in capital-account liberalization and restriction measures, and macroprudential policy measures.[20]

A first pattern in Table 9 is that a majority of countries experiencing sudden stops between 1991 and 2014 in fact eased monetary policy in response, whereas a majority tightened fiscal policy. Countries experiencing sudden stops need to simultaneously do something to reduce the level of spending relative to income when foreign finance becomes more difficult to tap, while at the same time taking other steps to support economic activity and aid the financial system.[21] Fiscal tightening evidently is the preferred policy to pursuing the former, while monetary easing the preferred instrument for achieving the latter. Governments could conceivably adopt the opposite policy mix, but in only 1 of 44 episodes do we observe this response. Budget deficits become more difficult to finance in the wake of sudden stops, especially if monetary policy is tightened, making some degree of fiscal consolidation inevitable for countries with preexisting fiscal deficits. Monetary tightening could reinforce the

[20] For macroprudential policy initiatives, we utilized AREAER information under heading XII: Provisions specific to the financial sector, supplemented with information from IMF Article IV reports.

[21] One is reminded, for example of Brazil's response to its sudden stop in 2015, which entailed fiscal consolidation and a reluctance to tighten monetary policy (keeping central bank interest rates on hold in a period when inflation was rising).

expenditure-reducing effects of fiscal consolidation, but monetary easing has the advantage of potentially relieving the strain on commercial-bank balance sheets.

Table 10 shows that this tendency to ease monetary policy in response to sudden stops was more prevalent in the second subperiod. The constraint on easing monetary policy and allowing the currency to depreciate is the existence of currency mismatches on the national balance sheet, insofar as depreciation raises the burden of foreign-currency-denominated liabilities. A number of emerging markets took steps to limit such mismatches following the Asian financial crisis and more generally; this may help to account for their greater willingness to ease monetary policy observed in the second subperiod. We provide more evidence on this in Table 12 below.

The tendency to tighten fiscal policy is similarly more evident in the first subperiod. On average, budget deficits as a share of GDP in the years preceding sudden stops were larger in the first subperiod. This plausibly explains why fiscal tightening was more widely resorted to in the first subperiod, reflecting both the greater difficulty of financing those deficits following sudden stops and the importance of fiscal consolidation in sending a confidence-enhancing signal to financial markets.[22]

In terms of financial policies, only a small handful of countries altered capital controls in response to sudden stops. Strikingly, that minority of cases was divided roughly equally between instances where controls were tightened (to limit capital outflows) and eased (presumably to enhance confidence in the effort to attract inflows). It is fair to say that there is no consensus on or general answer to the question how capital-control measures are best utilized in the event of a sudden stop. That fact is clearly evident in the data.

Macroprudential policies were strengthened in roughly a third of cases. Almost all of these were concentrated in the second subperiod when greater attention was paid to macroprudential regulation. We also observe a few cases where macroprudential policies were loosened for reasons of forbearance, not unlike how capital controls were loosened in a minority of cases. But these are exceptions to the rule. The exchange rate regime was changed in almost half of all cases in the 1991-2002 decade, uniformly in the direction of greater flexibility. In contrast, it was rarely changed in the second subperiod, a larger number of countries already having moved to more flexible rates.

We see more recourse to IMF support in the first subperiod than the second. Implementation or at least mention of structural reforms goes along with IMF programs, as shown in Table 11. Nearly three-fourths of structural reforms were implemented in conjunction with IMF programs, while almost all IMF programs entailed structural reforms. Mention of structural reforms is much more common in the first subperiod than the second. In the second subperiod, in almost half of all instances where countries experiencing sudden stops responded with self-advertised structural reform measures, they did so without resorting to an IMF program. There is also a greater tendency for countries in IMF programs to tighten monetary policy and loosen the exchange rate regime. Whether this difference is a function of IMF conditionality or of the fact that most program cases are in the first subperiod when the monetary

[22] Vegh and Vuletin (2014) note that the response of fiscal and monetary policies to growth crises has on average become more countercyclical in the Latin American countries since 1998.

and fiscal condition of the countries considered was weaker on average is difficult to say; the observed effect most likely reflects both influences.

Figure 3 summarizes the pattern of responses in the two subperiods. We assign either a zero, one, or negative one to a country in each episode, a one when a country tightened monetary policy, tightened fiscal policy, made its exchange rate regime more flexible, or committed to structural reforms; a zero when there is no change, and minus one when a country eased monetary policy or fiscal policy, or reversed the structural reforms, or made its exchange rate regime less flexible. Countries with all minus one are at the center of the figure, whereas countries with all ones are at the four vertexes (they trace out the diamond). We see a less sharp response along all four dimensions in the second subperiod, most noticeably in the cases of fiscal and monetary policies.

These choices seem consistent with the changing nature of the sudden stops and of the position of countries experiencing them. Table 12 shows the average values of a variety of policy variables in the eight quarters prior to sudden stops, again distinguishing the two subperiods. In the 1990s sudden stops were heavily associated with weak macroeconomic fundamentals, whereas episodes in the subsequent decade were associated more with external factors and occurred despite stronger domestic economic and financial fundamentals.

In the first subperiod, sudden stops required countries with large budget deficits and rapid inflation to tighten monetary and fiscal policies and request IMF assistance, both in order to adjust to tighter financing conditions and to send the necessary signal to the markets. In the second subperiod, compared to the first, countries experiencing sudden stops had smaller budget deficits and public debts (as shares of GDP) and significantly lower rates of inflation. Their international reserves as a share of GDP were more than twice as high as in the first subperiod. These stronger fundamentals made IMF support less imperative and gave them some additional leeway to adjust in ways that provided more support to domestic economic activity and the financial system, in some cases loosening monetary policy and limiting the extent of fiscal consolidation.

In the more recent decade, countries experiencing sudden stops were significantly more likely to have flexible exchange rates; they were more likely to be operating inflation targeting regimes. They had significantly deeper financial sectors (as measured by bank credit to the private sector as a share of GDP). They had significantly smaller foreign currency mismatches as measured by net foreign currency position, enabling them to rely more on exchange rate changes to facilitate adjustment.

All this points to the possibility that countries have more leeway to apply policies designed to buffer the real economic impact of sudden stops. It is worth emphasizing therefore that the year-on-year drop in growth rates in the first four quarters of sudden stops is no different in the second period than the first. (The drop in the second period is actually larger, as noted above, although the difference is not statistically significant.) This suggests that something else was also changing in a direction with less favorable consequences, where that something else could be the magnitude of capital inflows and the size of the capital-flow reversal, which were larger in the second subperiod.

5. Conclusion

We have updated earlier analyses of sudden stops in order to shed light on what is known, what is not known, and what is changing. We compare the 1991-2002 period that was the focus of early analyses and on whose basis generalizations and conclusions were drawn with the subsequent period 2003-2014.

We confirm, most obviously, that sudden stops remain a problem. We count more of them in the second subperiod, but there are also more emerging economies actively involved in global financial markets in the second period. On balance, the frequency, duration and severity of sudden stops remains roughly unchanged across subperiods. However, the associated decline in GDP is somewhat larger in the second subperiod, plausibly reflecting larger capital inflows in the preceding four or so quarters and a larger turnaround in capital flows with the onset of the sudden stop.

