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No. 9329

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Stijn Claessens and M. Ayhan Kose

*FINANCIAL ECONOMICS*



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Stijn Claessens, IMF, University of Amsterdam and CEPR  
M. Ayhan Kose, IMF

Discussion Paper No. 9329  
February 2013

Centre for Economic Policy Research  
77 Bastwick Street, London EC1V 3PZ, UK  
Tel: (44 20) 7183 8801, Fax: (44 20) 7183 8820  
Email: [cepr@cepr.org](mailto:cepr@cepr.org), Website: [www.cepr.org](http://www.cepr.org)

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## ABSTRACT

### Financial Crises: Explanations, Types, and Implications \*

This paper reviews the literature on financial crises focusing on three specific aspects. First, what are the main factors explaining financial crises? Since many theories on the sources of financial crises highlight the importance of sharp fluctuations in asset and credit markets, the paper briefly reviews theoretical and empirical studies on developments in these markets around financial crises. Second, what are the major types of financial crises? The paper focuses on the main theoretical and empirical explanations of four types of financial crises—currency crises, sudden stops, debt crises, and banking crises—and presents a survey of the literature that attempts to identify these episodes. Third, what are the real and financial sector implications of crises? The paper briefly reviews the short- and medium-run implications of crises for the real economy and financial sector. It concludes with a summary of the main lessons from the literature and future research directions.

JEL Classification: E32, E5, E6, F44, G01 and H12

Keywords: asset booms, banking crises, credit booms, crises prediction, currency crises, debt crises, defaults, financial restructuring, policy implications and sudden stops

Stijn Claessens  
Research Department  
International Monetary Fund  
700 19th Street NW  
Washington, DC 20431  
USA

M. Ayhan Kose  
International Monetary Fund  
700 19th Street, N.W.  
Washington DC 20431  
USA

Email: [sclaessens@imf.org](mailto:sclaessens@imf.org)

Email: [akose@imf.org](mailto:akose@imf.org)

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\*This paper is written for a forthcoming book, *Financial Crises: Causes, Consequences, and Policy Responses*, edited by Stijn Claessens, M. Ayhan Kose, Luc Laeven, and Fabián Valencia, to be published by the International Monetary Fund. We thank Ezgi Ozturk for outstanding research assistance. The views expressed in this paper are those of the authors and do not necessarily represent those of the IMF or IMF policy.

Submitted 23 January 2013

## I. INTRODUCTION

The 2007-09 global financial crisis has been a painful reminder of the multifaceted nature of crises. They hit small and large countries as well as poor and rich ones. As fittingly described by Reinhart and Rogoff (2009a), “*financial crises are an equal opportunity menace.*” They can have domestic or external origins, and stem from private or public sectors. They come in different shapes and sizes, evolve over time into different forms, and can rapidly spread across borders. They often require immediate and comprehensive policy responses, call for major changes in financial sector and fiscal policies, and can necessitate global coordination of policies.

The widespread impact of the latest global financial crisis underlines the importance of having a solid understanding of crises. As the latest episode has vividly showed, the implications of financial turmoil can be substantial and greatly affect the conduct of economic and financial policies. A thorough analysis of the consequences of and best responses to crises has become an integral part of current policy debates as the lingering effects of the latest crisis are still being felt around the world.

This paper provides a selected survey of the literature on financial crises.<sup>2</sup> Crises are, at a certain level, extreme manifestations of the interactions between the financial sector and the real economy. As such, understanding financial crises requires an understanding of macro-financial linkages, a truly complex challenge in itself. The objective of this paper is more modest: it presents a focused survey considering three specific questions. First, what are the main factors explaining financial crises? Second, what are the major types of financial crises? Third, what are the real and financial sector implications of crises? The paper also briefly reviews the literature on the prediction of crises and the evolution of early warning models.

Section II reviews the main factors explaining financial crises. A financial crisis is often an amalgam of events, including substantial changes in credit volume and asset prices, severe disruptions in financial intermediation, notably the supply of external financing, large scale balance sheet problems, and the need for large scale government support. While these events can be driven by a variety of factors, financial crises often are preceded by asset and credit booms that then turn into busts. As such, many theories focusing on the sources of financial crises have recognized the importance of sharp movements in asset and credit markets. In light of this, this section briefly reviews theoretical and empirical studies analyzing the developments in credit and asset markets around financial crises.

Section III classifies the types of financial crises identified in many studies. It is useful to classify crises in four groups: currency crises; sudden stop (or capital account or balance of

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<sup>2</sup> For further reading on financial crises, the starting point is the authoritative study by Reinhart and Rogoff (2009). Classical references are Minsky (1975) and Kindleberger (1976). See IMF (1998), Eichengreen (2002), Tirole (2002), Allen and Gale (2007), Allen, Babus, Carletti (2009), Allen (2009), and Gorton (2012) for reviews on causes and consequences of financial crises.

payments) crises; debt crises; and banking crises. The section summarizes the findings of the literature on analytical causes and empirical determinants of each type of crisis.

The identification of crises is discussed in Section IV. Theories, that are designed to explain crises, are used to guide the literature on the identification of crises. However, it has been difficult to transform the predictions of the theories into practice. While it is easy to design quantitative methods to identify currency (and inflation) crises and sudden stops, the identification of debt and banking crises is typically based on qualitative and judgmental analyses. Irrespective of the classification one uses, different types of crises are likely to overlap. Many banking crises, for example, are also associated with sudden stop episodes and currency crises. The coincidence of multiple types of crises leads to further challenges of identification. The literature therefore employs a wide range of methods to identify and classify crises. The section considers various identification approaches and reviews the frequency of crises over time and across different groups of countries.

Section V analyzes the implications of financial crises. The macroeconomic and financial implications of crises are typically severe and share many commonalities across various types. Large output losses are common to many crises, and other macroeconomic variables typically register significant declines. Financial variables, such as asset prices and credit, usually follow qualitatively similar patterns across crises, albeit with variations in terms of duration and severity of declines. The section examines the short- and medium-run effects of crises and presents a set of stylized facts with respect to their macroeconomic and financial implications.

Section VI summarizes the main methods used for predicting crises. It has been a challenge to predict the timing of crises. Financial markets with high leverage can easily be subject to crises of confidence, making fickleness the main reason why the exact timing of crises is very difficult to predict. Moreover, the nature of crises changes over time as economic and financial structures evolve. Not surprisingly, early warning tools can quickly become obsolete or inadequate. This section presents a summary of the evolution of different types of prediction models and considers the current state of early warning models.

The last section concludes with a summary and suggestions for future research. It first summarizes the major lessons from this literature review. It then considers the most relevant issues for research in light of these lessons. One is that future research should be geared to eliminate the “*this-time-is-different*” syndrome. However, this is a very broad task requiring to address two major questions: How to prevent financial crises? And, how to mitigate their costs when they take place? In addition, there have to be more intensive efforts to collect necessary data and to develop new methodologies in order to guide both empirical and theoretical studies.

## II. EXPLAINING FINANCIAL CRISES

While financial crises have common elements, they do come in many forms. A financial crisis is often associated with one or more of the following phenomena: substantial changes in credit volume and asset prices; severe disruptions in financial intermediation and the

supply of external financing to various actors in the economy; large scale balance sheet problems (of firms, households, financial intermediaries and sovereigns); and large scale government support (in the form of liquidity support and recapitalization). As such, financial crises are typically multidimensional events and can be hard to characterize using a single indicator.

The literature has clarified some of the factors driving crises, but it remains a challenge to definitively identify their deeper causes. Many theories have been developed over the years regarding the underlying causes of crises. While fundamental factors—macroeconomic imbalances, internal or external shocks—are often observed, many questions remain on the exact causes of crises. Financial crises sometimes appear to be driven by “irrational” factors. These include sudden runs on banks, contagion and spillovers among financial markets, limits to arbitrage during times of stress, emergence of asset busts, credit crunches, and fire-sales, and other aspects related to financial turmoil. Indeed, the idea of “animal spirits” (as a source of financial market movements) has long occupied a significant space in the literature attempting to explain crises (Keynes, 1930; Minsky, 1975; Kindleberger, 1978).<sup>3</sup>

Financial crises are often preceded by asset and credit booms that eventually turn into busts. Many theories focusing on the sources of crises have recognized the importance of booms in asset and credit markets. However, explaining why asset price bubbles or credit booms are allowed to continue and eventually become unsustainable and turn into busts or crunches has been challenging. This naturally requires answering why neither financial market participants nor policy makers foresee the risks and attempt to slow down the expansion of credit and increase in asset prices.

The dynamics of macroeconomic and financial variables around crises have been extensively studied. Empirical studies have documented the various phases of financial crises, from initial, small-scale financial disruptions to large-scale national, regional, or even global crises. They have also described how, in the aftermath of financial crises, asset prices and credit growth can remain depressed for a long time and how crises can have long-lasting consequences for the real economy. Given their central roles, we next briefly discuss developments in asset and credit markets around financial crises.

### **A. Asset Price Booms and Busts**

Sharp increases in asset prices, sometimes called bubbles, and often followed by crashes have been around for centuries. Asset prices sometimes seem to deviate from what fundamentals would suggest and exhibit patterns different than predictions of standard models with perfect financial markets. A bubble, an extreme form of such deviation, can be defined as “*the part of a grossly upward asset price movement that is unexplainable based on fundamentals*” (Garber, 2000). Patterns of exuberant increases in asset prices, often followed by crashes, figure prominently in many accounts of financial instability, both for advanced

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<sup>3</sup> Related are such concepts as “reflexivity” (Soros, 1987), “irrational exuberance” (Greenspan, 1996), and “collective cognition” (De La Torre and Ize, 2011).

and emerging market countries alike, going back millenniums (see Evanoff, Kaufman, Malliaris (2012) and Scherbina (2013) for detailed reviews of asset price bubbles).

Some asset price bubbles and crashes are well known. Such historical cases include the Dutch Tulip Mania from 1634 to 1637, the French Mississippi Bubble in 1719-20, and the South Sea Bubble in the United Kingdom in 1720 (Garber, 2000; Kindleberger, 1986). During some of these periods, certain asset prices increased very rapidly in a short period of time, followed by sharp corrections. These cases are extreme, but not unique. In the recent financial crisis, for example, house prices in a number of countries have followed this inverse U-shape pattern (Figure 1).

### ***What explains asset price bubbles?***

Formal models attempting to explain asset price bubbles have been developed for some time. Some of these models consider how individual rational behavior can lead to collective mispricing, which in turn can result in bubbles. Others rely on microeconomic distortions that can lead to mispricing. Some others assume “irrationality” on the part of investors. Although there are parallels, explaining asset price busts (such as fire-sales) often requires accounting for different factors than explaining bubbles.

Some models employing rational investors can explain bubbles without distortions. These consider asset price bubbles as agents’ “justified” expectations about future returns. For example, in Blanchard and Watson (1982), under rational expectations, the asset price does not need to equal its fundamental value, leading to “rational” bubbles. Thus, observed prices, while exhibiting extremely large fluctuations, are not necessarily excessive or irrational. These models have been applied relatively successfully to explain the internet “bubble” of the late 1990s. Pastor and Veronesi (2006) show how a standard model can reproduce the valuation and volatility of internet stocks in the late 1990s, thus arguing that there is no reason to refer to a “dotcom bubble.” Branch and Evans (2008), employing a theory of learning where investors use most recent (instead of past) data, find that shocks to fundamentals may increase return expectations. This may cause stock prices to rise above levels consistent with fundamentals. As prices increase, investors’ perceived riskiness declines until the bubble bursts.<sup>4</sup> More generally, theories suggest that bubbles can appear without distortions, uncertainty, speculation, or bounded rationality (see Garber (2000) and Scherbina (2013) for reviews of models of bubbles).

But both micro distortions and macro factors can lead to bubbles as well. Bubbles may relate to agency issues (Allen and Gale, 2007). For example, due to risk shifting – as when agents borrow to invest (e.g., margin lending for stocks, mortgages for housing), but can default if rates of return are not sufficiently high – prices can escalate rapidly. Fund managers who are rewarded on the upside more than on the downside (somewhat analogous to limited liability of financial institutions), bias their portfolios towards risky assets, which may trigger a

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<sup>4</sup> Wen and Wang (2012) argue that systemic risk, commonly perceived changes in the bubble's probability of bursting, can produce asset price movements many times more volatile than the economy's fundamentals and generate boom-bust cycles in the context of a DSGE model.



bubble (Rajan, 2005).<sup>5</sup> Other microeconomic factors (e.g., interest rate deductibility for household mortgages and corporate debt) can add to this, possibly leading to bubbles (see BIS, 2002 for a general review, and IMF (2009) for a review of debt and other biases in tax policy with respect to the recent financial crisis).

Investors' behavior can also drive asset prices away from fundamentals, at least temporarily. Frictions in financial markets (notably those associated with information asymmetries) and institutional factors can affect asset prices. Theory suggests, for example, that differences of information and opinions among investors (related to disagreements about valuation of assets), short sales constraints, and other limits to arbitrage are possible reasons for asset prices to deviate from fundamentals.<sup>6</sup> Mechanisms, such as herding among financial market players, informational cascades, and market sentiment, can affect asset prices. Virtuous feedback loops – rising asset prices, increasing net worth positions, allowing financial intermediaries to leverage up, and buy more of the same assets – play a significant role in driving the evolution of bubbles. The phenomenon of contagion – spillovers beyond what “fundamentals” suggest – may have similar roots. Brunnermeier (2001) reviews these models and show how they can help understand bubbles, crashes, and other market inefficiencies and frictions. Empirical work confirms some of these channels, but formal econometric tests are most often not powerful enough to separate bubbles from rational increases in prices, let alone to detect the causes of bubbles (Gürkaynak, 2008).<sup>7</sup>

Bubbles may also be the results of the same factors that are argued to lead to asset price anomalies. Many “deviations” of asset prices from the predictions of efficient markets models, on a small scale with no systemic implications, have been documented (Schwert, 2003 and Lo and MacKinlay, 2001, and earlier Fama 1998 review).<sup>8</sup> While some of these deviations have diminished over time, possibly as investors have implemented strategies to exploit them, others, even though documented extensively, persist to today. Furthermore, deviations have been found in similar ways across various markets, time periods, and institutional contexts. As such, anomalies cannot easily be attributed to specific, institution-related distortions. Rather, they appear to reflect factors intrinsic to financial markets. Studies under the rubric of “behavioral finance” have tried to explain these patterns, with some

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<sup>5</sup> In Rajan's (2005) “alpha-seeking” argument, firms, asset managers, and traders take more risk to improve returns, with private rewards in the short-run. See Gorton and He (2000) and Dell'Ariccia and Marquez (2000) for theories linking credit booms to the quality of lending standards and competition.

<sup>6</sup> Models include Miller (1977), Harrison and Kreps (1978), Chen, Hong and Stein (2002), Scheinkman and Xiong (2003), and Hong, Scheinkman and Xiong (2007).

<sup>7</sup> Empirical studies include Abreu and Brunnermeier (2003), Diether, Malloy and Scherbina (2002), Lamont and Thaler (2003), Ofek and Richardson (2003), and Shleifer and Vishny (1997).

<sup>8</sup> For example, stocks of small firms get higher rates of return than other stocks do, even after adjusting for risk, liquidity and other factors. Spreads on lower-rated corporate bonds appear to have a relatively larger compensation for default risk than higher-rated bonds do. Mutual funds whose assets cannot be liquidated when investors sell the funds (so called closed-end funds) can trade at prices different those implied by the intrinsic value of their assets.

success (Shleifer 2000, and Barberis and Thaler 2003 review).<sup>9</sup> Of course, “evidence of irrationally” may reflect a mis-specified model, i.e., irrational behavior is not easily falsifiable.

Busts following bubbles can be triggered by small shocks. Asset prices may experience small declines, whether due to changes in fundamental values or sentiment. Changes in international financial and economic conditions, for example, may drive prices down. The channels by which such small declines in asset prices can trigger a crisis are well understood by now. Given information asymmetries, for example, a small shock can lead to market freezes. Adverse feedback loops may then arise, where asset prices exhibit rapid declines and downward spirals. Notably, a drop in prices can trigger a fire sale, as financial institutions experiencing a decline in asset values struggle to attract short-term financing. Such “sudden stops” can lead to a cascade of forced sales and liquidations of assets, and further declines in prices, with consequences for the real economy.

Flight to quality can further intensify financial turmoil. Relationships among financial intermediaries are multiple and complex. Information asymmetries are prevalent among intermediaries and in financial markets. These problems can easily lead to financial turmoil. They can be aggravated by preferences of investors to hold debt claims (Gorton, 2008). Specifically, debt claims are “low information-intensive” in normal states of the world – as the risk of default is remote, they require little analysis of the underlying asset value. They become “high information-intensive,” however, in times of financial turmoil as risks increase, requiring investors to assess default risks, a complex task involving a multitude of information problems. This puts a premium on safety and can create perverse spirals. As investors flight to quality assets, e.g., government bonds, they avoid some, lower quality types of debt claims, leading to sharper drops in their prices (Gorton and Ordonez, 2012).

