

PHOENIX MIRACLES

RECOVERING FROM SYSTEMIC FINANCIAL CRISES IN EMERGING MARKETS

by

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Abstract: Using a sample of emerging markets that are integrated into global bond markets, we analyze the recovery phase of output collapses that coincide with systemic episodes of capital market turmoil, defined as periods of skyrocketing aggregate bond spreads and large capital flow reversals. Our findings indicate the presence of a very similar pattern across different episodes: output recovers relatively quickly in a context of virtually no recovery in either domestic or foreign credit, and little improvement in investment, an event that we characterize as a Phoenix Miracle, where output “rises from its ashes.” These Phoenix Miracle-type elements are also shared by the recovery phase following the US Great Depression. However, in contrast to the US Great Depression, EM output collapses occur in a context of accelerating price inflation and falling real wages, casting doubts on price deflation and nominal wage rigidity as key elements in explaining output collapse, and suggesting that financial factors may be a more promising avenue for understanding these collapses.

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I. Introduction

In the last quarter century, the Emerging Market (EM) landscape has been plagued with financial crises of severe magnitude. Many of these crises occurred during periods of systemic capital market turmoil (henceforth, SCMT), as evidenced by skyrocketing EM aggregate bond spreads and capital inflow collapse, or Sudden Stop, that affected a wide range of countries at approximately the same time. In several instances, financial crises coincided with severe output losses and dire social consequences.

Turmoil in EM world capital markets, coupled with specific country vulnerabilities, such as the level of domestic liability dollarization (DLD) and the size of the supply of tradable goods, is key to explaining recent financial crises in EMs involving sudden interruptions in capital flows.¹ Shocks at the heart of capital markets, or “incipient” Sudden Stops in the Calvo, Izquierdo and Loo-Kung (2005) lexicon, have typically been a triggering factor behind these crises. Contagion, for example—be it because countries are treated as part of a particular asset class, borrow from the same set of banks, are part of the same set of investment fund portfolios, or simply because liquidity shocks to international investors spread to different countries as they sell assets in their portfolio to restore liquidity—works like a market test for EMs.² As Calvo and Talvi (2005) point out, these market tests can be followed by a painful adjustment and sharp reduction in economic growth, or can turn into a “full-fledged” financial crisis cum output collapse, depending on domestic vulnerabilities.

¹ See Calvo, Izquierdo and Talvi (2003), Calvo, Izquierdo and Mejía (2004), Calvo and Talvi (2005) and Calvo, Izquierdo and Loo-Kung (2005).

² For the spread of liquidity shocks see, for example, Calvo (1999)

In this paper we focus on the anatomy of post-collapse recoveries, i.e., how economies emerge from output collapses that occurred in the aftermath of SCMT—periods characterized by skyrocketing bond spreads and collapsing capital inflows that affect a large set of countries at about the same time. Periods of SCMT offer a unique natural experiment: the shock is large and easy to identify, it originates in capital markets per se, and it simultaneously affects many countries. By offering a common trigger, these periods allow us to focus on key issues pertaining to these crises, namely, the dynamics of output collapses and subsequent recoveries, the financial factors at play, and how these crises could be avoided—without getting distracted by idiosyncratic factors.

Our interest in the dynamics of output collapses that occurred during periods of SCMT is also inspired in the belief that these are “accidents that *should not* have happened,” given that the recovery occurs with little improvement in investment, and virtually no recovery of domestic or foreign credit.

Given these considerations, in this paper we focus on a sample of EMs that are integrated with world capital markets—a relevant set of countries that is likely to be affected by SCMT events.³ The sample includes most of the recent high-profile crisis episodes, such as the Tequila crisis episodes (Argentina 1995, Mexico 1995, Turkey 1995), East Asian crisis episodes (Indonesia 1998, Malaysia 1998, Thailand 1998) and the Russian crisis episodes of the late 1990s (Ecuador 1999, Turkey 1999, Argentina 2002), as well as the Latin American Debt Crisis episodes of the 1980s (Argentina 1982, Brazil, 1983, Chile 1983, Mexico 1983, Peru 1983, Venezuela 1983, Uruguay 1984).

³ As indicated by their ability to place a sizeable amount of international bonds. For practical purposes, we consider countries tracked by JP Morgan in the construction of its global Emerging Market Bond Index. See Section II for more details.

Main Results

Economies emerging from output collapses that occurred in the aftermath of SCMT exhibit a clear-cut pattern that displays the following characteristics:⁴

- Post-collapse recoveries tend to be steep, i.e., economic activity reaches its pre-crisis levels relatively quickly, on average, less than three years following the output trough.
- Post-collapse recoveries materialize with virtually no recovery in external or domestic credit, and a very weak recovery in investment (all of which collapse together with output at the time of the SCMT crisis).

This behavior is clearly depicted in Figure 1, which contrasts the V-shaped pattern in output behavior from pre-crisis peak to full recovery, with that of investment, the current account balance and domestic bank credit to the private sector.^{5 6} These characteristics constitute the core of what can be defined as “Phoenix Miracles,” that is, cases where output appears to “rise from the ashes.”⁷ Notice that our interest lies on recovery to pre-crisis output levels and not on recovery to trend output, as is the case of studies such as that of Cerra and Chaman Saxena (2005)—who find that, on average, trend output loss is not regained after economic contractions. We focus on the first type of recovery because we wish to understand *how* economies bounce back to pre-crisis

⁴ As described in Section II, we define an output collapse as a 4.4% decline of GDP from pre-crisis peak to trough.

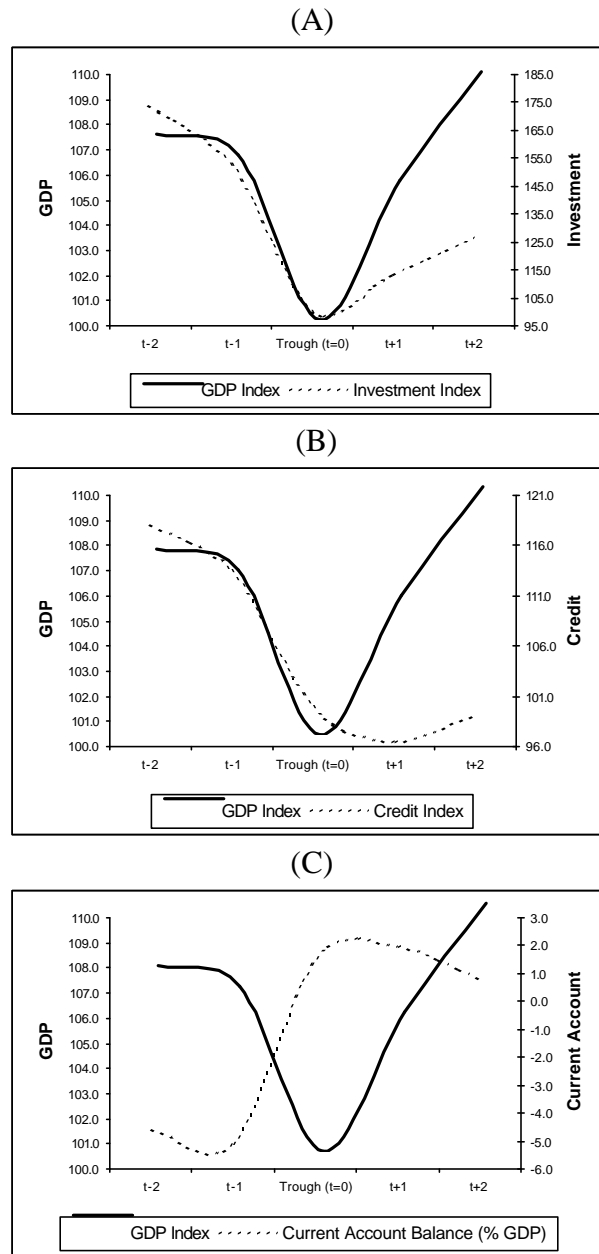
⁵ Each of the variables presented here is an average of the 22 SCMT collapse episodes that will be introduced in Section III along with formal tests.

⁶ We define a pre-crisis peak as the time when output reaches its maximum value before a trough, and a full recovery as the time when output recovers to pre-crisis peak levels following collapse. See Section II for more details.

⁷ This element suggests, as will be discussed later on, that “capacity underutilization”, in some way defined, is likely to have played a major role in these episodes (see the model in Section IV where “capacity underutilization” is defined as a deviation from unconstrained optima).

output levels—the study of which revealed the Phoenix Miracle phenomenon—rather than explaining long-run effects of crisis on trend output.⁸

Figure 1. The Phoenix Miracle in Emerging Markets



Note: Various Sources. See Data Appendix for details.

⁸ Additionally, in contrast to Cerra and Chaman Saxena (2005), we focus on a very particular set of contractions, namely SCMT collapses, which comprise episodes in which the origin of the crisis is linked to systemic capital market turmoil rather than the myriad of other possible shocks behind output collapse.

