Financial Cycles: What? How? When?[ϒ]

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Abstract: This paper provides a comprehensive analysis of financial cycles using a large database covering 21 advanced countries over the period 1960:1-2007:4. Specifically, we analyze cycles in credit, house prices, and equity prices. We report three main results. First, financial cycles tend to be long and severe, especially those in housing and equity markets. Second, they are highly synchronized within countries, particularly credit and house price cycles. The extent of synchronization of financial cycles across countries is high as well, mainly for credit and equity cycles, and has been increasing over time. Third, financial cycles accentuate each other and become magnified, especially during coincident downturns in credit and housing markets. Moreover, globally synchronized downturns tend to be associated with more prolonged and costly episodes, especially for credit and equity cycles. We discuss how these findings can guide future research on various aspects of financial market developments.

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1. Introduction

A short history of economic developments over the past two decades vividly shows that gyrations in financial markets have greatly influenced real activity around the world. Following the largest housing bubble of modern history, Japan experienced a massive asset market crash in the early 1990s which marked the start of its "Lost Decade." After prolonged credit booms, many emerging countries in Asia faced major financial crises in the second half of the 1990s. The equity market booms of the late 1990s in a number of advanced economies ended with synchronized busts and cyclical downturns. Many countries enjoyed credit and housing booms over 2003-2007 as the global economy registered its best performance of the past four decades. However, these episodes also ended with severe financial disruptions in the form of credit crunches and asset price busts, and resulted in the deepest financial crisis since the Great Depression. Not surprisingly, understanding financial cycles has become an important research area.

The objective of this paper is to provide a comprehensive empirical overview of financial cycles. We ask three specific questions. First, *what* are the main features of financial cycles? Second, *how* synchronized are financial cycles within and across countries? Third, *when* do the coincidences of cycles lead to magnified financial outcomes? In order to answer these questions, we employ an extensive database of cycles in credit, house prices, and equity prices for a large number of advanced countries over a long period.

Although there is a rich literature analyzing various aspects of financial market developments, our understanding of financial cycles is still limited.[1] This reflects the simple fact that most of the literature considers only selected aspects of financial cycles. For example, a number of studies examine the implications of only booms in asset prices and credit, rather than considering full cycles in these markets. Others focus on financial crises—in many respects only the extreme versions of the downturn phases of cycles.

We extend the literature on financial cycles in a number of dimensions. First, we provide the first detailed, cross-country empirical analysis documenting the main features of financial cycles and

[1] Claessens, Kose, and Terrones (2010) provide a review of this literature. Starting with Fisher (1933), a number of researchers emphasize the importance of financial cycles for the real economy. Sinai (1992) reviews some of the early literature. The importance of credit for business cycles has been an intensive area of research, e.g., Bernanke, Gertler, and Gilchrist (1996), and Gilchrist and Zakrajsek (2008). Recent research on credit and housing cycles using micro data includes Ivashina and Scharfstein (2010) and Mian and Sufi (2010). For a discussion about equity price cycles, see Malkiel (2007). For the history of financial crises, see Kindleberger and Aliber (2005) and Reinhart and Rogoff (2009). In addition to numerous papers on the dynamics of financial markets, recent books (e.g., James (2009) and Ferguson (2009)) analyze the global financial crisis from different angles through the lens of history.

the interactions across different cyclical phases using a large sample. Second, in parallel with the business cycle literature, we use a well-established and reproducible methodology for the dating of financial downturns and upturns. Furthermore, since we employ quarterly data, rather than the annual data typically used in other cross-country studies, we can better identify and document the properties of financial cycles. Third, taking advantage of our large data set and using regression models, we study various factors associated with the duration and amplitude of financial cycles.

Section 2 presents our database and methodology. The dataset includes 21 "advanced" OECD countries and covers the period 1960:1-2007:4. It is easy to provide a *qualitative* characterization of financial cycles.[2] However, this is not very useful for our purpose since our objective is to study cycles across a large number of countries over an extended time period. To identify cycles in a systematic way and present a *quantitative* characterization, we employ a methodology widely used in determining the turning points of business cycles for advanced countries. This allows us to create a chronology of financial cycles following the tradition of Burns and Mitchell (1946) who provided the fundamental approach for the study of U.S. business cycles. Specifically, we rely on their "classical" definition of a cycle since it provides a simple but effective way to identify turning points. Using this methodology, we determine the dates of upturns and downturns and identify more than 470 financial cycles. To study how financial cycles have evolved over time, possibly due to ongoing globalization, we divide our sample into two distinct periods—the pre-globalization period (1960-1985) and the globalization period (1986-2007).

To answer the first question, Section 3 documents the main features of financial cycles. It highlights three facts. First, downturns tend to feature sharp declines in short periods, lasting about five to eight quarters, while upturns are often much longer and slower. Second, equity and house prices cycles tend to be longer and more pronounced than credit cycles. Third, there have been changes in the features of cycles over time, in particular, equity price cycles have become shorter.

We answer the second question by analyzing the extent of synchronization of cycles within and across countries. Results indicate that financial cycles are closely, but not perfectly correlated with each other. Cycles in credit and house prices appear to be the most highly synchronized within countries. The degree of synchronization across countries is the highest for credit and equity cycles, and has been increasing over time.

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[2] Archetypical is the credit cycle, or the relative ease of access to credit by borrowers. A typical credit cycle starts when funds are easy to borrow, a period maybe characterized by low (real) interest rates, rising collateral values and easing lending requirements. This period is followed by tightening in the availability of funds, when interest rates go up, collateral values fall and loan provision becomes stricter, leading fewer people to borrow.

In section 4, we study the implications of the coincidence of financial cycles. We find that there are indeed feedback effects between house price and credit cycles as disruptions in one market aggravate the problems of the other, probably because of collateral constraints and complementarities between credit and housing finance. When housing downturns are accompanied by financial crises, downturns tend to become longer and deeper. Globally synchronized financial downturns also result in longer and deeper episodes, especially for credit and equity cycles.

These results set the stage for the more formal empirical analysis in Section 5, where we employ various regression models to analyze the roles played by a wide range of factors in explaining the duration and amplitude of cycles. We find positive duration dependence for the downturn phase of financial cycles, implying that the longer a downturn has gone on, the more likely it is to end. The regression results also confirm the presence of feedback effects between financial cycles, even after controlling for other potential factors. Section 6 concludes with a brief discussion of results and directions for future research.

2. Database and Methodology

Database. We construct an extensive dataset using quarterly series of financial variables for 21 "advanced" OECD countries covering the period 1960:1-2007:4.[3] To study how cycles have evolved over time, we divide our sample into two distinct periods—the pre-globalization period (1960-1985) and the globalization period (1986-2008). We use 1985 as the demarcation for three reasons. First, global trade and financial flows have increased markedly since the mid-1980s. Second, the earlier period witnessed a number of common shocks associated with sharp fluctuations in the price of oil in the 1970s, and common contractionary monetary policies in major advanced economies in the early 1980s. Third, the beginning of the globalization period coincides with a structural decline in the volatility of business cycles in advanced countries. Until the financial crisis erupted in mid-2008, the second period had come to be known as the period of the "Great Moderation" because of the prolonged decline in the volatility of output accompanied by relatively low and stable levels of inflation.[4]

We concentrate on cycles in three distinct market segments, which together constitute the core of financial intermediation. Specifically, we study cycles in credit, housing, and equity markets. Our measure of credit is aggregate claims on the private sector by deposit money banks. Credit is a natural aggregate to analyze financial cycles as it is the single most important link between

[3] The countries are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Switzerland, Sweden, the United Kingdom, and the United States. We do not include the period of the recent global financial crisis, since we want to focus on complete financial cycles.

[4] See Stock and Watson (2005) about international aspects of the Great Moderation. For details about the time demarcation, see Kose, Prasad and Terrones (2003a, 2003b).

savings and investment. Our measure has often been used in earlier cross-country studies on credit dynamics (see Mendoza and Terrones, 2008).[5] The two other variables we use are house and equity prices. House price series correspond to various measures of indices of house or land prices depending on the source country. Equity prices are share price indices weighted with the market value of outstanding shares. Both of these asset price measures have been employed in earlier studies.[6]

Credit series are collected from the IFS, house price series are mostly from the OECD, and equity prices are from the IFS and DATASTREAM. All series are seasonally adjusted whenever necessary and in constant prices. In addition to these variables, we use some other variables in our formal empirical analysis (see Claessens, Kose, and Terrones (2010) for details on sources for these variables).

*Methodology***.** In order to identify financial cycles, we borrow methods widely employed in the business cycle literature. In particular, we use the "classical" definition of a business cycle which provides a simple but effective procedure to identify turning points. The definition goes back to the pioneering work of Burns and Mitchell (1946) who laid the methodological foundation for the analysis of business cycles in the United States.[7]

Our methodology focuses on changes in levels of variables. An alternative methodology considers how a variable fluctuates around its trend, and then identifies a "financial cycle" as a deviation from this trend. Our objective here, however, is to produce a well-defined chronology of financial cycles, rather than studying the second moments of fluctuations.[8] Another advantage of using the classical methodology is that the turning points identified are robust to the inclusion of newly available data: in other methodologies, the addition of new data can affect the estimated

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[5] For a broader perspective of financial cycles, it could be useful to consider alternative measures of credit and asset prices. For example, some recent papers (e.g., Chari, Christiano, and Kehoe (2008) and Cohen-Cole et al., (2008)) highlight the importance of going beyond aggregate measures (for example, differentiating credit to corporations from credit to households) to study the dynamics of credit markets. Unfortunately, such disaggregated credit series are not available for a large number of countries over the sample period we analyze.

[6] See Pagan and Sossounov (2003), Gomez and Perez de Gracia (2003), and Hall, McDermott and Tremewan (2006). While useful to employ alternative asset price series, it is not possible to put together a more comprehensive database that includes consistent measures across different countries.