## **B. Credit Booms and Busts**

A rapid increase in credit is another common thread running through the narratives of events prior to financial crises. Leverage buildups and greater risk-taking through rapid credit expansion, in concert with increases in asset prices, often precede crises (albeit typically only recognized with the benefits of hindsight). Both distant past and more recent crises episodes typically witnessed a period of significant growth in credit (and external financing), followed by busts in credit markets along with sharp corrections in asset prices. In many respects, the descriptions of the Australian boom and bust of the 1880-90s, for example, fit the more recent episodes of financial instability. Likewise, the patterns before the East Asian financial crisis in the late-1990s resembled those of the earlier ones in Nordic countries as banking

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<sup>9</sup> For example, firms tend to issue new stocks when prices (and firm profitability) are high and markets’ reaction to initial public offerings can be “hot” or “cold.” Both contradict the assumption that firms seek external financing only when they need to (due to lack of internal funds while having good growth opportunities). Many individual investors also appear to diversify their assets insufficiently (or naively) and rebalance their portfolio too infrequently. At the same time, some investors respond too much to price movements, and sell winners too early and hold on to losers too long. These patterns have been “explained” by various behavioral factors.

systems collapsed following periods of rapid credit growth related to investment in real estate. The experience of the United States in the late 1920s and early 1930s exhibits some features similar to the run-up to the recent global financial crisis with, beside rapid growth in asset prices and land speculation, a sharp increase in (household) leverage. The literature has also documented common patterns in various other macroeconomic and financial variables around these episodes.

### *What explains credit booms?*

Credit booms can be triggered by a wide range of factors, including shocks and structural changes in markets.<sup>10</sup> Shocks that can lead to credit booms include changes in productivity, economic policies, and capital flows. Some credit booms tend to be associated with positive productivity shocks. These generally start during or after periods of buoyant economic growth. Dell’Ariccia and others (2013) find that lagged GDP growth is positively associated with the probability of a credit boom: in the three-year period preceding a boom, the average real GDP growth rate reaches 5.1 percent, compared to 3.4 percent during a tranquil three-year period.

Sharp increases in international financial flows can amplify credit booms. Most national financial markets are affected by global conditions, even more so today, making asset bubbles easily spill across borders. Fluctuations in capital flows can amplify movements in local financial markets when inflows lead to a significant increase in the funds available to banks, relaxing credit constraints for corporations and households (Claessens et al. 2010). Rapid expansion of credit and sharp growth in house and other asset prices were indeed associated with large capital inflows in many countries before the recent financial crisis.

Accommodative monetary policies, especially when in place for extended periods, have been linked to credit booms and excessive risk taking. The channel is as follows. Interest rates affect asset prices and borrower’s net worth, in turn affecting lending conditions. Analytical models, including on the relationship between agency problems and interest rates (e.g., Stiglitz and Weiss, 1981), suggest more risk-taking when interest rates decline and a flight to quality when interest rates rise, with consequent effects on the availability of external financing. Empirical evidence (e.g., for Spain, Maddaloni and Peydró, 2010; Ongena et al. 2009), supports such a channel as credit standards tend to loosen when policy rates decline. The relatively low interest rates in the U.S. during 2001-04 are often mentioned as a main factor behind the rapid increases in house prices and household leverage (Lansing, 2008; Hirata et. al, 2012).<sup>11</sup>

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<sup>10</sup> For reviews of factors associated with the onset of credit booms, see further Mendoza and Terrones (2008 and 2012), Magud, Reinhart, and Vesperoni (2012), and Dell’Ariccia and others (2013).

<sup>11</sup> However, whether and how monetary policy affects risk taking, and thereby asset prices and leverage, remains a subject of further research (see De Nicolo and others (2010) for recent analysis and review). The extent of bank capitalization appears to be an important factor as it affects incentives: when facing a lower interest rate, a well-capitalized bank decreases its monitoring and takes more risk, while a highly levered, low capitalized bank does the opposite (see further Dell’Ariccia, Laeven and Marquez (2010)).

Structural factors include financial liberalization and innovation. Financial liberalization, especially when poorly designed or sequenced, and financial innovation can trigger credit booms and lead to excessive increases in leverage of borrowers and lenders by facilitating more risk taking. Indeed, financial liberalization has been found to often precede crises in empirical studies (Kaminsky and Reinhart, 1999; Detragiache and Demirguc-Kunt, 2006). Dell’Ariccia and others (2013) report that roughly a third of booms they identify follow or coincide with financial liberalization episodes.

The mechanisms involved include institutional weaknesses as well as the perverse effects of competition. One channel seems to be that regulation, supervision, and market discipline is slow to catch up with greater competition and innovation (possibly set in motion by shocks or liberalization). Vulnerabilities in credit markets can naturally arise. Another mechanism commonly linking booms to crises is a decline in lending standards. Greater competition in financial services, while generally enhancing efficiency and stability in the long run, can contribute to financial fragility over shorter periods. For the latest crisis in the United States, this was evident in higher delinquency rates in those metropolitan areas with higher growth in loan origination prior to the onset of the crisis, with the deterioration in lending standards appearing in part related to increases in competition (Dell’Ariccia, Igan and Laeven, 2012).

### C. Impact of Asset Price and Credit Busts

Sharp movements in asset and credit markets during financial crises are quite different from those normally observed. Asset prices and credit booms and busts differ from the movements observed over the course of a normal business cycle. Booms in credit and asset markets are shorter, stronger, and faster than other upturns. For example, these episodes often take place over relatively shorter time periods than other episodes and are associated with much faster increases in the financial variables (Figure 2A). The slope of a typical boom is two to three times larger than that of regular episodes. And crunches and busts are longer, deeper and more violent than other downturns. Credit crunches and asset price busts have much larger declines than other declines (Figure 2B). Specifically, credit crunches and house price busts lead to respectively roughly 10 and 15 times larger drops than other downturns, while equity busts more than 2.5 times as large. These episodes also last longer, some two times, than other downturns, with house price busts the longest of all, about 18 quarters, whereas a credit crunch and equity busts last about 10-12 quarters. Moreover, disruptions are more violent, as evidenced by higher slope coefficients, with busts in equity prices three times more violent than those in credit and house prices (Claessens, Kose and Terrones, 2010a).

There are typically adverse real effects of asset price busts and credit crunches on the real economy.<sup>12</sup> Asset price busts can affect bank lending and other financial institutions’

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<sup>12</sup> Some used to be sanguine on the costs of busts in credit and asset markets. Until the most recent crisis, for example, some appeared to be sanguine on the economic cost of bubbles. For example, Roger W. Ferguson, then Vice Chairman of the Federal Reserve Board, argued in January 2005 that *“recessions that follow swings in asset prices are not necessarily longer, deeper, and associated with a greater fall in output and investment than other recessions...”* There are also theories in which even fully irrational asset bubbles are not necessarily harmful or could even be beneficial (Kocherlakota, (continued...))

investment decisions and in turn the real economy through two channels. First, when borrowing/lending is collateralized and the market price of collateral falls, the ability of firms to rely on assets as collateral for new loans and financial institutions' ability to extend new credit become impaired, which in turn adversely affect investment. Second, the prospect of large price dislocations arising from fire sales and related financial turmoil distorts decisions of financial institutions to lend or invest, prompting them inter alia to hoard cash. Through these channels, fire sales can trigger a credit crunch and cause a severe contraction in real activity.

Those asset price booms supported through leveraged financing and involving financial intermediaries appear to entail larger risks for the economy. Evidence from past episodes suggests that whether excessive movements in asset prices lead to severe misallocations of resources depends in large part on the nature of boom and how it is financed. Booms largely involving equity market activities appear to have lower risks of adverse consequences. The burst of the internet bubble of the late 1990s, which largely involved only equity markets, has not been very costly for the real economy. When banks are involved in financing asset price booms, however, as in real estate mortgage and corporate sector financing, risks of adverse consequences of a following asset bust are typically much higher. The main reason is that these booms involve leverage and banks, implying that the flow of credit to the economy gets interrupted when a bust occurs.

The burst of the latest bubble, as it was financed by banks (and the shadow banking system) and involving housing, has been very costly. For the most recent episode, Dell'Ariccia et al (2011) report that, in a 40-country sample, almost all the countries with "twin booms" in real estate and credit markets (21 out of 23) ended up suffering from either a crisis or a severe drop in GDP growth rate relative to the country's performance in the 2003–07 period (Figure 3). Eleven of these countries actually suffered both financial sector damage and a sharp drop in economic activity. In contrast, of the seven countries that experienced a real estate boom, but not a credit boom, only two went through a systemic crisis and, on average, had relatively mild recessions. We present a broader discussion of the real and financial implications of financial crises and disruptions in Section V.

### III. TYPES OF FINANCIAL CRISES

While financial crises can take various shapes and forms, in terms of classification, broadly two types can be distinguished. Reinhart and Rogoff (2009a) distinguish two types of crises: those classified using strictly quantitative definitions; and those dependent largely on qualitative and judgmental analysis. The first group mainly includes *currency* and *sudden stop* crises and the second group contains *debt* and *banking* crises. Regardless, definitions are strongly influenced by the theories trying to explain crises.

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2009). Bubbles can allow for a store of value ("collateral") and thereby enhance overall financial intermediation through facilitating exchanges, and thereby improve overall economic performance. As such, the presence of bubbles *per se*, whether rational or irrational, need not necessarily be a cause for concern.

While financial crises can take various shapes and forms, the literature has been able to arrive at concrete definitions of many types of crises. For example, a *currency* crisis involves a speculative attack on the currency resulting in a devaluation (or sharp depreciation), or forcing the authorities to defend the currency by expending large amount of international reserves, or sharply raising interest rates, or imposing capital controls. A *sudden stop* (or a capital account or balance of payments crisis) can be defined as a large (and often unexpected) fall in international capital inflows or a sharp reversal in aggregate capital flows to a country, likely taking place in conjunction with a sharp rise in its credit spreads. Since these are measurable variables, they lend themselves to the use of quantitative methodologies.

Other crises are associated with adverse debt dynamics or banking system turmoil. A *foreign debt* crisis takes place when a country cannot (or does not want to) service its foreign debt. It can take the form of a sovereign or private (or both) debt crisis. A *domestic public debt* crisis takes place when a country does not honor its domestic fiscal obligations in real terms, either by defaulting explicitly, or by inflating or otherwise debasing its currency, or by employing some (other) forms of financial repression. In a *systemic banking* crisis, actual or potential bank runs and failures can induce banks to suspend the convertibility of their liabilities or compel the government to intervene to prevent this by extending liquidity and capital assistance on a large scale. Since these are not so easily measurable variables, they lend themselves more to the use of qualitative methodologies.

Other classifications are possible, but regardless the types of crises likely overlap. A number of banking crises, for example, are associated with sudden stop episodes and currency crises. We examine analytical causes and empirical determinants of each type of crisis in this section and consider the identification, dating and frequency of crises in the next section.

### A. Currency Crises

Theories on currency crises, often more precisely articulated than for other types of crises, have evolved over time in part as the nature of such crises has changed. In particular, the literature has evolved from a focus on the fundamental causes of currency crises, to emphasizing the scope for multiple equilibria, and to stressing the role of financial variables, especially changes in balance sheets, in triggering currency crises (and other types of financial turmoil). Three generations of models are typically used to explain currency crises that took place during the past four decades.

The *first generation* of models, largely motivated by the collapse in the price of gold, an important nominal anchor before the floating of exchange rates in the 1970s, was often applied to currency devaluations in Latin America and other developing countries (Claessens, 1991).<sup>13</sup> These models are from seminal papers by Krugman (1979) and Flood and Garber (1984), and hence called “KFG” models. They show that a sudden speculative attack on a fixed or pegged currency can result from rational behavior by investors who correctly foresee that a government has been running excessive deficits financed with central bank credit.

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<sup>13</sup> Earlier versions of the canonical crisis model were Salant and Henderson (1978) and Salant (1983).

Investors continue to hold the currency as long as they expect the exchange rate regime remain intact, but they start dumping it when they anticipate that the peg is about to end. This run leads the central bank to quickly lose its liquid assets or hard foreign currency supporting the exchange rate. The currency then collapses.

The *second generation* of models stresses the importance of multiple equilibria. These models show that doubts about whether a government is willing to maintain its exchange rate peg could lead to multiple equilibria and currency crises (Obstfeld and Rogoff, 1986). In these models, self-fulfilling prophecies are possible, in which the reason investors attack the currency is simply that they expect other investors to attack the currency. As discussed in Flood and Marion (1997), policies prior to the attack in the first generation models can translate into a crisis, whereas changes in policies in response to a possible attack (even if these policies are compatible with macroeconomic fundamentals) can lead to an attack and be the trigger of a crisis. The second generation models are in part motivated by episodes like the European Exchange Rate Mechanism crisis, where countries like the UK came under pressure in 1992 and ended up devaluing, even though other outcomes (that were consistent with macroeconomic fundamentals) were possible too (see Eichengreen, Rose and Wyplosz (1996), Frankel and Rose (1996)).

The *third generation* of crisis models explores how rapid deteriorations of balance sheets associated with fluctuations in asset prices, including exchange rates, can lead to currency crises. These models are largely motivated by the Asian crises of the late 1990s. In the case of Asian countries, macroeconomic imbalances were small before the crisis – fiscal positions were often in surplus and current account deficits appeared to be manageable, but vulnerabilities associated with financial and corporate sectors were large. Models show how balance sheets mismatches in these sectors can give rise to currency crises. For example, Chang and Velasco (2000) show how, if local banks have large debts outstanding denominated in foreign currency, this may lead to a banking *cum* currency crisis.<sup>14</sup>

This generation of models also considers the roles played by banks and the self-fulfilling nature of crises. McKinnon and Pill (1996), Krugman (1998), and Corsetti, Pesenti, and Roubini (1998) suggest that over-borrowing by banks can arise due to government subsidies (to the extent that governments would bail out failing banks). In turn, vulnerabilities stemming from over-borrowing can trigger currency crises. Burnside, Eichenbaum, and Rebelo (2001 and 2004) argue that crises can be self-fulfilling because of fiscal concerns and volatile real exchange rate movements (when the banking system has such a government guarantee, a good and/or a bad equilibrium can result). Radelet and Sachs (1998) argue more generally that self-fulfilling panics hitting financial intermediaries can force liquidation of assets, which then confirms the panic and leads to a currency crisis.

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<sup>14</sup> Hallwood and MacDonald (2000) provide a detailed summary of the first and second generation models and consider their extensions to different contexts. Krugman (1999), in an attempt to explain the Asian financial crisis, also provides a similar mechanism operating through firms' balance sheets, and investment is a function of net worth.

Empirical research has not been able to differentiate which generation of these models provides the best characterization of currency crises. Early work had good success with the KFG model. Blanco and Garber (1986), for example, applied the KFG model to the Mexican devaluations in 1976 and 1981-82 and showed crisis probabilities to build up to peaks just before the devaluations (Cumby and van Wijnbergen (1989) and Klein and Marion (1994)). However, while the KFG model worked well in cases where macroeconomic fundamentals grow explosively, it was not successful when fundamentals are merely highly volatile and money-demand unstable.

Later empirical work moved away from explicit tests of structural models. Some studies used censored dependent variable models, e.g., Logit models, to estimate crisis probabilities based on a wide range of lagged variables (Eichengreen, Rose and Wyploz (1996), Frankel and Rose (1996), Kumar et al (2003)). Others, such as Kaminsky, Lizondo, and Reinhart (1998) and Kaminsky and Reinhart (1999), employed signaling models to evaluate the usefulness of several variables in signaling an impending crisis. While this literature has found that certain indicators tend to be associated with crises, the outcomes have been nevertheless disappointing, with the timing of crises very hard to predict (see Kaminsky, Lizondo and Reinhart (1998) for an early review, Kaminsky (2003) for an update, and Frankel and Saravelos (2012) for an extensive recent survey up to the 2000s). We will revisit the issue of crisis prediction later.

## **B. Sudden Stops**

Models with sudden stops make a closer association with disruptions in the supply of external financing. These models resemble the latest generation of currency crises models in that they also focus on balance sheet mismatches – notably currency, but also maturity – in financial and corporate sectors (Calvo et al., 2006). They tend to give greater weight, however, to the role of international factors (as captured, for example, by changes in international interest rates or spreads on risky assets) in causing “sudden stops” in capital flows. These models can account for the current account reversals and the real exchange rate depreciation typically observed during crises in emerging markets. The models explain less well the typical sharp drops in output and total factor productivity (TFP).

In order to match data better, more recent sudden stop models introduce various frictions. While counterintuitive, in most models, a sudden stop *cum* currency crisis generates an increase in output, rather than a drop. This happens through an abrupt increase in net exports resulting from the currency depreciation. This has led to various arguments explaining why sudden stops in capital flows are associated with large output losses, as is often the case. Models typically include Fisherian channels and financial accelerator mechanisms, or frictions in labor markets, to generate an output drop during a sudden stop, without losing the ability to account for the movements of other variables.

Following closely the domestic literature, models with financial frictions help to account better for the dynamics of output and productivity in sudden stops. With frictions, e.g., when firms must borrow in advance to pay for inputs (e.g., wages, foreign inputs), a fall in credit – the sudden stop combined with rising external financing premium – reduces aggregate demand and causes a fall in output (Calvo and Reinhart, 2000). Or because of collateral



constraints in lending, a sudden stop can lead to a debt-deflation spiral of declines in credit, prices and quantity of collateral assets, resulting in a fall in output. Like the domestic financial accelerator mechanism, financial distress and bankruptcies cause negative externalities, as banks become more cautious and reduce new lending, in turn inducing a further fall in credit, and thereby contributing to a recession (Calvo, 2000).