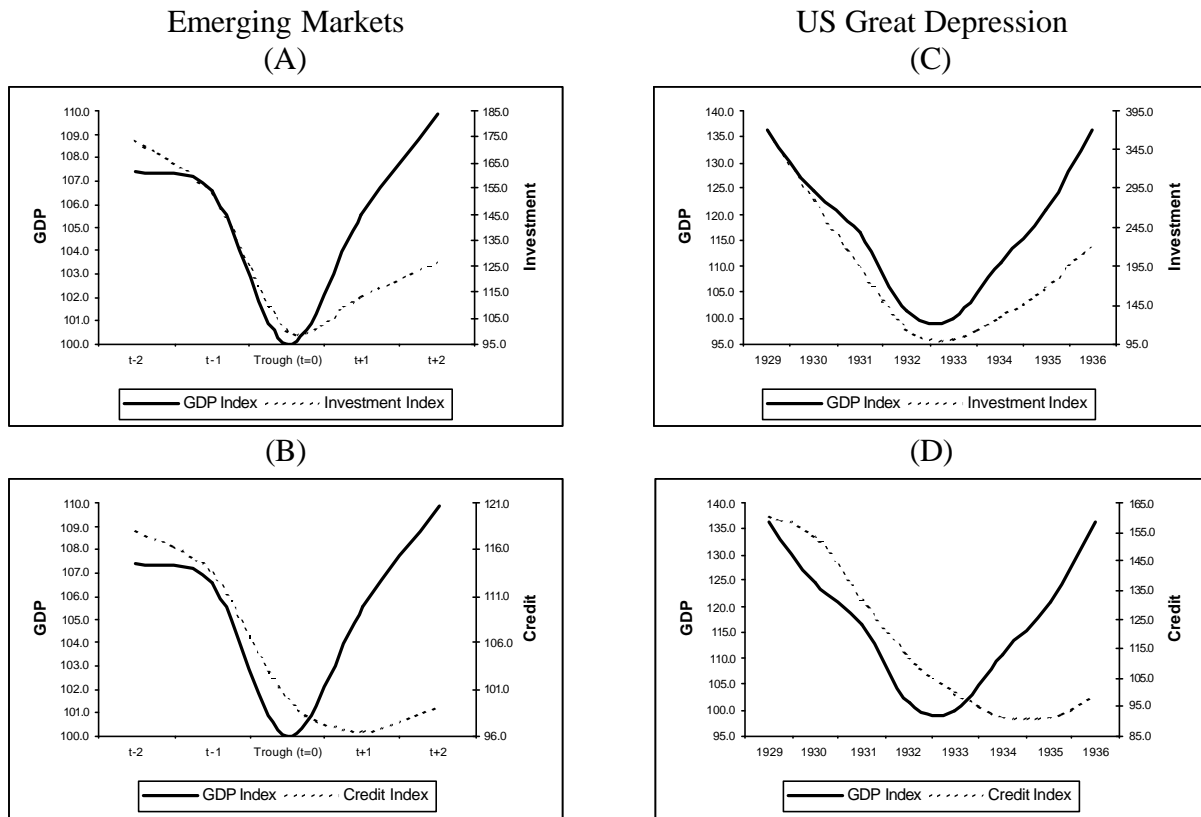
Such a surprising set of characteristics of post-collapse recoveries in EMs led us to the question of whether one of the most studied—and still controversial—episodes of output collapse, i.e., the US 1930s Great Depression, shared these Phoenix Miracle-type elements during the recovery phase. Crises involving severe output losses are the order of the day in EMs, and comparisons with the US Great Depression are potentially illuminating both in understanding the forces at work in EM crises and in providing a fresh look at the US Great Depression in light of EM experience.

Our findings show that the parallels are striking, but so are the differences, and both are quite revealing. The US Great Depression experience is similar to that of EM post-collapse recoveries in that the recovery in economic activity also materializes with virtually no recovery in domestic bank credit and a very weak recovery in investment (see Figure 2, Panels C and D).

However, the US Great Depression differs substantially from output collapses in EMs in many other aspects, which are of the utmost importance when reflecting on the causes of output collapse. These differences are revealed in the behavior of a key set of variables during the contraction phase of output spanning from pre-crisis peak to trough. During the contraction phase, the US Great Depression exhibits price deflation, no currency devaluation, and a substantial increase in real wages (see Figure 3, Panels E through H).⁹ In stark contrast to these developments, the output collapse phase in EMs is characterized by an acceleration in price inflation, a sharp nominal (and real) currency depreciation, and a sharp fall in real wages (see Figure 3, panels A through D).

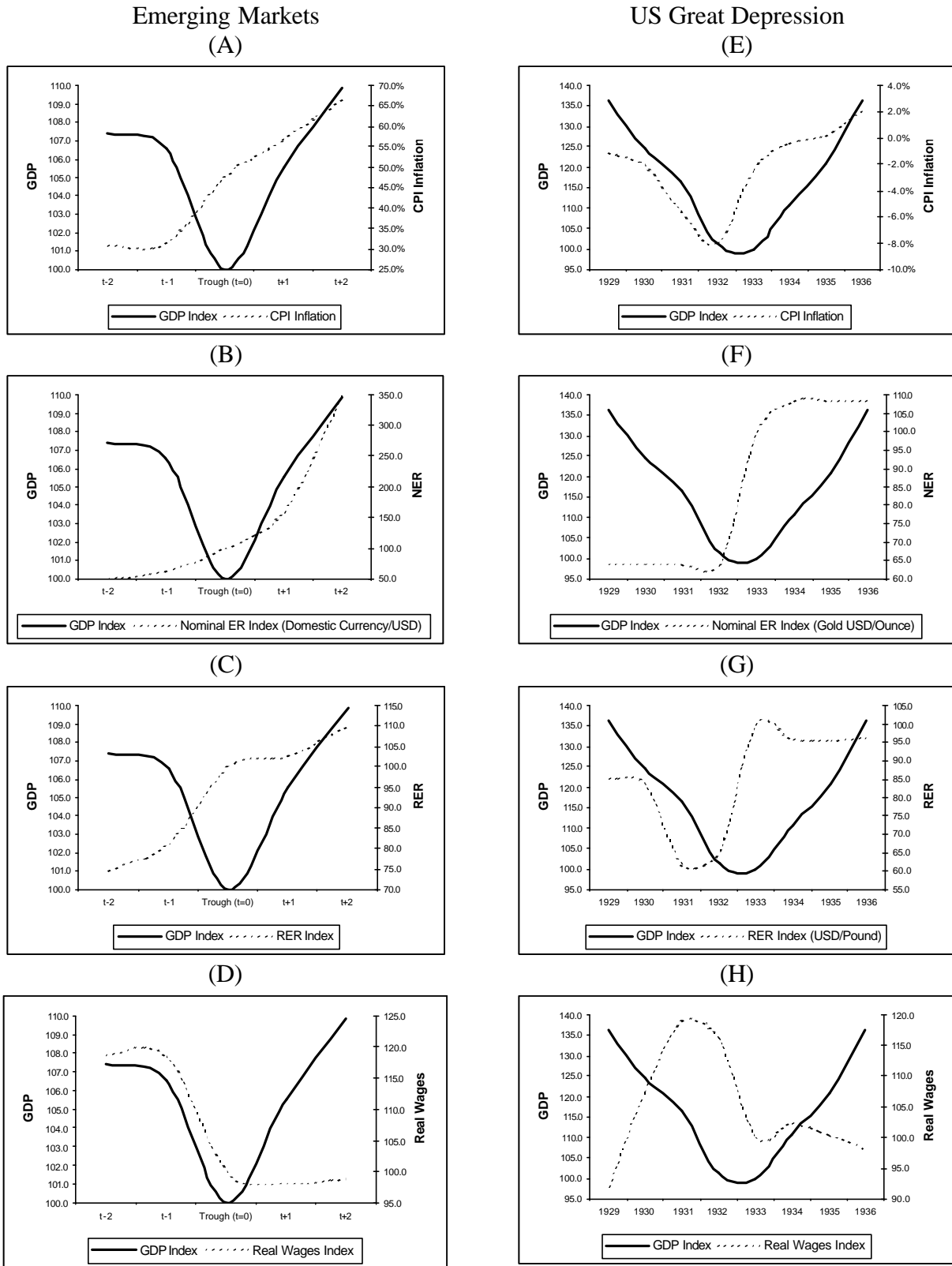
⁹ Real wages are obtained using as deflator the wholesale price index.

Figure 2. The Phoenix Miracle: A Comparison with the US Great Depression



Note: Various Sources. See Data Appendix for details.

Figure 3. Selected Variables: A Comparison with the US Great Depression



Note: Various Sources. See Data Appendix for details.

These differences are quite relevant for two reasons: First, by remaining on gold, the US kept its exchange rate unchanged at its pre-crisis peak level for almost four years. Several prominent explanations of the Great Depression assign a crucial role to the Gold Standard and the limits it imposed on expansionary monetary policy. Friedman and Schwartz (1963), for example, suggest that if money supply had not been allowed to fall (a policy that the Federal Reserve could have easily implemented), the Great Depression would at worst be listed among the set of mild (and boring) US recessions, as deflation would have been avoided. In contrast to the US deflationary experience, EM collapse episodes are characterized by a steady rise in the nominal exchange rate and an acceleration of inflation during the output contraction phase, a fact that calls into question the hypothesis that price deflation per se is an essential ingredient in triggering an output collapse.

Second, leading explanations for the size and persistence of output contraction during the Great Depression have relied on two major rigidities, namely, nominal wage stickiness and non-contingent financial contracts, that, in the face of price deflation, caused significant increases in real output wages and in real debt—the latter known as Debt Deflation, discussed by Irving Fischer (1933).¹⁰ The real wage increase argument, due to nominal wage rigidities and price deflation, is clearly consistent with unemployment and “capacity underutilization”. On the other hand, the Debt Deflation argument relies on largely unanticipated price falls leading to an increase in real ex-post interest rates that may trigger bankruptcies in highly indebted sectors and induce a

¹⁰ For a very useful exposition and evidence on these leading explanations of the US Great Depression, see Bernanke (1995).

financial crisis, constituting a major cause for the propagation and further deepening of the output contraction.

In practice, and due to the lack of data for a significant number of similar episodes, it has been problematic to disentangle the share that each of these rigidities had in accounting for output collapse. The evidence presented in this paper for the EM sample of output collapses clearly suggests that nominal wage stickiness is not a key factor—thus increasing the likelihood that financial frictions/rigidities are a major cause behind these output collapses.