[7] Moreover, it constitutes the guiding principle of the Business Cycle Dating Committees of the National Bureau of Economic Research (NBER) and of the Center for Economic Policy Research (CEPR) in determining the turning points of U.S. and European business cycles. However, it is not easy to reproduce exactly the dates of cycles identified by the NBER Committee as it involves a judgmental approach considering various dimensions of activity, not just output, and employs monthly data. See further Stock and Watson (2010) and Sinai (2010) for recent examples of various dating methods.

[8] A rich research program uses detrended series (and their second moments, such as volatility and correlations) to study business cycles (see Stock and Watson, 1999; and Backus and Kehoe, 1992).

trend, and thus the identification of a cycle (see Canova, 1998). Furthermore, the classical method is easier to apply in a cross-country context.

The specific cycle dating algorithm we use is the one introduced by Harding and Pagan (2002a), which extends the so-called BB algorithm developed by Bry and Boschan (1971), to identify the turning points in the log-level of a series.[9] It requires a search for maxima and minima over a given period of time. Then, it selects pairs of adjacent, locally absolute maxima and minima that meet certain censoring rules In particular, we require the duration of a complete cycle to be at least five quarters and of each phase to be at least two quarters. Specifically, a peak in a quarterly financial series f_t occurs at time t if:

$$\{[(f_t - f_{t-2}) > 0,\ (f_t - f_{t-1}) > 0]\ \textit{and}\ [(f_{t+2} - f_t) < 0,\ (f_{t+1} - f_t) < 0]\}$$

Similarly, a cyclical trough occurs at time t if:

$$\{[(f_t - f_{t-2}) < 0,\ (f_t - f_{t-1}) < 0]\ \textit{and}\ [(f_{t+2} - f_t) > 0,\ (f_{t+1} - f_t) > 0]\}$$

It is useful to draw some parallels between the phases of financial cycles and those of business cycles. A complete business cycle comprises of two phases, the contraction or recession phase (from peak to trough) and the expansion phase (from trough to the next peak). In addition to these two phases, recoveries from recessions have been widely studied (see Eckstein and Sinai, 1986). The recovery phase is the early part of the expansion phase and is usually defined as the time it takes for output to rebound from its trough to the peak level just before the latest decline. Some other associate recovery with the growth achieved within a certain time period, such as four or six quarters, following the trough (see Sichel, 1994). Given their complementary nature, we use both definitions of recovery in our analysis of financial cycles below.

Our characterization of financial cycles closely follows that of business cycles. We call the recovery phase of a financial cycle the "upturn" and the contraction phase the "downturn". These two phases of financial cycles provide rather well-defined time windows. We do not study expansions, which are typically much longer, and can be affected by many structural factors (e.g., the level of the country's legal and institutional development greatly affects the scope for financial development) and initial conditions (e.g., the initial depth of the country's financial system has a substantial impact on the scope for long expansions in credit).
Compared to the financial crisis literature, our approach has some clear advantages in terms of dating of events. For one, in parallel with the business cycles literature, we use a well-established

[9] The algorithm we employ is known as the BBQ algorithm since it is applied to quarterly data. It has been widely used in earlier studies in the context of business cycles (King and Plosser, 1994; Watson, 1994; Artis, Kontolemis, and Osborn, 1997) as well as cycles in equity and housing prices (Pagan and Sossounov, 2003; Hall, McDermott and Tremewan, 2006).

and reproducible methodology for dating, whereas crisis dating is based on historical records and often subjective, especially for banking crises (in many cases, ending dates are selected in an *ad hoc* manner). Related, we consider financial events that are not necessarily crises, yet did create stress in some markets with potentially severe macroeconomic consequences. In addition, we consider three types of financial events, allowing us to investigate different cycles and evaluate the interactions across them, whereas a financial crisis dummy often lumps them together.

Defining the features of financial cycles. The main characteristics of cyclical phases are their duration, amplitude, and slope. The duration of a downturn, D_c, is the number of quarters, k, between a peak and the next trough. Likewise, the duration of an upturn, D_u, is the number of quarters it takes for a variable f_t to reach its previous peak after the trough. The amplitude of a downturn, A_c, measures the change in f_t from a peak (f_0) to the next trough (f_k), i.e., $A_c = f_k - f_0$. The amplitude of an upturn, A_u, measures the change in f_t from a trough (f_k) to the level reached in the first four quarters of an expansion (f_{k+4}), i.e., $A_u = f_{k+4} - f_k$. Lastly, the slope of a financial downturn is the ratio of the amplitude to the duration of the downturn. The slope of an upturn is the ratio of the change of a variable from the trough to the quarter at which it attains its last peak divided by the duration. Thus, the slope measures the violence of a given cyclical phase.

To examine the extent of synchronization across financial cycles, we use the concordance index developed by Harding and Pagan (2002b). The concordance index for variables x and y, CI_{xy}, over period $t=1,...T$, is defined as:

$$CI_{xy} = \frac{1}{T}\sum_{t=1}^{T}[C_t^x.C_t^y + (1-C_t^x).(1-C_t^y)]$$

where

$C_t^x = \{0, \text{if } x \text{ is in downturn phase at time } t;\ 1, \text{if } x \text{ is in expansion phase at time } t\}$

$C_t^y = \{0, \text{if } y \text{ is in downturn phase at time } t;\ 1, \text{if } y \text{ is in expansion phase at time } t\}$

In other words, C_t^x and C_t^y change depending on the phase of the cycle. The concordance index provides a measure of the fraction of time the two series are in the same phase of their respective cycles. The series are perfectly procyclical (countercyclical) if the index is equal to unity (zero).

We also study the more intense forms of financial cycles, disruptions and booms, and their implications. To identify these, we rank the changes in each variable during downturns and upturns. We then classify an episode as a financial disruption (boom) if the change in the variable during the downturn (upturn) falls into the bottom (top) quartile of all changes. We call disruptions crunches or busts depending on the variable (i.e., credit crunch, house or equity price bust). Similarly, we have credit, house, and equity price booms.

3. What are the Main Features of Financial Cycles?

3.1. Frequency, Duration, Amplitude and Slope

Frequency. We identify 473 complete financial cycles over the period 1960:1-2007:4. In particular, our full sample features 114 downturns in credit, 114 in house prices, and 245 equity prices (Table 1A). Conversely, the full sample includes 115, 114, and 251 upturns in credit, and house and equity prices, respectively. Since equity prices are more volatile than credit and house prices, they naturally feature more downturns and upturns than the others. Financial cycles are more frequent in the pre-globalization period (1960-1985) than in the globalization period (1986-2007). In the case of credit, for example, the number of downturns (up) in the first period is 69 (67) whereas it is only 45 (48) in the second.[10] The sample of equity cycles is roughly equally divided over the two periods.

The proportion of time spent in upturns or downturns scales the length of cycles by the period studied. This metric varies considerably by financial variable, with equity and house prices in either upturn or downturn phase of the cycle most of the time (data in the table refer to sample means, with medians presented in brackets). While, only 30 (20) percent of the time credit experiences a downturn (upturn) episode, these fractions are 41 (31) percent for downturns (upturns) of house prices, and 45 (38) percent for equity prices. Across the two sub-periods, there are some significant changes in the proportion of time spent in different phases of cycles. For example, the average time spent in downturns for house and equity price cycles becomes significantly shorter in the globalization period, while the time in upturns is shorter for credit.

We can compare the frequency of financial cycles with that of business cycles using earlier work which reported 122 business cycles in advanced countries over the same period (see Claessens, Kose, and Terrones (2009)). This indicates that cycles in equity prices are more frequent than that of business cycles while the frequencies of credit and housing cycles are comparable to that of business cycles. The decline in the number of downturns in credit over time is also consistent with the reduction in the number of recessions: while 73 out of 122 business cycles occur before 1985, only 49 take place in the globalization period.

Duration. Financial cycles typically feature downturns lasting about five to eight quarters (Table 1B). In contrast, the upturns tend to be much longer than downturns. Episodes of equity price upturns, for instance, last on average about 22 quarters while house prices take about 14 quarters to recover. Credit upturns are relatively short, on average 8 quarters. Given that a typical recession (or recovery) last about four quarters, our findings suggest that financial cycles are often more protracted than business cycles are.

[10] House price data start in 1970 for all countries, except Austria (1986:3), Belgium (1985:1), Greece (1993:4), and Portugal (1988:1).

While the average duration of downturns has been stable over time, financial upturns have become shorter. In particular, asset price upturns are shorter in the globalization period, with equity upturns lasting 10 quarters, compared to almost 32 quarters in the earlier period. The means being (much) larger than the medians suggest though that durations of financial cycles often exhibit rather skewed distributions.[11]

Amplitude and Slope. Financial cycles tend to be intense (Table 1B). A typical credit downturn episode features about a 4 percent decline in credit and house and equity price downturns typically mean declines of some 6 and 24 percent in the respective asset price. The strength of upturns generally matches that of downturns. However, the amplitude of downturns and upturns differs across periods. Both phases of credit cycles tend to be deeper in the pre-globalization period, but upturns of equity prices are more robust in the globalization period, which coincides with the rapid development of equity markets in many countries.

The violence (speed) of cycles varies across markets. Downturns and upturns in credit and housing markets exhibit similar speeds, about 1 percent per quarter. Equity price cycles, however, tend to be three to four times more violent. These findings suggest that financial cycles, especially those in equity markets, are more pronounced than business cycles as they exhibit larger changes over the cycle and tend to be more violent.[12]

The violence of financial cycles also differs over time. Downturns in credit and house prices are much faster in the pre-globalization period, while those in equity are faster in the globalization period. These findings are consistent with earlier results in the literature suggesting that equity markets exhibit more rapid adjustment in the globalization period, reflecting more liberalized and expanded sets of arbitrage opportunities (for example, Bekaert, Harvey and Lumsdaine (2002) report that equity markets tend to be more volatile following financial liberalization).