These types of amplification mechanisms can make small shocks cause sudden stops. Relatively small shocks – to imported input prices, the world interest rate, or productivity – can trigger collateral constraints on debt and working capital, especially when borrowing levels are high relative to asset values. Fisher's style debt-deflation mechanisms can then cause sudden stops through a spiraling decline in asset prices and holdings of collateral assets (Fisher, 1933). This chain of events immediately affects output and demand. Mendoza (2009) shows how a business cycle model with collateral constraints can be consistent with the key features of sudden stops. Korinek (2010) provides a model analyzing the adverse implications of large movements in capital flows on real activity.

Sudden stops often take place in countries with relatively small tradable sectors and large foreign exchange liabilities. Sudden stops have affected countries with widely disparate per capita GDPs, levels of financial development, and exchange rate regimes, as well as countries with different levels of reserve coverage. There are though two elements most episodes share, as Calvo, Izquierdo and Mejía (2008) document: a small supply of tradable goods relative to domestic absorption – a proxy for potential changes in the real exchange rate – and a domestic banking system with large foreign-exchange denominated liabilities, raising the probability of a “perverse” cycle.

Empirical studies find that many sudden stops have been associated with global shocks. For a number of emerging markets, e.g., those in Latin America and Asia in the 1990s and in Central and Eastern Europe in the 2000s, following a period of large capital inflows, a sharp retrenchment or reversal of capital flows occurred, triggered by global shocks (such as increases in interest rates or changes in commodity prices). Sudden stops are more likely with large cross-border financial linkages. Milesi-Ferretti and Tille (2011) document that rapid changes in capital flows were important triggers of local crises during the recent crisis. Other papers, e.g., Rose and Spiegel (2011), however, find little role for international factors, including capital flows, in the spread of the recent crisis.

### **C. Foreign and Domestic Debt Crises**

Theories on foreign debt crises and default are closely linked to those explaining sovereign lending. Absent “gun-boat” diplomacy, lenders cannot seize collateral from another country, or at least from a sovereign, when it refuses to honor its debt obligations. Without an enforcement mechanism, i.e., the analogue to domestic bankruptcy, economic reasons, instead of legal arguments, are needed to explain why international (sovereign) lending exists at all.

Models developed rely, as a gross simplification, on either intertemporal or intratemporal sanctions. Intertemporal sanctions arise because of a threat of cutoff from future lending if a

country defaults (Eaton and Gersovitz, 1981). With no access (forever or for some time), the country can no longer smooth idiosyncratic income shocks using international financial markets. This cost can induce the country to continue its debt payments today, even though there are no immediate, direct costs to default. Intratemporal sanctions can arise from the inability to earn foreign exchange today because trading partners impose sanctions or otherwise shut the country out of international markets, again forever or for some time (Bulow and Rogoff, 1989a). Both types of costs can support a certain volume of sovereign lending (see Eaton and Fernandez, (1995) and Panizza, Sturzenegger and Zettelmeyer (2009) for reviews).

These models imply that inability or unwillingness to pay, i.e., default, can result from different factors. The incentives governments face in repaying debt differ from those for corporations and households in a domestic context. They also vary across models. In the intertemporal model, a country defaults when the opportunity cost of not being able to borrow ever again is low, one such case presumably being when the terms of trade is good and is expected to remain so (Kletzer and Wright, 2000). In the intratemporal sanction model, in contrast, the costs of a cutoff from trade may be the least when the terms of trade is bad. Indeed, Aguiar and Gopinath (2006) demonstrate how in a model with persistent shocks, countries default in bad times to smooth consumption. The models thus also have different implications with respect to a country's borrowing capacity.

Such models are unable, however, to fully account why sovereigns default and why creditors lend as much as they do. Many models actually predict that default does not happen in equilibrium as creditors and debtors avoid the dead-weight costs of default and renegotiate debt payments. While some models have been calibrated to match actual experiences of default, models often still underpredict the likelihood of actual defaults. Notably, countries do not always default when times are bad, as most models predict: Tomz and Wright (2007) report that in only 62 percent of defaults cases output was below trend. Models also underestimate the willingness of investors to lend to countries in spite of large default risk. Moreover, changes in the institutional environment, such as those implemented after the debt crises of the 1980s, do not appear to have modified the relation between economic and political variables and the probability of a debt default. Together, this suggests that models still fail to capture all aspects necessary to explain defaults (Panizza, Sturzenegger and Zettelmeyer, 2009).

Although domestic debt crises have been prevalent throughout history, these episodes had received only limited attention in the literature until recently. Economic theory assigns a trivial role to domestic debt crises since models often assume that governments always honor their domestic debt obligations—the typical assumption is of the “risk-free” government assets. Models also often assume Ricardian equivalence, making government debt less relevant. However, recent reviews of history (Reinhart and Rogoff, 2009a) show that few countries were able to escape default on domestic debt, with often adverse economic consequences.

This often happens through bouts of high inflation because of the abuse of governments' monopoly on currency issuance. One such episode was when the U.S. experienced a rate of

inflation close to 200 percent in the late 1770s. The periods of hyperinflation in some European countries following the World War II were also in this category. Debt defaults in the form of inflation are often followed by currency crashes. In the past, countries would often “debase” their currency by reducing the metal content of coins or switching to another metal. This reduced the real value of government debt and thus provided fiscal relief. There have also been other forms of debt “default,” including through financial repression (Reinhart, Kirkegaard, and Sbrancia, 2011). After inflation or debasing crises, it takes a long time to convince the public to start using the currency with confidence again. This in turn significantly increases the fiscal costs of inflation stabilization, leading to large negative real effects of high inflation and associated currency crashes.

Debt intolerance tends to be associated with the “extreme duress” many emerging economies experience at levels of external debt that would often be easily managed by advanced countries. Empirical studies on debt intolerance and serial default suggests that, while safe debt thresholds hinge on country specific factors, such as a country’s record of default and inflation, when the external debt level of an emerging economy is above 30-35 percent of GNP, the likelihood of an external debt crisis rises substantially (Reinhart and Rogoff, 2009b). More importantly, when an emerging market country becomes a serial defaulter of its external debt, this increases its debt intolerance and, in turn, makes it very difficult to graduate to the club of countries that have continuous access to global capital markets.

Many challenges remain regarding modeling the countries’ ability to sustain various types of domestic and external debt. An important challenge is that the form of financing countries use is endogenous. Jeanne (2003) argues that short-term (foreign exchange) debt can be a useful commitment device for countries to employ good macroeconomic policies. Diamond and Rajan (2001) posit that banks in developing countries have little choice but to borrow short-term to finance illiquid projects given the low-quality institutional environment they operate in. Eichengreen and Hausmann (1999) propose the “original sin” argument explaining how countries with unfavorable conditions have no choice but to rely mostly on short-term, foreign currency denominated debt as their main source of capital. More generally, although short-term debt can increase vulnerabilities, especially when the domestic financial system is underdeveloped, poorly supervised, and subject to governance problems, it also may be the only source of (external) financing for a capital-poor country with limited access to equity or FDI inflows. This makes the countries’ choice of accumulating short-term debt and becoming more vulnerable to crises simultaneous outcomes.

More generally, the deeper causes driving debt crises are hard to separate from the proximate causes. Many of the vulnerabilities raising the risk of a debt crisis can result from factors related to financial integration, political economy and institutional environments. Opening up to capital flows can make countries with profligate governments and weakly supervised financial sectors more vulnerable to shocks. McKinnon and Pill (1996, 1998) describe how moral hazard and inadequate supervision combined with unrestricted capital flows can lead to crises as banks incur currency risks. Debt crises are also likely to involve sudden stops, currency or banking crises (or various combinations), making it hard to identify the initial cause. Empirical studies on the identification of causes are thus subject to the usual problems of omitted variables, endogeneity and simultaneity. Although using short-term (foreign

currency) debt as a crisis predictor may work, for example, it does not constitute a proof of the root cause of the crisis. The difficulty to identify the deeper causes is more generally reflected in the fact that debt crises have also been around throughout history.

#### **D. Banking Crises**

Banking crises are quite common, but perhaps the least understood type of crises. Banks are inherently fragile, making them subject to runs by depositors. Moreover, problems of individual banks can quickly spread to the whole banking system. While public safety nets – including deposit insurance – can limit this risk, public support comes with distortions that can actually increase the likelihood of a crisis. Institutional weaknesses can also elevate the risk of a crisis. For example, banks heavily depend on the information, legal and judicial environments to make prudent investment decisions and collect on their loans. With institutional weaknesses, risks can be higher. While banking crises have occurred over centuries and exhibited some common patterns, their timing remains empirically hard to pin down.

##### ***Bank Runs and Banking Crises***

Financial institutions are inherently fragile entities, giving rise to many possible coordination problems. Because of their roles in maturity transformation and liquidity creation, financial institutions operate with highly leveraged balance sheets. Hence, banking, and other similar forms of financial intermediation, can be precarious undertakings. Fragility makes coordination, or lack thereof, a major challenge in financial markets. Coordination problems arise when investors and/or institutions take actions – like withdrawing liquidity or capital – merely out of fear that others also take similar actions. Given this fragility, a crisis can easily take place, where large amounts of liquidity or capital are withdrawn because of a self-fulfilling belief – it happens because investors fear it will happen. Small shocks, whether real or financial, can translate into turmoil in markets and even a financial crisis.

A simple example of a coordination problem is a bank run. It is a truism that banks borrow short and lend long. This maturity transformation reflects preferences of consumers and borrowers. However, it makes banks vulnerable to sudden demands for liquidity, i.e., “runs” (the seminal reference here is Diamond and Dybvig, 1983). A run occurs when a large number of customers withdraw their deposits because they believe the bank is, or might become, insolvent. As a bank run proceeds, it generates its own momentum, leading to a self-fulfilling prophecy (or perverse feedback loop): as more people withdraw their deposits, the likelihood of default increases, and this encourages further withdrawals. This can destabilize the bank to the point where it faces bankruptcy as it cannot liquidate assets fast enough to cover its short-term liabilities.

These fragilities have long been recognized, and markets, institutions, and policy makers have developed many “coping” mechanisms (see further Dewatripoint and Tirole, 1994). Market discipline encourages institutions to limit vulnerabilities. At the firm level, intermediaries have adopted risk management strategies to reduce their fragility. Furthermore, micro-prudential regulation, with supervision to enforce rules, is designed to reduce risky behavior of individual financial institutions and can help engineer stability.

Deposit insurance can eliminate concerns of small depositors and can help reduce coordination problems. Lender of last resort facilities (i.e., central banks) can provide short-run liquidity to banks during periods of elevated financial stress. Policy interventions by public sector, such as public guarantees, capital support and purchases of non-performing assets, can mitigate systemic risk when financial turmoil hits.

Although regulation and safety net measures can help, when poorly designed or implemented they can increase the likelihood of a banking crisis. Regulations aim to reduce fragilities (for example, limits on balance sheet mismatches stemming from interest rate, exchange rate, maturity mismatches, or certain activities of financial institutions). Regulation (and supervision), however, often finds itself playing catch up with innovation. And it can be poorly designed or implemented. Support from the public sector can also have distortionary effects (see further Barth, Caprio and Levine, 2006). Moral hazard due to a state guarantee (e.g., explicit or implicit deposit insurance) may, for example, lead banks to assume too much leverage. Institutions that know they are too big to fail or unwind, can take excessive risks, thereby creating systemic vulnerabilities.<sup>15</sup> More generally, fragilities in the banking system can arise because of policies at both micro and macro levels (Laeven, 2011).

### *History of banks runs*

Runs have occurred in many countries throughout history. In the U.S., bank runs were common during the banking panics of the 1800s and in the early 1900s (during the Great Depression). Only with the introduction of deposit insurance in 1933, did most runs stop in the U.S. (Calomiris and Gorton, 1998). Wide-spread runs also happened frequently in emerging markets and developing countries in recent decades, such as in Indonesia during the 1997 Asian financial crisis. Runs occurred more rarely in other advanced countries, and even less so in recent decades, in part due to the wide spread availability of deposit insurance.<sup>16</sup> Yet, Northern Rock, a bank specializing in housing finance in the U.K., constitutes a very recent example of a bank run in an advanced country (Shin, 2011). Rapid withdrawals of wholesale market funding also took place during the recent financial crisis, when several investment and some commercial banks faced large liquidity demands from investors.

Widespread runs can also take place in non-bank financial markets. For example, in the U.S. during the fall of 2008, some mutual funds “broke the buck”, i.e., their net asset value fell below par. This triggered sharp outflows from individual investors and many other mutual funds (Wermers, 2012). This “run”, in turn, led the government to provide a guarantee against further declines. These guarantees constitute a continued source of fiscal risk as the

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<sup>15</sup> Ranciere and Tornell (2011) model how financial innovations can allow institutions to maximize a systemic bailout guarantee, and report evidence supporting this mechanism in the context of the 2007 US financial crisis.

<sup>16</sup> Deposit insurance, first introduced in the U.S. in 1933, was adopted following the World War II by many advanced countries, and has since employed by developing countries (Demirguc-Kunt, Kane and Laeven, 2008). While deposit insurance can reduce the risk of bank runs, it can have severe negative side effects, including increased moral hazard, leading to more risk taking.

government might be forced to step in to prevent a run again. Other investment vehicles specializing in specific asset classes (such as emerging markets) also experienced sharp outflows as there was a general “flight to safety” (i.e., more demand for advanced countries’ government bonds and T-bills). More generally, the 2007-08 crisis has been interpreted by many as a widespread liquidity run (Gorton, 2009).

### *Deeper causes of banking crises*

Although funding and liquidity problems can be triggers or proximate causes, a broader perspective shows that banking crises often relate to problems in asset markets. Banking crises may appear to originate from the liability side, but they typically reflect solvency issues. Banks often run into problems when many of their loans go sour or when securities quickly lose their value. This happened in crises as diverse as the Nordic banking crises in the late 1980s, the crisis in Japan in the late 1990s, and the recent crises in Europe. In all of these episodes, there were actually no large-scale deposit runs on banks, but large-scale problems arising from real estate loans made many banks undercapitalized and required support of governments. Problems in asset markets, such as those related to the subprime and other mortgage loans, also played a major role part during the recent crisis. These types of problems in asset markets can go undetected for some time, and a banking crisis often comes into the open through the emergence of funding difficulties among a large fraction of banks.

Although the exact causal sources are often hard to identify, and risks can be difficult to foresee beforehand, looking back banking crises and other financial panics are rarely random events. Banking panics more likely occur near the peak of the business cycle, with recessions on the horizon, because of concerns that loans do not get repaid (Gorton 1988; Gorton and Wilton, 2000). Depositors, noticing the risks, demand cash from the banks. As banks cannot (immediately) satisfy all requests, a panic may occur. The large scale bank distress in the 1930s was traced back this way to shocks in the real sector. In many emerging markets, banking crises were triggered by external developments, such as sharp movements in capital flows, global interest rates and commodity prices, which in turn led to an increase in non-performing loans.

Panics can too be policy induced. Panics can take place when some banks experience difficulties and governments intervene in an *ad-hoc* manner, without providing clear signals as to the status of other institutions. The banking panic in Indonesia in 1997, has been attributed to poorly-managed early interventions (see Honohan and Laeven, 2007, for this and other case studies). Runs can also be directly triggered by government actions: the runs on banks in Argentina in 2001 occurred when the government imposed a limit on withdrawals, making depositors question the soundness of the entire banking system. The recent financial crisis in advanced countries has in part been attributed to the lack of consistency across government interventions and other policy measures (e.g., Calomiris, 2009).

Structural problems can also lead to banking crises. Studies (e.g., Lindgren, Garcia and Saal, 1996; Barth, Caprio and Levine, 2006, and many others) have identified some common, structural characteristics related to banking crises. These include notably: poor market

discipline due to moral hazard and excessive deposit insurance; limited disclosure; weak corporate governance framework; and poor supervision, in part due to conflict of interests.<sup>17</sup> Other structural aspects found to increase the risk of a crisis include: large state-ownership and limited competition in the financial system, including restricted entry from abroad; and an undiversified financial system, e.g., a dominance of banks (World Bank, 2001).

Because the financial sector receives many forms of public support, policy distortions that can lead to crises easily arise. In the context of the recent financial crisis in the US, large government support for housing finance (through the government sponsored enterprises Fannie Mae and Freddie Mac) has been argued to lead to excessive risk taking. The tendency to pursue accommodative monetary and fiscal policies following crises, at least in some advanced countries, can also be interpreted as a form of an *ex-post* systemic bailout, which in turn distorts *ex-ante* incentives and can lead to excessive risk taking (Farhi and Tirole, 2010). Another often cited problem has been “connected lending” which leads to perverse incentives – as corporations and politicians borrow too much from banks – and can cause a buildup of systemic risk. Some well-studied cases of this phenomenon include Mexico (La Porta et al. 2000; Haber 2005), Russia (Laeven, 2001), and Indonesia (Fisman, 2000).

Systemic banking panics still require further study as many puzzles remain, especially regarding how contagion arises. The individual importance of the factors listed above in contributing to crises is not known, in part since many of them tend to be observed at the same time. Fragilities remain inherent to the process of financial intermediation, with the causes for panics often difficult to understand. For reasons often unknown, small shocks can result significant problems for the entire financial system. Similarly, shocks may spillover from one market to another and/or from one country to others leading to financial crises.