In addition, there are indications of changes over time in the relative importance of global economic conditions and of country characteristics and policies in the incidence of sudden stops. We present some evidence that global factors, while always important, have grown more important recently. Our evidence suggests also that the global factors that matter most have been changing. Increases in U.S. policy interest rates, which matter for the supply of global liquidity, were relatively important in the 1990s. In contrast, the VIX, which contains information about global risk aversion and the demand for liquidity, was more important in the subsequent decade. In a number of respects, the policies of countries experiencing sudden stops were stronger in the second subperiod, but this was still no guarantee of insulation from sudden stops.

What stronger policies did permit, however, was a different response at the national level. In the first subperiod, countries with large budget deficits and high inflation had no choice but to tighten monetary and fiscal policies. In the second subperiod, the deficits and inflation rates of the affected countries were lower on average. Sudden stops still made financing deficits more difficult and required policy makers to stake painful steps so as to send reassuring signals to financial markets. But in a number of cases they were able to do so by tightening fiscal policy while at the same time loosening monetary policy so as to support domestic economic activity and the financial system. That foreign-currency mismatches were less and a significant number of central banks had installed inflation targeting regimes permitted them to adopt a more permissive attitude toward exchange rate depreciation than in the first subperiod. Larger foreign reserves similarly provided reassurance that the authorities had the wherewithal to intervene were those exchange rate movements to get out of hand.

That governments seemingly have more leeway in the more recent period for using monetary, fiscal and exchange rate policies in response to sudden stops would suggest that the negative output effects in these more recent episodes should have been less. Paradoxically, we find that the year-on-year output drop is at least as large in the second subperiod. This suggests that something else is also changing to magnify the output effects, where that something else could be the volume and make-up of international capital flows and/or the prevalence and impact of external shocks.

That stronger fiscal positions, more flexible exchange rates, deeper financial markets and less foreign currency mismatch has not better insulated emerging markets from sudden stops and

their disruptive output effects is troubling. Evidently, neither national officials, with the increased policy space, nor the international financial institutions, with their proliferation of new financing facilities, have succeeded in cushioning emerging markets from these effects. It would appear that any benefit from stronger country fundamentals has been offset by larger external shocks emanating from the rest of the world. The question is what to do.

One option would be to attempt to limit exposure to capital flows and external shocks at the border through the application of capital inflow taxes and regulations, reducing the volume and volatility of capital movements; doing so would be consistent with the IMF's so-called "new institutional view" of capital flow regulation.

A second option would be to invest further in reforms designed to enhance further the flexibility of the policy response to capital flow surges and stops (strengthen fiscal positions still further, make exchange rates still more flexible, deepen financial markets further, reduce foreign currency mismatches even more from current levels) on the grounds that existing policy reforms, while an appropriate response to the circumstances of the earlier period, are no longer sufficient in a world of even larger and more volatile capital flows.

A third option would be to arrange financial insurance against sudden stops: credit lines with the IMF, with regional arrangements like the Chiang Mai Initiative Multilateralization, and with individual national partners. This will require additional reforms to make the terms and conditions attached to these facilities more efficient so that countries experiencing sudden stops are actually willing to take recourse to them. There is reason to think that these options are complements, not incompatible alternatives.

References

Calvo, Guillermo, Alejandro Izquierdo and Luis-Fernando Mejia (2004), "On the Empirics of Sudden Stops: The Relevance of Balance-Sheet Effects," NBER Working Paper no. 10520 (May).

Calvo, Guillermo, Alejandro Izquierdo and Ernesto Talvi (2003), "Sudden Stops, the Real Exchange Rate and Fiscal Sustainability: Argentina's Lessons," NBER Working Paper no. 9828 (July).

Cavallo, Eduardo and Jeffrey Frankel (2008), "Does Openness to Trade Make Countries More Vulnerable to Sudden Stops, or Less? Using Gravity to Establish Causality," *Journal of International Money and Finance* 27, pp.1430-1452.

Cavallo Eduardo, Andrew Powell, Mathieu Pedemonte and Pilar Tavella (2013), "A New Taxonomy of Sudden Stops: Which Sudden Stops Should Countries Be Most Concerned About?" Inter-American Development Bank Working Paper no.430.

Demirgüç-Kunt, Asli, and Enrica Detragiache (2000), "Financial Liberalization and Financial Fragility," in Gerard Caprio, Patrick Honohan and Joseph Stiglitz (eds), *Financial Liberalization: How Far? How Fast?* New York: Cambridge University Press, pp.96–122.

Edwards, Sebastian (2004a), "Financial Openness, Sudden Stops, and Current Account Reversals," *American Economic Review* 94(2):59-64.

Edwards, Sebastian (2004b), "Thirty Years of Current Account Imbalances, Current Account Reversals and Sudden Stops," NBER Working Paper no. 10276 (February).

Efremidze, Levan, Sungsoo Kim, Ozan Sula and Thomas Willett (2015), "The Relationships Among Capital Flow Surges, Reversals and Sudden Stops," unpublished manuscript, Claremont Institute for Economic Policy Studies (December).

Eichengreen, Barry, Andrew Rose and Charles Wyplosz (1995), "Exchange Market Mayhem: The Antecedents and Aftermath of Speculative Attacks," *Economic Policy* 21, pp.249-315.

Forbes, Kristin J. and Francis E. Warnock (2012), "Capital Flow Waves: Surges, Stops, Flight, and Retrenchment," *Journal of International Economics* 88, pp.235-251

Gourinchas, Pierre-Olivier and Maurice Obstfeld (2012), "Stories of the Twentieth Century for the Twenty-First," *American Economic Journal: Macroeconomics* 4, pp.226–265

International Monetary Fund (2012), *The Liberalization and Management of Capital Flows-An Institutional View*, Washington, D.C.: IMF.

International Monetary Fund (various years), *Annual Report on Exchange Arrangements and Exchange Restrictions*, Washington, D.C.: IMF.

International Monetary Fund (various years), “Article IV Reports,” Washington, D.C.: IMF.

Jorda, Oscar, Moritz, Schularick and Alan M. Taylor 2013, When Credit Bites Back, Journal of Money, Credit and Banking, 45, pp. 3-28.

Lane, Philip and Gian Maria Milesi-Ferretti (2007), "The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970–2004," *Journal of International Economics* 73, pp.223-250.

Lane, Philip R., and Jay C. Shambaugh (2010), "Financial Exchange Rates and International Currency Exposures." *American Economic Review* 100, pp. 518-40.

Vegh, Carlos, A. and Guillermo Vuletin (2014), “The Road to Redemption: Policy Response to Crises in Latin America,” *IMF Economic Review* 62(4), pp 526-568.