3.2. Synchronization of Financial Cycles

Synchronization within countries. We next study the extent of synchronization across the three financial cycles within countries (Table 2). We first compute the concordance between financial cycles in each country, and then calculate both mean and median statistics of the concordance across countries. We also compute these statistics for each sub-period to analyze the evolution of synchronization over time.

[11] We also study the full distributions of the durations of the downturns and upturns. These confirm our summary findings here (for details, see Claessens, Kose, and Terrones, 2010).

[12] A long list of studies examines why asset prices are more volatile than fundamentals (see Bikhchandani and Sharma (2000) for a review of this literature).

The extent of synchronization between financial cycles varies, but is not driven by outliers (means and medians are very similar). Cycles in credit and house prices are the most highly synchronized, with a median and mean of 0.68, i.e., in 68 percent of the time the two are in the same phase.[13] This shows the strong linkages between cycles in credit and housing markets, possibly due to feedback effects between these two markets. The concordance statistics for cycles in equity prices are the lowest, implying that the linkages between equity markets and other financial markets are relatively weak.[14] As financial markets become more sophisticated, linkages across different market segments become stronger, as evidenced by the higher concordances in the globalization period.

Synchronization across countries. We next study the extent of synchronization of cycles across countries (Table 3). The highest degree of cross-country synchronization is between cycles in credit and the least between cycles in house prices. These results are broadly consistent with the notion that credit and equity markets are the most closely integrated across borders. Although housing is a non-tradable asset, the extent of synchronization is still rather high, about 60 percent. This finding echoes some recent studies (see Terrones, 2004). It partly reflects the important roles played by global factors, including the world interest rate, the U.S. business cycle, and global commodity prices in asset prices, underscoring how cross-country real and financial linkages can drive asset price movements around the world.

Results suggest an increase in the degree of synchronization over time, with differences significant for house and equity prices. Some earlier studies also document that asset prices become more correlated over time as global factors become increasingly important in determining asset prices (see Ehrmann, Fratzscher, and Rigobon, 2005). Related, both real and financial integration appear to drive the increased comovement of asset prices. For example, equity prices tend to become more correlated following capital account liberalization.[15]

4. When do Financial Cycles Become More Intense?

Do financial cycles accentuate each other? To answer this question, we first analyze the implications of intense episodes of financial cycles, i.e., financial disruptions and booms. As we

[13] We also study the concordance of national cycles with those in the U.S. and find those to be quite similar to overall concordance, suggesting that there are strong linkages between the U.S. and global financial markets. The results at the country level are available from the authors upon request.

[14] Some other studies focus on the lead-lag characteristics between cycles in asset markets. For example, Borio and McGuire (2004) report that housing price peaks lag equity price peaks by up to 2-year and that the lag length is negatively related to changes in short-term interest rates.

[15] See Bekaert and Harvey (2000), Goetzman and others (2005), and Quinn and Voth (2008) on the role of financial linkages. Edwards, Biscarri and Perez de Gracia (2003) find that the concordance of cycles across stock markets has increased over time, especially for Latin American countries after liberalization.

explain earlier, financial disruptions (booms) correspond to the bottom (top) quartile of all events in financial downturns (upturns) by amplitude. To be able to utilize the largest number of observations available, we focus our analysis on the full sample period.

4.1. Intense Financial Cycles: Financial Disruptions and Booms

Financial disruptions. We identify 28 credit crunches, 28 house price busts, and 61 equity price busts (Table 4). This finding is slightly different than the results documented in the earlier literature focusing exclusively on booms and busts in housing and equity markets. For example, using a different methodology, Bordo and Jeanne (2002) report that boom-bust episodes tend to be much more prevalent in house than in equity prices.[16] Since our study considers a broader concept of cycles, we identify a larger number of cycles in equity prices. Our result is also intuitively more appealing given that equity prices are much more volatile than house prices.

By design, compared with other downturns, disruptions result in much larger declines. Credit crunches and house price busts lead to respectively roughly four and seven times larger drops than other downturns, while equity busts are twice as large. Disruptions also last longer, some two times longer than other downturns, with house price busts last the longest of all, 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 disruptions in equity prices three times more violent than those in credit and house prices.

Financial booms. We similarly analyze the main features of financial booms (Table 4). Our sample includes 24 credit, 28 house price, and 63 equity price booms. By design, booms are associated with much larger increases in the respective variables, about three to five times more than during other upturns. Not surprisingly, equity prices register the largest gain during boom periods, about 46 percent compared to about 12 percent for the other financial variables.

Booms take place over relatively shorter time periods than other upturns do as they are associated with much rapid increase in the financial variables. Compared with booms in other variables, house prices take the longest time to reach their previous peak (13 quarters) and credit booms the shortest (4 quarters). The slope of a typical boom is two to three times larger than that of other upturns. Figure 1 provides a summary of our findings with respect to intense financial cycles. It shows that disruptions are longer, deeper and more violent than other downturns, and that booms are shorter, stronger, and faster than other upturns.

[16] Bordo and Jeanne (2002) identify episodes of booms-busts in asset prices by considering deviations of moving averages of growth rates in asset prices from their long-run averages.

Figure 2 present the evolution of variables around disruption and boom episodes.[17] Episodes of disruptions are generally preceded by periods of rapid increases in financial variables. For example, the median (year-to-year) credit growth is 5 to 6 percent just before the peak is reached, and then slows down sharply over the crunch period, by more than 10 percentage points, falling to - 6 percent and not returning to positive levels until 10 quarters after the credit crunch started. Credit booms tend to display a V-shape pattern and often take place over four quarters.

House prices during busts follow a similar path and decline for an extended period, typically more than three years. Boom episodes in housing markets usually follow a prolonged period of low growth in prices, but then see a sustained recovery after about a year with a more than 15 percentage points change in the growth rate of house prices. Falls in equity prices are sharp and prolonged as prices do not start to recover within a three year period following the start of the bust. Booms in equity prices follow a trajectory similar to that exhibited by other financial variables. After the trough, the growth rapidly accelerates over the following four quarters, but then tends to decline sharply.

4.2. Implications of Coincidence of Financial Cycles

Having documented the general coincidence of financial cycles, we can now investigate whether downturns and upturns in a specific financial variable become more intense when they coincide with disruptions and booms in other financial variables. We consider an upturn (downturn) to be associated with another disruption (boom), if it starts at the same time or after the beginning of an ongoing episode of the other variable. These associations, by definition, imply coincidences of events, but do not suggest causal links. These exercises help us understand whether financial cycles become more pronounced when they coincide with each other.

We consider each financial variable separately to identify what combination of cycles has the most impact on other financial variables. To provide a sense of distributions, we also examine those downturns (upturns) coinciding with severe financial disruptions (strong financial booms), consisting of the bottom (top) 12.5 percent of all downturns (upturns) in financial variables, or, in other words, the bottom (top) half of all disruptions (booms).

We first examine how the likelihoods of downturns and upturns change conditional on having other financial disruptions and booms. The unconditional probability of being in a downturn or an upturn in any given quarter varies across financial cycles. For credit, the unconditional probability of being in a downturn (upturn) phase is 27 (19) percent (Table 5). Asset prices have

[17] We focus on patterns in the year-on-year growth in each variable over a 6-year window—12 quarters before and 12 quarters after a peak of an expansion. All panels include the median growth rates, i.e., the typical behavior, along with the top and bottom quartiles.

a higher likelihood of being in a downturn episode. For example, the likelihood of being in a downturn is 41 percent for house prices and 45 percent for equity prices.

If there is a financial disruption (or a boom) episode in the same quarter, the probability of having a downturn (or an upturn) increases substantially for most variables. The likelihood of a credit downturn (or upturn) taking place goes up some 20 percentage points to 48 (42) percent if there is also a disruption (or boom) episode in house prices. Similarly, if a credit disruption (boom) is already underway, the probability of having a downturn (upturn) in house prices rises to 78 (50) percent. The likelihood of downturns and upturns also increase for equity prices, when these events coincide with disruptions and booms in credit and housing markets.

We next study what happens when cycles coincide, starting with the coincidence of credit downturns with disruptions in other financial variables (Table 6). We find that credit downturns that overlap with house price busts are longer and deeper than other credit downturns. This suggests that the two cycles feed off each other highlighting the importance of the links between housing and credit markets, for example, as house purchases are financed with mortgages which constitute a sizeable share of credit markets.

When credit downturns coincide with equity price busts, their duration does not become significantly longer, but these downturns are more severe than others. When credit downturns are accompanied by financial crises, they are much longer, deeper, and more violent than other downturns (though these differences are not statistically significant). When credit upturns coincide with episodes of booms in other financial variables, we again find that housing market dynamics relate the most to credit since such credit upturns that overlap with house booms tend to be longer, stronger, and faster than other upturns. During these episodes, equity prices also register sharper increases. There is no significant difference in the main features of credit upturns, when these episodes coincide with equity price booms.

When housing downturns coincide with other disruptions, similar results are obtained as those reported for credit downturns (Table 7). Housing downturns that overlap with credit crunches are similar to other house price downturns in most dimensions. There are stronger associations between housing downturns and equity price busts: when the two overlap, there is a difference in length (albeit not significant), depth and intensity compared to other downturns (with differences statistically significant). As one would expect, when associated with financial crises, housing downturns are longer and deeper than other downturns. These episodes also witness substantially larger declines in equity prices. House price upturns become longer and stronger when they overlap with booms in credit and equity markets, with increases in house prices two to three times larger.

We also analyze the implications of coincidence for equity cycles. The results do not indicate substantial changes in equity cycles in most cases (Table 8). For example, downturns in equity prices do not become significantly longer and deeper when they are accompanied with other disruptions. Interestingly, they are shorter and shallower when they coincide with house price busts. The coincidence of equity price upturns with other booms show no statistically significant differences in financial outcomes.