The latest financial crisis had many elements in its genesis common to other crises. Much has been written about the causes of the recent crisis (see Calomiris (2009), Gorton (2009), Claessens et al. (2012), and many others). While observers differ on the exact weights given to various factors, the list of factors common to previous crises is generally similar. Four features often mentioned in common are: (1) asset price increases that turned out to be unsustainable; (2) credit booms that led to excessive debt burdens; (3) build-up of marginal

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<sup>17</sup> Failures in regulation and supervision remain the most mentioned cause for crises, despite significant upgrading of regulations, supervisory capacity and expertise over decades. For analysis how weaknesses in regulation and supervision contributed to the recent crisis, see Čihák, Demirgüç-Kunt, Martínez Pería and Mohseni-Cheraghloo (2012). Analysis suggests though that the design of regulation matters for the risk of financial distress. Barth, Caprio and Levine (2006; 2012), for example, suggest not relying solely on regulation and supervision. Rather, they advocate, inter alia, for an active but carefully balanced mix of market discipline and official regulation and supervision. This should all be supported by institutional infrastructure that protects property rights, allows for competition, including engagement with global finance, and ensures adequate information. The wider threats to financial stability, including those arising from political economy and corruption, should be kept at bay.

loans and systemic risk; and (4) the failure of regulation and supervision to keep up with financial innovation and get ahead of the crisis when it erupted.<sup>18</sup>

The global financial crisis was, however, also rooted in some new factors. Four key new aspects often mentioned are: (1) the widespread use of complex and opaque financial instruments; (2) the increased interconnectedness among financial markets, nationally and internationally, with the U.S. at the core; (3) the high degree of leverage of financial institutions; and (4) the central role of the household sector. These factors, in combination with the ones common to other crises, and fuelled at times by poor government interventions during different stages, led to the worst financial crisis since the Great Depression. It required massive government outlays and guarantees to restore confidence in financial systems. The consequences of the crisis are still being felt in many advanced countries and the crisis is still ongoing in some European countries.

#### IV. IDENTIFICATION, DATING AND FREQUENCY OF CRISES

A large body of work has been devoted to the identification and dating of crises, but ambiguities remain. Methodologies based on the main theories explaining various types of crises can be used to identify (and accordingly classify) crises.<sup>19</sup> In practice, however, this is not straightforward. While currency (and inflation) crises and sudden stops lend themselves to quantitative approaches, the dating of debt and banking crises is typically based on qualitative and judgmental analyses. Irrespective of type, variations in methodologies can lead to differences in the start and end dates of crises. And, as noted, various types of crises can overlap in a single episode, creating possible ambiguities as to how to classify the episode.

This in part because the frequency and types of financial crises have evolved over time. In practice, a wide range of quantitative and qualitative methods involving judgment are used to identify and classify crises. The data also shows that crises have evolved over time. For example, currency crises were dominant during the 1980s whereas banking crises and sudden stops became more prevalent in the 1990s and 2000s. This section begins with a summary of common identification and dating methods (see also IMF WEO 1998; Reinhart and Rogoff, 2009a; and Laeven and Valencia, 2008, 2012). It then provides a summary of the frequency of crises over time, across groups of countries, and the overlap among types of crises.

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<sup>18</sup> Specifically, there was an increase in real estate prices in many markets around the world, paralleled by a run-up in other asset prices, especially in equity. Reinhart and Rogoff (2008) demonstrate that the appreciation of equity and house prices in the U.S. before the crisis was even more dramatic than appreciations experienced before the “Big Five” post-war debt crises. As the global crisis unfolded, those countries that had experienced the greatest increases in equity and house prices during the boom found themselves most vulnerable (see Feldstein, 2009, and Teslik, 2009). Unfortunately, the similarity in crises patterns was, as is often the case, only recognized ex-post.

<sup>19</sup> Dating does not of course establish causes, including whether the event was a rational outcome to some other “cause” (e.g., a crash in an asset price may be rational in response to a real shock or not).



### A. Identification and Dating

*Currency crises*, as they involve large changes in exchange rates, and (related) inflation crises, are relatively easy to identify. Reinhart and Rogoff (2009a) distinguish these episodes by assigning threshold values for the relevant variables. In the case of currency crises, they consider exchange rate depreciations in excess of 15 percent per year as a crisis, while, for inflation, they adopt a threshold of 20 percent per year.<sup>20</sup> A currency crisis is defined in Frankel and Rose (1996) as a depreciation of at least 25 percent cumulative over a 12-month period, and at least 10 percentage points greater than in the preceding 12 months. The dates identified are obviously sensitive to such thresholds used. These thresholds can also be universal, specific to the sample of countries under study, or country-specific (as when the threshold is adjusted for the country's "normal" exchange rate variations).

A measurement issue naturally arises when there was no significant adjustment in currency, even if there were pressures or attacks. Movements in international reserves or adjustment in interest rates can absorb exchange rate pressures and prevent or moderate the fluctuations in the rate. However, episodes involving such pressures and/or attacks are also important to document and study. To address this, starting with Eichengreen, Rose and Wyplosz (1996), different methodologies have been employed. A composite index of speculative pressure is often constructed based on actual exchange rate changes, and movements in international reserves and interest rates, with weights chosen to equalize the variance of the components, thereby avoiding one component dominating the index. Thresholds are then set to date the currency events, including both large exchange rate movements and periods of pressure (see Frankel and Saravelos (2012) and Glick and Hutchison (2012) for reviews; Cardarelli, Elekdag and Kose (2010) for applications).

*Sudden stops and balance-of-payments crises* can also be objectively classified. Calvo, Izquierdo and Talvi (2004) define systemic sudden stop events as episodes with output collapses that coincide with large reversals in capital flows. Calvo, Izquierdo and Mejía (2008) expand on these criteria in two ways: one, the period contains one or more year-on-year fall in capital flows that are at least two standard deviations below its sample mean (this addresses the "unexpected" requirement of a Sudden Stop); two, it starts (ends) when the annual change in capital flows falls (exceeds) one standard deviation below (above) its mean (Mauro and Becker, 2006).

Since methodologies vary, various samples of events follow. Calvo et al. (2004) identified 33 Sudden Stop events with large and mild output collapses in a sample of 31 emerging market countries. While studies use different cutoff criteria (Calvo and Reinhart (1999), Calvo, Izquierdo and Loo-Kung (2006), and Milesi-Ferretti and Razin (2000), for example differ),

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<sup>20</sup> Their comprehensive analysis also includes the 1258-1799 period during which the principal means of exchange was metallic coins. During this earlier era, instead of modern inflation and currency crises, there were a number of episodes of currency debasements which were associated with a reduction in the metallic content of coins in circulation in excess of 5 percent. They also consider the introduction of a brand new currency replacing a much-depreciated earlier currency in circulation as another form of currency debasement, which has still been practiced in the modern era.

the datings of events are very similar. Some studies also require a fall in output, but later studies excluded this requirement (since a fall may be endogenous) and replaced it with the requirement of large spikes in the Emerging Markets Bond Index (EMBI) spread, indicating a shift in the supply of foreign capital (see further Izquierdo, 2012). Cardarelli, Kose and Elekdag (2010) consider a large capital inflow episode to end “abruptly” if the ratio of net private capital inflows to GDP in the year after the episode terminates is more than 5 percentage point lower than at the end of the episode – closely following the definition of “sudden stops” in the literature. An episode is also considered to finish abruptly if its end coincides with a currency crisis.

*Balance-of-payments crises* and other parallel episodes can similarly be identified using capital flows data. Although there are some differences in approaches (e.g., how reserves losses are treated) and statistical variations across studies (e.g., whether the same current account deficit threshold is used for all countries or whether country-specific variables thresholds are used), but many of them point to similar samples of actual events. Forbes and Warnock (2012) analyze for a large set of countries gross flows, instead of the more typical net capital flows (or current account). They identify episodes of extreme capital flow movements using quarterly data, differentiating activity by foreigners and domestics. They classify episodes as “surge”, “stop”, “flight,” or “retrenchment, with surges and stops related respectively to periods of large gross capital in- or outflows by foreigners, and flights and retrenchments respectively related to periods of large capital out- or inflows by domestic residents.

*External sovereign debt crises* are generally easy to identify as well, although there remain differences in classifications across studies. Sovereign defaults are relatively easy to identify since they involve a unique event, the default on payments. Typical dating of such episodes relies on the classification of rating agencies or on information from international financial institutions (see McFadden, Eckaus, Feder, and Hajivassiliou (1984); and papers summarized in Sturzenegger and Zettelmeier (2007)). Still, there are choices in terms of methodology. For example differences arise from considering the magnitude of defaults (whether default has to be widespread or on just one class of claims), default by type of claims (such as bank claims or bond claims, private or public claims), and the length of default (missing a single or several payments). Others look instead at the increases in spreads in sovereign bonds as an indicator of (the probability of) default (Edwards, 1984).

The end of a default is harder to date though. A major issue with dating, including of default and sovereign debt crises, can be identifying their end, i.e., when default is over. Some studies date this as when countries regained access in some form to private financial markets. Others use as a criteria when countries regain a certain credit rating (IMF, 2005 and 2011). Differences consequently arise as to how long it takes for a country to emerge after a sovereign default.

*Domestic debt crises* are more difficult to identify. First, consistent historical data on domestic public debt across countries was missing, at least until recently. Furthermore, following a crisis, unrecorded debt obligations can come to light. However, Abbas et al (2011) and Reinhart and Rogoff (2009a) have since made significant progress in putting

together historical series on (domestic) debt. Second, countries can default in many ways: outright direct defaults; periods of hyper- or high inflation; punitive taxation of interest payments; forced interest rate or principal adjustments or conversions; gold clause abrogation; debasing of currency; and forms of financial repression. Reinhart and Rogoff (2009a) describe these and make clear that there remains considerable ambiguity in classifications of defaults, especially of “inflation-related default” episodes.

*Banking crises* can be particularly challenging to date as to when they start and especially when they end. Such crises have usually been dated by researchers using a qualitative approach on the basis of a combination of events – such as forced closures, mergers, or government takeover of many financial institutions, runs on several banks, or the extension of government assistance to one or more financial institutions. In addition, in-depth assessments of financial conditions have been used as a criterion. Another metric used has been the fiscal costs associated with resolving these episodes. The end of a banking crisis is also difficult to identify, in part since its effects can linger on for some time.

There are large overlaps in the dating of banking crises across different studies. Reinhart and Rogoff (2009a) date the beginning of banking crises by two types of events: bank runs that lead to closure of, merging or takeover by the public sector of one or more financial institutions. If there are no runs, they check the closure, merging, takeover, or large-scale public assistance of an important financial institution. As they acknowledge, this approach has some obvious drawbacks: it could date crises too late (or too early) and gives no information about the end date of these episodes. Still, the classification of Reinhart and Rogoff (2009a) largely overlaps with that of Laeven and Valencia (2012).

Still, there remain differences in the dating of crises which can affect analyses. One example of difference is the start of Japan’s banking crisis which is dated by Reinhart and Rogoff (2009a) as of 1992 and as of 1997 by Laeven and Valencia. Another example, with significant implications for analyses, is from Lopez-Salido and Nelson (2010). Analyzing events surrounding financial market difficulties in the U.S. over the past 60 years, Lopez-Salido and Nelson report three distinct crises: 1973–75; 1982–84; and 1988–91. This differs from Reinhart and Rogoff, who identify only one crisis (1984–91), and Laeven and Valencia (2012) who also have only one crisis, 1988 (and since then 2007), over that period. Importantly, using their new chronology, Lopez-Salido and Nelson argue that crises need not impact the strength of recoveries, in contrast to most claims that recoveries are systematically slower after financial crises.<sup>21</sup> These differences clearly show the importance of dating.

Lastly, asset price and credit booms, busts and crunches, common to many crises, are relatively easy to classify, but again specific approaches vary across studies. Asset prices (notably equity and to a lesser degree house prices) and credit volumes are available from standard data sources. Large changes (in nominal or real terms) in these variables can thus easily be identified. Still, since approaches and focus vary, so do the classifications of booms, busts, and crunches. Claessens, Kose and Terrones (2012) use the classical business cycles

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<sup>21</sup> Bordo and Haubrich (2012) and Howard, Martin and Wilson (2011) also argue that recoveries following financial crises do not appear to be different than typical recoveries.

approach, looking at the level of real asset prices or credit to identify peaks and troughs in these variables. They then focus on the top and bottom quartile of these changes to determine the booms, busts, or crunches. Other methods exist: large deviations from trend in real credit growth (Mendoza and Terrones, 2008) and from the credit-to-GDP ratio can be used to classify credit booms. And Gourinchas, Valdes, and Landerretche (2001) classify 80 booms based on absolute and relative (to the credit-to-GDP ratio) deviation from trend, but rather than setting the thresholds first, they limit the number of episodes they want to classify.

Regardless, it is important to recognize that different types of crises can overlap and do not necessarily take place as independent events. One type of crisis can lead to another type of crisis. Or two crises can take place simultaneously due to common factors. To classify a crisis as only one type can then be misleading when one event is really a derivative of another. Crises in emerging markets, for example, often have been combinations of currency and banking crises, associated with sudden stops in capital flows, and often subsequently turning into sovereign debt crises. Overall, considerable ambiguity remains on the identification and dating of financial crises, which should serve as an important caveat when one reviews the frequency and distribution of crises over time as we do in the next section.

## **B. Frequency and Distribution**

Crises have afflicted both emerging markets and advanced countries throughout centuries. In the three decades before 2007, most crises occurred in emerging markets. Emerging market crises during those decades include the Latin American crises in the late 1970s-early 1980s, the Mexican crisis in 1995, and the East Asian crises in the mid- to late 1990s. “Emerging” markets being more prone to crises is not new (Reinhart and Rogoff, 2013). History shows that many countries which are developed today experienced financial crises when they were going through their own process of emergence, including Australia, Spain, the U.K. and the U.S. in the 1800s. For example, France defaulted on its external debt eight times over the period 1550-1800. Some advanced countries experienced crises in recent decades as well, from the Nordic countries in the late 1980s, to the Japan in the 1990s. The most recent crises starting with the U.S. subprime crisis in late 2007 and then spreading to other advanced countries show (once again) that crises can affect all types of countries.

Some claim that crises have become more frequent over time. The three decades after the World War II were relatively crises-free, whereas the most recent three decades have seen many episodes (Figure 4). Some relate this increase to more liberalized financial markets, including floating exchange rates, and greater financial integration. Indeed, using macroeconomic and financial series for 14 advanced countries for the 1870-2008 period, Jordà, Schularick and Taylor (2012) report no financial crises during the Bretton Woods period of highly regulated financial markets and capital controls. Also, Bordo et al. (2001) argue that the sudden stop problem has become more severe since the abandonment of the Gold Standard in the early 1970s.

More recent crises seem to have lasted shorter though, but banking crises still last the longest. The median duration of debt default episodes in the post-World War II has been much shorter than for the period 1800-1945, possibly because of improvement in policies in the later period, improved international financial markets, or the active involvement of

multilateral lending agencies (see further Das and others (2012)). Currency and sudden stop crises are relatively short (almost by definition). With the major caveat that their end is hard to date, banking crises tend to last the longest, consistent with their large real and fiscal impacts.

Financial crises clearly often come in bunches. Sovereign defaults tend to come in waves and in specific regions. Jordà, Schularick and Taylor (2012) report that there were five major periods when a substantial number of now-advanced countries experienced a crisis: 1893, the early 1890s, 1907, 1930-31, and 2007-08. Earlier crises bunched around events such as the Napoleonic Wars. Examples of bunches over the last three decades include in the 1980s, the Latin America debt crises; in 1992, the European ERM currency crises; in the late 1990s, the East Asian, Russia and Brazil financial crisis; the multiple episodes observed in 2007-2008, and the ongoing crises in Europe. Periods of widespread sovereign defaults often coincide with a sharp rise in the number of countries going through a banking crisis. These coincidences point towards common factors driving these episodes as well as spillovers of financial crises across borders.

Some types of crises are more frequent than others. Comparisons can be made for the post Bretton Woods period (while some types of crises have been documented for longer periods, not all have; and currency crises were non-existent during the fixed exchange rate period; together this necessitates the common, but shorter period). Of the total number of crises Laeven and Valencia (2013) report, there are 147 banking crises, 217 currency crises, and 67 sovereign debt crises over the period 1970 to 2011 (note that several countries experienced multiple crises of the same type).

However, as noted before, there is some overlap between the various types of crises. Currency crises frequently tend to overlap with banking crises – so called *twin crises* (Kaminsky and Reinhart, 1999). In addition, sudden stop crises, not surprisingly, can overlap with currency and balance-of-payments crises, and sometimes sovereign crises (Figure 5). Of the 431 banking (147), currency (217) and sovereign (67) crises Laeven and Valencia (2013) report, they consider 68 as twin crises, and 8 can be classified as triple crises. The overlaps are thus far from complete. There are also relative differences in coincidences of these episodes. A systemic banking crisis, for example, often involves a currency crisis and a sovereign crisis sometimes overlaps with other crises, 20 out of 67 sovereign crises are also a banking and 42 also a currency crisis.

## V. REAL AND FINANCIAL IMPLICATIONS OF CRISES

Macroeconomic and financial consequences of crises are typically severe and share many commonalities across various types. While there are obviously differences between crises, there are many similarities in terms of the patterns macroeconomic variables follow during these episodes. Large output losses are common to many crises and other macroeconomic variables (consumption, investment and industrial production) typically register significant declines. And financial variables like asset prices and credit usually follow qualitatively similar patterns across crises, albeit with variations in terms of duration and severity. This section provides a summary of the literature on the macroeconomic and financial implications of crises.