Figure 1. Portfolio and Other Capital Flows
(Median flows for all emerging markets in % of GDP)

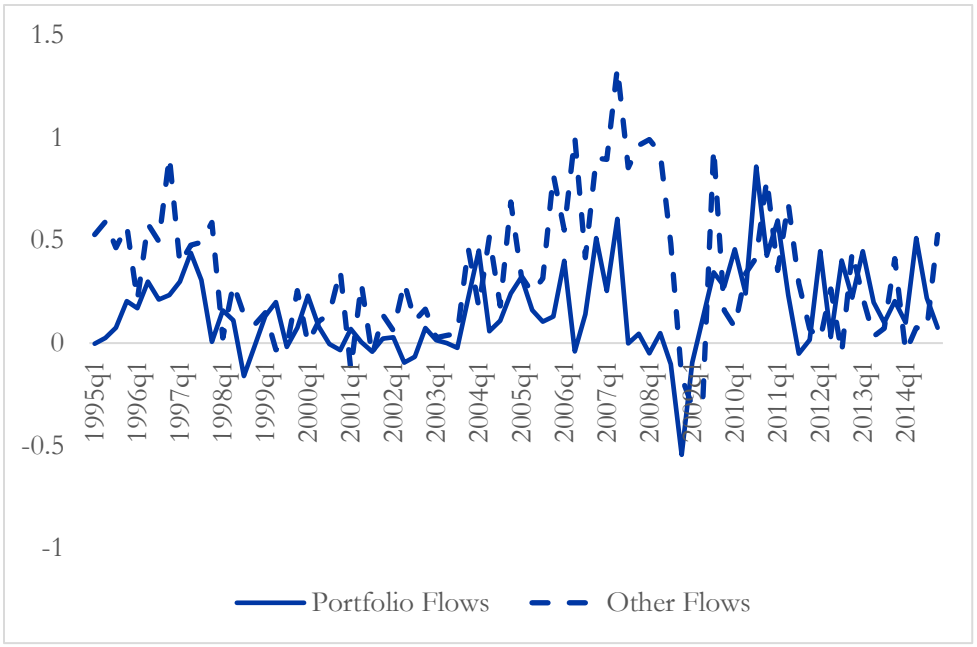


Figure 2. Magnitude of FDI and non-FDI flows
(Median flows for all emerging markets in % of GDP)

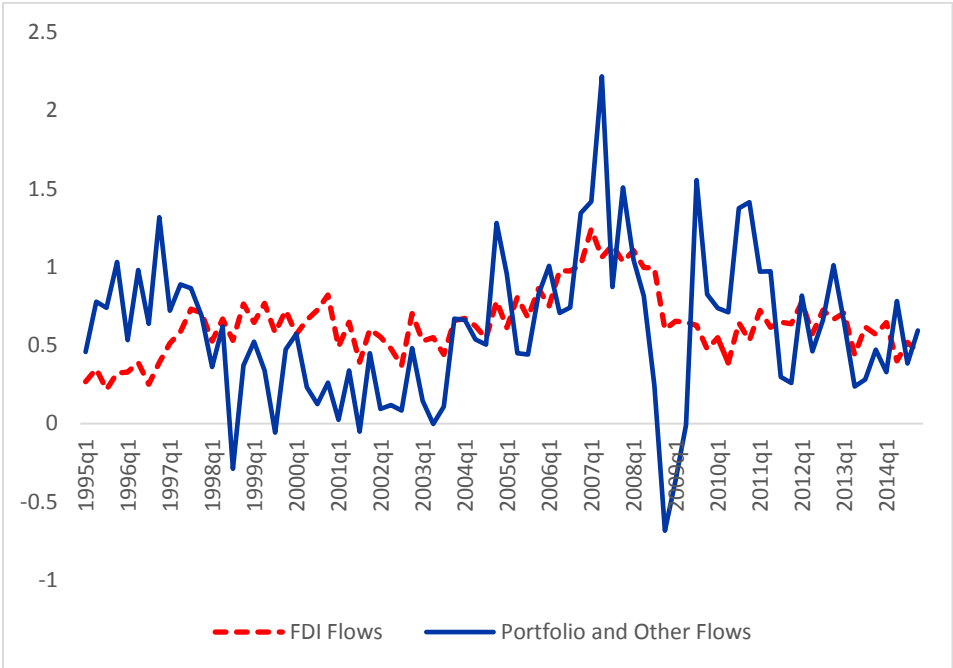
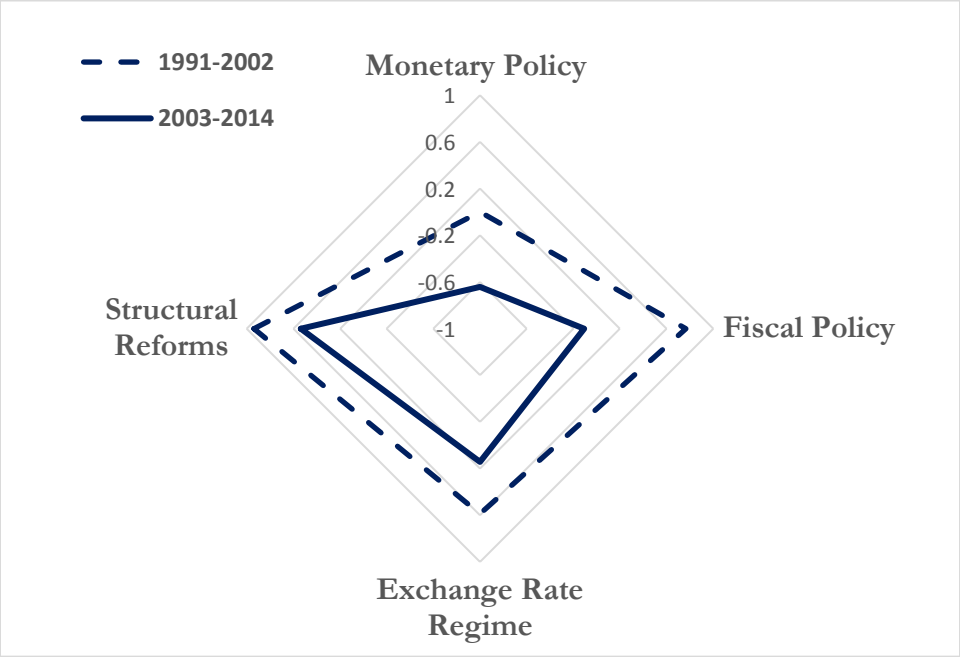


Figure 3. Policy Tradeoffs in Sudden Stop Episodes



We assign either a zero, one, or negative one to a country in each episode, with a one when a country tightened monetary policy, tightened fiscal policy, made its exchange rate regime more flexible, or committed to structural reforms. Zero when there is no change, and minus one when a country eased monetary policy or fiscal policy. Countries with all minus one are at the center of the figure, whereas countries with all ones are at the four vertexes (they trace out the diamond).

Table 1. Sudden Stops, 1991-2002 vs. 2003-214
[Table updated with data for 2015]

	1991-2002	**2003-2014**
# of sudden stops	16	28
As percent of available observations	1.8 % (16/903)	2.1 % (28/1354)
# of quarters for which the sudden stops last	4.5	3.64
Capital flows during Sudden stops (% of GDP), first quarter	-1.61	-1.28
Capital flows during sudden stops (% of GDP), average for first four quarters	-1.79	-1.4
Capital flows in the four quarters preceding Sudden stops (% of GDP)	1.28	2.1^^
Portfolio flows in the four quarters preceding Sudden stops (% of GDP)	.68	.40**
Other flows in the four quarters preceding Sudden stops (% of GDP)	.60	1.70^^^
Capital flow turnaround: Avg. capital flows during four quarters of sudden stops- Avg. capital flows in the four preceding quarters	-3.06	-3.59*
Capital flow turnaround: Avg. Capital flows during all quarters of sudden stops- Avg. capital flows in the four preceding quarters	-2.28	-3.21***

*, **, *** indicate that the value is significantly lower in the second column, compared to its value in the first column at 10, 5 or 1 percent level of significance (in a one tailed test). ^, ^^, ^^^ indicate that the value is significantly higher in the second column, compared to its value in the first column, at 10, 5 or 1 percent level of significance (in a one tailed test).