EM crises triggered during periods of SCMT have been characterized by a sharp increase in real interest rates faced by borrowers.¹¹ However, Debt Deflation as such cannot be claimed to be a relevant factor in our EM sample because, as noted, currency devaluation and inflation acceleration rather than price deflation are the rule in EM crisis episodes. Nonetheless, a similar effect is produced by *Liability Dollarization*, i.e., foreign-exchange denominated debt, a common feature in EMs. Under those circumstances, *real* depreciation increases the output value of outstanding debt (particularly in non-tradable firms), causing the real value of debt to inflate. Thus, sharp nominal (and real) currency devaluation in the presence of *Liability Dollarization* may have worked in EMs as a new version of Fisher's Debt Deflation syndrome, and may be key in explaining output collapses.

The rest of the paper is organized as follows: Section II discusses the choice of sample and elaborates further on the object of study. Section III highlights key stylized facts of post-collapse recoveries following SCMT episodes in EMs and provides

¹¹ For example, in the aftermath of the Russian crisis in August 1998, country risk, as measured by aggregate indices such as J.P. Morgan's Emerging Market Bond Index, skyrocketed beyond 1700 basis points above US Treasuries.

empirical support for the significance of these facts. In order to see whether Phoenix Miracles are phenomena unique to output collapse episodes, we compare the results with recoveries following mild recessions. Section III also highlights in detail similarities and differences between EM collapses and the US Great Depression. Section IV introduces a partial equilibrium model with financial frictions that captures the essential elements of the observed Phoenix Miracle phenomena concerning output, investment and credit. Section V concludes with a brief summary and some implications.

II. Output Collapse in Emerging Markets: The Sample

Given the considerations outlined above regarding SCMT episodes, natural candidates for the analysis of collapses in output related to systemic financial turmoil are countries that are integrated into the world capital market. One possible measure of integration is the ability to place a sizeable amount of international bonds. For this reason, the sample selected for the analysis is composed of countries that are tracked by JP Morgan to construct its global Emerging Market Bond Index, or global EMBI, with observations spanning the period 1980-2004.¹²

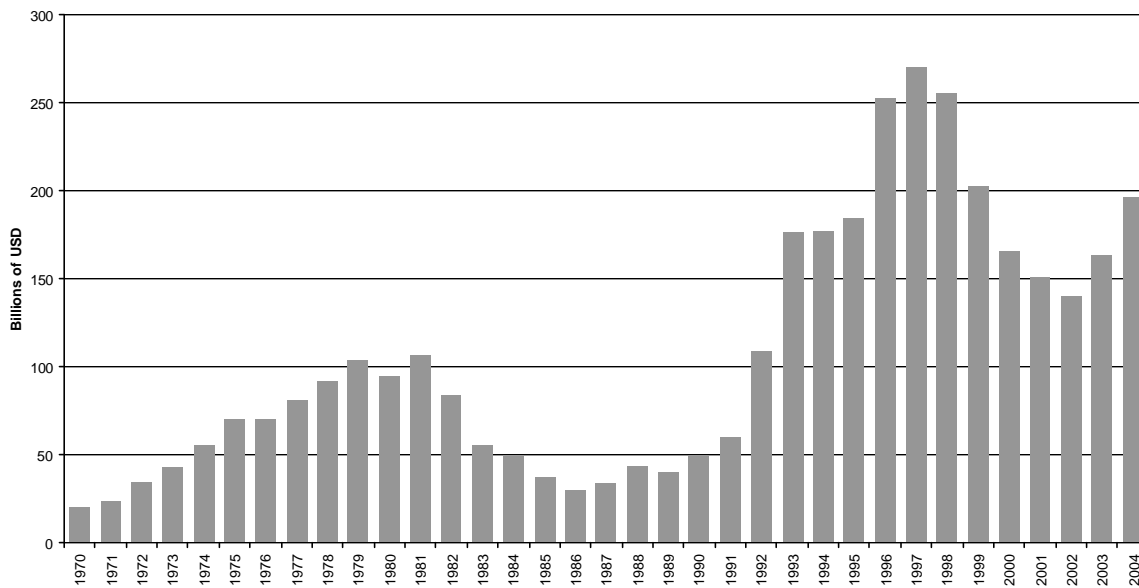
Periods of SCMT involving output collapses and Phoenix Miracle-type recoveries are highly suggestive of sudden “underutilization of capacity”. It is difficult to rationalize the speedy post-collapse recoveries observed in EMs in a context of little recovery in investment and virtually no recovery in foreign or domestic credit, unless idle resources are part of the equation. In this vein, we chose to study output collapses—and

¹² The list of countries includes Argentina, Brazil, Bulgaria, Chile, Colombia, Croatia, Czech Republic, the Dominican Republic, Ecuador, El Salvador, Hungary, Indonesia, Ivory Coast, Lebanon, Malaysia, Mexico, Morocco, Nigeria, Panama, Peru, Philippines, Poland, Russia, South Africa, South Korea, Thailand, Tunisia, Turkey, Ukraine, Uruguay, and Venezuela (see Data Appendix for details).

not deviations from trend—because the former measure better captures cases of underutilization.¹³

We focus next on the definition of output collapse. We start by looking at cumulative contractions in output for our sample of EMs throughout the period 1980-2004. We cover this particular timeframe because it represents a phase where international capital flows to EMs were already substantial (after their sustained rise in the 1970s) and subject to considerable aggregate swings, as shown in Figure 4.

Figure 4. Real Private Capital Flows to Emerging Markets



Net capital flows to Emerging Countries in East Asia & Pacific, Europe & Central Asia, Latin America & Caribbean, Middle East & North Africa.
 Net private capital flows consist of private debt and nondebt flows. Private debt flows include commercial bank lending, bonds, and other private credits; nondebt private flows are foreign direct investment and portfolio equity investment.
 Source: Worldbank, WDI.

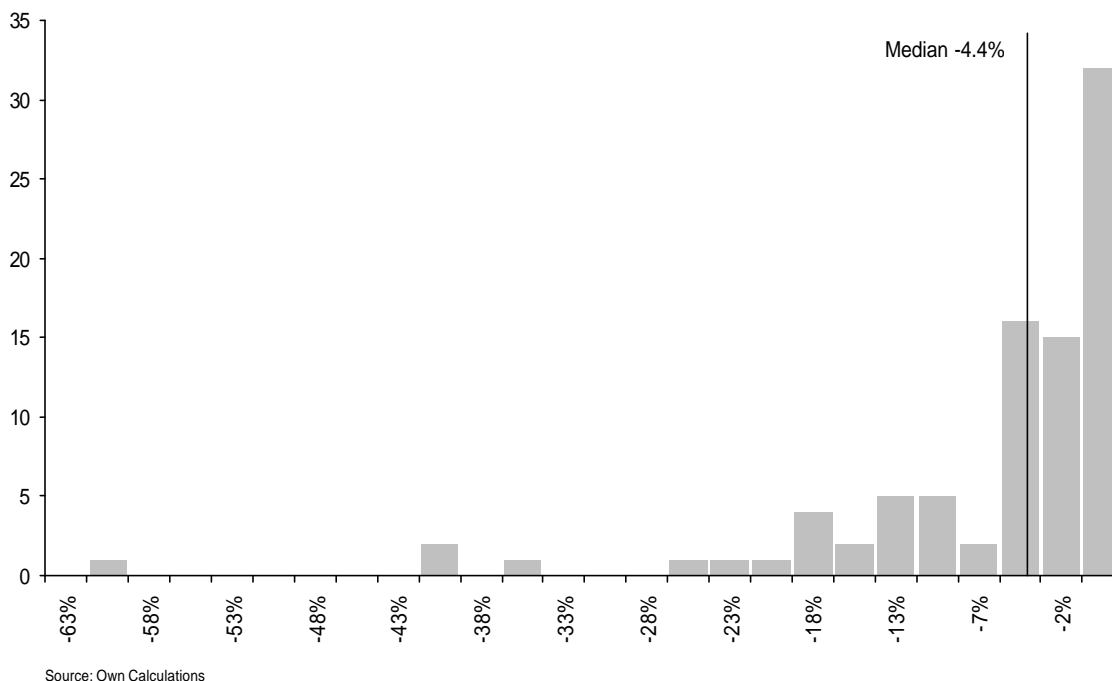
¹³ As opposed to deviations from trend, which would most likely also be capturing cyclical factors. Our main concern is not whether these crises had cyclical effects, or even long-term growth effects, but rather that output collapsed because of specific constraints that forbade the proper use of available resources in a context of systemic capital market turmoil (an issue that will be addressed by the model presented in Section IV). This justifies the question, introduced in the previous section, that perhaps these accidents should not have happened. For similar reasons, we do not focus either on output per capita measures.

The resulting distribution of cumulative contractions comprising all countries and periods is shown in Figure 5, for a total of 83 episodes (see Table 1 of the Appendix for a complete list). It is clearly asymmetric, with an average cumulative contraction of 7.8 percent, and a large concentration around small drops in output. We use this distribution to define a collapse as a contraction that lies to the left of the median, implying a cut-off output contraction of 4.4 percent. For each of these episodes, we define a pre-crisis peak, trough and full recovery point.¹⁴ The pre-crisis peak is the period displaying the maximum level of output preceding a trough, and the full recovery point is that period in which the pre-crisis peak output level is fully restored. A trough is the local minimum following the onset of a crisis.¹⁵ This methodology led to the identification of 45 episodes of output collapse spanning the period 1980-2004.

¹⁴ To make sure that we are capturing the appropriate trough point for collapse episodes, we look for additional contractions in output to the right of the initially detected trough that do not qualify as collapses and lie no more than three periods away from the initially detected trough (thus allowing for temporary positive growth “blips” of up to two periods and a “double dip” contraction). If the cumulative collapse in output at the new trough exceeds that of the initially detected trough, we extend the collapse episode to include the new trough point, so that it becomes part of the same episode. This procedure led to the reclassification of trough points for only five episodes out of a sample comprising 83 episodes, namely, Brazil 1983, Nigeria 1984, Peru 1990, Czech Republic 1992, and Croatia 1993.