### A. Real Effects of Crises

Financial crises have large economic costs. Crises have large effects on economic activity and can trigger recessions (Claessens, Kose, and Terrones, 2009 and 2012). There are indeed many recessions associated with financial crises (Figure 6). And financial crises often tend to make these recessions worse than a “normal” business cycle recession (Figure 7). The average duration of a recession associated with a financial crisis is some six quarters, two more than a normal recession. There is also typically a larger output decline in recessions associated with crises than in other recessions. And the cumulative loss of a recession associated with a crisis (computed using the lost output relative to the pre-crisis peak) is also much larger than that of a recession without a crisis.

The real impact of a crisis on output can be computed using various approaches. For a large cross-section of countries and long time period, Claessens, Kose and Terrones (2012) use the traditional business cycles methodology to identify recessions. They show that recessions associated with credit crunches and housing busts tend to be more costly than those associated with equity price busts. Overall losses can also be estimated by adding up the differences between trend growth and actual growth for a number of years following the crisis or until the time when annual output growth returned to its trend. On this basis, Laeven and Valencia (2012) estimate that the cumulative cost of banking crises is on average about 23 percent of GDP during the first four years.<sup>22</sup> Regardless of the methodology, losses do vary across countries. While overall losses tend to be larger in emerging markets, the large losses in recent crises in advanced countries (e.g., both Iceland and Ireland’s output losses exceed 100 percent) paint a different picture. The median output loss for advanced countries is now about 33 percent which exceeds that of emerging markets, 26 percent.

Crises are generally associated with significant declines in a wide range of macroeconomic aggregates. Recessions following crises exhibit much larger declines in consumption, investment, industrial production, employment, exports and imports, compared to those recessions without crises. For example, the decline in consumption during recessions associated with financial crises is typically seven to ten times larger than those without such crises in emerging markets. In recessions without crises, the growth rate of consumption slows down but does not fall below zero. In contrast, consumption tends to contract during recessions associated with financial crises, another indication of the significant toll that crises have on overall welfare.

There are also large declines in global output during financial crises episodes. The significant cost for the world economy associated with the Great Depression has been documented in many studies. The global financial crisis was associated with the worst recession since WWII, as it saw a 2 percent decline in world per capita GDP in 2009. In addition to 2009, there were two other years after WWII the world economy experienced a global recession and witnessed crises in multiple countries (Kose, Loungani and Terrones, 2013). In 1982, a

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<sup>22</sup> These loss numbers rely on an estimated trend growth, typically proxied by the trend in GDP growth up to the year preceding the crisis. They can overstate output losses, however, as the economy could have experienced a growth boom before the crisis or been on an unsustainable growth path.

global recession was associated with a host of problems in advanced countries, as well as the Latin American debt crisis.<sup>23</sup> The global recession in 1991 also coincided with financial crises in many parts of the world, including difficulties in US credit markets, banking and currency crises in Europe, and the burst of the asset price bubble in Japan. While the world per capita GDP grows by about 2 percent in a typical year, it declined by about 0.8 percent in 1982 and 0.2 percent in 1991.

Recent studies also document that recoveries following crises tend to be weak and slow, with long-lasting effects. Kannan, Scott, and Terrones (2013) employ cross-country data and conclude that recoveries following financial crises have been typically slower, associated with weak domestic demand and tight credit conditions. These findings are consistent with those reported in several other studies (Reinhart and Rogoff, 2009a; Claessens, Kose, and Terrones, 2012; Papell and Prudan, 2011; and Jordà, Schularick and Taylor, 2012). Abiad and others (2013) analyze the medium term impact of financial crises and conclude that output tends to be depressed substantially following banking crises. Specifically, seven years after a crisis, the level of output is typically about 10 percent lower relative to precrisis trend (even though growth tends to eventually return to its precrisis rate). They report that the depressed path of output is associated with long-lasting reductions of roughly equal proportions in the employment rate, the capital-to-labor ratio, and total factor productivity.

From a fiscal perspective, especially banking crises can be very costly. Both gross fiscal outlays and net fiscal costs of resolving financial distress and restructuring the financial sector can be very large. For banking crises, Laeven and Valencia (2013), estimate that fiscal costs, net of recoveries, associated with crisis are on average about 6.8 percent of GDP. They can, however, be as high as 57 percent of GDP and in several cases are over 40 percent of GDP (for example Chile and Argentina in the early 1980s, Indonesia in the later 1990s, and Iceland and Ireland in 2008). Net resolution costs for banking crises tend to be higher for emerging markets, 10 percent vs. 3.8 percent for advanced countries. Although gross fiscal outlays can be very large in advanced countries as well—as in many of the recent and ongoing cases, the final direct fiscal costs have generally been lower in advanced countries, reflecting the better recoveries of fiscal outlays.

Debt crises can be costly for the real economy. Borensztein and Panizza (2009), Levy-Yeyati and Panizza (2011), and Furceri and Zdzienicka (2012) all document that debt crises are associated with substantial GDP losses. Furceri and Zdzienicka (2012) report that debt crises are more costly than banking and currency crises and are typically associated with output declines of 3-5 percent after one year and 6-12 percent after 8 years. Gupta, Mishra, and Sahay (2007) find that currency crises are often contractionary.

The combination of financial system restructuring costs and a slow economy can lead public debt to rise sharply during financial crises. Reinhart and Rogoff (2009a) document that crises episodes are often associated with substantial declines in tax revenues and significant

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<sup>23</sup> Mexico's default in August 1982 marked the beginning of the crisis and the region's decade long stagnation (i.e., the lost decade). A number of Latin American countries, including Argentina, Mexico and Venezuela in 1982, and Brazil and Chile in 1983, experienced debt crises during the period.

increases in government spending. For example, government debt on average rises by 86 percent during the three years following a banking crisis. Using a larger sample, Laeven and Valencia (2013) report the median increase in public debt to be about 12 percent for their sample of 147 systemic banking crises. Including indirect fiscal costs, such as those resulting from expansionary fiscal policy and reduced fiscal revenues as a consequence of a recession, makes the overall fiscal costs of the recent crises in advanced countries actually greater than those in emerging markets, 21.4 percent vs. 9.1 percent of GDP.<sup>24</sup>

Although empirical work has not been able to pinpoint the exact reasons, sudden stops are especially costly. Using a panel data set over 1975–1997 and covering 24 emerging markets, Hutchison (2008) finds that while a currency crisis typically reduces output by 2–3%, a sudden stop reduces output by an additional 6–8 percent in the year of the crisis. The cumulative output loss of a sudden stop is even larger, about 13–15 percent over a 3-year period.<sup>25</sup> Edwards (2004) finds sudden stops and current account reversals to be closely related, with reversals in turn having a negative effect on real growth and more so for emerging markets. Cardarelli, Kose and Elekdag (2010), examining 109 episodes of large net private capital inflows to 52 countries over 1987–2007, report that the typical post-inflow decline in GDP growth for episodes that end abruptly is about 3 percentage points lower than during the episode, and about 1 percentage point lower than during the two years before the episode. These fluctuations are also accompanied by a significant deterioration of the current account during the inflow period and a sharp reversal at the end.

## **B. Financial Effects of Crises**

Crises are associated with large downward corrections in financial variables. A large research program has analyzed the evolution of financial variables around crises. Some of the studies in this literature focus on crises episodes using the dates identified in other work, others consider the behavior of the financial variables during periods of disruptions, including credit crunches, house and equity price busts. Although results differ across the types of crises, both credit and asset prices tend to decline or grow at much lower rates during crises and disruptions than they do during tranquil periods, confirming the boom-bust cycles in these variables discussed in previous sections. In a large sample of advanced countries (Figure 8), credit declines by about 7 percent, house prices fall by about 12 percent and equity prices drop by more than 15 percent during credit crunches, house and equity price busts, respectively (Claessens, Kose and Terrones, 2011). Asset prices (exchange rates, equity and house prices) and credit around crises exhibit qualitatively similar properties in terms of their temporal evolution in advanced and emerging market countries, but the duration and amplitude of declines tend to be larger for the latter than for the former.

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<sup>24</sup> Reinhart and Rogoff (2011) provide further statistical analysis of the linkages between debt and banking crises.

<sup>25</sup> Of course, this and other analyses can suffer from reverse causality. That is, private agents see events that lead them to predict future drops in a country's output, and as a result, these agents pull their capital from the country. In this view, anticipated output drops drive sudden stops, rather than the reverse. While possible and reasonable, is hard to document or refute quantitatively this view.



The most notable drag on the real economy from a financial crisis is the lack of credit from banks and other financial institutions. Dell’Ariccia, Detragiache, Rajan (2005) and Klingebiel, Laeven and Kroszner (2007) show how after banking crises, sectors grow slower than naturally need more external financing, likely because banks are impaired in their lending capacity. Recoveries in aggregate output and its components following recessions associated with credit crunches tend to take place before the revival of credit growth and turnaround in house prices (Figure 9). These temporal patterns are similar to those in the case of house price busts, i.e., economic recoveries start before house prices bottom out during recessions coinciding with sharp drops in house prices.

Both advanced and emerging market countries have experienced the phenomenon of "creditless recoveries". Creditless recoveries are quite common to financial crises associated with sudden-stops in many emerging market economies (Calvo, Izquierdo and Talvi, 2006). Abiad, Dell’Ariccia, and Li (2013) using a large sample of countries, show that about one out of five recoveries is creditless. Creditless recoveries are, as expected, more common after banking crises and credit booms. The average GDP growth during these episodes is about a third lower than during “normal” recoveries.<sup>26</sup> Furthermore, sectors more dependent on external finance grow relatively less and more financially dependent activities (such as investment) are curtailed more (see also Kannan (2009)). Micro evidence for individual countries also shows that financial crises are associated with reductions in investment, R&D and employment, and firms passing up on growth opportunities (Campello, Graham, and Harvey, 2010 review evidence for the U.S.). Collectively, this suggests that the supply of credit following a financial crisis can constrain economic growth.

## VI. PREDICTING FINANCIAL CRISES

It has long been a challenge to predict the timing of crises. There is obviously a great benefit in knowing whether and if so when a crisis may occur: it can help put in place measures aimed at preventing a crisis from occurring in the first place or limiting the damage if it does happen. As such, there is much to be gained from better detecting the likelihood of a crisis. Yet, in spite of much effort, no single set of indicators has proven to explain the various types of crises or consistently so over time. Periods of turmoil often arise in endogenous

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<sup>26</sup> The fact that the economy recovers without credit growth and increases in asset prices reflects a combination of factors. First, consumption is typically the key driver of recoveries. In particular, private consumption is often the most important contributor to output growth during recoveries. Investment (especially non-residential) recovers only with a lag, with the contribution of fixed investment growth to recovery often relatively small. Second, firms and households may be able to get external financing from sources other than commercial banks that are adversely affected by the crisis. These sources are not captured in the aggregate credit series most studies focus on. Thirdly, there can be a switch from more to less credit-intensive sectors in such a way that overall credit does not expand, yet, because of productivity gains, output increases. The aggregate data employed in many studies hide such reallocations of credit across sectors, including between corporations and households that vary in their “credit-intensity.”

ways, with possibilities of multiple equilibria and many non-linearities.<sup>27</sup> And while it is easier to document vulnerabilities, such as increasing asset prices and high leverage, it remains difficult to predict with some accuracy the timing of crises. This section presents a short review of the evolution of the empirical literature on prediction of crises.<sup>28</sup>

Early warning models have evolved over time, with the first generation of models focusing on macroeconomic imbalances. In early crisis prediction models, mostly aimed at banking and currency crises, the focus was largely on macroeconomic and financial imbalances, and often in the context of emerging markets. Kaminsky and Reinhart (1999) show that growth rates in money, credit, and several other variables exceeding certain thresholds made a banking crisis more likely. In a comprehensive review, Goldstein, Kaminsky and Reinhart (2000) report that a wide range of monthly indicators help predict currency crises, including the appreciation of the real exchange rate (relative to trend), a banking crisis, a decline in equity prices, a fall in exports, a high ratio of broad money (M2) to international reserves, and a recession. Among annual indicators, the two best were both current-account indicators, namely, a large current-account deficit relative to both GDP and investment. For banking crises, the best (in descending order) monthly indicators were: appreciation of the real exchange rate (relative to trend), a decline in equity prices, a rise in the money (M2) multiplier, a decline in real output, a fall in exports, and a rise in the real interest rate. Among eight annual indicators tested, the best were a high ratio of short-term capital flows to GDP and a large current-account deficit relative to investment.<sup>29</sup>

In the next generation of models, still largely geared towards external crises, balance sheet variables became more pronounced. Relevant indicators found include substantial short-term debt coming due (Berg et al. 2004). The ratio of broad money to international reserves in the year before the crisis was found to be higher (and GDP growth slower) for crises in emerging markets. In these models, fiscal deficit, public debt, inflation, and real broad money growth, however, were often found not to be consistently different between crisis and non-crisis countries before major crises. Neither did interest rate spreads or sovereign credit ratings generally rank high in the list of early warning indicators of currency and systemic banking crises. Rather, crises were more likely preceded by rapid real exchange rate appreciation, current account deficits, domestic credit expansion, and increases in stock prices.

Later models showed that a combination of variables can help identify situations of financial stress and vulnerabilities. Frankel and Saravelos (2012) perform a meta-analysis based on reviews of crises prediction models and seven papers published since 2002. The growth rate of credit, foreign exchange reserves, the real exchange rate, GDP growth, and the current

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<sup>27</sup> The slow movement of the financial system from stability to crisis is something for which Hyman Minsky is best known, and the phrase "Minsky moment" – the sudden occurrence of an open financial crisis – refers to this aspect of his work, see Minsky (1992).

<sup>28</sup> Babecky and others (2012) present a detailed review of the empirical studies of early warning models.

<sup>29</sup> Crespo-Cuaresma and Slacik (2009) report that most of the early warning variables for currency crises in the literature are quite fragile whereas the extent of real exchange rate misalignment and financial market indicators appear to be relatively robust determinants of crisis in certain contexts.

account to GDP are the most frequent significant indicators in the 83 papers reviewed (see also Threhan, 2009; Lane and Milesi-Ferretti, 2011). Crises are typically preceded by somewhat larger current account deficits relative to historical averages, although credit trends more than external imbalances appear to be the best predictor (Schularick and Taylor, 2011; Taylor, 2013; Alessi and Detken, 2011).

Global factors can play important roles in driving sovereign, currency, balance-of-payments, and sudden stops crises. A variety of global factors is often reported to trigger crises, including deterioration in the terms of trade, and shocks to world interest rates and commodity prices. For example, the sharp rise in US interest rates at the time has been identified as a trigger for the Latin American sovereign debt crises of the 1980s. More generally, crises are often preceded by interest rate hikes in advanced economies and by sudden changes in commodity, especially oil, prices. But low interest rates can matter as well. For example, Jordà, Schularick and Taylor (2011) report that global financial crises often take place in an environment of low interest rates. Other studies argue that the global imbalances of the 2000s and the recent crisis are intimately connected (Obstfeld and Rogoff, 2009; Obstfeld, 2012). International trade and other real linkages can be channels of transmission, and contagion in financial markets is associated with crises (Forbes, 2012). Studies highlight for example the role of a common lender in particular in spreading the East Asian financial crisis (Kaminsky and Reinhart, 2001). These global factors can themselves be outcomes, as in the most recent crisis, when interest rates and commodity prices experienced sharp adjustments following the onset of the crisis.

Overall though, rapid growth in credit and asset prices is found to be the most reliably related to increases in financial stress and vulnerabilities. Borio and Lowe (2002) document that out of asset prices, credit and investment data, a measure based on credit and asset prices is the most useful: almost 80 percent of crises can be predicted on the basis of a credit boom at a one-year horizon, while false positive signals are issued only about 18 percent of the time. Building on this, Cardarelli, Elekdag, and Lall (2009) find that banking crises are typically preceded by sharp increases in credit and house prices. Many others have found the coexistence of unusually rapid increases in credit and asset prices, large booms in residential investment, as well as deteriorating current account balances, to contribute to the likelihood of credit crunch and asset price busts.

Recent studies confirm that credit growth is the most important, but still imperfect predictor. Many of the indicators, such as sharp asset price increases, a sustained worsening of the trade balance, and a marked increase in bank leverage, lose predictive significance once one condition for the presence of a credit boom. Still, there are both Type I and Type II errors. As Dell’Ariccia et al (2012) show, not all booms are associated with crises: only about a third of boom cases end up in financial crises. Others do not lead to busts but are followed by extended periods of below-trend economic growth. And many booms result in permanent financial deepening and benefit long-term economic growth. While not all booms end up in a crisis, the probability of a crisis increases with a boom. Furthermore, the larger the size of a boom episode, the more likely it results in a crisis. Dell’Ariccia and others (2013) find that close to half or more of the booms that either lasted longer than six years (4 out of 9),

exceeded 25 percent of average annual growth (8 out of 18), or started at an initial credit-to-GDP ratio higher than 60 percent (15 out of 26) ended up in crises.