Table 2. FDI, portfolio and other capital flows by Nonresidents and Residents during Sudden Stops
[Table updated with data for 2015]

VARIABLES	(1) Portfolio Flows (% of GDP)	(2) Other Flows (% of GDP)	(3) Total Flows (Portfolio + Other, % of GDP)	(4) Net Capital Flows by residents and nonresidents (% of GDP)
Sudden Stop	-0.62***	-1.81***	-2.43***	-2.335***
	[3.30]	[4.06]	[6.66]	[7.27]
Dummy for 2003-2014	0.11*	0.13	0.23*	-0.061
	[1.97]	[1.23]	[2.01]	[0.55]
Sudden Stop * Dummy for 2003-2014	-0.35	0.09	-0.24	0.372
	[1.46]	[0.22]	[0.60]	[0.93]
Constant	0.29***	0.52***	0.79***	0.406***
	[8.21]	[8.03]	[11.55]	[6.33]
Observations	2,546	2,530	2,530	2,530
R-squared	0.053	0.080	0.133	0.086
Number of countries	34	34	34	34
Adj. R-squared	0.0521	0.0789	0.132	0.0852

Data are quarterly over the period 1991-2014. Dependent variable is portfolio, other flows, or their sum by nonresidents; or net flows by residents and nonresidents, in percent of GDP. Regressions include country fixed effects. First four quarters of the sudden stop are included in the regressions. Robust t statistics are in parentheses. *, **, or *** indicate the coefficients are significant at 10, 5 or 1 percent level of significance. Regressions with year fixed effects instead of a different intercept for post 2003 period yield similar coefficients.

Table 3. Comparing the Impact Over Time

VARIABLES	(1) Exchange Rate Depreciation	(2) NEER (% change)	(3) REER (% change)	(4) % Change in Reserves	(5) % Change in Equity prices (real)	(6) GDP growth (quarterly yoy)	(7) Investment Growth (quarterly yoy)	(8) Current Account Balance % GDP
Sudden Stop	11.08**	9.15**	8.77***	-12.24**	-3.20	-3.78***	-11.64***	1.67
	[2.58]	[2.29]	[3.53]	[2.65]	[0.96]	[3.39]	[2.88]	[1.52]
Dummy 2003-2014	-4.51***	-2.68*	-0.11	-0.39	2.81***	0.77*	0.48	-0.20
	[2.92]	[1.80]	[0.41]	[0.90]	[4.52]	[1.78]	[0.29]	[0.24]
Sudden Stop * Dummy for 2003-2014	-3.08	-4.93	-5.29**	4.26	-7.89*	-1.47	0.92	-0.76
	[0.69]	[1.21]	[2.06]	[0.84]	[2.04]	[0.99]	[0.15]	[0.52]
Constant	4.46***	-2.44***	0.30	2.86***	-1.64***	3.78***	7.78***	-1.51**
	[4.71]	[3.23]	[1.58]	[8.84]	[3.78]	[12.73]	[7.09]	[2.74]
Observations	2,569	1,926	2,159	2,573	2,284	2,160	1,959	2,000
R-squared	0.054	0.05	0.076	0.023	0.026	0.081	0.031	0.005
Number of countries	34	26	28	34	31	32	29	30
Adj. R-squared	0.053	0.048	0.075	0.022	0.025	0.079	0.030	0.003

Data are quarterly over the period 1991-2015. Dependent variables are as indicated in the first row. All variables are in percentage. GDP growth and investment growth are year-over-year. Regressions include country fixed effects. Robust t statistics are in parentheses. *, **, or *** indicate the coefficients are significant at 10, 5 or 1 percent level of significance. Regressions with year fixed effects instead of a different intercept for post 2003 period yield similar coefficients.

Table 4. Impact on economic and financial variables

Dependent → Variables	Exchange Rate Depreciation	% change in Reserves	% change equity prices (real)	GDP Growth (yoy)	Investment Growth (yoy)	Current account balance/GDP
Quarter 1	10.414***	-15.331***	-16.479***	-2.437***	-6.379**	-0.859
	[4.25]	[4.85]	[5.35]	[3.01]	[2.68]	[1.37]
Quarter 2	13.568***	-7.060***	-10.997***	-5.721***	-9.255**	0.966
	[3.42]	[3.00]	[3.22]	[4.88]	[2.14]	[1.07]
Quarter 3	3.427**	-8.104	3.097	-6.089***	-17.550***	2.804**
	[2.23]	[1.50]	[0.82]	[4.45]	[3.88]	[2.55]
Quarter 4	5.894	-5.113	-0.210	-5.477***	-15.336**	3.304***
	[1.66]	[0.65]	[0.05]	[2.82]	[2.43]	[2.80]
Constant	1.735***	2.628***	2.625***	4.279***	8.110***	-1.648***
	[16.21]	[19.01]	[22.41]	[66.39]	[39.97]	[39.01]
Observations	2,569	2,573	2,284	2,160	1,959	2,000
R-squared	0.030	0.026	0.034	0.082	0.036	0.012
Number of countries	34	34	31	32	29	30
Adj. R-squared	0.0289	0.0243	0.0324	0.0805	0.0343	0.00985

Data are quarterly over the period 1991-2014. Dependent variables are as indicated in the first row. All variables are in percentage. GDP growth and investment growth are year-over-year. Regressions include country fixed effects. Robust t statistics are in parentheses. *, **, or *** indicate the coefficients are significant at 10, 5 or 1 percent level of significance. Regressions with year fixed effects instead of a different intercept for post 2003 period yield similar coefficients.

Table 5. Correlates of Sudden Stops (Probit model, marginal effects, 1991-2014)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VIX, Log	0.01***	0.0121***	0.0120***	0.0120***	0.0121***	0.0069***	0.0094***	0.0066***
	[7.02]	[6.92]	[6.66]	[6.87]	[6.90]	[3.62]	[4.36]	[3.28]
US Policy Rates (%)	0.00*	0.0030**	0.0030*	0.0034**	0.0031**	0.0042***	0.0042***	0.0045***
	[1.81]	[2.04]	[1.81]	[2.34]	[2.15]	[2.61]	[2.75]	[2.77]
Capital Flows/GDP	0.01***	0.0052***	0.0050***	0.0050***	0.0051***	0.0040***	0.0043***	0.0038**
	[4.03]	[3.62]	[3.50]	[3.65]	[3.60]	[2.58]	[2.59]	[2.32]
Domestic Credit/GDP		0.0029**	0.0033***	0.0022*	0.0028**	0.0028**	0.0034***	0.0030***
		[2.49]	[2.96]	[1.71]	[2.48]	[2.48]	[2.98]	[2.68]
RER (% Change)			-0.0013					
			[1.04]					
Reserves/GDP				0.0019				
				[1.21]				
External Liabilities/GDP					0.001			
					[0.35]			
# of Sudden Stops elsewhere in the world						0.0053***		0.0045***
						[4.41]		[2.86]
# of Sudden Stops elsewhere in the Region							0.0036***	0.0014
							[3.16]	[1.01]
Observations	2,208	2,178	2,150	2,178	2,177	2,178	2,178	2,178
Pseudo R-squared	0.180	0.185	0.185	0.188	0.186	0.229	0.213	0.232

Dependent variable is a binary variable which is equal to 1 if a sudden stop occurs and 0 otherwise. The first quarter of sudden stop is included in the regressions, and all subsequent quarters dropped. Domestic variables are averages of previous eight quarters. All variables have been standardized around zero mean and standard deviation equal to 1. Capital flows, domestic credit and reserves, and international investment are in percent of GDP. Real exchange rate is in percent change; an increase denotes a depreciation. VIX is in log; sudden stop episodes elsewhere in the world or region are the number of sudden stops elsewhere in the same quarter. Regressions are estimated with robust standard errors, and observations clustered by countries. Z statistics reported in parentheses. ***,** and * indicate significance at 1, 5, and 10% levels, respectively.