¹⁵ For the very few collapse episodes in which output did not fully recover before being hit by another collapse episode, we take the observation showing the highest value of output prior to the next collapse as the full recovery point. This occurred for only a few episodes: Argentina 1982, Brazil 1990, Côte d’Ivoire 1990 and 2000, Russia 1996, and Bulgaria 1993.

Figure 5. Distribution of Cumulative Contractions in Output



With these episodes at hand, we now turn our attention to those that occurred during periods of SCMT. We believe this is a key element to consider, not only because of the reasons already stated earlier, but also because, in contrast to non-SCMT episodes that may cover a wide variety of shocks with several possible outcomes, SCMT episodes are characterized by very specific phenomena related to disruption in access to international credit markets.

SCMT collapses are portrayed as output collapses that occur during a period of plummeting capital flows in a context of substantial turmoil in global capital markets. In similar fashion to Calvo, Izquierdo and Loo-Kung (2005), we define a SCMT window as

- a *capital-flow window* containing a large fall in capital flows for a given country exceeding two standard deviations from its mean (that starts when the fall in

capital flows exceeds one standard deviation, and ends when it is smaller than one standard deviation) that overlaps with

- an *aggregate-spread window* containing a spike in the aggregate EMBI spread exceeding two standard deviations from its mean (that starts when the aggregate EMBI spread exceeds one standard deviation, and ends when it is smaller than one standard deviation).¹⁶

If either the pre-crisis peak or trough of a previously identified output collapse episode falls within the SCMT window, it is classified as an SCMT collapse. This classification yields a group of 22 SCMT collapses that contains most of the well-known crises throughout the 1980s and 1990s, including the Latin American Debt Crisis episodes (Argentina 1982, Brazil 1983, Chile 1983, Mexico 1983, Peru 1983, Venezuela 1983, Uruguay 1984), the Tequila crisis episodes (Argentina 1995, Mexico 1995, Turkey 1995), the East Asian crisis episodes (Indonesia 1998, Malaysia 1998, Thailand 1998) and the Russian crisis episodes of the late 1990s (Ecuador 1999, Turkey 1999, Argentina 2002). Table 2 of the Appendix provides a complete list.

III. Output Collapses in EMs under Systemic Capital Market Turmoil: Stylized Facts

We now turn to the analysis of the behavior of a key set of variables throughout SCMT collapse episodes. We look at the performance of three variables, namely, investment, private sector bank credit, and the current account balance (as a measure of external financing) relative to that of GDP. Behavior for the average episode is shown in

¹⁶ Given that the EMBI is not available for the 1980s, we used the Federal Funds rate instead as a proxy that captures the cost of access to international financing for EMs. This is a reasonable assumption since bank credit was the dominant source of funding for EMs during that period.

Figure 1, covering a five-year window centered on troughs in output that tracks the whole phase from pre-crisis peak to full recovery.

The first element that can readily be observed is that the average path of GDP from pre-crisis peak to full recovery is clearly V-shaped. Average output collapses by 7 percent within a two-year period, but what is more important, it recovers fully in just about two years.¹⁷ In contrast, Figure 1, Panel A shows that average investment hits its trough at the same time that GDP does, declining by about 42 percent in real terms relative to its value at pre-crisis peak time. At the time of full recovery, two years after the slump, only 35 percent of the investment gap has been filled.

In terms of domestic financing, Figure 1, Panel B shows that average domestic bank credit to the private sector collapses by about 15 percent in real terms from pre-crisis peak to trough, and none of the initial credit gap is closed at the time of full recovery. External financing, as measured by the current account balance, follows a pattern similar to that of domestic financing (see Figure 1, Panel C). The average current account balance adjusts by about 6 percentage points of GDP from pre-crisis peak to trough, and it remains relatively constant at high surplus levels thereafter, implying that only close to 13 percent of the initial current account reversal was closed at the time of full recovery.

We complement this visual inspection with statistical tests, starting with the behavior of investment. We are interested in determining significant percentage differences in the investment-to-GDP ratio between pre-crisis peak, trough, and full recovery points, based on individual episode values. In analogous fashion to difference-

¹⁷ The figure of 7 percent, indicating the fall in average output differs from the average fall in output across all 22 episodes, which is 10 percent. Similarly, the recovery phase of average output is 2 years, while the average recovery phase across all 22 episodes is 2.8 years.

in-means tests, we run a regression of percentage differences in the investment-to-GDP ratio (covering all episodes) against a constant to determine their significance using standard t-statistics. This procedure is applied to differences from pre-crisis peak to trough, trough to full recovery, and pre-crisis peak to full recovery. Results are shown in Table 1. They indicate that investment as a share of GDP collapses on average by about 34 percent from pre-crisis peak to trough, compared to an average collapse of GDP from pre-crisis peak to trough of 10 percent. The investment-to-GDP ratio remains around 23 percent below its pre-crisis peak value at full recovery time. All these differences are significant at the 1 percent level.

Table 1. SCMT Collapse Episodes: Average Differences along Pre-Crisis Peaks, Troughs, and Full Recovery Points

	Peak to Through	Trough to Recovery	Peak To Recovery
Investment/GDP	-0.342*** [0.042] 22	0.202*** [0.066] 22	-0.232*** [0.050] 22
Credit/GDP	0.039 [0.055] 22	-0.200*** [0.055] 22	-0.168** [0.070] 22
Current Account Balance/GDP	5.706*** [1.689] 22	-1.545 [1.078] 22	4.161*** [1.359] 22

Standard errors in brackets. Number of episodes is also reported.
* significant at 10%; ** significant at 5%; *** significant at 1%

This fact has interesting implications for “capacity underutilization”. A key feature that may signal “capacity underutilization” is the fact that in most cases output recoveries occurred without a substantial pickup in investment. In particular, the fact that many of these recoveries were characterized by high output growth at lower investment-

to-GDP ratios suggests that there was a “capacity underutilization” element at play. For example, consider the case of a fixed coefficients Harrod-Domar production function, where investment (I) as a share of GDP(Y) is proportional to output growth, or:

$$\frac{\Delta Y}{Y} = \alpha \frac{I}{Y}, \quad (1)$$

where α is a factor of proportionality commonly referred to as the incremental capital output ratio (ICOR). Lower levels of investment as a share of GDP, coupled with high output growth, would imply massive changes in ICOR, an unlikely event that would support the alternative hypothesis of “capacity underutilization”. Recalling equation (1), if the investment-to-GDP ratio at the full recovery point is lower than at the pre-crisis peak point (as is the case for SCMT collapse episodes), then output should be growing more slowly at full recovery than at pre-crisis peak, but this implication is not supported by the data. We test this by conducting a difference in means test for the ICOR coefficient at pre-crisis peak vis-à-vis full recovery.¹⁸ Results show that there is a very strong and statistically significant increase in ICOR from pre-crisis peak to post-collapse recovery (the coefficient almost triples), a fact that suggests that—unless one were willing to accept that very large productivity gains took place after the crisis—there are signs of “capacity underutilization”.¹⁹ In all fairness, other factors different from “capacity underutilization” may affect the ICOR coefficient as well. For example, a fall in real wages—typical in times of crisis—would lead to recovery with a lower capital-labor ratio and a lower ICOR. Another commonly observed regularity is that total factor

¹⁸ That is, we run a regression with absolute differences in ICOR between pre-crisis peak and full recovery against a constant and test for its significance.

¹⁹ ICOR at full recovery stands at 0.335, compared to a value of 0.12 at pre-crisis peak, a difference of 0.215, equivalent to a 174 percent increase in ICOR and significant at the 1 percent level.

productivity increases during recessions, leading to lower ICOR. However, the fact that the ICOR coefficient triples in our sample of SMTC collapses makes it improbable for these other factors alone to account for such a dramatic change in ICOR, suggesting instead that “capacity underutilization” must have been present at the time of recovery.

Tests on private sector credit as a share of GDP and the current account balance (a measure of foreign financing) as a share of GDP confirm the statistical significance of the behavior suggested by Panels B and C of Figure 1. Credit as a share of GDP does not change much from pre-crisis peak to trough (the estimated coefficient is small and not significantly different from zero), implying that the collapse in output is accompanied by a collapse in credit of similar magnitude. However, there is a large and significant drop of about 20 percent in the credit-to-GDP ratio between trough and full recovery, providing clear indication that credit remains stagnant at trough levels while GDP recovers (see Table 1). At full recovery, credit as a share of GDP is close to 17 percent lower than its prevailing value at the pre-crisis peak of the average episode.

Similar results are obtained with foreign financing, where after the crisis a marked de-leveraging process takes place. This is shown by the severe adjustment in the current account balance, which increases significantly from pre-crisis peak to trough by about 6 percentage points of GDP (see Table 1) and remains in surplus thereafter (the difference from trough to full recovery is relatively small and not significant), implying that there should be large and significant changes between pre-crisis peak and full recovery; this is confirmed by the pre-crisis peak to full recovery test presented in Table 1. As a matter of fact, the current account balance remains on average about 4 points of GDP higher at full recovery than at pre-crisis peak (see Table 1).

In summary, SCMT episodes seem to be characterized by substantial collapses in investment, bank credit and the current account deficit, and little or no recovery in either at full recovery time, as if output were “rising from its ashes.” A possible interpretation is that, in the absence of domestic or external credit, lower investment makes room for working capital accumulation which, coupled with “excess capacity”, leads to output recovery.²⁰

Having identified Phoenix Miracle-type behavior across SCMT episodes, we now turn to the analysis of an additional set of variables of interest and explore their performance along the post-collapse recovery phase. This set of variables was chosen not only because they are interesting in their own right, but also in order to understand similarities and differences with one of the most studied output collapse episodes: the US Great Depression of the 1930s. This comparison is carried out along two dimensions. First, it dwells on similarities in the post-collapse recovery phase. Second, it looks at differences during the collapse phase, in order to shed some light on the causes of output collapse.