In practical terms, recent early warning models typically use a wide array of quantitative leading indicators of vulnerabilities, with a heavy focus on international aspects. Indicators used capture vulnerabilities that stem from or are centered in the external, public, financial, nonfinancial corporate, or household sectors – and combine these with qualitative inputs (IMF-FSB, 2010). Since international financial markets can play multiple roles in transmitting and causing, or at least triggering, various types of crises, as happened recently, several international linkages measures are typically used. Notably banking system measures, such as exposures to international funding risks and the ratio of non-core to core liabilities, have been found to help signal vulnerabilities (Shin, 2013).<sup>30</sup> Since international markets can also help with risk-sharing and can reduce volatility, and the empirical evidence is mixed, the overall relationship of international financial integration and crises is, however, much debated (Kose and others, 2010; Lane, 2012).

## VII. CONCLUSIONS

### *A Summary*

This paper presents a survey on financial crises to answer three specific questions. First, what are the main factors explaining financial crises? Although the literature has clarified some of the main factors driving crises, it remains a challenge to definitively identify their causes. Many theories have been developed over the years regarding the underlying causes of crises. These have recognized the importance of booms in asset and credit markets that turned into busts as the main driving forces of most crises episodes. Given their central roles, the paper briefly summarizes the theoretical and empirical literature analyzing developments in credit and asset markets around financial crises.

Second, what are the major types of crises? While financial crises can take various shapes and forms, the literature has focused on four major types of crises: currency crises; sudden stop (or capital account or balance of payments) crises; debt crises; and banking crises. It is possible to classify crises in other ways, but regardless they can often overlap in types. A number of banking crises, for example, are also sudden stop episodes and currency crises. The paper examines the literature on the analytical causes and empirical determinants of each type of crisis. In addition, it presents a review of studies on various approaches for the identification of crises, their frequency over time and across different groups of countries.

Third, what are the real and financial sector implications of crises? Large output losses are common to many crises and other macroeconomic variables (consumption, investment and industrial production) typically register significant declines. Financial variables like asset

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<sup>30</sup> Shin (2013) compares the predictive power from price-based measures (CDS and other spreads, implied volatility, Value-at-Risk, etc.), the gap of credit-to-GDP ratio from a trend, and monetary aggregates and other bank liability aggregates, and shows that the last group has the most predictive power.

prices and credit usually follow qualitatively similar patterns across crises, albeit with variations in terms of duration and severity of declines. The paper provides a summary of the literature on the macroeconomic and financial implications of crises.

The paper also briefly reviews the literature on the prediction of crises. While there are many benefits in knowing whether and if so when a crisis may occur, it has been a challenge to predict crises. It is easy to document vulnerabilities, such as increasing asset prices and high leverage, but it remains difficult to predict with some accuracy the timing of crises. No single set of indicators has proven to predict the various types of crises. The paper reviews how the empirical literature on prediction of crises has evolved and analyzes its current state.

### ***Is this time really different?***

One of the main conclusions of the literature on financial crises is that it has been hard to beat the “*this-time-is-different*” syndrome. This, as aptly described by Reinhart and Rogoff (2009a), is the belief that “*financial crises are things that happen to other people in other countries at other times; crises do not happen to us, here and now. We are doing things better, we are smarter, we have learned from past mistakes.*” Although often preceded by similar patterns, policy makers tend to ignore the warnings and argue that: “*the current boom, unlike the many booms that preceded catastrophic collapses in the past (even in our country) is built on sound fundamentals...*” Leading up to every crisis, it is often claimed that developments appear to be different from those before the earlier episodes. Before the latest episode, for example, the extensive diversification of risks and advanced institutional frameworks were touted as such features argued to justify the belief that “this time is different”.

As the literature reviewed here makes abundantly clear, there are many similarities in the run-ups to crises. In the latest one, increases in credit and asset prices were common to those observed in the earlier ones. Given these commonalities, it should be possible to prevent crises. Yet, that seems to have been an impossible task. This suggests that future research should be geared to beat the “this-time-is-different” syndrome. This is a very broad task requiring addressing of two major questions: How to prevent financial crises? How to mitigate their costs when they take place? In addition, there have to be more intensive efforts to collect necessary data to guide both empirical and theoretical studies. The rest of this conclusion takes each of these issues in turn and points to future research directions.

### ***How to prevent financial crises?***

In light of the lessons from the latest crisis, many agree that asset price bubbles and credit booms can entail substantial costs, if they deflate rapidly. Specifically, many now agree on a number of issues with respect to asset price bubbles and credit booms. First, rapid increases in asset prices and credit can lead to financial turmoil and crises with significant adverse macroeconomic effects. Second, it is important to monitor vulnerabilities stemming from such sharp increases, and determine if they could be followed by large and rapid declines (crashes, busts or crunches, capital outflows). Third, the subsequent busts and crunches are likely to be more harmful if bubbles arise due to “distortions.” Fourth, even if not due to

distortions, evidence of irrationality can be interpreted as a sign of inefficiency and a potential source of welfare loss. As such, bubbles and credit booms can call for interventions.

The challenge for policy makers and researchers is twofold: when to intervene and how to intervene. First, they need to determine when (and to what extent) increases in asset prices and credit represent substantial deviations from those that can be explained by fundamentals. Second, if the behavior of credit and asset markets suggests signs of risk, they need to determine what would be the optimal policy responses to minimize risks and mitigate the adverse effects when risks materialize.

There has been an active debate on if, and how, monetary policy should respond to movements in asset prices and credit. The consensus before the crisis was that the formulation of monetary policy only needed to consider asset prices to the extent that they were relevant for forecasting economic outlook and inflation, but not otherwise (see Mishkin 2008, and Kohn 2008, for reviews; and Campbell 2008 for a collection of papers). However, the crisis has made clear (again) that both financial stability and economic activity might be affected by asset price movements and a view has emerged that monetary policy should take into account to some degree developments in asset prices (Blanchard, Dell’Ariccia and Mauro, 2009; Bernanke, 2009 and 2011; Trichet, 2009). How to operationalize this, remains under discussion though (Eichengreen et. al 2011; Mishkin, 2011). While the case for policy intervention is considered stronger when the banking system is directly involved in financing the bubble, whereas other asset price bubbles can more justifiably be left to themselves (Crowe et. al, 2011), the exact adjustment of monetary policy remains unclear (Bean, Paustian, Penalver, and Taylor, 2010; King, 2012).

There remain important lessons to be learned about the design of micro-prudential regulations and institutional structures for the prevention of crises. The latest crisis has once again exposed flaws in the micro-prudential regulatory and institutional frameworks. The global nature of the crisis has also shown that financially integrated markets have benefits, but also present risks, with the international financial architecture still far from institutionally matching the policy demands of the closely-integrated financial systems. Although elements of existing frameworks provide foundations, the crisis has forced a rethink of regulatory policies, with many open questions. While rules calling for well capitalized and liquid banks that are transparent and adhere to sound accounting standards are being put in place (e.g., Basel III), clarity on how to deal with large, complex financial institutions that operate across many borders is still needed. In addition, it remains unclear what types of changes to the institutional environments – e.g., changes in the accounting standards for mark-to-market valuation, adaptations of employee compensation rules, moves of some derivatives trading to formal exchanges, greater use of central counter parties – help best to reduce financial markets’ procyclicality and the buildup of systemic risks. The crisis has also showed that fiscal policies, both micro – such as deductibility of interest payments – and macro – as in the amount of resources available to deal with financial crises – can play a role in creating vulnerabilities, but which adaptations are needed is not always clear.

While there is also a call for the use of macro-prudential policies, the design of such policies and their interactions with other policies, especially monetary policy, remain unclear. By

constraining *ex-ante* financial markets participants' behavior, macroprudential policies can reduce the impact of externalities and market failures that lead to systemic vulnerabilities. In that way, they can reduce the risks of financial crises and help improve macroeconomic stability (De Nicolò and others (2012)). But the exact design of such policies is yet to be formulated. Although it is clear that multiple tools are needed, complications are abundant. Different financial distortions, for example, can lead to different types of risks, which in turn imply the use of multiple intermediate targets. Moreover, the relevant distortions can change over time and vary by country circumstances. Excessive leverage among corporations may give way, for example, to excessive leverage in the household sector. Factors, such as development of financial sector and exchange rate regime, can greatly affect the types of risks economies face. Much is still unknown on these factors and implications for the formulation of macroprudential policies. As new macroprudential frameworks are being established, policymakers have also been increasingly turning their attention to the complex dynamics between macroprudential and monetary policies. These hinge importantly on the "side effects" that one policy has on the other, but conceptual models and empirical evidence on these issues are still at early stages (see IMF (2013) for a review).

The review here clearly shows that further analytical research and empirical work on these issues are needed. Macroeconomic models need to better reflect the roles of financial intermediaries. Current models are often limited in the way that they capture financial frictions. In terms of financial stress, they often assume that available instruments can fully offset financial shocks and abstract from effects, such as those of monetary policy on financial stability. More realistic modeling of the channels that give rise to financial instability and the actual transmission of policies and instruments is needed. In particular, the supply side of finance is not well understood and models with realistic calibrations reflecting periods of financial turmoil are still missing (Brunnermeier and Sanikov, 2012). The roles of liquidity and leverage in such periods have yet to be examined using models better suited to address the relevant policy questions. More insights, including from empirical studies, are necessary to help calibrate these models and allow the formulation of policy prescriptions that can be adapted to different country circumstances. Only with progress in modeling financial crises, can one hope to not only avoid some of these episodes and be prepared with better policies when they occur, but also to minimize their impacts.

From an applied perspective, there remains a need for better early warning models. An issue extensively discussed in policy forums and receiving substantial attention from international organizations is the need to improve the prediction of the onset of crises (IMF, 2010). As the review here shows, the predictive power of available models remains limited. Historical record indicates that asset price busts have been especially difficult to predict. Even the best indicator failed to raise an alarm one to three years ahead of roughly one-half of all busts since 1985. This was the case again for the recent crisis. *Although a number of recent papers that analyze the ability of various models in predicting the latest crisis come to negative conclusions as well, others have found some predictive patterns.* Regardless, there is scope to improve these models.

While known risks are being addressed, new risks can emerge. The limited ability of crises prediction models arises in part because countries do take steps to reduce vulnerabilities. In

response to increased financial globalization and sudden stop risks, many emerging markets increased their international reserves since the late 1990s, which may have helped some countries avoid the impact of the recent crisis (De Gregorio, 2013; Kose and Prasad, 2010). Similarly, improvements in institutional environments which many countries have put in place over the last decades likely helped reduce some vulnerabilities. At the same time, however, new risks have emerged. In the latest crisis, the explosion of complex financial instruments and greater balance-sheet opaqueness and reliance on wholesale funding in highly integrated global financial markets led to greater risks of a crisis.

### *How to mitigate the costs of financial crises?*

It has been a challenge to explain the substantial (real) costs associated with crises. As documented, there are various theories regarding the channels by which different types of crises affect the real economy. There also exist many descriptions of the empirical patterns around crises episodes. Yet, why crises cause large costs remains an enigma. Many of the channels that lead to macro-financial linkages during normal times also “cause” the adverse effects of crises, but it is also clear that there are other dynamics at work. Normal lending seems undermined for an extended period as evidenced by creditless recoveries following crises. Fiscal policy and public debt dynamics can be affected for decades, in part since governments often end up directly supporting financial systems (by injecting liquidity or recapitalization) or suffer from the expansionary policies to mitigate the costs of crises.

In great part, the major challenge is to explain the sharp, non-linear behavior of financial markets in response to “small” shocks. While the procyclicality of leverage among financial institutions, as highlighted by its increase during the run up to the 2007-09 crisis followed by the sharp deleveraging in its aftermath, has extensively been documented (Adrian and Shin, 2012), the exact causes of this behavior have yet to be identified. Why crises involve the degree of liquidity hoarding leading to aggregate liquidity shortages and disrupt transmission of monetary policy remains a puzzle. Although credit crunches are in part attributable to capital shortages at financial institutions, these do not seem to fully explain the phenomena with lenders becoming overly risk-averse following a crisis. This lack of knowledge of the forces shaping the dynamics before and during periods of financial stress greatly complicates the design of proper policy responses.

It is also important to explore why financial spillovers across entities (institutions, markets, countries, etc.) are much more potent than most fundamentals suggest (in other words, why is there so much contagion?). Financial crises often generate effects across markets and have global repercussions. The latest episode is a case in point as its global reach and depth are without precedent in the post-World War II period. This emphasizes the value of having a better grasp of transmission mechanisms through which such episodes spill over to other countries. In addition to trade and cross-border banking linkages, research needs to consider the roles played by new financial channels, such as commercial paper conduits and shadow banking, and new trade channels, such as vertical trade networks, in the transmission of crises across borders. Given their adverse impact, the exact nature of these spillovers matters for the appropriate design of both crisis mitigation and crisis management responses. In light of their cross-border implications, pooling (regional or global) resources to provide ample



liquidity proactively becomes, for example, more important as it can avoid liquidity runs escalating into self-fulfilling solvency crises and help break chains of contagion.

Although many stylized facts are already available, work on the implications of interactions among different crises and sovereign debt defaults is still limited. The review documents that various types of crises can overlap in a single episode, but research on the implications of such overlapping crises episodes has been lagging. Although default on domestic debt tends to be less frequent than that on external debt, it still takes place quite often, suggesting the usual assumption of risk-free government debt needs to be revisited. Furthermore, there appear to be interplays between domestic and foreign debt defaults. While domestic debt tends to account for a large share of the total debt stock in both advanced countries and emerging markets, many emerging countries default on their external debt at seemingly low thresholds of debt levels. This suggests that for a given level of unsustainable debt, the cost of defaulting on external debt appears less than that on domestic debt. More generally, there are likely tradeoffs that depend on country circumstances, maybe because the risk of high inflation varies. With the rising public debt stocks in many advanced countries, more work on this would be very useful.

There are still many questions about the best policy responses to financial crises. The global crisis and associated recessions have shown the limits of policy measures in dealing with financial meltdowns. It has led to an extensive discussion about the ability of macroeconomic and financial sector policies to mitigate the costs stemming from such episodes. Some research shows that countercyclical policies might mitigate the cost and reduce the duration of recessions (Kannan, Terrones, and Scott, 2013). Others argue that such policies can worsen recession outcomes (Taylor, 2009 and 2011). And some others find limited effects associated with expansionary policies (Claessens, Kose, and Terrones, 2009; Baldacci, Gupta, Mulas-Granados, 2013). The discussion on the potency of policies clearly indicates a fertile ground for future research as well.

While there are valuable lessons on crisis resolution, countries are still far from adopting the “best” practices to respond to financial turmoil. It is clear now that open-bank assistance without proper restructuring and recapitalization is not an efficient way of dealing with an ailing banking system (Laeven and Valencia, 2013; Landier and Ueda, 2013). Excessive liquidity support and guarantees of bank liabilities cannot substitute for proper restructuring and recapitalization either as most banking crises involve solvency problems and not only liquidity shortfalls. In the case of banking crises, the sooner restructuring is implemented, the better outcomes are. Such a strategy removes residual uncertainty that triggers precautionary contractions in consumption and investment, which in turn further exacerbate recessions. Still in spite of this understanding, many countries do not adopt these policy responses, including in some current crises (Claessens et al. 2013), suggesting that there are deeper factors that research has not been able to uncover or address. Moreover, issues related to restructuring of both household debt and sovereign debt require more sophisticated theoretical and empirical approaches (Laeven and Laryea, 2013; Das, 2013; Igan and others, 2013).

*What are the major needs for additional data and methods?*

As the review here documents, it is necessary to put together new data series and to design new methodologies to get a better understanding of crises episodes. The review lists several recent studies that put together new data series on financial crises. In spite of these, there is clearly a case for more research to collect additional cross-country data on aspects relevant to financial crises. Better data on domestic debt and house prices are urgently needed to get a richer understanding of domestic debt dynamics and fluctuations in housing markets. There is also a need for better (international) data for both surveillance and early warning exercises (see Heath, 2013 and Cerutti, Claessens and McGuire, 2013, for data needs). For a deeper understanding of crises and the policy issues surrounding these episodes, another need is to design new methods to classify crises in a more robust manner. Moreover, it would be important to examine periods of financial disruptions, which are not necessarily crises. Although good luck or adequate policy measures may have prevented a financial crisis following such disruption episodes, there are lessons to be learned since those are the types of periods that can provide case studies of counterfactuals to analyze the macroeconomic outcomes and implications of policy responses.