Table 6. Correlates of Sudden Stops
(Probit model, marginal effects, 1991-2002)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VIX, Log	0.01*	0.0086*	0.0079*	0.0087**	0.0083**	0.0079*	0.0067	0.0074
	[1.93]	[1.92]	[1.92]	[2.18]	[2.10]	[1.65]	[1.61]	[1.61]
US Policy Rates (%)	0.01***	0.0097***	0.0092***	0.0083***	0.0084***	0.0092***	0.0085***	0.0090***
	[4.27]	[4.79]	[4.32]	[4.25]	[4.15]	[3.46]	[4.22]	[3.61]
Capital Flows/GDP	0.01***	0.0128***	0.0117***	0.0130***	0.0139***	0.0128***	0.0121***	0.0121***
	[6.46]	[6.02]	[6.09]	[6.27]	[5.12]	[5.99]	[6.13]	[6.17]
Domestic Credit/GDP		-0.0023	-0.0012	-0.0012	-0.0021	-0.0022	-0.0017	-0.0017
		[1.07]	[0.72]	[0.48]	[1.08]	[1.05]	[0.76]	[0.80]
RER (% Change)			-0.0045*					
			[1.93]					
Reserves/GDP				-0.0068*				
				[1.93]				
External Liabilities/GDP					-0.0044*			
					[1.70]			
# of Sudden Stops elsewhere in the world						0.0021		-0.0032
						[0.47]		[0.50]
# of Sudden Stops elsewhere in the Region							0.0065*	0.0079*
							[1.96]	[1.66]
Observations	882	862	840	862	861	862	862	862
Pseudo R-squared	0.120	0.121	0.130	0.137	0.129	0.122	0.135	0.137

Dependent variable is a binary variable which is equal to 1 if a sudden stop occurs and 0 otherwise. The first quarter of sudden stops are included in the regressions, all subsequent quarters dropped. Domestic variables are averages of previous eight quarters. All variables have been standardized around zero mean and standard deviation equal to 1. Capital flows, domestic credit and reserves, and international investment are in percent of GDP. Real exchange rate is in percent change; an increase denotes a depreciation. VIX is in log; sudden stop episodes elsewhere in the world or region are the number of sudden stops elsewhere in the same quarter. Regressions are estimated with robust standard errors, and observations clustered by countries. Z statistics reported in parentheses. ***,** and * indicate significance at 1, 5, and 10% levels, respectively.

Table 7. Correlates of Sudden Stops
(Probit model, marginal effects, 2003-2014)

	(1)	(2)	(3)	(5)	(6)	(7)	(8)
VIX, Log	0.01***	0.0114***	0.0114***	0.0113***	0.0064**	0.0099***	0.0062**
	[6.63]	[6.56]	[6.74]	[6.42]	[2.25]	[3.75]	[2.04]
US Policy Rates (%)	0.01	0.0051*	0.0054*	0.0053*	0.0035	0.0057*	0.0039
	[1.60]	[1.76]	[1.88]	[1.79]	[1.05]	[1.87]	[1.21]
Capital Flows/GDP	0.00*	0.0014	0.0017	0.0009	0.0011	0.0005	0.0007
	[1.72]	[1.22]	[1.58]	[0.75]	[0.80]	[0.37]	[0.52]
Domestic Credit/GDP		0.0034***	0.0032***	0.0030***	0.0036***	0.0040***	0.0037***
		[3.06]	[2.91]	[2.95]	[2.92]	[3.36]	[3.05]
RER (% Change)			0.0020*				
			[1.76]				
External Liabilities/GDP				0.0012			
				[1.13]			
# of Sudden Stops elsewhere in the world					0.0041***		0.0037**
					[3.06]		[2.39]
# of Sudden Stops elsewhere in the Region						0.0024**	0.0009
						[2.22]	[0.80]
Observations	1,326	1,316	1,310	1,316	1,316	1,316	1,316
Pseudo R-squared	0.263	0.278	0.281	0.281	0.327	0.305	0.330

Dependent variable is a binary variable which is equal to 1 if a sudden stop occurs and 0 otherwise. The first quarter of sudden stops are included in the regressions, all subsequent quarters dropped. Domestic variables are averages of previous eight quarters. All variables have been standardized around zero mean and standard deviation equal to 1. Capital flows, domestic credit and reserves, and international investment are in percent of GDP. Real exchange rate is in percent change; an increase denotes a depreciation. VIX is in log; sudden stop episodes elsewhere in the world or region are the number of sudden stops elsewhere in the same quarter. Regressions are estimated with robust standard errors, and observations clustered by countries. Z statistics reported in parentheses. ***,** and * indicate significance at 1, 5, and 10% levels, respectively.

Table 8. Average (Year on Year) GDP growth in the First Four Quarters of Sudden Stops

	(1)	(2)	(3)
Capital Flows (% of GDP, Average of past 8 quarters)	-1.800**	1.080	1.727
	[2.14]	[0.68]	[1.11]
Capital Flows (% of GDP, Average of past 8 quarters)* dummy 2003-2014		-3.305*	-3.861**
		[1.80]	[2.12]
Other Flows/Total Flows	-0.677		-3.819
	[1.09]		[1.40]
(Other Flows/Total Flows)* dummy 2003-2014			3.235
			[1.16]
Dummy for 2003-2014		5.145*	4.790*
		[1.99]	[1.85]
Constant	2.018*	-2.494	-2.045
	[1.71]	[1.12]	[0.92]
Observations	41	41	41
R-squared	0.241	0.281	0.309
Adj. R-squared	0.201	0.223	0.211

Robust t statistics in parentheses. **,** and * indicate significance at 1, 5, and 10% levels, respectively

Table 9. Policies during Sudden Stops 1991-2014

	1991-2014	
	Number of cases	**Fraction of cases**
Monetary Policy		
Eased	27	63%
Tightened	9	21%
No change, or no clear stance	7	16%
Fiscal Policy		
Eased	14	33%
Tightened	23	53%
No change, or no clear stance	6	14%
Capital account transactions		
Eased	9	23%
Tightened	7	17%
No change, or no clear stance	24	60%
Macro prudential Measures		
Strengthened	13	33%
Eased	4	10%
No change, or no clear stance	22	56%
Exchange Rate regime		
Changed	14	33%
No change	29	67%
IMF program		
New or ongoing	22	49%
No program	21	51%
New program	12	29%
No new program	29	71%