Interestingly, the Great Depression also experienced a Phoenix Miracle-type process in that output recovery occurred with virtually no recovery of private sector credit and only a weak recovery in investment (see Figure 2, Panels C and D). After having fallen by 73 percent from pre-crisis peak to trough, investment had only closed 46 percent of the initial gap at the time of full recovery in output. Credit to the private sector fell by 43 percent from pre-crisis peak to trough. At full recovery, it was still 39 percent less than the prevailing level at pre-crisis peak time, implying that only 11 percent of the initial credit gap had been closed at the time of full recovery.

²⁰ Some of these ingredients will be fleshed out formally in the model presented in Section IV.

However, differences become particularly evident when analyzing the collapse phase. Figure 3 displays the behavior of domestic price inflation, the nominal and real exchange rate (RER), and real wages. Tests showing differences along pre-crisis peak, trough and full recovery points are presented in Table 2. Both sets of information support the following differences in the behavioral pattern for each of these variables:

- First and foremost, a key distinction that emerges on the monetary front is that, for EMs, annual inflation at the time of the trough is 16 percentage points above its pre-crisis peak levels (significant at the 1 percent level; see Table 2).

Moreover, the average cumulative increase in domestic prices from peak to trough is 93 percent. These developments contrast dramatically with the US Great Depression experience, where annual inflation at the time of the trough was -2.4 percent, compared to -1.1 percent at pre-crisis peak—in spite of the fact that devaluation took place precisely at the time of the trough, if anything, putting upward pressure on domestic prices.²¹ Moreover, cumulative *deflation* exceeded 17 percent from pre-crisis peak to trough.

- While in the US the nominal exchange rate basically remained at its 1929 pre-crisis peak gold parity until mid-1933 (its trough year), EMs showed steady depreciation of the nominal exchange rate. However, the US devalued heavily around the time of the trough, so when considering pre-crisis peak to trough differences in the nominal exchange rate, the US experience (Figure 3, Panel F) is not very different from the behavior of the average EM (Figure 3, Panel B). Yet,

²¹ The available measure of the US consumer price index excludes food items.

differences become substantial at the time of full recovery, when average nominal exchange rates keep on rising dramatically in EMs, but not in the US.

- The dynamics for the RER also exhibited substantial differences. For EM episodes, the RER shoots up by about 49 percent from pre-crisis peak to trough (and this increase is significant at the 1 percent level, see Table 2).²² This fact is one of the key points regarding Sudden Stops and systemic crises made by Calvo, Izquierdo and Talvi (2003), stressing the impact of a sudden collapse in external financing of the current account deficit over the RER. More importantly, the RER does not go back to pre-crisis levels at full recovery. As a matter of fact, the RER is on average about 55 percent higher at full recovery than at the pre-crisis peak point (and significant at the 1 percent level, see Table 2). In contrast, the US experience is characterized by a steady *real appreciation* of about 23 percent until mid-1933 (covering most of the output contraction phase), and real depreciation of only 13 percent relative to pre-crisis peak levels by the time of full recovery.
- Another key difference emerges in the labor market. Real wages in the US case (using wholesale prices as a deflator) hit a peak by 1931, marking an increase of 30 percent from pre-crisis peak levels. Even when output reaches its trough, real wages remain 9 percent higher than at their pre-crisis peak value. This is also the case at full recovery, when they are still 7 percent higher than at their pre-crisis peak. This is one of the main elements behind traditional explanations of the Great Depression: rising real wages in a context of domestic price deflation and limited nominal wage flexibility. By contrast, in EM crisis episodes the average fall in real wages from pre-crisis peak to trough is close to 10 percent (although

²² An increase the RER is equivalent to a real depreciation of the domestic currency.

this estimate is not significant at the 10 percent level).^{23 24} The fall continues from trough to full recovery by another 7 percent (but, again, it is not significant at the 10 percent level). When compounding these two differences into one, i.e., when analyzing behavior between pre-crisis peak and full recovery, the fall in real wages amounts on average to 20 percent, and it is significant at the 1 percent level (see Table 2). These facts show that even though there may be differences across countries in terms of the timing of the real wage adjustment process, there is definitely a substantial and significant drop in real wages by the time of full recovery, providing little support for the hypothesis that higher real wages are a dominant force behind output collapse in EMs.

Table 2. Phoenix Miracles: Average Differences along Pre-Crisis Peaks, Troughs, and Full Recovery Points for Selected Variables

	Peak to Through	Trough to Recovery	Peak To Recovery
CPI Inflation	0.159*** [0.052] 22	0.211 [0.221] 22	0.37 [0.241] 22
Real Exchange Rate	0.493*** [0.123] 22	0.12 [0.142] 22	0.547*** [0.143] 22
Real Wages	-0.099 [0.067] 18	-0.072 [0.062] 18	-0.203*** [0.049] 18

Standard errors in brackets. Number of episodes is also reported.
* significant at 10%; ** significant at 5%; *** significant at 1%

A Brief Detour: Mild Recessions vs. Output Collapses

One may ask whether the Phoenix Miracle occurs only in episodes displaying output collapse. For this reason, we compare SCMT output collapses with SCMT mild

²³ It is significant at the 16 percent level.

²⁴ Due to lack of data, coverage of real wages reduces the sample to 18 out of 22 episodes.

recessions (i.e., SCMT episodes with cumulative contractions in output smaller than the median contraction). This leaves us with 22 output collapse episodes and 11 mild recession episodes. Given the small number of mild episodes, we interpret these differences with caution. Under this new classification, the salient features that seem to separate collapses from mild recessions in terms of Phoenix Miracle characteristics are as follows (see Table 3 for point estimates and tests):

- Although percentage differences in investment-to-GDP ratios between pre-crisis peak and full recovery points are significant at the 10-percent level for mild recession episodes, they are smaller than for output collapse episodes (on average, a difference of 10 percent for mild recessions vs. 23 percent for collapses). Significance for collapses stands at the 1 percent level, indicating a much tighter pattern than that of mild episodes (significant at the 10 percent level).
- Differences in ICOR between full recovery and pre-crisis peak points, while significant for collapses (at the 1 percent level), are not significant for mild recessions (at the 10 percent level).
- There seems to be no clear difference in domestic credit to the private sector as a share of GDP between pre-crisis peak and full recovery points for mild recessions, an element that, as previously stated, does come out distinctively for collapses.
- In terms of external financing, there seems to be more dispersion across mild recessions. Although the coefficient indicating differences in the current account balance measured in points of GDP is 2.7, it is not significant at the 10 percent

level, yet another difference with collapses (where differences in the current account balance are much larger and statistically significant).

Given the small number of mild recession episodes analyzed, rather than emphasizing individual differences with collapses, it is worth highlighting that, in contrast to mild recessions, collapses do display a very clear and homogeneous pattern (with significant differences at the 1 percent level). What is evident from these results is that SCMT collapse episodes fully pass tests for investment, bank credit and current account balance differences, and represent the quintessence of Phoenix Miracles. Moreover, they account for two-thirds of the number of SCMT contraction episodes analyzed here (22 cases out of 33), with an average output collapse of almost 10 percent.²⁵ This fact points to the relevance of SCMT events in the behavior of output in EMs.

Table 3. Mild Recession Episodes: Average Differences along Pre-crisis peaks, Troughs, and Full Recovery Points

	Peak to Trough	Trough to Recovery	Peak To Recovery
Investment/GDP	-0.119** [0.041] 11	0.023 [0.037] 11	-0.102* [0.052] 11
Credit/GDP	-0.003 [0.047] 11	-0.026 [0.022] 11	-0.02 [0.061] 11
Current Account Balance/GDP	2.405* [1.217] 11	0.287 [0.816] 11	2.692 [1.487] 11

Standard errors in brackets. Number of episodes is also reported.
* significant at 10%; ** significant at 5%; *** significant at 1%

IV. A Partial Equilibrium Model

²⁵ This contrasts with non-systemic episodes in our sample of contractions, where only 38 percent come along with collapses in output.

The objective of this section is to discuss a simple framework for the firms sector that has the potential of bearing out the central stylized facts discussed above. It should be clear at the start, however, that the following model is not intended faithfully to replicate stylized facts but, rather, to help intuition, and to provide basic ingredients that would eventually be capable to support a more ambitious general equilibrium exercise.²⁶ The model places major emphasis on frictions in the financial sector and analyzes the implications of a sudden increase in short-term interest rates on firms' decisions to produce, invest and borrow.²⁷

We will focus on bank credit for working capital and, for the sake of simplicity, assume that firms have to finance physical capital with retained earnings. This pattern is especially relevant for economies in which there is poor effective creditor protection (as in Latin America, see IPES (2005)). Under those circumstances, credit will likely be constrained to small and short-term projects, like those associated with *working capital*, i.e., capital utilized to finance inventory accumulation or the wage bill.²⁸

Consider the case in which output of domestic goods is produced by physical capital, K , and inventories, Z . Both have to be invested one period in advance. Capital lasts forever while inventories are fully consumed by the one-period production process. For the sake of simplicity, we will conduct most of the discussion under the assumption that capital has a perfect secondary market subject to no adjustment costs. Hence, assuming that the relative price of capital in terms of domestic output is unity, the firm

²⁶ Actually, Neumeyer and Perri (2005) carry out a calibration exercise in a related RBC model. However, they do not address the issues raised here. Moreover, they abstract from the EM credit market imperfections that motivate the present analysis.

²⁷ Since the analysis focuses entirely on the firms sector, it says nothing about the current account. The latter requires bringing into the picture the households sector, a task that will be left for another paper.