The strong linkages between credit and asset price cycles we document here are consistent with the mechanisms described in a number of theoretical models. For example, models featuring the so-called financial accelerator mechanism emphasize the importance of feedback affects across financial markets. Starting with Bernanke and Gertler (1989), and since then many followers, this class of models implies that a decline in net worth, induced perhaps by a fall in asset prices, leads borrowers to reduce their spending, investment, and credit demand. This in turn causes real activity to contract more and translates into a cycle of falling output and asset price deflation.[18] In similar models –notably the model by Kiyotaki and Moore (1997)– movements in asset prices and credit are endogenous and exhibit a sequence of declines and increases, i.e., financial cycles, both because financial variables reflect developments in the real economy, and because they are propagation mechanisms themselves.

Related earlier studies focus on banks' role in financial intermediation, with special reference to the bank lending channel for the transmission of monetary policy.[19] In response to liquidity or interest rate shocks, for example, banks' access to deposits and funding can change, and in turn they need to adjust lending practices. This can also create movements in asset prices and translate into credit cycles and asset price moving together and financial cycles influencing each other.

A more recent class of models operating on the supply side of finance also suggests strong linkages between various financial markets (see Adrian and Shin (2010) for a review of this literature). These models emphasize the importance of financial intermediaries' balance sheets for their ability to provide credit and other external financing. By doing so, they stress that conditions in credit markets can influence asset prices (and real activity) and vice-versa. For example, as banks increase their leverage, asset prices can rise. Conversely, a decrease in leverage can lead to asset price declines, including through fire-sales.

[18] These models provide the formal underpinnings of Fisher's (1933) "debt-deflation" mechanism of how a decline in net worth induced by falls in asset prices leads borrowers to reduce their demand for credit along with their spending and investment.

[19] For early surveys of the literature on bank lending channel of monetary transmission, see Bernanke (1993) and Cecchetti (1995). For a recent survey, see Boivin, Kiley and Mishkin (2010).

Our findings with respect to the sharp downturns during crises also resonate with the literature related to the occurrence of crises (see Allen and Gale, 2007; Reinhart and Rogoff, 2009). Following a prolonged boom in economic activity fueled by credit and often accompanied by a rapid escalation of asset prices, a financial crisis may occur (for early empirical work see Goldstein, Kaminsky and Reinhart, 2000). Indeed, systemic banking crises are typically preceded by sharp increases in credit and house prices (Mendoza and Terrones, 2008). Borio and Lowe (2002) report that almost 80 percent of crises can be predicted on the basis of a credit boom at a one-year horizon.

We also investigate the implications of coincidence of financial cycles across countries. We define a downturn to be a synchronized one when more than 40 percent of the countries experience the same event, and it to be a highly synchronized episode when more than 50 percent experience the same event. Results show that synchronized downturns have more adverse implications than other downturns do (Table 9)**.** In particular, although synchronized episodes do not necessarily last longer, they are typically much more severe. For example, in case of highly synchronized equity downturns, prices drop by about 40 percent, compared to 18 percent for other downturns. These episodes also tend to be more violent with significantly higher slope coefficients. When one of the financial variables experiences a synchronized downturn, other financial aggregates also perform worse. House prices drop much more during synchronized credit downturns, while credit grows less during synchronized housing downturns. It is well known that globally synchronized downturns tend to result in much larger declines in equity prices and our findings extend this observation to other financial market segments (see Forbes and Rigobon, 2002).

5. Duration and Amplitude of Financial Cycles: A Formal Analysis

We examine next the roles played by various factors in shaping financial downturns and upturns using regression models. In particular, as noted earlier, the coincidence of downturns (upturns) with other financial disruptions (booms) seems to be important in shaping the duration and amplitude of cycles. Some other factors, including the degree of trade and financial openness, as well as the state of the global financial markets can also be expected to influence the length and severity of financial cycles.

5.1. Duration of Downturns

We examine the duration of financial downturns by utilizing methods often used in the business cycle literature, motivated by the objective of predicting the end date of a recession.[20] In

[20] Although most of this literature uses simple duration models with no covariates, studies also consider whether different indicators of activity (including leading economic indicators, private investment, oil prices, and U.S. recession dates) help explain the duration of cycles (see Diebold and Rudebusch (1991), Ohn, Taylor and Pagan (2004) and Castro (2008)).

particular, we employ the Weibull model to study the duration of downturns (see Diebold, Rudebusch and Sichel, 1993). However, our approach is different than most other studies in the literature. We employ panel regressions with fixed effects whereas most other studies, having only a limited number of observations per country, need to rule out the use of fixed effects. Although other studies consider various controls to account for country specific features, it is hard to capture all of them in a parsimonious fashion which then leads to a possible omitted variable bias.

Since many studies on business cycles document that recessions are more likely to end, the longer they have gone on, we first examine whether there is positive duration dependence in the case of financial downturns as well.[21] Table 10 reports the estimation results of the Weibull duration model. Since the model includes country fixed-effects, it assumes that country specific-factors have a proportional impact on the baseline hazard function. We find evidence of positive duration dependence for all cycles as the estimate of p, the Weibull distribution parameter, is always positive, when not using any other variables (columns 1, 3 and 5; between 1.47, in the case of house prices, and 1.71 in the case of credit). In all cases we can reject the H_o: p=1 against H_1: p >1. Thus, the longer it has gone on, the more likely a financial downturn is to end. These findings echo those obtained examining the properties of business cycles.

We next analyze what financial conditions and country characteristics affect the likelihood of a credit/asset price downturn ending in the next quarter. In particular, we first consider a number of potential variables, running bivariate regressions, i.e., controlling one variable at a time. Results are reported in a way that each coefficient refers to one regression, with the ranges for the p values reported at the bottom of each column (columns 2, 4, and 6). We first include as regressors three dummy variables that capture whether a downturn coincides with a disruption in another financial market, one at a time. Only house price busts seem to be significantly associated with the duration of credit and equity price downturns (columns 2 and 6, row 2). In particular, house price busts tend to lengthen credit downturns and shorten equity price downturns. The former is consistent with our finding on the feedback effects between cycles in housing and credit markets. The latter suggests that developments in housing and equity markets are offsetting, perhaps as they are substitute forms of financing.

We investigate the roles played by global financial conditions – as proxied by the global growth rate of the respective financial variable in the first year of the downturn, and by domestic dynamics – as proxied by the average inflation rate in the run up to the downturn. Three results stand out. First, strongly performing global credit and equity markets in the period immediately

[21] An early attempt to examine duration dependence in stock prices is Lunde and Timmermann (2004). They report evidence of duration dependence in equity price contractions (bear markets) in the United States during the period 1885-1997.

after the beginning of a downturn make countries emerge faster from downturns in their domestic financial markets. Second, inflationary pressures in the run up to a credit or an equity price downturn make an exit from these downturns less likely. This may reflect the negative impact of lingering uncertainty associated with price dynamics on financial markets. Third, greater trade and financial openness are in general associated with significantly shorter downturns, particularly for housing and equity markets. This result is also intuitively appealing as it suggests the possibility of a stronger bounce in domestic financial markets with the support of global activity.

We also explore the role of crises, the duration of previous expansions, the era of globalization, and the coincidence with a synchronized downturn. We find that crises delay the exit from a credit downturn, but hasten the exit from an equity price downturn. These findings may reflect, besides that crises are more often defined by developments in credit markets than in other financial markets, that equity prices tend to adjust faster after a crisis. When the duration of the previous expansion is longer, the exit from a house price downturn becomes less likely, suggesting a greater buildup of imbalances that takes a more protracted period to unwind.

We find that the probability of exit from an equity price downturn is higher during the globalization period, consistent with the decline in the duration of equity downturns reported in the earlier sections. When we check how duration changes for synchronized downturns, we find that exit from synchronized credit downturn is significantly less likely, but not so for other asset price downturns. This confirms our earlier findings of the adverse effects of synchronized episodes on the duration of downturns.

5.2. Amplitude of Downturns and Upturns

We next study the determinants of downturns' amplitude employing again panel regression models with country-fixed effects (Table 11). The results confirm that credit contractions associated with a house price bust are deeper (column 1) while equity price contractions associated with a house price bust are shallower (column 3). There is also evidence that a house price downturn associated with an equity price bust is more severe. These findings reinforce those reported for duration, since the same factors affect both length and severity of downturns, notably the coincidence of credit downturns with disruptions in housing markets.

We also find that favorable conditions in global financial markets tend to mitigate the severity of downturns, particularly for credit and equity price episodes. Inflationary pressures in the run up to a downturn tend to accentuate its severity. Trade and financial openness both help moderate house and equity price downturns. The results regarding the impact of openness on the duration and amplitude of downturns have a counterpart in the literature as some studies report that trade and financial openness can help reduce the risk of financial crises. For example, Cavallo and

Frankel (2008) conclude that a 10 percentage point increase in trade openness reduces the probability of a sudden stop by about 30 percent.[22]

Crises are associated with deeper credit downturns, while the amplitude of the previous expansion makes the depth of downturns smaller for all except equity episodes. During the globalization period equity price downturns are less severe, but the amplitudes of other downturns are not significantly different. Synchronized downturns tend to result in larger declines in credit and equity prices, but their impact on house prices is not statistically significant. This lends support to our earlier findings.

We also explore the factors correlated with the amplitude of a recovery, that is, the increase in credit or asset prices within the first four quarters after the trough of a downturn. We do not provide the detailed regression tables here since only a small number of factors appear to relate significantly to the amplitude of upturns.[23] In general, there is no significant evidence that credit or asset price recoveries associated with booms are stronger. However, there is some evidence that global financial conditions tend to help financial recoveries, particularly of equity prices.