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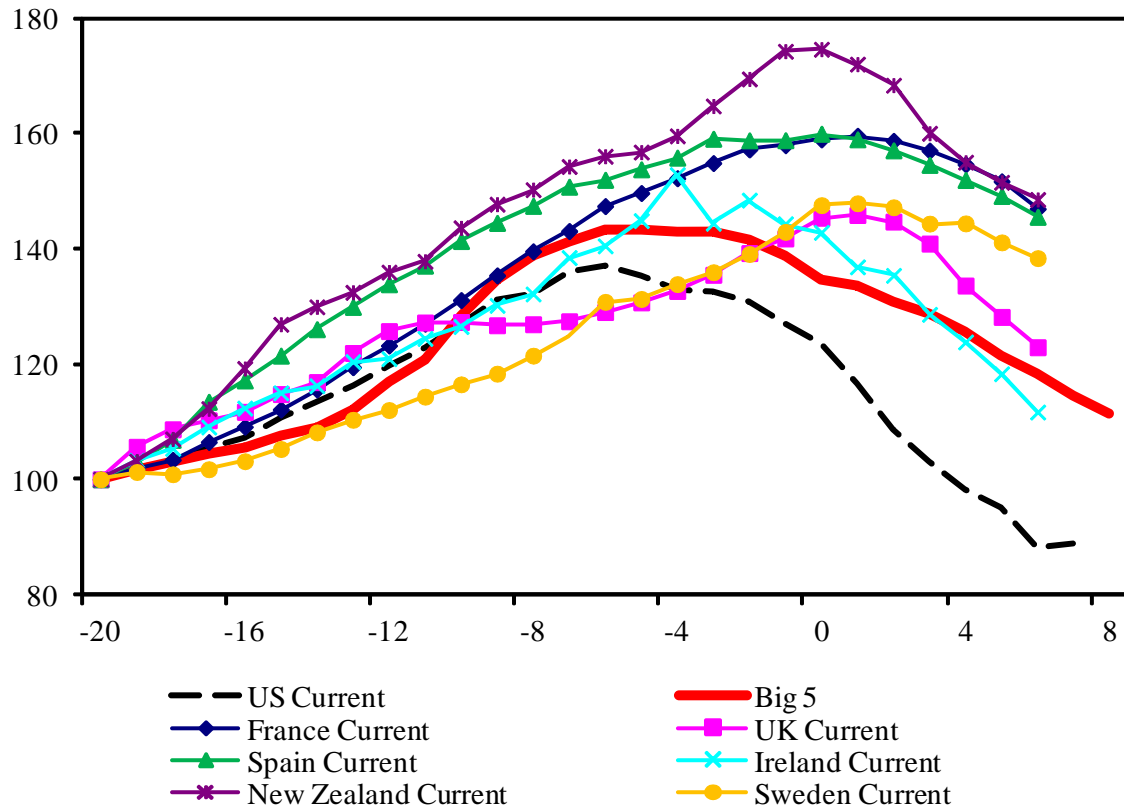
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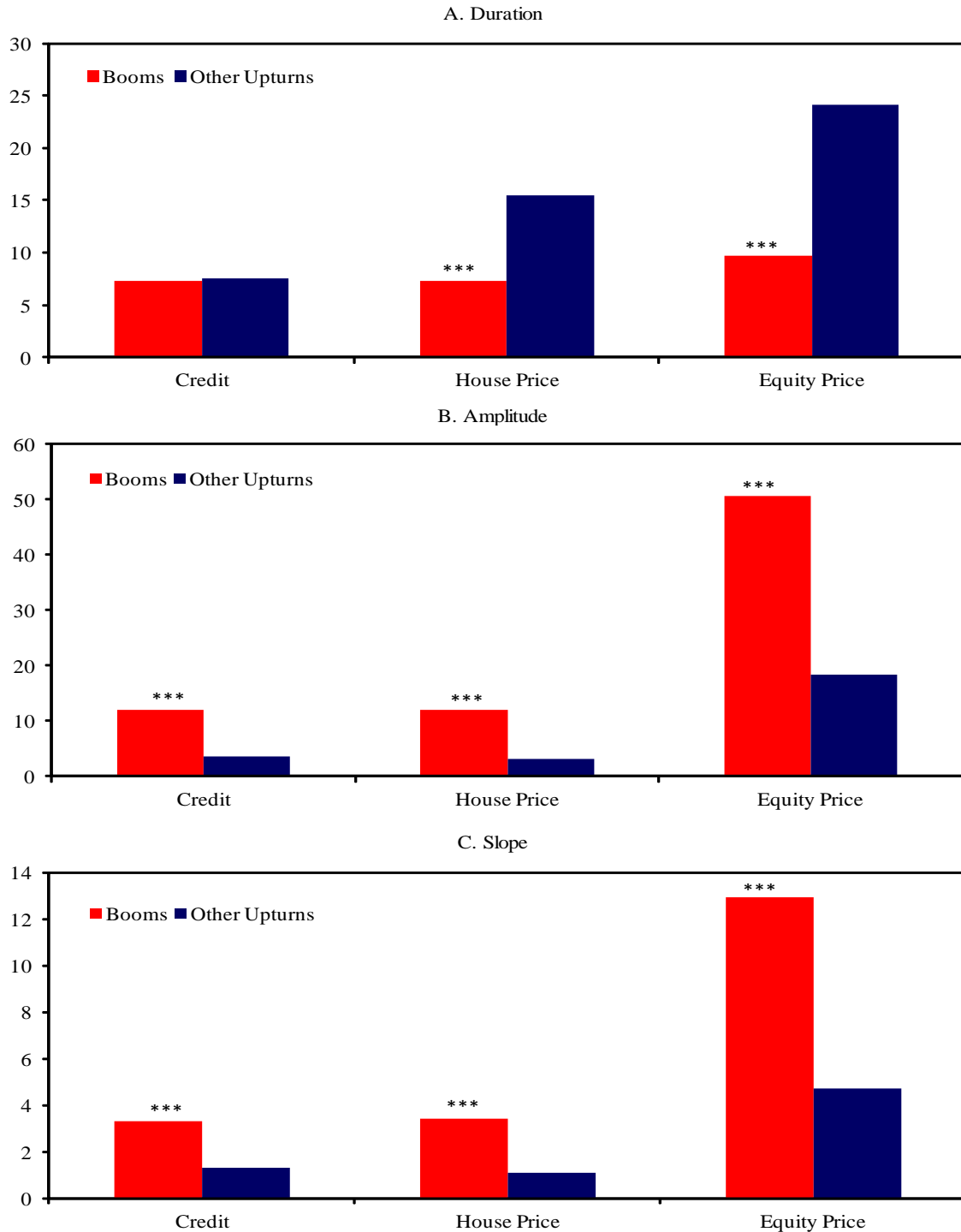
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**Figure 1. Evolution of House Prices During Financial Crises**



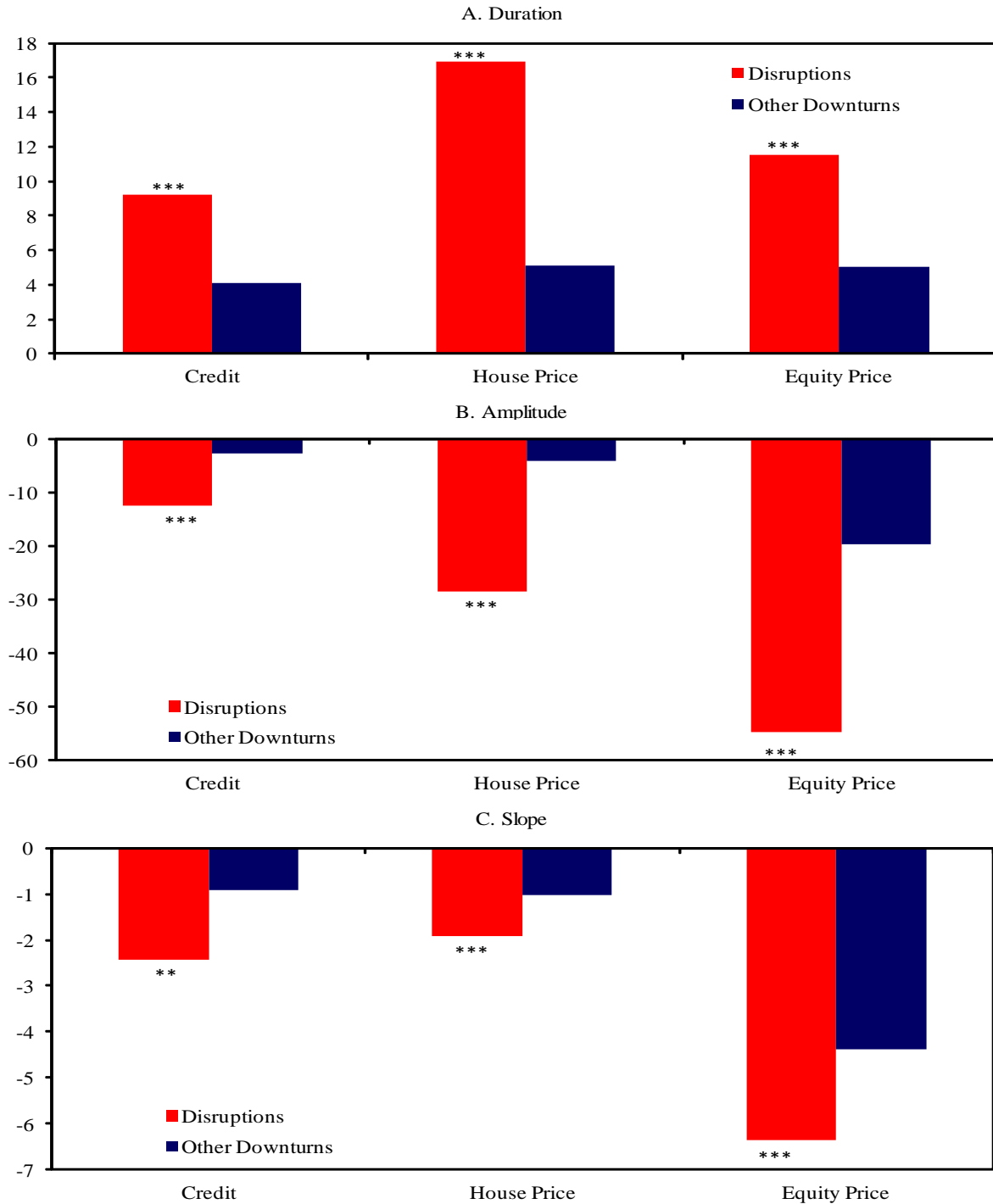
*Notes* : Real house price index is equal to 100 five years prior to the banking crises. Big 5 refers to the average of indices for the five major banking crises (Spain - 1977, Norway - 1987, Finland - 1991, Sweden - 1991, and Japan - 1992). For the current crisis, the beginning date is assumed to be 2007Q3. House price series for the US is the S&P Case-Shiller National Home Price Index.  
*Sources* : BIS, OECD, and Haver Analytics.

Figure 2.A. Credit and Asset Price Booms



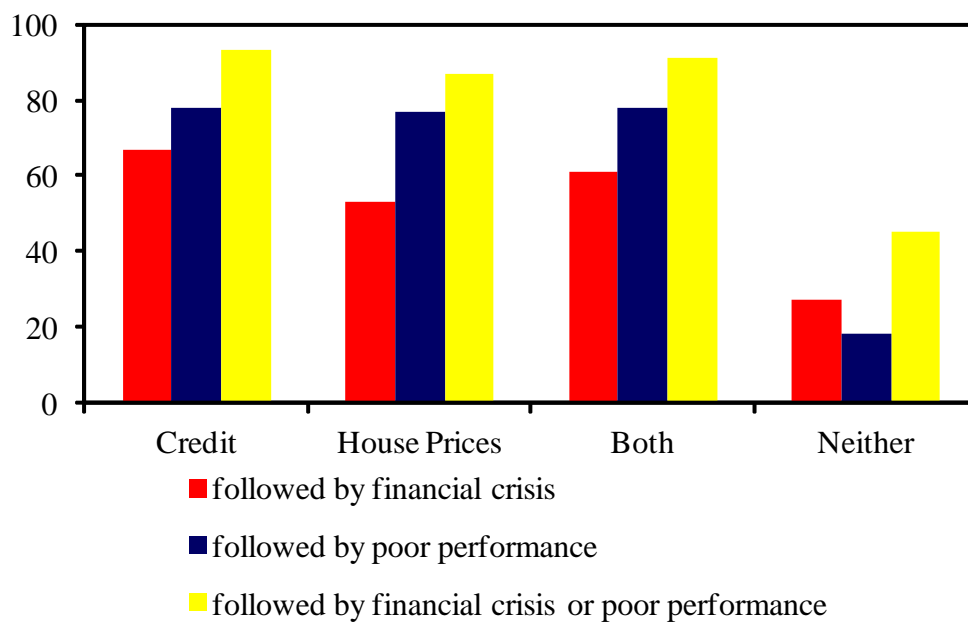
*Notes:* Amplitude and slope correspond to sample median and duration corresponds to sample mean. Duration is the time it takes to attain the level at the previous peak after the trough. Amplitude is calculated based on the one year change in each respective variable after the trough. Slope is the amplitude from peak to trough divided by the duration. Booms are the top 25 percent of upturns calculated by the amplitude. \*\*\* indicate that the difference between corresponding financial boom and other upturns is statistically significant at 1 percent level. The sample includes data for 23 advanced countries and covers 1960-2011.

Figure 2.B. Credit Crunches and Asset Price Busts



*Notes:* Amplitude and slope correspond to sample median and duration corresponds to sample mean. Duration is the number of quarters between peak and trough. Amplitude is calculated based on the decline in each respective variable during the downturn. Slope is the amplitude from peak to trough divided by the duration. Crunches and busts are the worst 25 percent of downturns calculated by the amplitude. \*\*\*, \*\* indicate that the difference between the corresponding disruptions and other downturns is statistically significant at 1 and 5 percent level, respectively. The sample includes data for 23 advanced countries and covers 1960-2011.

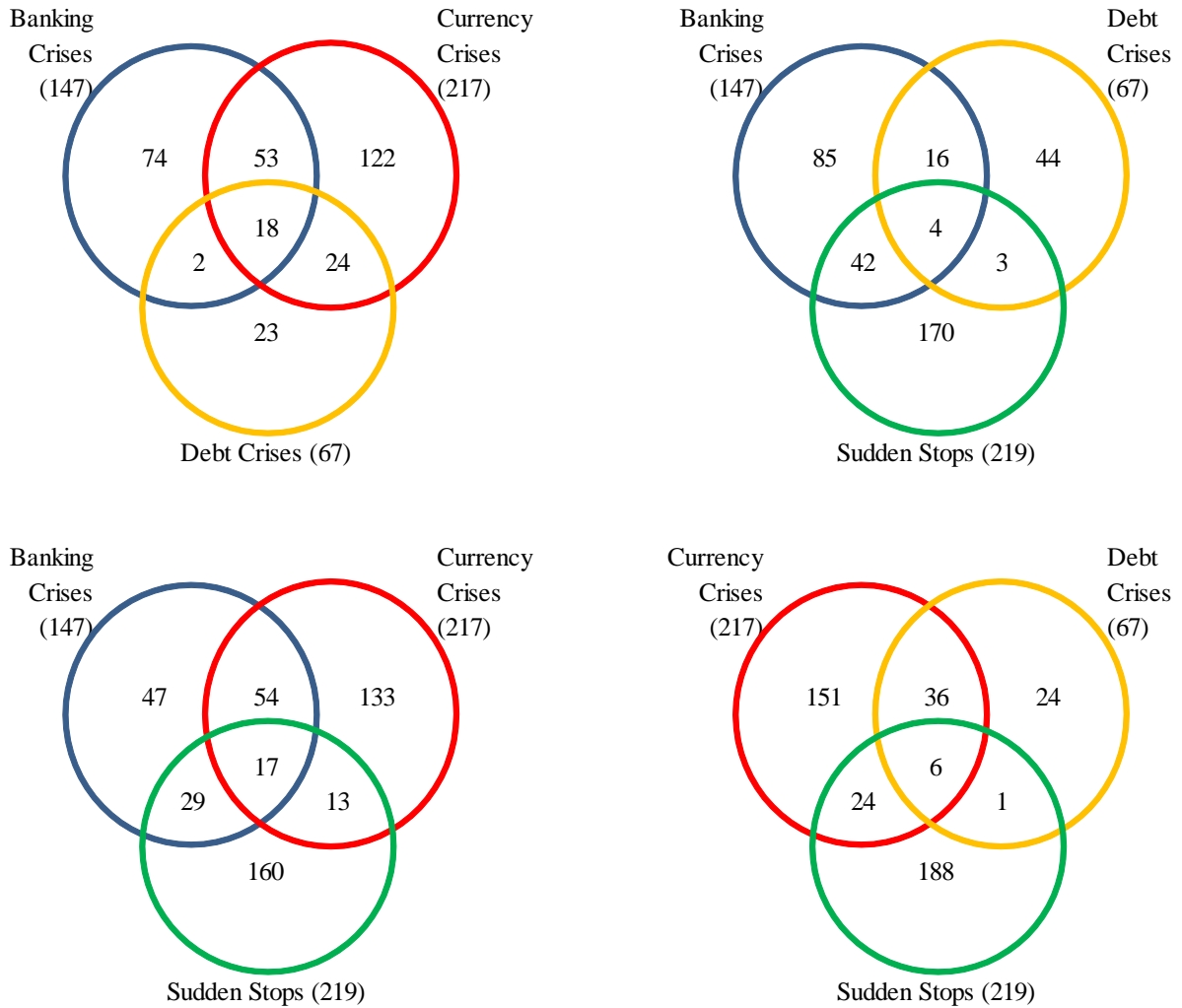
**Figure 3. Coincidence of Financial Booms and Crises**  
*(fraction of total, in percent)*



*Notes :* The sample consists of 40 countries. The numbers, except in the last column show the percent of the cases in which a crisis or poor macroeconomic performance happened after a boom was observed (out of the total number of cases where the boom occurred).