²⁸ The role of short-term credit as a disciplining device is a familiar theme in the microeconomic theory of finance. See, for example, Hart (1995).

can sell its capital for domestic output at a price equal to 1. Let A denote the firm's initial positive net assets (in terms of output), which can be allocated to the accumulation of K and Z .²⁹ Then,

$$A + B = K + pZ, \quad (2)$$

where p and B are the relative price of raw materials in terms of output, and one-period bank loans, respectively. B can be utilized only to acquire inventories, and is constrained to be non-negative (i.e., firms can borrow from, but cannot lend to, banks). Thus, the rate of interest at which firms borrow from banks could be thought of as banks' *active* interest rate, as opposed to their *passive* rate that applies to deposits.³⁰ For the sake of simplicity, we will assume that the passive rate is small enough so that, under the conditions discussed in the rest of this section, firms will not have incentives to lend to banks (i.e., open a deposit account). This provides a rationale for the assumption that $B > 0$, stated above. Thus, formally

$$0 \leq B \leq pZ. \quad (3)$$

Moreover, defining gross revenue(at the end of the production process, after accounting for interest payments) by π , we have

$$\pi = F(K, Z) - B(1 + r), \quad (4)$$

where r is the one-period (banks' active) real interest rate; production function F is assumed to be linear homogenous and, to ensure interior solutions in K and Z , to satisfy Inada's conditions, for example. Firms are profit maximizers. To study the implications of this assumption, let us first consider the problem of maximizing gross revenue, i.e.,

²⁹ More realistically, one may want to allow the firm to buy financial assets, for example. However, if the rate of return on those assets were low enough, the present assumptions in the model would yield similar results, since the firm would have no incentives to divert funds to outside projects.

³⁰ In the spirit of partial equilibrium analysis, we will not model the spread between the active and the passive rates.

maximize expression (4) with respect to B and Z , subject to (2) and (3) (this will be shown to be equivalent to profit maximization). Hence, employing (2) to substitute for K , the associated Kuhn-Tucker expression is³¹

$$F(A + B - pZ, Z) - B(1 + r) + \gamma(pZ - B) + \xi B, \quad (5)$$

where γ and ξ are non-negative parameters, and

$$\gamma(pZ - B) = \xi B = 0. \quad (6)$$

Thus, the first-order conditions with respect to B and Z are, respectively,

$$F_K(K, Z) - (1 + r) - \gamma + \xi = 0, \quad (7)$$

and,

$$-pF_K(K, Z) + F_Z(K, Z) + \gamma p = 0, \quad (8)$$

where F_j , $j = K, Z$, denotes the partial derivative of function F with respect to j .

Let us first consider the case in which no constraint in expression (3) is binding.

Hence, by (6), (7) and (8), we have $\gamma = \xi = 0$, implying that

$$F_K(K, Z) = 1 + r, \quad (9)$$

and

$$F_Z(K, Z) = p(1 + r). \quad (10)$$

Hence, given that $B = pZ$, it follows from equations (4), (9) and (10) that $\pi = (1+r)K$ and, therefore, if the passive interest rate (i.e., the opportunity cost of K), denoted by ρ , is such that $\rho < r$, gross revenue maximization is equivalent to profit maximization, because it is more profitable to invest in K than to put the money in a bank account yielding ρ .

Notice that, given that F is linear homogeneous, for each p there exists a unique r simultaneously satisfying equations (9) and (10). Moreover, by (9), the gross marginal

³¹ Notice that since constraints are linear, Kuhn-Tucker's *regularity condition* holds a fortiori.

productivity of capital equals the gross interest factor that banks charge on working capital (i.e., $1 + r$). As will become apparent by the ensuing discussion, the no-binding constraint situation will be a borderline case. The two other “robust” cases are: the Normal case in which the gross marginal productivity of capital exceeds $1 + r$, and the Deep Crisis case in which the gross marginal productivity of capital falls short of $1 + r$.

Normal Case. This corresponds to a situation in which firms, if allowed, would like to borrow in order to accumulate physical capital K , implying that $B > 0$, $\xi = 0$, $pZ = B$, and $\gamma > 0$. In words, inventory accumulation is fully financed by bank credit and, if possible, firms would like to borrow more in order to accumulate physical capital (which the model does not allow). By (7) and (8), it readily follows that

$$F_K(K, Z) - (1 + r) = \gamma > 0, \quad (11)$$

and,

$$F_Z(K, Z) = p(1 + r). \quad (12)$$

Notice that, by (11), the gross marginal productivity of capital is larger than $(1 + r)$, a fact that can be used as in the borderline case to show that gross revenue maximization is equivalent to profit maximization (recalling that $r > \rho$). Equation (12) is just the same equilibrium condition as when there are no binding constraints on inputs, stating that, at equilibrium, the marginal product of inventories equals its marginal cost (including the cost of credit) $p(1 + r)$, as in the no-binding constraint case discussed above. Moreover, given that inventories are fully financed by bank loans, it follows from equation (2) that the firm will devote its net assets to the accumulation of physical capital. Hence, $K = A$.

We will now sketch out some dynamic considerations. Consider the case in which firms maximize the present discounted stream of profits. Clearly, as long as the

rate of return on capital exceeds ρ , the firm will accumulate capital at the maximum possible rate. Let us study what this implies.

Let A' denote “next period initial net assets,” and, for the sake of concreteness, let us focus on a period in which $p(1 + r)$ is constant. We will denote by z the inventory/capital ratio, Z/K . Linear homogeneity implies, recalling (12), that z is determined once $p(1 + r)$ is known. This implies that firms will expand along a constant inventory/capital ray z . Moreover,

$$A' = p. \quad (13)$$

From equation (4), the fact that $B = pZ$, and linear homogeneity of $F(K, Z)$, we get

$$p = F_K(K, Z)K. \quad (14)$$

As already noted, firms will employ their entire net assets to accumulate physical capital. Therefore, if “next period capital” is denoted by K' , we have, by (11), (13) and (14) that

$$K' = K(1 + r + g) = (1 + mpk), \quad (15)$$

where mpk stands for net Marginal Productivity of Capital. Clearly, due to linear homogeneity, mpk is a negative function of $p(1 + r)$. We will collect the main results in the following Proposition:

Proposition 1. In the Normal case, the gross marginal productivity of capital exceeds the interest rate factor $1 + r$ on working capital loans, and the firm’s own assets are entirely devoted to physical capital accumulation. Moreover, in periods in which p and r are constant, output, capital, and inventories will grow at a rate equal to the equilibrium net marginal productivity of capital. The latter is a downward-sloping function of the interest rate on working capital loans.

We will now show that all the main stylized facts highlighted in the previous sections are borne out in the Normal case, if we interpret the Sudden Stop in capital flows shock as a jump in working capital interest rate r to a (temporary) higher plateau, and assume that the elasticity of substitution between K and Z is less than unity.

An increase in r that keeps firms in the Normal phase implies, by (12), a fall in Z , since the inventory/capital ratio must fall, and capital remains the same. This results in a fall in output and the net marginal productivity of capital, mpk .³² Afterwards, growth resumes but at a lower rate (recall equation (15)). On the other hand, the investment/output ratio is given by

$$\frac{p - K}{F(K, Z)}, \quad (16)$$

which would be constant if F is Cobb-Douglas. However, in the more realistic case in which the elasticity of substitution is less than unity, a fall in the inventory/capital ratio (associated with a rise in r) would result in a fall in the share of capital and hence, by (16), in the investment/output ratio. This result is consistent with the empirical observation that the investment/output ratio is lower following a SCMT collapse.

Finally, the credit/output ratio is given by

$$\frac{pZ}{F(K, Z)} = \frac{pz}{F(1, z)}, \quad (17)$$

³² Notice that since a rise in the interest rate for working capital results in lower output, the model helps to capture a situation in which “capacity underutilization” increases during a Sudden Stop episode. Under this optic, capacity underutilization is not a demand-driven phenomenon as in a typical textbook Keynesian model, but it is a result of tighter credit constraints, which would not be there under perfect credit markets. Thus, capacity underutilization, as the term has been loosely used in the text, should be interpreted as being measured relative to a first-best equilibrium (or an equilibrium in which credit market distortions are much less severe).

which falls as z contracts (which is in line with the data discussed above).³³

There is a technical point that needs to be addressed. By (11) and (15), physical capital and profits grow at the rate $mpk > \rho$ and, therefore, the present discounted sum of the stream of profits would not converge if the discount rate is ρ , unless, for example, after a given point in time $mpk = \rho$. This is a familiar difficulty in open-economy models, which is usually formally resolved by assuming that eventually price and interest configurations ensure the existence of a stationary steady state (e.g., at the risk of sounding repetitious, that after some point in time $mpk = \rho$). Due to the model's linearity and, thus, the bang-bang nature of optimal solutions, it can readily be shown that Proposition 1 and 2 (below) hold true, as long as price/interest configurations that ensure the existence of present discounted values are exogenous.^{34,35}

Deep Crisis Case. It corresponds to the situation in which r rises above the borderline case where no inequality constraint (expression (3)) is binding—resulting in $\gamma = 0$, and $\xi > 0$. Thus, by (5),

$$F_K(K, Z) - (1 + r) = -\xi < 0, \quad (18)$$

and,

$$F_Z(K, Z) = pF_K(K, Z) < p(1 + r), \quad (19)$$

where the inequality in expression (19) follows from (18). Once again, to ensure that gross revenue maximization is equivalent to profit maximization, we will assume that F_K

³³ However, there is a slight difference with the data in that here credit as a share of GDP falls at trough time and it remains lower at the time of full recovery, whereas in the empirical section credit as a share of GDP remains the same on average at trough time, and later declines as GDP recovers.

³⁴ If, in contrast to the present model, the maximand were not linear in K , for example, the level of K would be a factor determining the rate of investment.