6. Conclusion

The 2008-2009 global crisis is the latest in a long list of economic events shaped by cycles in financial markets. The severity of the latest crisis has instantly made the study of financial cycles a central topic of research. Although there have been many studies covering various aspects of fluctuations in financial markets, research has yet to provide a comprehensive analysis of these cycles using objective methods, such as those well-known to business cycle analyses, and utilizing extensive cross-country evidence for a long time period. The objective of this paper is to fill this gap.

We examine financial cycles from a variety of perspectives. First, we document their main characteristics: frequency, duration, amplitude, and slope. We differentiate financial cycles by their severity, investigate financial disruptions and booms, and consider temporal changes in their main features. Second, we document the synchronization of financial cycles within and across countries. Third, we analyze the changes in the nature of financial cycles when they are accompanied by other cycles (or crises) to help understand whether they accentuate each other

[22] Kose et al. (2010) survey the literature analyzing the impact of financial integration on the likelihood of crises. Frankel and Saravelos (2010) provide a detailed analysis on how various leading indicators help explain the cross-country incidence of the 2008-09 financial crisis.

[23] These results are available from the authors upon request. We also run multivariate models, where we include various factors at the same time. The results are broadly consistent with those reported here. In addition to the duration and amplitude of downturns, we also examine the factors driving the slope and cumulative loss of such episodes, with results again mostly confirming the importance of the explanatory variables discussed here.

and become more magnified. We also conduct formal econometric analyses to determine the main factors explaining the duration and amplitude of cycles.

We document a rich set of empirical regularities, but some of them definitely stand out. First, equity and house price cycles are longer and more pronounced than credit cycles are. Second, the degree of synchronization across countries is the highest for credit and equity cycles, and has been increasing over time. Third, linkages across markets and countries are important, suggesting cross-asset interactions can amplify financial cycles. In particular, national credit and house price cycles feed off of each other and translate into more intense episodes. Globally synchronized downturns in credit and equity markets tend to be longer and deeper. A number of panel regressions confirm these empirical regularities.

Where do we go from here? Our findings provide fertile ground for future research. First, an important challenge for models analyzing the role of financial frictions is to quantitatively match these main features of financial cycles. Although many of the mechanisms described in models are consistent with broad patterns observed in financial markets, the models are yet to replicate the quantitative features we document here. Second, as the latest crisis has shown, understanding the welfare implications of financial disruptions is a new area of research. This will require models that are not only able to explain the basic properties of these episodes, but can also provide a general equilibrium interpretation, including by analyzing links with the real economy.[24] Third, building on our work, more econometric analyses can be performed regarding the determinants of the duration and amplitude of financial cycles, including by studying the roles of countries' institutional, financial market and other characteristics, as well as of global conditions. Moreover, it would be useful to study expansion phase of financial cycles going beyond the two phases we consider here.

Lastly, our analysis provides much input for current policy debate, in particular regarding the role of financial markets in the real economy, including the need for and design of macro-prudential approaches. Specifically, it presents much needed data to analyze a number of issues relevant to long-standing policy debates on cycles in credit and asset markets. These policy interests arise from the harm asset price and credit booms can do to the real economy when they burst. It is widely recognized, for example, that, while not all booms end up in disasters, many asset price booms and fast credit expansions have been followed by busts with adverse real economic consequences. We plan to explore these issues and possible policy implications in our future research.

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[24] Cecchetti (2006) finds evidence that housing booms worsen growth prospects and that equity booms have little impact on expected mean and variance of macroeconomic performance, although they do aggravate the adverse outcomes. In a related paper, Cecchetti and Lee (2008) study the impact of equity and house price booms on the extreme tails of the distributions of fluctuations in output and prices.

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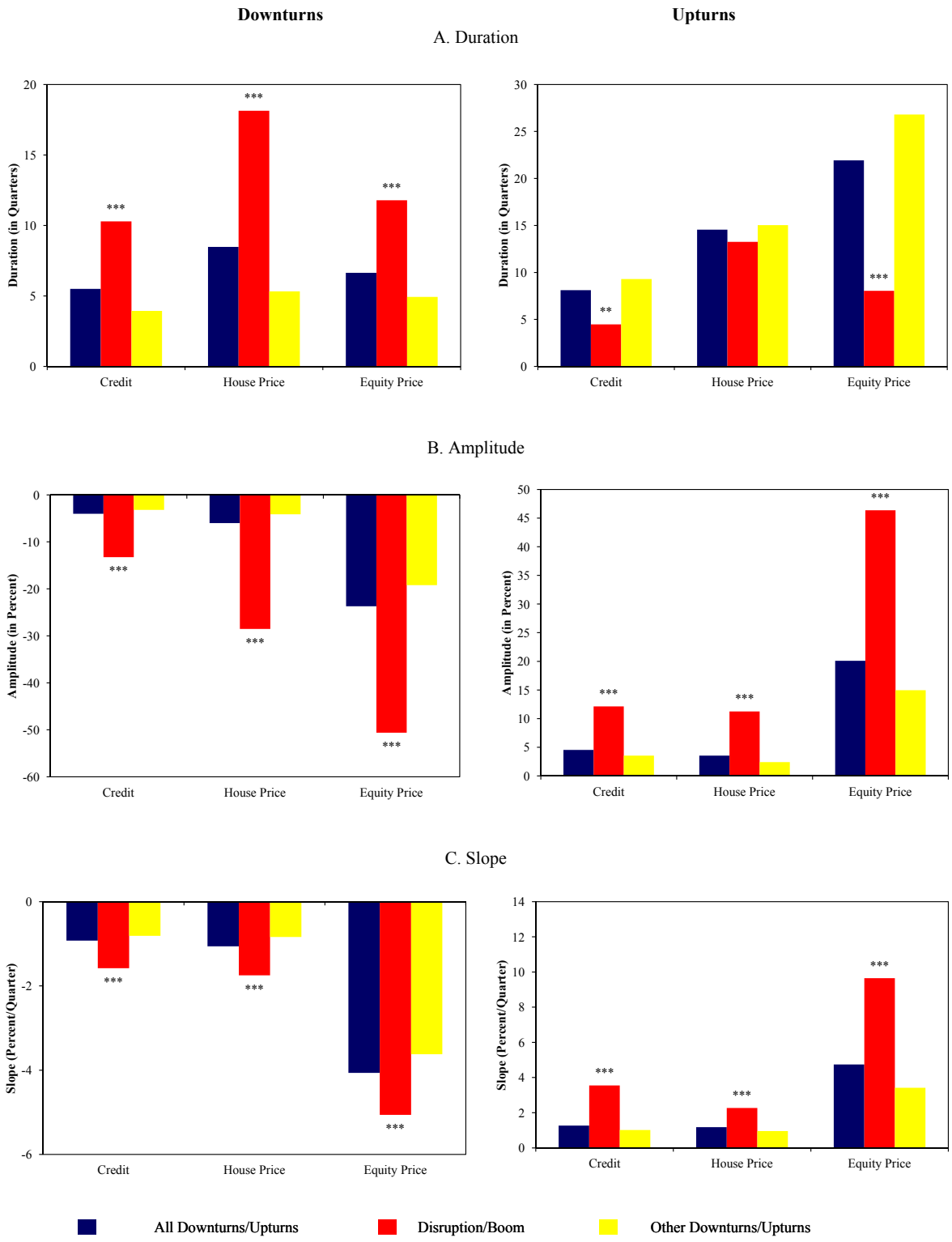
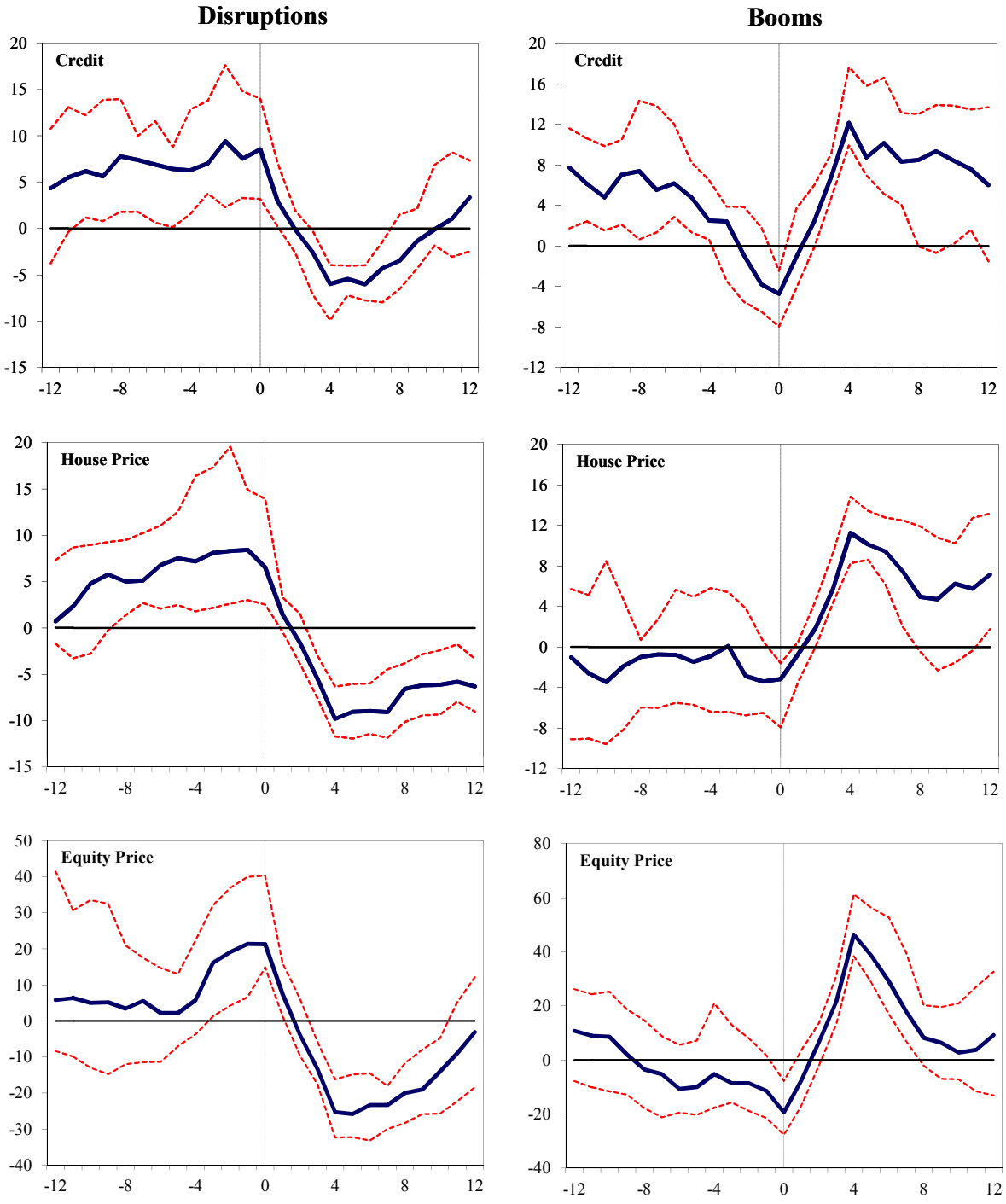
Figure 1. Financial Cycles: Downturns/ Upturns and Disruptions