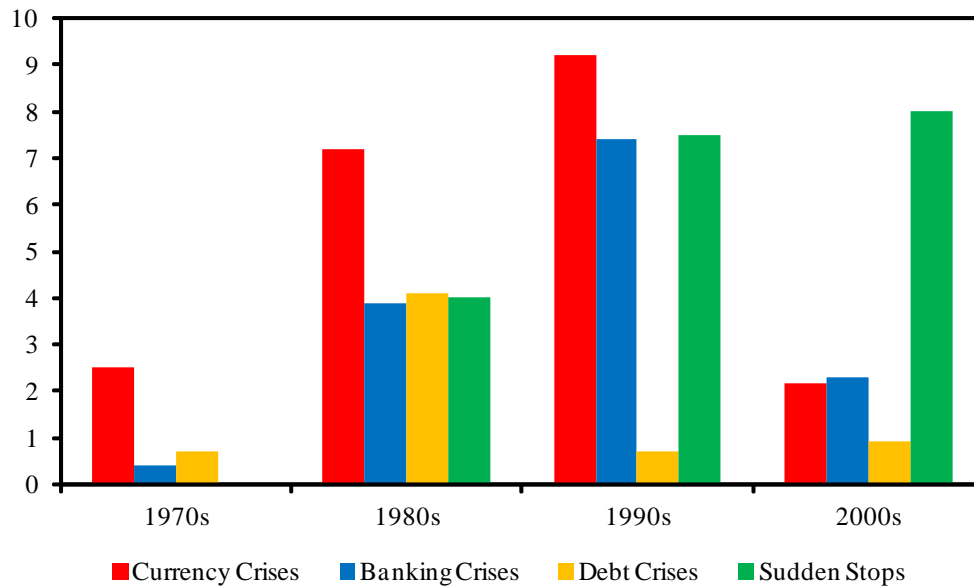
*Source :* Dell'Ariccia et. al (2011)

Figure 4. Coincidence of Financial Crises



*Notes:* A financial crisis starting at time T coincides with another financial crisis if the latter starts at any time between T-3 and T+3. A financial crisis starting at time T coincides with two other financial crisis if the latter two start at any time between T-3 and T+3. The sample consists of 181 countries.

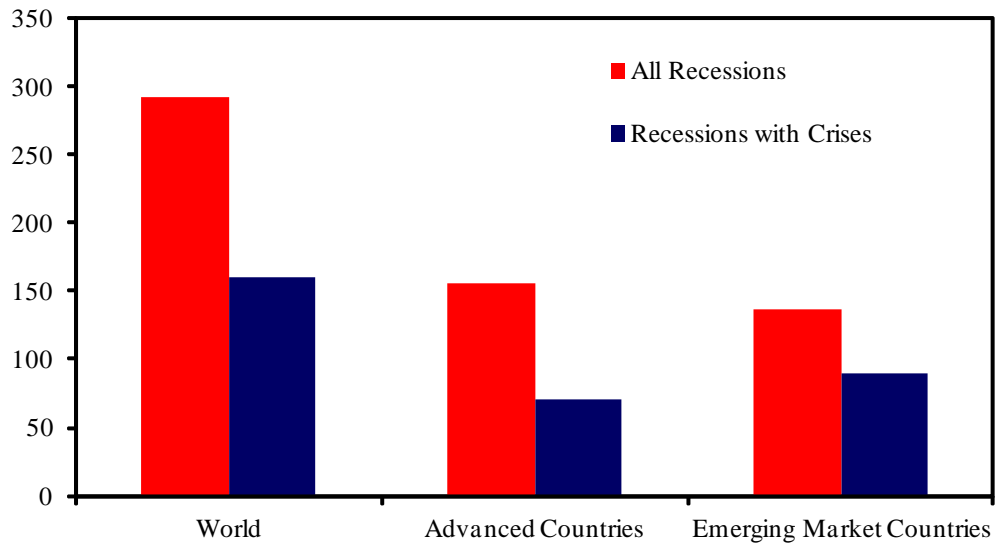
*Sources:* The dates of banking, currency, and debt crises are from Laeven and Valencia (2008, 2011) and the dates of sudden stops are from Forbes and Warnock (2011).

**Figure 5. Average Number of Financial Crises over Decades**

*Notes* : This graph shows the average number of financial crises in respective decades.

*Sources* : The dates of banking, currency, and debt crises are from Laeven and Valencia (2008, 2011) and the dates of sudden stops are from Forbes and Warnock (2011).

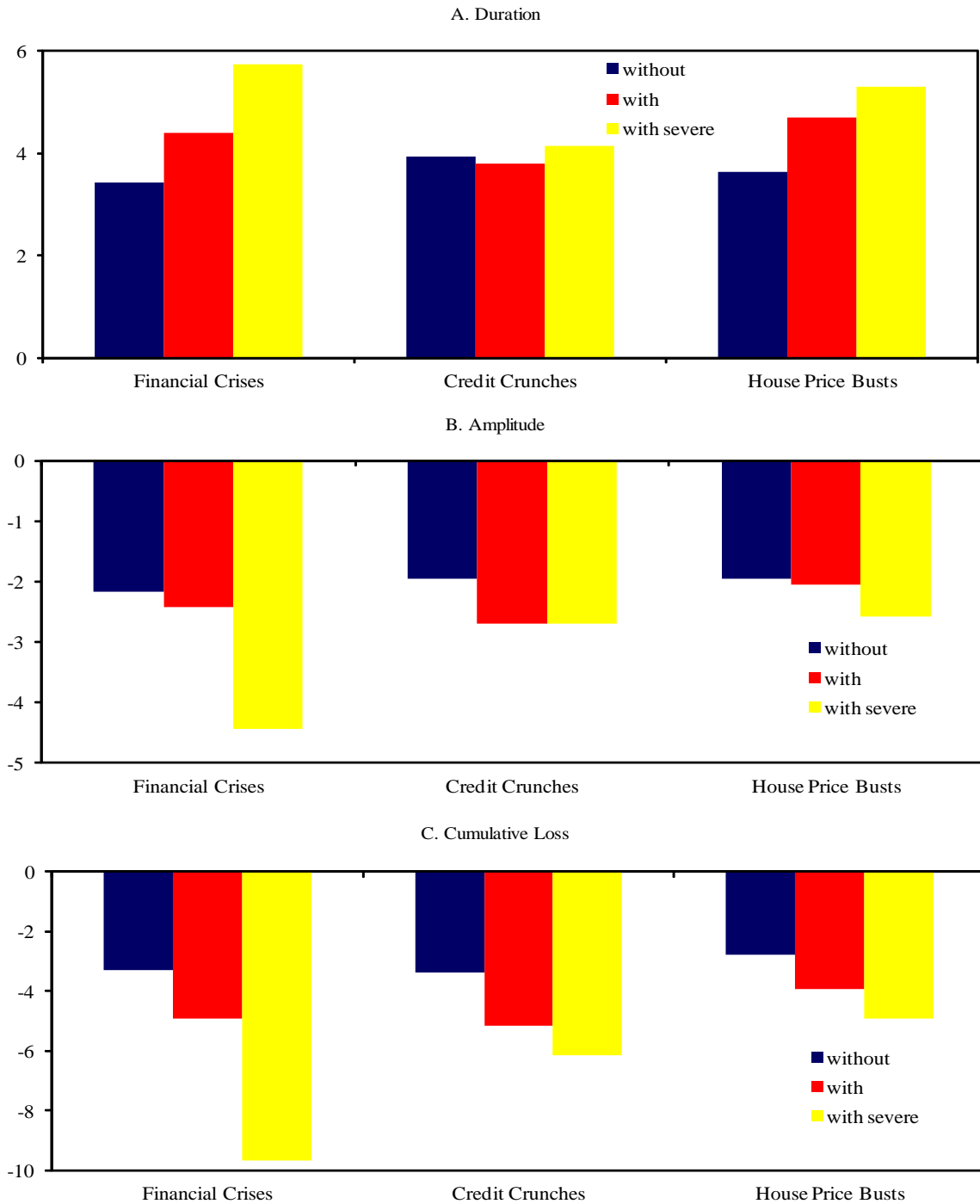
**Figure 6. Coincidence of Recessions and Crises**  
( number of events)



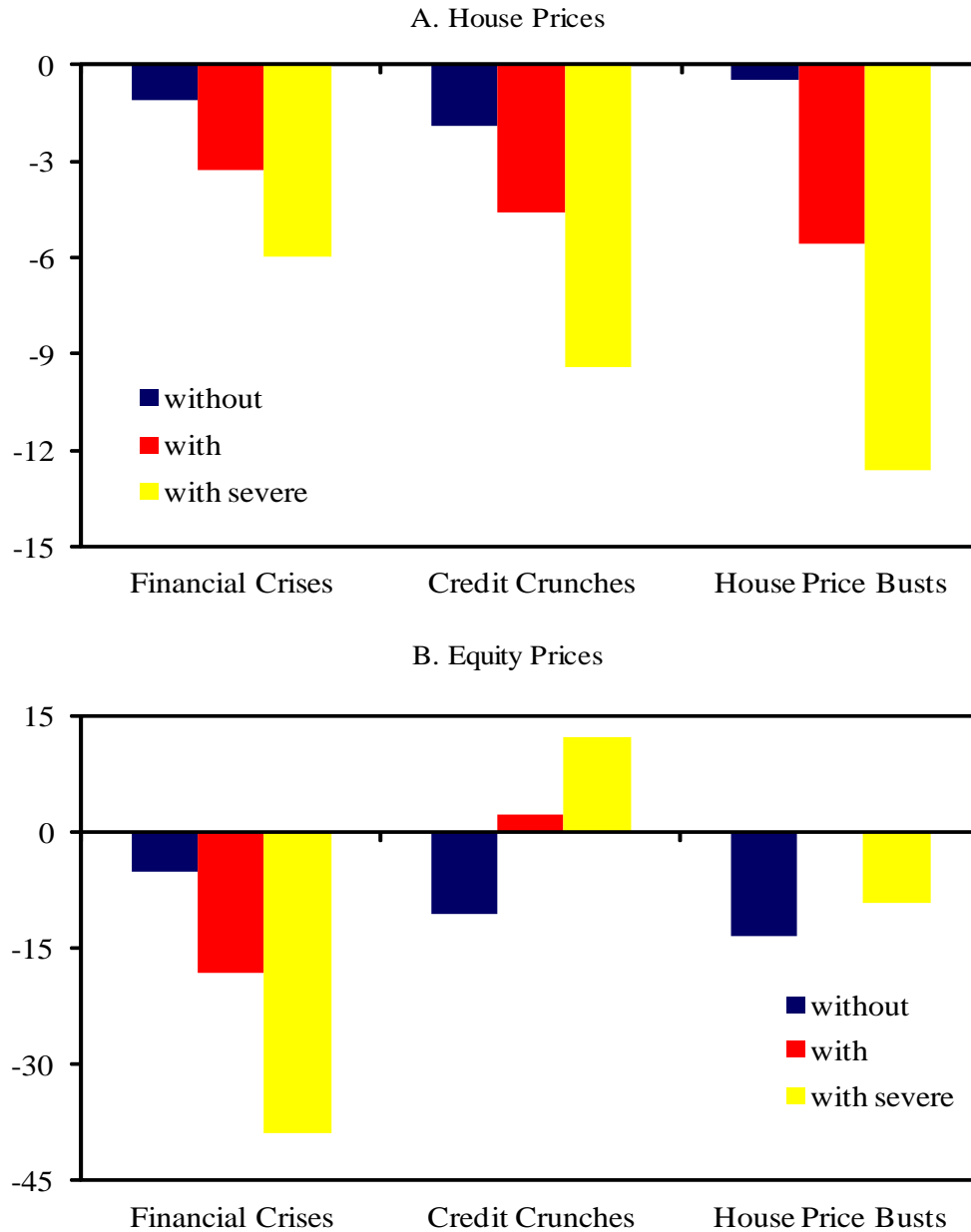
*Notes* : A recession is associated with a financial crisis if the financial crisis starts at the same time with the recession or one year before or two years after the peak of the recession. The sample includes data for 23 advanced countries and 38 emerging market countries, and covers 1960-2011.



Figure 7. Real Implications of Financial Crises, Crunches, and Busts

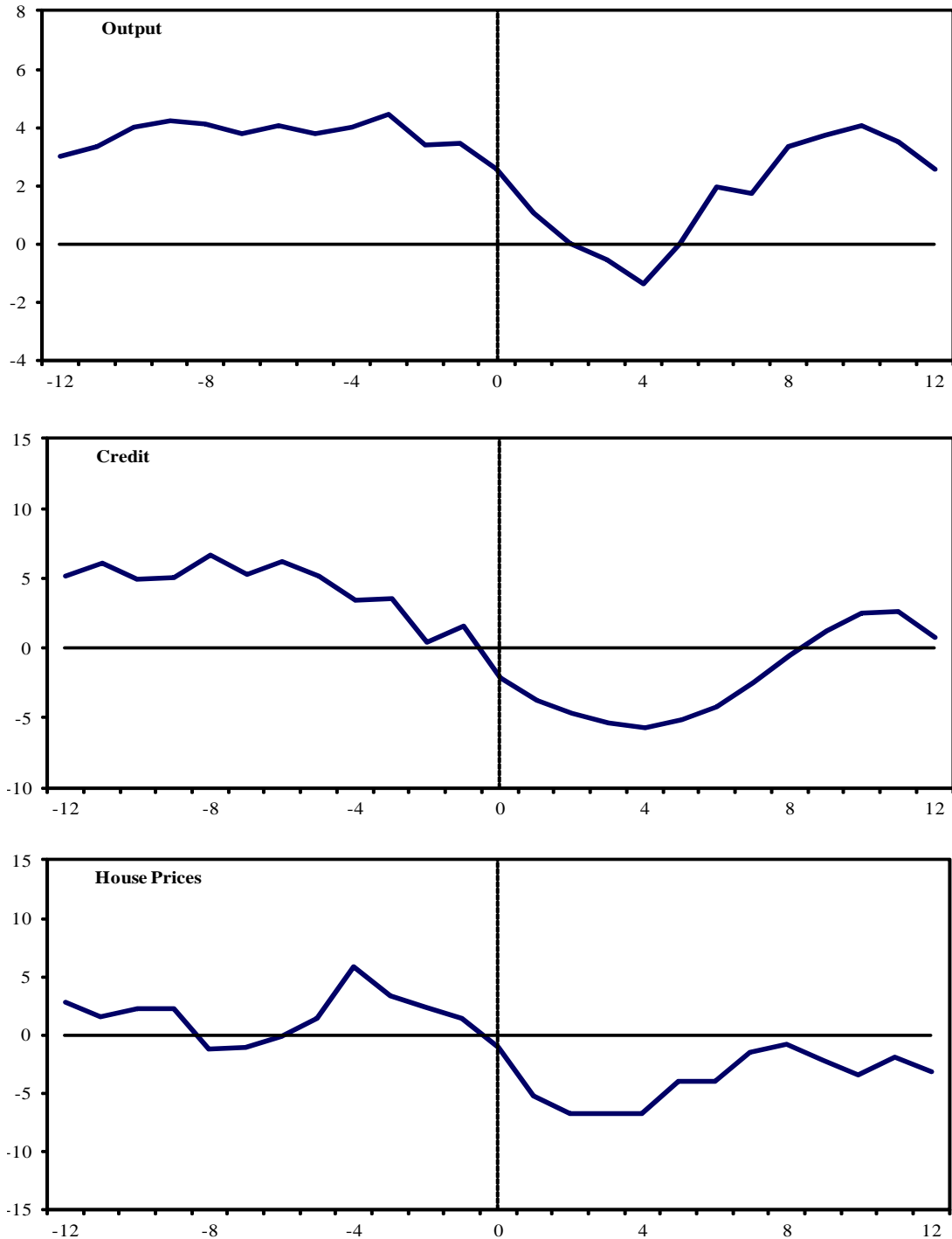


*Notes:* For "Duration" means are shown, for "Cumulative Loss" and "Amplitude" medians are shown. Amplitude is calculated based on the decline in output from peak to trough of a recession, duration is the number of quarters between peak and trough, and cumulative loss combines information about the duration and amplitude to measure overall cost of a recession and is expressed in percent. Disruptions (severe disruptions) are the worst 25% (12.5%) of downturns calculated by amplitude. A recession is associated with a (severe) credit crunch or a house price bust if the (severe) credit crunch or the house price bust starts at the same time or one quarter before the peak of the recession. A recession is associated with a financial crisis if the financial crisis starts at the same time of the recession or one year before or two years after the peak of the recession. The severe financial crises are the worst 50% of financial crises as measured by output decline during the recession. The sample includes data for 23 advanced countries and covers 1960-2011.

**Figure 8. Financial Implications of Crises, Crunches, and Busts**

*Notes* : Each panel shows the median change in respective variable during recessions associated with indicated financial events. Disruptions (severe disruptions) are the worst 25% (12.5%) of downturns calculated by amplitude. A recession is associated with a (severe) credit crunch or a house price bust if the (severe) credit crunch or house price bust starts at the same time or one quarter before the peak of the recession. A recession is associated with a financial crisis if the crisis starts at the same time of the recession or one year before or two years after the output peak preceding the recession. Severe financial crises are the worst 50% of financial crises as measured by output decline during the recession. The sample includes data for 23 advanced countries and covers 1960-2011.

**Figure 9. Creditless Recoveries**  
*(Percent change from a year earlier; zero denotes peak; x-axis quarter)*



*Notes:* Each panel shows the median year-over-year growth rate of the respective variable during recessions associated with credit crunches. Zero is the quarter at which a recession with credit crunch begins. The sample includes data for 23 advanced countries and covers 1960-2011.