³⁵ Alternatively, Proposition 1 would also hold true if it is assumed that beyond a given output scale, the maximand becomes concave in K , e.g., because of the existence of a fixed factor.

$> I + \rho$. In a standard neoclassical model with no constraints like (3), the inequality in (19) would imply that $Z = 0$. However, this is not the case here because, in the first place, we have assumed Inada conditions. Moreover, notice that (19) is satisfied in the borderline case (dividing equation (10) by equation (9)). This implies (because of linear homogeneity) that the inventory/capital ratio is the same in Deep Crisis as in the borderline case. Let z^b denote the inventory/capital ratio corresponding to the borderline case. Then, in Deep Crisis,

$$Z = z^b K. \quad (20)$$

In Deep Crisis $B = 0$, i.e., there is no bank borrowing. Hence, by equations (2) and (20),

$$A = K + pZ = (1 + pz^b)K. \quad (21)$$

Hence,

$$K = \frac{A}{1 + pz^b} < A. \quad (22)$$

Contrary to previous cases, the demand for capital is lower than it would be if the firm's available assets were entirely devoted to investment in physical capital. The intuition for this is that, given the high cost of working capital credit, firms prefer to use their own resources to accumulate inventories. This result is in line with the empirical observation that credit remains constant following SCMT collapse episodes while GDP recovers.

The following Proposition collects the substantive implications of the analysis:

Proposition 2. Firms enter into Deep Crisis as the rate of interest exceeds the level that gives rise to the borderline case (in which inequality constraints are not binding). However, the inventory/capital ratio remains as in the borderline case.

In contrast, the demand for working capital credit vanishes, and the demand for capital drops. As a result, output and the credit/output ratio fall.

The behavior of the investment/output ratio is ambiguous as firms enter the Deep Crisis phase. For example, if initially firms are at the borderline case, then a slight increase in interest rate r has a slight negative effect on net revenue $\pi \cdot K$, and a large effect on output (as argued above). Thus, the investment/output ratio would sharply rise. On the other hand, if initially firms are well inside the Normal phase, the opposite may occur. However, ambiguity is partly a reflection of the unrealistic assumption that physical capital can be disposed of without incurring adjustment costs. Consider the polar case in which K cannot be disinvested. Then, the analysis of the Normal case would apply and, thus, if the elasticity of substitution between K and Z is less than unity, the investment/output ratio falls during the recovery phase. More interesting still is the case where disinvestment is costly but not prohibitively so. Suppose, for example, that the rate of disinvestment has an upper bound equal to η , such that if $-\Delta K/K \leq \eta$, capital can be disinvested with no adjustment cost, as in the previous model. Take η as small relative to the optimal disinvestment if there were no adjustment costs. Then, starting from the borderline case, investment will actually be *negative* during an initial phase. Therefore, the stylized facts about investment will be borne out with a vengeance: not only will the investment/output ratio fall, but it will also actually become negative!

Further Insights from the Model. The model highlights how certain imperfections in the capital market could open the door to major crises. In the model, firms can borrow for projects that would be very costly to discontinue because, for instance, it is not possible to effectively attach loan collateral. The risk is that the capital market may stop working

smoothly (e.g., because of a global financial shock, like the Russian crisis and related events in 1998), resulting in a sharp rise in the interest rate of working capital loans or, more generally, loans that would be very costly to discontinue.³⁶ Therefore, in the final analysis, Sudden Stops and Phoenix Miracles may be reflecting fundamental weaknesses in EMs' domestic financial systems, which, combined with global shocks, give rise to major crises.

Real wages. The model could be readily extended to accommodate real wages. Consider the case where now output is produced with long-term capital (K), short-term capital (Z), and labor (L), satisfying a Leontieff technology between capital and labor:

$$Y = \min[F(K, Z), L] \quad (23)$$

As we have already shown, an increase in the real interest rate r would call for lower $F(K, Z)$, and now call for a lower demand for labor as well. Adding to the model an upward-sloping supply of labor with respect to the real wage would lead to a decline in real wages in the new equilibrium, which is in line with the observations.

Liability Dollarization. The present model captures effects on credit and output stemming from increases in r but does not include a Liability Dollarization element. However, similar results could be obtained if one assumes, for example, that bankruptcy probabilities are a decreasing function of firms' net worth. Sudden Stops in capital flows typically lead to an increase in the real exchange rate and a subsequent fall in net worth of currency-mismatched firms, a factor that confronts firms with a higher bankruptcy probability (given the same or higher interest rates). Thus, firms are hit twice: First, because they face higher interest rates and, second, because they face higher expected

³⁶ See Calvo (2005).

bankruptcy costs. The second, in particular, induces a fall in the demand for inventories with similar consequences as those underlined in our model. Thus, the element of Debt Deflation comes back to the picture as net worth declines due to Liability Dollarization, bringing up once again the issue of financial frictions and output collapse.

The Current Account. The above model is unable to characterize the Current Account (of the balance of payments) because we have not modeled consumption. The standard way to do this would be to assume a representative household subject to a lifetime budget constraint. Interestingly, however, if the interest rate faced by households were constant over time, then one should expect aggregate consumption to suffer only minor changes during a crisis. This is so because, as shown in the paper, as a general rule recovery takes place within a short span of time, implying that, if the crisis were well understood by households, it would cause only a minor dent in households' Permanent Income. This further implies that from peak to trough the consumption/output ratio would rise by about the same proportional rate as the (proportional) fall in output. This is not borne out by the facts. In our sample of SCMT collapses, for example, the change in the private-consumption/output ratio from peak to trough is not significantly different from zero. This suggests that households may also have been subject to a credit squeeze, which is a reasonable hypothesis given that in crisis episodes governments become hyperactive, and tend to "socialize" the financial crisis, thus damaging the creditworthiness of the great majority of the economy's agents. This topic will not be pursued here, but it is worth highlighting because it should be an exciting topic for future research.³⁷

³⁷ Notice that the constancy of the "average propensity to consume" through financial crises is in line with the Keynesian multiplier (which actually only requires constancy of the *marginal* propensity to consume). Constancy of average/marginal propensity to consume would receive strong support if one could show that consumers lose access to credit during a financial crisis. Interestingly, this argument is not exploited in

Other extensions and related literature. It is worth noting that the model discussed above can also be extended in other directions to fit more realistic cases. For example, one can relax the assumption that bank credit is not available for physical capital accumulation. The essential results of our model hold if one assumes that in the Normal case the firm's collateral is not high enough to ensure that bank loans by themselves are able to drive the marginal return on physical capital down to the level of the interest rate on bank loans.

As noted at the outset of this section, Neumeyer and Perri (2005) have worked out an RBC model that captures some of the flavor of our model. As in our setup, interest rates on working capital loans are assumed exogenous to the model. This is a plausible assumption given the prevalence of factors that are external to EMs which, among other things, is reflected in a remarkable *bunching* of crisis episodes.³⁸ A similar research strategy is followed in Mendoza and Smith (2002), for example, although the exogenous crisis-triggering factors are Sudden Stops.

V. Summary and Some Implications

Results in this paper support the view that recent capital-market crises in Emerging Market economies reflect the existence of serious malfunctioning in the domestic financial system (e.g., excessive short-term lending and Liability Dollarization). This makes economies vulnerable to shocks that otherwise would result in mild recessions.

Book III of the *General Theory* (Keynes, 1961)). Thus, later developments in Consumption Theory involving concepts like the Permanent Income Hypothesis, which are interesting for their own sake, may be highly inappropriate in crisis episodes, and may have unduly tarnished the relevance of the Keynesian multiplier for those episodes.

³⁸ See Calvo (2005).

Interestingly, however, output-collapse episodes show that recovery can be fast and take place in a Phoenix-like fashion. This sounds paradoxical but, upon reflection, it is not. As shown in the model developed in Section IV, an output collapse may be the result of a “liquidity crunch” provoked by a sharp increase in interest rates. Liquidity, however, can be restored by different means, one of which is a discontinuation of investment projects. In this fashion, liquidity and output thus increase, while investment (a key engine of growth under normal circumstances) collapses – giving the appearance of what we label a Phoenix Miracle.

One implication of the analysis is that financial globalization must be accompanied by a strengthening of the domestic financial system. In particular, firms must be better protected from temporary interest-rate spikes. A system with weak creditors’ protection, for example, may give rise to a pattern of bank credit heavily biased towards short-term lending, mostly geared to working capital which, as shown in Section IV, makes output highly sensitive to short-term interest rates. Consequently, a first order of business is undertaking a fundamental overhaul of the legal infrastructure behind financial contracts.

However, legal reform is a time-consuming process, and may not be enough. For example, it is not clear that such reform will succeed in doing away with Liability Dollarization. Liability Dollarization probably is a reflection of deeply rooted credibility problems likely due to many years of monetary mismanagement. Regaining credibility is also likely to be a time-consuming process since it requires not only belief in the actions of current policymakers, but also the belief that future policymakers will follow suit. Thus, EMs may not be able to effectively unshackle their firms and households from

borrowing in terms of hard currencies (e.g., the US dollar, the euro, the Japanese yen). Therefore, credit and balance-sheet vulnerabilities may remain, and if they are socially excessive, further policy action at both the local and international levels may be needed. At the local level, this may call for government support for the development of, for instance, local currency debt instruments. At the international level, International Financial Institutions could also contribute to the development of those local instruments by lending in local currencies.³⁹ Moreover, information frictions (which might account for across-the-board EM interest rate spikes) could be partially remedied by the creation of an Emerging Market Fund, EMF, in charge of stabilizing a global EMs interest index like JP Morgan's EMBI.⁴⁰

On the other hand, the paper casts doubt on the relevance of standard *nominal* wage and exchange rate rigidities in explaining deep crises. Most EM crises have taken place in the midst of large currency devaluation and a decline in real wages. Thus, it seems unlikely that more lax monetary policy would have significantly improved conditions.⁴¹ However, the analysis gives some support to the view that central banks should try to prevent a large surge of short-term bank credit, given that its reversal may result in output collapse and general economic disruption. This could be partially achieved, for instance, by raising reserve requirements during capital-inflow episodes. It is worth noting that this recommendation is not, by any means, equivalent to controls on capital mobility. The latter does not necessarily prevent large credit surges and,

³⁹ See for example, Eichengreen and Hausmann (2005).