Table 10. Policies during Sudden Stops – Subperiods

	1991-2002		2003-2014	
	Number of cases	**Fraction of cases**	**Number of cases**	**Fraction of cases**
Monetary Policy				
Eased	7	44%	20	74%
Tightened	6	38%	3	11%
No change, or no clear stance	3	19%	4	15%
Fiscal Policy				
Eased	1	6%	13	48%
Tightened	13	81%	10	37%
No change, or no clear stance	2	13%	4	15%
Capital Account Transactions				
Eased	5	39%	4	15%
Tightened	3	23%	4	15%
No change, or no clear stance	5	39%	19	70%
Macro Prudential Measures				
Strengthened	3	25%	10	37%
Eased	0		4	15%
No change, or no clear stance	9	75%	13	48%
Exchange Rate Regime				
Changed	10	63%	4	15%
No change	6	37%	23	85%
IMF program				
New or ongoing	15	94%	7	26%
No program	1	6%	20	74%
New program	7	50%	5	19%
No new program	7	50%	22	81%
Structural reforms				
Reforms	14	7%	14	52%
No reforms	1	93%	13	48%

Table 11. IMF Programs and Structural Reform

Full period, 1991-2014

Structural reform → / IMF program ↓	No	Yes	Total
No	13	8	21
Yes	1	20	21
Total	14	28	42

First Subperiod, 1991-2002

Structural reform → / IMF program ↓	No	Yes	Total
No	1	0	1
Yes	0	14	14
Total	1	14	15

Second Subperiod, 2003-2014

Structural reform → / IMF program ↓	No	Yes	Total
No	12	8	20
Yes	1	6	7
Total	13	14	27

Source: see text.

Table 12. Macroeconomic Frameworks and Structural Factors in the Eight Quarters Before Sudden Stops

Dependent Variable →	(1) Fiscal Balance/ GDP	(2) Public Debt/ GDP	(3) Inflation	(4) Exchange Rate regime	(5) Reserves/ GDP	(6) Foreign Currency Position	(7) Capital Controls	(8) Inflation Targeting	(9) Domestic Credit
Dummy for 2003-2014	1.4*	-11.03*	-3.27**	0.44**	11.39***	0.32***	-0.14*	0.46***	14.78**
	[1.14]	[1.09]	[1.31]	[1.70]	[4.01]	[5.25]	[0.97]	[3.34]	[1.34]
Constant	-2.45**	51.20***	10.69***	1.75***	8.95***	-0.31***	0.55***	0.06	43.33***
	[2.31]	[6.33]	[5.19]	[8.61]	[3.98]	[6.52]	[4.55]	[0.58]	[4.95]
Observations	36	42	38	43	43	32	30	43	43
R-squared	0.037	0.029	0.046	0.066	0.282	0.479	0.033	0.214	0.042

For inflation we dropped two episodes where inflation was more than 40 percent. Exchange rate regime is an index. A higher value implies more flexible exchange rate regime. Foreign currency position is an index, a higher value means less negative foreign currency position. For capital controls a higher value means more controls. Inflation targeting is a dummy for inflation targeting countries. Domestic credit is ratio of private sector bank credit to GDP. Results are for linear regressions of dependent variables in first row. Coefficients indicate averages for the sudden stops across two sub periods. *, **, *** indicate if the coefficients across subperiods are significant at 20, 10 or 1 percent level of significance in a one tailed test. Data are from the sources noted in appendix, and from the IMF reports.

Appendix A. Countries, Data availability, and Sudden Stops

Country	Data from	SS1 Start date, Duration in quarters		SS 2 Start date, Duration in quarters		SS1 Modified Start date, Duration in quarters		SS2 Modified Start date, Duration in quarters	
Argentina	1985					1998q4	3	1998q4	4
Armenia	1996	No SS							
Belarus	1996					2012q1	3	2012q1	5
Brazil	1984	1998q3	3	1998q3	9	1998q3	3	1998q3	9
						2008q4	2	2008q4	2
Bulgaria	1996								
Chile	1991					2008q4	3	2008q4	3
Colombia	1996	No SS							
Croatia	1996	2011q3	2	2011q3	7	2011q3	2	2011q3	7
Czech Republic	1994	2008q4	2	2008q4	2	2008q4	2	2008q4	2
Guatemala	1995	2008q4	2	2008q4	4	2008q4	4	2008q4	4
Hungary	1993	1996q1	2	1996q1	3	1996q1	2	1996q1	3
						2011q4	5	2011q4	5
India	1992	2008q3	4	2008q3	4	2008q3	4	2008q3	4
Indonesia	1993	1997q4	2	1997q4	9	1997q4	2	1997q4	9
Israel	1994	2011q3	4	2011q3	5	2011q3	4	2011q3	5
Jordan	1985	2003q1	2	2003q1	6	1993q1	5	1993q1	5
		2003q4	2			2003q1	5	2003q1	5
						2007q3	3	2007q3	3
Kazakhstan	1995					2007q3	13	2007q3	13
Korea, Rep.	1990	1997q4	2	1997q4	9	1997q4	5	1997q4	5
		2008q3	2	2008q3	3	2008q3	2	2008q3	2
Latvia	2001	2008q4	3	2008q4	3	2008q4	3	2008q4	3
Lithuania	1995					2008q4	2	2008q4	2
Malaysia	2000-2009	2008q3	2	2008q3	4	2008q3	3	2008q3	4
Mexico	1985	1994q4	3	1994q4	4	1994q2	5	1994q2	6
Pakistan	1995	1998q1	4	1998q1	13	1998q1	9	1998q1	13
		1999q2	5						
Peru	1991	1998q4	4	1998q4	10	1998q4	4	1998q4	4
						2008q3	4	2008q3	4
Philippines	1990	1997q3	3	1997q3	6	1997q3	3	2008q1	6
						2008q1	4	2008q1	6
Poland	2000	2008q4	2	2008q4	2	2008q3	3	2008q3	3
Romania	1991	2008q4	3	2008q4	3	2008q4	3	2008q4	3
Russia Federation	1994					1998q4	8	1998q4	8
		2008q4	2	2008q4	10	2008q4	2	2008q4	2
		2014q1	5	2014q1	5	2014q1	5	2014q1	5

South Africa	1985	2000q4	3	2000q4	10	2000q4	3	2000q4	10
		2008q3	2	2008q3	4	2008q3	2	2008q3	4
Sri Lanka	1985					2001q1	7	2001q1	7
Thailand	1985	1997q2	6	1997q2	15	1997q2	6	1997q2	15
		2008q3	3	2008q3	4	2008q3	3	2008q3	4
Turkey	1985	1994q1	3	1994q1	5	1994q1	3	1994q1	5
		2000q4	3	2000q4	8	2000q4	3	2000q4	8
		2008q4	3	2008q4	6	2008q4	3	2008q4	6
Ukraine	1994					2008q4	5	2008q4	5
		2014q1	4	2014q1	4	2014q1	4	2014q1	4
Venezuela, RB	1994	2006q1	2	2006q1	3	2006q1	2	2006q1	3
Vietnam	2005								

SS1 denote sudden stop dates identified using the filters laid out in the text: a sudden stop episode starts when portfolio and other flows by nonresidents decline below the average of the previous 20 quarters by more than one standard deviation, and for more than one quarter; and in at least in one quarter of this period, flows are two standard deviations or more below the average. Sudden stops end when capital flows recover to a level above mean minus one standard. In SS2 a sudden stop ends when the flows have recovered to the average of the past 20 quarters. In SS1 modified and SS2 modified we make some judgment calls by looking at the trends in the data and include sudden stops even if the respective criteria are missed by a whisker. By design SS2 lasts longer than SS1.