Notes : Means are shown for duration, whereas medians are shown for amplitude and slope. Duration for downturns is the number of quarters between peak and trough. Duration for recoveries is the time it takes to attain the level at the previous peak after the trough. The amplitude for the downturns is calculated based on the decline in each respective variable during the peak to trough decline in the financial variable. The amplitude for the recoveries is calculated based on the one year change in each respective variable after the trough. The slope of the downturn is the amplitude from peak to trough divided by the duration. The slope of the upturns is the amplitude from the trough to the quarter at which the financial variable has reached the level at its last peak, divided by the duration. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between disruptions (booms) and other downturns (upturns).

Figure 2. Evolution of Financial Disruptions and Booms



Notes: In each panel, the solid line denotes the median year-over-year growth rate of the respective variable during respective financial booms, while dotted lines correspond to the upper and lower quartiles. Zero is the quarter at which a financial disruption or boom begins.

Table 1A. Financial Cycles: Basic Features

	Downturns		Upturns	
	Number	Time in Downturn	Number	Time in Upturn
Credit				
Full Period	114	0.30 *[0.30]*	115	0.20 *[0.23]*
1960-1985	69	0.29 *[0.21]*	67	0.24* *[0.23**]*
1986-2007	45	0.30 *[0.24]*	48	0.16 *[0.10]*
House Price				
Full Period	114	0.41 *[0.40]*	114	0.31 *[0.32]*
1960-1985	58	0.54*** *[0.55***]*	53	0.35 *[0.33]*
1986-2007	56	0.34 *[0.28]*	61	0.33 *[0.33]*
Equity Price				
Full Period	245	0.45 *[0.44]*	251	0.38 *[0.39]*
1960-1985	128	0.55*** *[0.57***]*	131	0.40 *[0.40]*
1986-2007	117	0.36 *[0.34]*	120	0.40 *[0.40]*

Notes: For the statistics "Time in Downturn" and "Time in Upturn" means are shown with medians in brackets. Time in Upturn (Downturn) refers to the ratio of the number of quarters in which the financial variable is in an upturn (downturn) over the given sample period. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between the 1960-1985 period and the 1986-2007 period.

Table 1B. Financial Cycles: Basic Features

	Downturns			Upturns		
	Duration	Amplitude	Slope	Duration	Amplitude	Slope
Credit						
Full Period	5.50	-4.03	-0.93	8.00	4.36	1.23
	[4.00]	*[-6.68]*	*[-1.25]*	*[4.00]*	*[6.44]*	
1960-1985	5.07	-4.64**	-1.31***	7.30	5.56***	1.31*
	[4.00]	*[-6.93]*	*[-1.47***]*	*[4.00]*	*[8.14***]*	*[2.26]*
1986-2007	6.16	-2.87	-0.65	9.05	2.88	1.01
	[4.00]	*[-6.30]*	*[-0.92]*	*[4.00]*	*[3.98]*	*[1.63]*
House Price						
Full Period	8.47	-5.99	-1.06	14.25	3.62	1.19
	[6.00]	*[-10.85]*	*[-1.22]*	*[6.50]*	*[5.64]*	*[1.54]*
1960-1985	7.93	-7.04	-1.22**	17.31*	4.48	1.10
	[6.00]	*[-11.84]*	*[-1.40**]*	*[8.00]*	*[6.74]*	*[1.65]*
1986-2007	9.04	-5.02	-0.93	11.30	3.13	1.36
	[5.50]	*[-9.82]*	*[-1.03]*	*[5.00]*	*[4.69]*	*[1.44]*
Equity Price						
Full Period	6.64	-23.70	-4.07	21.93	20.09	4.75
	[5.00]	*[-27.38]*	*[-4.70]*	*[7.00]*	*[24.08]*	*[5.99]*
1960-1985	7.84***	-25.53	-3.68**	31.93***	19.09	3.79***
	*[6.00***]*	*[-28.86]*	*[-4.12**]*	*[11.00***]*	*[23.32]*	*[5.27**]*
1986-2007	5.32	-22.74	-4.72	10.14	21.91	5.56
	[4.00]	*[-25.76]*	*[-5.35]*	*[5.00]*	*[24.92]*	*[6.85]*

Notes : The statistics for "Amplitude" and "Slope" refer to sample medians. Means are in brackets. For the statistic "Duration" means are shown with medians in brackets. Duration for downturns is the number of quarters between peak and trough. Duration for upturns is the time it takes to attain the level at the previous peak after the trough. The amplitude for the downturns is calculated based on the decline in each respective variable during the peak to trough decline in the financial variable. The amplitude for the upturns is calculated based on the one year change in each respective variable after the trough. The slope of the downturn is the amplitude from peak to trough divided by the duration. The slope of the upturns is the amplitude from the trough to the quarter at which the financial variable has reached the level at its last peak, divided by the duration. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between the 1960-1985 period and the 1986-2007 period.

Table 2. Synchronization of Cycles Within Countries

A. Full Sample *(Mean and Median)*

		Mean		
		Credit	House Price	Equity Price
Median	Credit	…	0.68	0.57
	House Price	0.68	…	0.55
	Equity Price	0.57	0.57	…

B. Sub-samples (*Median*)

		1986-2007		
		Credit	House Price	Equity Price
1960-1985	Credit	…	0.74	0.63***
	House Price	0.69	…	0.60*
	Equity Price	0.51	0.53	…

C. Sub-samples (*Mean*)

		1986-2007		
		Credit	House Price	Equity Price
1960-1985	Credit	…	0.70	0.62***
	House Price	0.65	…	0.58
	Equity Price	0.52	0.53	…

Notes : Each cell represents the mean or the median of the concordance statistics of the respective two cycles within countries. Concordance is calculated as the fraction of time that the two cycles are in the same phase. Part A presents the means and medians of concordances within countries for the full sample, where the numbers above the diagonal are the means, and the numbers below the diagonal are the medians. Parts B and C compare the means and medians of the concordance statistics for the sub-periods, where the numbers above the diagonal are the means (medians) for the 1986-2007 sub-sample, and the numbers below the diagonal are the means (medians) for the 1960-1985 sub-sample. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between the 1960-1985 period and the 1986-2007 period.

Table 3. Synchronization of Cycles Across Countries

		Sub-samples	
	Full Sample	1960-1985	1986-2007
Credit			
Mean	0.75	0.73	0.74
Median	0.75	0.75	0.74
Max	0.82	0.81	0.82
Min	0.67	0.58	0.51
House Price			
Mean	0.59	0.58	0.60
Median	0.59	0.58**	0.63
Max	0.66	0.62	0.70
Min	0.44	0.51	0.36
Equity Price			
Mean	0.70	0.63***	0.75
Median	0.71	0.63***	0.76
Max	0.77	0.71	0.81
Min	0.63	0.58	0.66

Notes: Each cell refers to the concordance statistic for the respective cycles across countries. Concordance is calculated as the fraction of time that two cycles are in the same phase. First the concordance statistic for each country pair is computed and then the relevant statistic for each financial variable over the full sample is calculated. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between the 1960-1985 period and the 1986-2007 period.