⁴⁰ See Calvo (2005, Chapter 16).

⁴¹ That does not rule out the possibility of exceptions. For example, Cowan and De Gregorio (2005) claim that a major factor in Chile's 1998 recession was tight monetary policy.

furthermore, its strict implementation may seriously interfere with the credit market, further debilitating one of the weakest links in many EMs.⁴²

⁴² See Calvo and Talvi (2004) for a discussion of capital controls. See also (IPES, 2005).

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Appendix Table 1.
Episodes of Output Contraction, 1980-2004

Non-Systemic Episodes						Systemic Capital Market Turmoil Episodes					
Type	Country	Peak	Trough	Recovery	Output Decline	Type	Country	Peak	Trough	Recovery	Output Decline
Mild	Algeria	1986	1988	1989	-1.69%	Collapse	Argentina	1980	1982	1984	-10.36%
Mild	Algeria	1990	1991	1992	-1.20%	Collapse	Argentina	1998	2002	2004	-18.36%
Mild	Algeria	1992	1994	1995	-2.98%	Mild	Argentina	1994	1995	1996	-2.85%
Collapse	Argentina	1984	1985	1987	-7.59%	Collapse	Brazil	1980	1983	1985	-7.12%
Collapse	Argentina	1987	1990	1992	-12.02%	Collapse	Chile	1981	1983	1986	-13.72%
Mild	Brazil	1987	1988	1989	-0.10%	Mild	Chile	1998	1999	2000	-1.14%
Mild	Brazil	1989	1990	1991	-4.30%	Mild	Colombia	1998	1999	2002	-4.20%
Mild	Brazil	1991	1992	1993	-0.50%	Collapse	Côte d'Ivoire	1982	1984	1986	-6.50%
Mild	Brazil	2002	2003	2004	-0.20%	Collapse	Ecuador	1998	1999	2001	-6.30%
Collapse	Bulgaria	1988	1993	1995	-26.49%	Mild	Ecuador	1981	1983	1984	-3.09%
Collapse	Bulgaria	1995	1997	2002	-14.47%	Collapse	El Salvador	1980	1982	1992	-16.10%
Collapse	Côte d'Ivoire	2001	2004	-	-6.18%	Collapse	Indonesia	1997	1998	2003	-13.13%
Mild	Côte d'Ivoire	1986	1987	1988	-0.35%	Mild	Lebanon	1999	2000	2001	-0.50%
Mild	Côte d'Ivoire	1989	1990	1991	-1.10%	Collapse	Malaysia	1997	1998	2000	-7.36%
Mild	Côte d'Ivoire	1991	1993	1994	-0.44%	Collapse	Mexico	1981	1983	1985	-4.80%
Mild	Côte d'Ivoire	1999	2000	2001	-2.27%	Collapse	Mexico	1994	1995	1997	-6.17%
Collapse	Croatia	1990	1993	2004	-35.92%	Collapse	Morocco	1994	1995	1996	-6.58%
Collapse	Czech Republic	1990	1992	2000	-12.07%	Mild	Morocco	1980	1981	1982	-2.76%
Collapse	Dominican Republic	1989	1990	1992	-5.83%	Mild	Morocco	1982	1983	1984	-0.56%
Mild	Dominican Republic	2002	2003	2004	-0.40%	Mild	Morocco	1996	1997	1998	-2.23%
Mild	Ecuador	1986	1987	1988	-2.15%	Collapse	Nigeria	1980	1984	1989	-21.88%
Collapse	Hungary	1989	1993	2000	-18.05%	Collapse	Peru	1981	1983	1986	-12.33%
Mild	Hungary	1984	1985	1986	-0.25%	Mild	Peru	1997	1998	1999	-0.65%
Mild	Hungary	1987	1988	1989	-0.07%	Mild	Philippines	1997	1998	1999	-0.58%
Collapse	Lebanon	1988	1989	1991	-42.45%	Collapse	Russia	1997	1998	1999	-5.30%
Mild	Malaysia	1984	1985	1986	-1.12%	Collapse	South Africa	1981	1983	1984	-6.07%
Mild	Mexico	1985	1986	1989	-3.75%	Collapse	South Korea	1997	1998	1999	-6.85%
Mild	Mexico	2000	2001	2002	-0.12%	Collapse	Thailand	1996	1998	2002	-11.74%
Collapse	Morocco	1991	1993	1994	-5.00%	Mild	Tunisia	1981	1982	1983	-0.49%
Mild	Morocco	1986	1987	1988	-2.54%	Collapse	Turkey	1993	1994	1995	-5.46%
Mild	Morocco	1998	1999	2000	-0.08%	Collapse	Turkey	1998	1999	2000	-4.71%
Collapse	Panama	1982	1983	1985	-4.49%	Collapse	Uruguay	1981	1984	1991	-19.95%
Collapse	Panama	1986	1988	1991	-14.95%	Collapse	Venezuela, Rep. Bol.	1980	1983	1986	-6.10%
Collapse	Peru	1987	1990	1996	-23.53%						
Collapse	Philippines	1983	1985	1989	-14.10%						
Mild	Philippines	1990	1991	1993	-0.58%						
Collapse	Poland	1990	1991	1994	-7.01%						
Collapse	Russia	1989	1996	1997	-41.91%						
Mild	South Africa	1984	1985	1988	-4.00%						
Mild	South Africa	1989	1992	1994	-3.44%						
Mild	Tunisia	1985	1986	1987	-1.45%						
Collapse	Turkey	2000	2001	2003	-7.49%						
Collapse	Ukraine	1989	1999	2004	-61.59%						
Collapse	Uruguay	1998	2002	2004	-17.69%						
Mild	Uruguay	1994	1995	1996	-1.45%						
Collapse	Venezuela, Rep. Bol.	1988	1989	1991	-8.57%						
Collapse	Venezuela, Rep. Bol.	1998	1999	2001	-6.09%						
Collapse	Venezuela, Rep. Bol.	2001	2003	2004	-15.91%						
Mild	Venezuela, Rep. Bol.	1993	1994	1995	-2.35%						
Mild	Venezuela, Rep. Bol.	1995	1996	1997	-0.19%						

Appendix Table 2.**Systemic Capital Market Turmoil Collapse Episodes**

Country	Peak	Trough	Recovery	Output Decline
Argentina	1980	1982	1984	-10.36%
Argentina	1998	2002	2004	-18.36%
Brazil	1980	1983	1985	-7.12%
Chile	1981	1983	1986	-13.72%
Côte d'Ivoire	1982	1984	1986	-6.50%
Ecuador	1998	1999	2001	-6.30%
El Salvador	1980	1982	1992	-16.10%
Indonesia	1997	1998	2003	-13.13%
Malaysia	1997	1998	2000	-7.36%
Mexico	1981	1983	1985	-4.80%
Mexico	1994	1995	1997	-6.17%
Morocco	1994	1995	1996	-6.58%
Nigeria	1980	1984	1989	-21.88%
Peru	1981	1983	1986	-12.33%
Russia	1997	1998	1999	-5.30%
South Africa	1981	1983	1984	-6.07%
South Korea	1997	1998	1999	-6.85%
Thailand	1996	1998	2002	-11.74%
Turkey	1993	1994	1995	-5.46%
Turkey	1998	1999	2000	-4.71%
Uruguay	1981	1984	1991	-19.95%
Venezuela, Rep. Bol.	1980	1983	1986	-6.10%

Data Appendix

Our sample of EMs is composed of those countries tracked by JP Morgan to construct its global Emerging Market Bond Index. The complete list of EMs includes Algeria, Argentina, Brazil, Bulgaria, Côte d'Ivoire, Chile, Colombia, Croatia, Czech Republic, Dominican Republic, Ecuador, El Salvador, Hungary, Indonesia, Lebanon, Malaysia, Mexico, Morocco, Nigeria, Panama, Peru, Philippines, Poland, Russia, South Africa, South Korea, Thailand, Tunisia, Turkey, Ukraine, Uruguay and Venezuela. Data is collected on an annual basis unless otherwise stated. Data for the US Great Depression comes from NBER's Macroeconomic History Database.

Variable	Definitions and Sources
EMBI Index	Emerging Markets Bond Index (monthly). Source: JP Morgan
Fed Funds Rate	Effective Fed Funds Rate (monthly). Source: Federal Reserve.
Gross Domestic Product	Real Gross Domestic Product. Source: World's Bank World Development Indicators database (WDI), except for Lebanon and Poland, whose GDP data are from IMF's World Economic Outlook (WEO) database.
Investment	Gross Private Investment. Source: WDI, except for Poland and Russia whose Investment data are from WEO.
Credit	Credit to Private Sector. Source: IMF IFS (Deposit Money Banks line 22d).
Consumer Price Index	Consumer Price Index. Source: IMF IFS.
Nominal Exchange Rate	Nominal Exchange Rate (Domestic Currency vis-à-vis USD, Average Period). Source: IMF IFS.
Current Account Balance (% GDP)	Current Account Balance. Source: IMF's World Economic Outlook (WEO) database.
Wages	Data on wages was obtained from International Labor Organization (ILO) database (complemented with data from CEPAL, Asian Development Bank, IFS and Central Bank databases).
WPI/PPI	Data on Wholesale Price Index or Producer Prices Index was obtained from IMF IFS database (complemented for a few cases with data from United Nations Statistics Division, Country's Statistics Offices, and Central Banks databases)