Appendix B. Correlations between Domestic Variables

In the main body of the text we include only subsets of our country characteristics and policy variables in the regressions on the grounds that a number of these variables are highly correlated with one another. It is also interesting that some of these correlations seem to have changed significantly over time. In the first half of the period correlation is stronger between capital flows and current account deficit and weaker between capital flows and reserves—suggestive of that the capital flows were instrumental in financing current account deficit than in the accumulation of reserves. The domestic banking sector seems to have played a less prominent role in mediating the capital flows in the first half of the period. In comparison, in the last decade capital flows correlate more strongly with reserves than in the past; and larger capital inflows go hand in hand with larger banking sector and rapid credit growth. These patterns suggest that the concerns related to financial sector stability matter more in recent sudden stops.

Table B1. Correlation Coefficients between Selective Domestic Factors, 1991-2002

	Capital flows/GDP	Current account deficit/GDP	Reserves /GDP	Credit/GDP	Credit Growth	% Change in Real Exchange Rate
Capital flows/GDP	1					
Current account deficit/GDP	0.62	1				
	(0.0)					
Reserves/GDP	0.017	-0.05	1			
	(0.62)	(0.26)				
Credit/GDP	0.066	-0.12	0.36	1		
	(0.05)	(0.01)	(0.0)			
Credit growth	0.28	0.25	0.004	-0.03	1	
	(0.0)	(0.0)	(0.92)	(0.50)		
% change in real exchange rate	-0.19	0.003	-0.03	0.009	-0.071	1
	(0.0)	(0.95)	(0.32)	(0.79)	(0.08)	

Correlation Coefficients between Selective Domestic Factors, 2003-2014

	Capital flows/GDP	Current account deficit/GDP	Reserves /GDP	Credit/GDP	Credit Growth	% Change in Real Exchange Rate
Capital flows/GDP	1					
Current account deficit/GDP	0.56	1				
	(0.0)					
Reserves/GDP	0.08	-0.15	1			
	(0.00)	(0.00)				
Credit/GDP	0.13	-0.10	0.51	1		
	(0.05)	(0.00)	(0.00)			
Credit growth	0.54	0.27	-0.12	-0.22	1	
	(0.0)	(0.00)	(0.00)	(0.00)		
% change in real exchange rate	-0.29	-0.06	-0.03	0.04	-0.35	1
	(0.0)	(0.04)	(0.24)	(0.16)	(0.00)	

In parentheses are the p values to accept the null hypothesis that the correlation coefficients are equal to zero.

Appendix B2: Variables and Sources of Data

Variable	Definition	Sources
Portfolio liabilities	Transactions with nonresidents in financial securities (such as corporate securities, bonds, notes, and money market instruments)	IFS (line 78bgd)
Other liabilities	Other transactions with nonresidents, major categories are: transactions in currency and deposit loans and trade credits	IFS (line 78bid)
Direct foreign liabilities	Equity capital, reinvested earnings	IFS (line 78bgd)
Capital flows	Sum of portfolio and other liabilities	IFS
Public debt	Gross general government debt (in some cases central government debt), % of GDP	IFS/National Sources
Fiscal balance	Revenue (including grants) minus expense, net acquisition of nonfinancial assets. % of GDP.	WEO
Capital controls	Overall restrictions index of all asset categories	Klein et al.,(2015)
Fed funds Rate	Fed fund rate (%) (US Policy Rate)	IFS
World GDP	World GDP (% per annum)	WDI, World Bank
VIX	CBOE Volatility Index	Bloomberg
Net foreign currency position	An index which takes values between (-1; 1):value of -1 corresponds to zero foreign-currency foreign assets and only foreign-currency liabilities, +1 corresponds to only foreign-currency foreign assets and no domestic-currency foreign liabilities	Lane and Shambaugh (2014), updated version of Lane and Milesi-Ferretti (2007) dataset
Political risk	Risk ratings range from a high of 100 (least risk) to a low of 0 (highest risk)	Political Risk Services (PRS)
Exchange regime	de facto exchange rate regime classification	Ilzetzki, Reinhart, Rogoff, 2008
Investment growth	Quarterly investment growth	IFS
Nominal GDP	Quarterly Nominal GDP	GEM, World Bank
Real GDP	Quarterly Real GDP	IFS
Foreign reserves	Foreign Exchange Reserves in Million USD (End of period data)	IFS
Exchange rate	Official exchange rate local currency per USD (Monthly average)	IFS
Stock price index	National Stock Price Indices, monthly average in current prices	IFS and Haver
Current account balance	Sum of net exports of goods and services, net primary income, and net secondary income, % of GDP	National Sources
Domestic credit to private sector	Financial resources provided to the private sector by financial corporations	WDI
Real effective exchange rate	Nominal effective exchange rate index adjusted for relative movements in national price or cost indicators of the home country, selected countries, and the euro area	JPMorgan Real Broad Effective Exchange Rate Index
Nominal effective exchange rate	Ratio (base 2010 = 100) of an index of a currency's period-average exchange rate to a weighted geometric average of exchange rates for currencies of selected countries and the euro area	JPMorgan Nominal Broad Effective Exchange Rate Index
Real exchange rate	Computed as nominal exchange rate*US consumer price index/ consumer price index	exchange rate from IFS; CPI from WDI
Inflation	CPI inflation calculated as % change over previous year. (% yoy)	IFS
Inflation targeting	dummy variable takes a value of 1 after a country moves to an inflation targeting regime and 0 before that	
External liabilities	External liabilities include portfolio equity, FDI and debt liabilities.	Lane and Milesi-Ferretti (2007)
G4-money supply	Sum of US, UK, Japan and Euro area money supply (M2)	Haver

Appendix C. Sensitivity Analysis

We can further compare the impact of global and domestic variables during the sudden stops and tranquil periods in the two halves of the sample period as per the equation below.

$$\text{External or Domestic Factor}_{k,it} = \alpha_i + \beta_k \text{ Sudden Stop}_{it} + \gamma_k \text{ Dummy for 2003-2014} + \tau \text{ Sudden Stop}_{it} * \text{Dummy for 2003-2014} + \varepsilon_{it}$$

Regressions are estimated with country fixed effects and robust standard errors. The average value of each variable in non-crisis years prior to 2003 is given in row (i); variable averages during sudden stops until 2002 is given by (i) + (ii). Average value in tranquil years post 2002 is given by (i) +(iii). variable averages during sudden stop after 2003 is given by (i) +(ii)+(iii) +(iv). A significant coefficient in (iv) indicates that the (Average value of variable in SS -lagged value in tranquil years)$_{2003\text{-}2014}$ - (Average value of variable in SS-lagged value in nonstop years)$_{1991\text{-}2002}$ is significant] This is the difference in difference estimate of the change in variables across sudden stops in two subperiods compared to their relative tranquil averages.