Table 4. Disruptions and Booms

	Financial Downturn				Other Financial Variables		
	Number of Events	Duration	Amplitude	Slope	Credit	House Price	Equity Price
A. Credit Downturns	114	5.50	-4.03	-0.93	-4.03	-2.76	-3.60
Credit Crunch	28	10.29***	-13.26***	-1.58***	-13.26***	-12.11***	0.97
Other Credit Downturns	86	3.94	-3.18	-0.81	-3.18	-1.82	-4.53
B. House Price Downturns	114	8.47	-5.99	-1.06	3.53	-5.99	-0.29
House Price Busts	28	18.14***	-28.52***	-1.75***	1.94	-28.52***	6.10
Other House Price Downturns	86	5.33	-4.14	-0.84	4.15	-4.14	-0.29
C. Equity Price Downturns	245	6.64	-23.70	-4.07	5.51	1.31	-23.70
Equity Price Busts	61	11.79***	-50.62***	-5.06***	12.07***	4.59	-50.62***
Other Equity Price Downturns	184	4.93	-19.20	-3.62	4.80	0.85	-19.20
	Financial Upturn				Other Financial Variables		
	Number of Events	Duration	Amplitude	Slope	Credit	House Price	Equity Price
A. Credit Upturns	96	8.11	4.53	1.27	4.53	-0.63	4.53
Credit Booms	24	4.48**	12.13***	3.55***	12.13***	4.14***	6.63
Other Credit Upturns	72	9.30	3.54	1.02	3.54	-1.56	4.53
B. House Price Upturns	111	14.54	3.54	1.18	4.85	3.54	7.42
House Price Booms	28	13.25	11.24***	2.27***	4.53	11.24***	7.76
Other House Price Upturns	83	15.03	2.40	0.96	4.90	2.40	7.39
C. Equity Price Upturns	251	21.93	20.09	4.75	5.22	1.39	20.09
Equity Price Booms	63	8.05***	46.36***	9.65***	4.42**	0.06**	46.36***
Other Equity Price Upturns	188	26.80	14.96	3.42	5.48	2.36	14.96

Notes : All statistics except "Duration" correspond to sample medians. For "Duration" means are shown. Duration for downturns is the number of quarters between peak and trough. Duration for upturns is the time it takes to attain the level at the previous peak after the trough. The amplitudes for downturns is calculated based on the decline in each respective variable during the downturn. The amplitude for the upturns is calculated based on the one year change in each respective variable after the trough in the financial variable. The slope of the downturns is the amplitude from peak to trough divided by the duration. The slope of the upturns is the amplitude from the trough to the quarter at which the financial variable has reached the level at its last peak, divided by the duration. Disruptions (Crunches and Busts) are the worst 25% of downturns as calculated by the amplitude. Booms are the top 25% of upturns as calculated by the amplitude. Only downturns (upturns) that are (part of) a completed phase are ranked as a disruption (boom) or other. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between financial disruptions (booms) and other financial downturns (upturns).

Table 5. Likelihood of Financial Cycles

(in percent)

	A. Downturns		
Probability of	Credit	House Price	Equity Price
Unconditional	26.96	40.52	45.46
Conditional On			
Credit Crunch	100	78.01	51.98
House Price Bust	48.09	100	46.26
Equity Price Bust	38.61	49.16	100

	B. Upturns		
Probability of	Credit	House Price	Equity Price
Unconditional	19.22	33.10	40.01
Conditional On			
Credit Boom	100	50.00	49.06
House Price Boom	41.73	100	52.72
Equity Price Boom	17.65	35.92	100

Notes : The unconditional probability of a downturn (upturn) is based on the fraction of time in which a downturn (upturn) occurs during the sample. The conditional probabilities refer to the fraction of time in which there is a downturn (upturn) given a financial disruption (boom).

Table 6. Credit Downturns Associated with Financial Disruptions

					Other Financial Variables	
	Number of Events	Duration	Amplitude	Slope	House Price	Equity Price
A. Credit Downturns without House Price Busts	51	4.86	-3.27	-0.76	0.60	-9.40
Credit Downturns with House Price Busts	32	7.38*	-4.42	-0.88	-7.19***	5.25***
Credit Downturns with Severe House Price Busts	18	7.28	-4.40*	-1.18	-8.45***	5.25**
B. Credit Downturns without Equity Price Busts	65	5.08	-3.42	-0.79	-2.76	-0.65
Credit Downturns with Equity Price Busts	33	6.52	-5.35*	-1.05	-2.99	-18.56***
Credit Downturns with Severe Equity Price Busts	18	6.67	-3.92	-1.00	-2.63	-25.96***
C. Credit Downturns without Financial Crises	99	5.25	-3.97	-0.91	-2.25	-5.97
Credit Downturns with Financial Crises	15	7.13	-4.61	-1.39	-5.17	10.48***
Credit Downturns with Severe Financial Crises	7	3.43*	-3.20	-1.54	-5.17	10.48**

Credit Upturns Associated with Financial Booms

					Other Financial Variables	
	Number of Events	Duration	Amplitude	Slope	House Price	Equity Price
A. Credit Upturns without House Price Booms	77	7.48	3.64	1.03	-0.85	5.70
Credit Upturns with House Price Booms	8	9.63	6.74*	2.14*	7.17***	15.76
Credit Upturns with Strong House Price Booms	4	11.50	9.87	2.17	9.79***	20.22*
B. Credit Upturns without Equity Price Booms	85	6.94	4.33	1.19	-0.74	3.72
Credit Upturns with Equity Price Booms	13	9.00	4.44	1.62	1.22	36.71***
Credit Upturns with Strong Equity Price Booms	8	9.75	4.52	1.82	1.29	51.14***

Notes : All statistics except "Duration" correspond to sample medians. For "Duration" means are shown. Duration for credit downturns is the number of quarters between peak and trough. Duration for credit upturns is the time it takes to attain the level of credit at the previous peak after the trough. The amplitude for the credit downturns is calculated based on the decline in each respective variable during the peak to trough decline in credit. The amplitudes for credit upturns is calculated based on the one year change in each respective variable after the trough in credit. The slope of the downturn is the amplitude from peak to trough divided by the duration. The slope of the credit upturns is the amplitude from the trough to the quarter at which credit has reached the level at its last peak, divided by the duration. Disruptions (Busts) are the worst 25% of downturns calculated by the amplitude. Severe disruptions are the worst 12.5% of downturns, or the worst 50% of disruptions, as calculated by amplitude. Financial crises are those crises as defined by Reinhart and Rogoff (2009). The severe financial crises are the worst 50% of financial crises as measured by output decline during the credit decline. Booms are the top 25% of upturns as calculated by the amplitude. Strong booms are the top 12.5% of upturns, or top 50% of booms, as calculated by the amplitude. Only credit downturns and upturns with data for each respective associated variable are included. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between credit downturns with a financial disruption and without, and between credit downturns with a severe financial disruption and without a financial disruption.

Table 7. House Price Downturns Associated with Financial Disruptions

					Other Financial Variables	
	Number of Events	Duration	Amplitude	Slope	Credit	Equity Price
A. House Price Downturns without Credit Crunches	104	8.47	-5.99	-1.04	4.15	-0.29
House Price Downturns with Credit Crunches	10	8.50	-6.14	-1.08	-4.57***	-0.03
House Price Downturns with Severe Credit Crunches	8	8.25	-5.01	-1.01	-5.55***	-0.03
B. House Price Downturns without Equity Price Busts	78	7.87	-4.63	-0.86	3.53	3.59
House Price Downturns with Equity Price Busts	36	9.78	-10.80***	-1.47***	3.75	-21.19***
House Price Downturns with Severe Equity Price Busts	18	11.50*	-13.30***	-1.59***	4.99	-36.90***
C. House Price Downturns without Financial Crises	102	7.37	-5.54	-1.04	3.34	-0.29
House Price Downturns with Financial Crises	12	17.83*	-26.72**	-1.18	4.33	-4.79
House Price Downturns with Severe Financial Crises	6	9.17	-8.41	-1.10	6.49	-17.09

House Price Upturns Associated with Financial Booms

					Other Financial Variables	
	Number of Events	Duration	Amplitude	Slope	Credit	Equity Price
A. House Price Upturns without Credit Booms	109	13.92	3.27	1.17	4.72	8.00
House Price Upturns with Credit Booms	5	20.80	11.05***	1.26	8.67*	3.77
House Price Upturns with Strong Credit Booms	3	29.33	13.25**	1.23	8.67*	3.77
B. House Price Upturns without Equity Price Booms	98	12.24	3.11	1.19	4.91	5.93
House Price Upturns with Equity Price Booms	16	25.50**	7.55**	1.24	3.69	42.33***
House Price Upturns with Strong Equity Price Booms	10	27.60	6.27	1.17	6.99	62.17***

Notes : All statistics except "Duration" correspond to sample medians. For "Duration" means are shown. Duration for house price downturns is the number of quarters between peak and trough. Duration for house price upturns is the time it takes to attain the level of house price at the previous peak after the trough. The amplitude for the house price downturns is calculated based on the decline in each respective variable during the peak to trough decline in house price. The amplitudes for house price upturns is calculated based on the one year change in each respective variable after the trough in house price. The slope of the downturn is the amplitude from peak to trough divided by the duration. The slope of the house price upturns is the amplitude from the trough to the quarter at which house price has reached the level at its last peak, divided by the duration. Disruptions (Busts) are the worst 25% of downturns calculated by the amplitude. Severe disruptions are the worst 12.5% of downturns, or the worst 50% of disruptions, as calculated by amplitude. Financial crises are those crises as defined by Reinhart and Rogoff (2009). The severe financial crises are the worst 50% of financial crises as measured by output decline during the house price decline. Booms are the top 25% of upturns as calculated by the amplitude. Strong booms are the top 12.5% of upturns, or top 50% of booms, as calculated by the amplitude. Only house price downturns and upturns with data for each respective associated variable are included. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between house price downturns with a financial disruption and without, and between house price downturns with a severe financial disruption and without a financial disruption.