Differences are evident across subperiods. A high U.S. fed funds rate is more strongly associated with sudden stops in the first subperiod than the second. The disproportionate importance of U.S. interest rates in triggering sudden stops – given the importance of dollar funding in global financial markets – is well known. Less obvious, especially given all the talk surrounding "tapering," is that this role appears to have diminished in the 2000s. The VIX is significantly higher during sudden stop episodes only in the second superiod, pointing to the growing importance of global as opposed to U.S. and financial as opposed to monetary factors. Whereas the external factors associated with the likelihood of sudden stops have changed over time, there is less evidence of such changes in the associated domestic factors. Two exceptions are the ratio of reserves to GDP (which was lower prior to sudden stop episodes in the 1990s compared to tranquil periods, but not in the 2000s) and foreign currency positions (which similarly were lower in sudden stop episodes in the 1990s but not subsequently).

Table C1. External and (lagged) domestic variables in sudden stop and normal years

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent → Variables	Fed Fund Rate (%)	VIX, Log	Capital Flows/GDP	% change in real exchange rate	Domestic credit/	Reserve /GDP	Foreign currency position
Sudden stop (ii)	0.63***	0.12	0.86***	-0.41	2.64	-1.19	-0.04*
	[3.32]	[1.56]	[3.62]	[1.53]	[0.91]	[1.29]	[1.75]
Sudden Stop in 2003-2014 (iv)	-1.25***	0.51***	-0.23	0.071	0.34	2.62*	0.057***
	[3.03]	[4.50]	[0.71]	[0.21]	[0.10]	[1.99]	[2.83]
Dummy 2003 (iii)	-2.63***	-0.16***	0.13	-1.23***	11.8***	6.36***	0.19***
	[35.43]	[6.00]	[1.00]	[5.92]	[3.34]	[6.18]	[5.80]
Constant (i)	4.38***	3.01***	0.73***	0.39***	37.94***	10.15**	-0.22***
	[100.55]	[186.3]	[9.63]	[3.10]	[17.63]	[16.42]	[11.02]
Observations	2,257	2,257	2,209	2,229	2,194	2,224	1,539
R-squared	0.336	0.098	0.015	0.084	0.14	0.323	0.419
Number of countries	34	34	34	34	34	34	27

Dependent variables are averages of eight previous quarters, except VIX and federal fund rate which are current quarter values. Capital flows are portfolio and other flows by nonresidents as % of GDP; real exchange rate is in percent change; an increase denotes a depreciation. Robust t-statistics in parentheses. ***,** and * indicate significance at 1, 5, and 10% levels.

Table C2. Probability of a Sudden Stop: Alternative Regression Models

	Logit regressions		Probit with Random Effects		Probit with country Fixed Effects	
	1991-2002	2003-2014	1991-2002	2003-2014	1991-2002	2003-2014
VIX, log	0.841*	1.362***	0.332	0.605***	0.596***	0.779***
	[1.88]	[7.47]	[1.46]	[5.86]	[2.73]	[7.29]
US Policy Rate	0.905***	0.695**	0.375***	0.274	0.317	0.308**
	[4.43]	[2.08]	[4.04]	[1.47]	[1.56]	[2.12]
Capital Flows/GDP	1.049***	0.146	0.493***	0.075	1.021***	0.032
	[6.06]	[1.17]	[4.54]	[1.04]	[4.26]	[0.29]
Domestic Credit/GDP	-0.128	0.448***	-0.09	0.179***	0.196	0.410
	[0.68]	[3.63]	[0.75]	[2.66]	[0.79]	[1.47]
Observations	862	1316	862	1316	515	914
Pseudo R-squared	0.116	0.285	.	.	0.237	0.348

Dependent variable is a binary variable which is equal to 1 if a sudden stop occurs and 0 otherwise. The first quarter of sudden stop is included in the regressions, and all subsequent quarters dropped. Domestic variables are averages of previous eight quarters. All variables have been standardized around zero mean and standard deviation equal to 1. ***,** and * indicate significance at 1, 5, and 10% levels, respectively.

Table C3. Probability of a Sudden Stop: Additional Domestic Variables (probit model, marginal effects)

	(1) 1991-2002	(2) 2003-2014	(3) 1991-2002	(4) 2003-2014	(5) 1991-2002	(6) 2003-2014	(7) 1991-2002	(8) 2003-2014	(9) 1991-2002	(10) 2003-2014	(11) 1991-2002	(12) 2003-2014
VIX, log	0.0089*	0.0109***	0.0051	0.0111***	0.0091*	0.0115***	0.0125**	0.0122***	0.0087*	0.0113***	0.0088*	0.0091***
	[1.93]	[6.34]	[1.49]	[6.22]	[1.86]	[6.53]	[2.46]	[5.82]	[1.89]	[6.60]	[1.70]	[6.43]
US Policy Rate	0.0101***	0.0038	0.0056***	0.0040	0.0092***	0.0052*	0.0080***	0.0049	0.0099***	0.0050*	0.0089***	0.0052***
	[4.39]	[1.54]	[2.96]	[1.31]	[4.22]	[1.78]	[3.25]	[1.37]	[4.88]	[1.72]	[5.45]	[2.68]
Capital Flows/GDP	0.0123***	0.0009	0.0088***	0.0012	0.0133***	0.0016	0.0054***	0.0020	0.0131***	0.0012	0.0124***	0.0006
	[5.96]	[0.72]	[5.43]	[1.04]	[5.14]	[1.37]	[3.50]	[1.36]	[6.52]	[1.00]	[6.00]	[0.67]
Domestic Credit/GDP	-0.0027	0.0038***	-0.0020	0.0030**	-0.0023	0.0034***	-0.0022	0.0028**	-0.0030	0.0031***	-0.0006	0.0037**
	[1.28]	[3.83]	[1.21]	[2.56]	[0.98]	[3.05]	[1.55]	[2.49]	[1.31]	[3.08]	[0.26]	[2.13]
GDP Growth	0.0020	0.0026										
	[0.65]	[1.06]										
Fiscal deficit/GDP			-0.0029	-0.0028*								
			[1.05]	[1.65]								
Debt/GDP					-0.0007	0.0007						
					[0.43]	[0.32]						
Capital Controls							0.0011	-0.0001				
							[0.76]	[0.08]				
Political Risk									0.0005	0.0010		
									[0.30]	[0.58]		
Foreign currency position											-0.0091***	-0.0004
											[3.42]	[0.22]
Observations	861	1307	660	1286	777	1306	454	1073	846	1316	603	875
Pseudo R-squared	0.124	0.269	0.156	0.283	0.132	0.277	0.205	0.265	0.130	0.278	0.162	0.363

Dependent variable is a binary variable which is equal to 1 if a sudden stop occurs and 0 otherwise. The first quarter of sudden stop is included in the regressions, and all subsequent quarters dropped. Domestic variables are averages of previous eight quarters. All variables have been standardized around zero mean and standard deviation equal to 1. Regressions are estimated with robust standard errors, and observations clustered by countries. Z statistics reported in parentheses. ***,** and * indicate significance at 1, 5, and 10% levels, respectively.

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