Table 8. Equity Price Downturns Associated with Financial Disruptions

					Other Financial Variables	
	Number of Events	Duration	Amplitude	Slope	Credit	House Price
A. Equity Price Downturns without Credit Crunches	222	6.63	-23.57	-4.17	5.89	2.15
Equity Price Downturns with Credit Crunches	15	5.20	-25.52	-4.27	-3.72***	-4.92***
Equity Price Downturns with Severe Credit Crunches	10	5.90	-27.97	-3.92	-5.28***	-5.29**
B. Equity Price Downturns without House Price Busts	153	6.37	-25.18	-4.59	5.57	3.03
Equity Price Downturns with House Price Busts	34	4.29***	-21.14**	-4.39	2.48***	-4.59***
Equity Price Downturns with Severe House Price Busts	22	4.55**	-21.82	-4.73	2.48***	-4.97***
C. Equity Price Downturns without Financial Crises	229	6.72	-23.45	-3.98	5.76	2.13
Equity Price Downturns with Financial Crises	16	5.56	-25.57	-5.83**	3.27	-2.24**
Equity Price Downturns with Severe Financial Crises	8	4.38***	-28.95	-6.69***	2.23**	-5.11***

Equity Price Upturns Associated with Financial Booms

					Other Financial Variables	
	Number of Events	Duration	Amplitude	Slope	Credit	House Price
A. Equity Price Upturns without Credit Booms	233	22.07	20.09	4.73	5.03	1.39
Equity Price Upturns with Credit Booms	12	13.33	25.91	7.06	9.57**	0.80
Equity Price Upturns with Strong Credit Booms	6	22.17	15.74	4.55	15.69***	1.80
B. Equity Price Upturns without House Price Booms	190	17.39	21.90	5.09	4.44	0.82
Equity Price Upturns with House Price Booms	13	18.58	17.73	6.96	5.46	10.14***
Equity Price Upturns with Strong House Price Booms	6	24.83	27.55	10.43	3.07	11.90***

Notes : All statistics except "Duration" correspond to sample medians. For "Duration" means are shown. Duration for equity price downturns is the number of quarters between peak and trough. Duration for equity price upturns is the time it takes to attain the level of equity price at the previous peak after the trough. The amplitude for the equity price downturns is calculated based on the decline in each respective variable during the peak to trough decline in equity price. The amplitudes for equity price upturns is calculated based on the one year change in each respective variable after the trough in equity price. The slope of the downturn is the amplitude from peak to trough divided by the duration. The slope of the equity price upturns is the amplitude from the trough to the quarter at which equity price has reached the level at its last peak, divided by the duration. Disruptions (Busts) are the worst 25% of downturns calculated by the amplitude. Severe disruptions are the worst 12.5% of downturns, or the worst 50% of disruptions, as calculated by amplitude. Financial crises are those crises as defined by Reinhart and Rogoff (2009). The severe financial crises are the worst 50% of financial crises as measured by output decline during the equity price decline. Booms are the top 25% of upturns as calculated by the amplitude. Strong booms are the top 12.5% of upturns, or top 50% of booms, as calculated by the amplitude. Only equity price downturns and upturns with data for each respective associated variable are included. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between equity price downturns with a financial disruption and without, and between equity price downturns with a severe financial disruption and without a financial disruption.

Table 9. Synchronized Financial Downturns

					Other Financial Variables		
	Number of Events	Duration	Amplitude	Slope	Credit	House Price	Equity Price
A. Credit Downturns without Synchronization	77	5.25	-3.42	-0.91	-3.42	-1.06	-4.89
Credit Downturns with Synchonization	37	6.03	-6.63**	-1.25	-6.63**	-5.38*	-1.44
Credit Downturns with High Synchronization	20	5.25	-7.25**	-1.48*	-7.25**	-6.81**	-12.75*
B. House Price Downturns without Synchronization	29	9.69	-3.97	-0.77	5.53	-3.97	-0.23
House Price Downturns with Synchonization	85	8.06	-6.89	-1.08*	2.38***	-6.89	-0.29
House Price Downturns with High Synchronization	76	8.41	-7.28*	-1.14**	2.44***	-7.28*	-2.64
C. Equity Price Downturns without Synchronization	119	6.82	-17.98	-3.37	5.95	1.27	-17.98
Equity Price Downturns with Synchonization	126	6.48	-29.00***	-4.86***	5.14	1.84	-29.00***
Equity Price Downturns with High Synchronization	63	7.16	-37.05***	-5.30***	5.84	2.55	-37.05***

Notes : All statistics except "Duration" correspond to sample medians. For "Duration" means are shown. Duration for downturns is the number of quarters between peak and trough. The amplitude for the downturns is calculated based on the decline in each respective variable during the peak to trough decline in the financial variable. The slope of the downturn is the amplitude from peak to trough divided by the duration. Downturns are considered synchronized if they occur during a period where more than 40% of countries are experiencing downturns, and highly synchronized if they occur during a period where more than 50% of countries are experiencing downturns. In the case of equity price downturns the numbers are 80% and 90%, respectively, given that equity price cycles generally exhibit a higher degree of cross country synchronization. Cycles are considered to be highly synchronized if they are ongoing during a period of high synchronization as defined by the aforementioned thresholds, started at most 8 quarters before the period of high synchronization, and ended at most 8 quarters after the period of high synchronization. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between synchronizated and non-synchronized downturns, and between highly synchronized and non-synchronized downturns.

Table 10. Determinants of the Duration of Financial Downturns: Bivariate Regressions

	Weibull Duration Models [1/]					
	Credit		House Price		Equity Price	
	(1)	(2)	(3)	(4)	(5)	(6)
Downturn with Credit Crunch [2/]				0.273		0.118
				[0.350]		[0.352]
Downturn with House Price Bust [2/]		-0.961***				0.970***
		[0.275]				[0.188]
Downturn with Equity Price Bust [2/]		0.111		-0.355		
		[0.246]		[0.263]		
World Growth (Average 1 year After the Peak)		0.105***		0.033		0.022***
		[0.032]		[0.033]		[0.005]
Inflation (Average 3 Years Before the Peak)		-0.185***		0.030		-0.143***
		[0.061]		[0.073]		[0.055]
Trade Openness (at Peak)		0.002		0.023***		0.016***
		[0.011]		[0.007]		[0.004]
Financial Openness (at Peak)		0.025		0.101**		0.069*
		[0.125]		[0.040]		[0.038]
Financial Crisis [5/]		-2.050***		-0.037		0.659*
		[0.423]		[0.318]		[0.361]
Duration of Previous Expansion		-0.006		-0.033**		0.006
		[0.010]		[0.016]		[0.017]
Globalization Dummy		-0.331		0.117		0.657***
		[0.251]		[0.215]		[0.140]
Synchronization Dummy		-0.356*		0.129		0.036
		[0.209]		[0.300]		[0.134]
P (Weibull distribution parameter) [3/]	1.707	[1.706 - 1.92]	1.469	[1.468 - 1.565]	1.627	[1.626 - 1.701]
	[0.087]	[0.086 - 0.108]	[0.078]	[0.077 - 0.108]	[0.060]	[0.058 - 0.066]
Number of Observations [4/]	114	[94 - 114]	117	[96 - 117]	245	[194 - 245]

Notes : All regressions include country fixed effects. Coefficents shown along with robust standard errors in brackets below respective coeffient estimate. The dependent variable is the duration of a downturn. A downturn associated with a financial disruption (credit crunch, equity price bust, and house price bust) dummy variable takes on a value of 1 when a disruption is ongoing when the downturn begins or ended at most one quarter before the downturn began. The synchronization dummy takes on a value of 1 when the downturn occurs during a period of synchronized downturns across countries in the respective variable. World growth is the PPP weighted annualized quarterly growth of the respective financial variable from OECD countries. Trade openness is defined as (exports+imports) as percent of GDP. Financial Openness is defined as (Total Assets+Total Liabilities)/GDP. *** implies coefficent is significant at 1% level, ** implies coefficent is significant at 5% level, * implies coefficent is significant at 10% level.

[1/] Regression model with one covariate at a time.

[2/] Downturn of the variable in the heading row.

[3/] Weibull distribution parameter, range values obtained from the bivariate regressions.

[4/] Range values obtained from the bivariate regressions.

[5/] As defined by Laeven and Valencia

Table 11. Determinants of the Amplitude of Financial Downturns: Bivariate Regressions

	Amplitude [1/]		
	Credit	House Price	Equity Price
	(1)	(2)	(3)
Downturn with Credit Crunch [2/]		-0.809	-0.482
		[3.761]	[3.978]
Downturn with House Price Bust [2/]	3.305**		-11.185***
	[1.442]		[2.815]
Downturn with Equity Price Bust [2/]	0.899	6.499*	
	[1.285]	[3.611]	
World Growth (Average 1 year After the Peak)	-0.542***	-0.308	-0.679***
	[0.173]	[0.300]	[0.076]
Inflation (Average 3 Years Before the Peak)	1.302**	0.83	2.812***
	[0.587]	[0.873]	[0.976]
Trade Openness (at Peak)	-0.03	-0.210*	-0.145*
	[0.047]	[0.112]	[0.074]
Financial Openness (at Peak)	-0.486	-0.872**	-1.626**
	[0.574]	[0.400]	[0.632]
Financial Crisis [5/]	10.085**	2.418	-2.019
	[4.714]	[2.285]	[3.428]
Amplitude of Previous Expansion	-0.014**	-0.103**	-0.021
	[0.005]	[0.043]	[0.019]
Globalization Dummy	0.154	-0.516	-4.432**
	[1.980]	[2.036]	[2.010]
Synchronization Dummy	3.089**	2.179	9.116***
	[1.228]	[2.748]	[1.868]
Adjusted R-Squared [4/]	[-0.009 - 0.157]	[-0.008 - 0.067]	[-0.004 - 0.202]
Number of Observations [4/]	[94 - 114]	[96 - 117]	[194 - 245]

Notes : All regressions include country fixed effects. Coefficents shown along with robust standard errors in brackets below respective coeffient estimate. The dependent variable is the amplitude of a downturn. A downturn associated with a financial disruption (credit crunch, equity price bust, and house price bust) dummy variable takes on a value of 1 when a disruption is ongoing when the downturn begins or ended at most on quarter before the downturn began. The synchronization dummy takes on a value of 1 when the downturn occurs during a period of synchronized downturns across countries in the respective variable. World growth is the PPP weighted annualized quarterly growth of the respective financial variable from OECD countries. Trade openness is defined as (exports+imports) as percent of GDP. Financial Openness is defined as (Total Assets+Total Liabilities)/GDP. *** implies coefficent is significant at 1% level, ** implies coefficent is significant at 5% level, * implies coefficent is significant at 10% level.

[1/] Regression model with one covariate at a time.

[2/] Downturn of the variable in the heading row.

[3/] Weibull distribution parameter, range values obtained from the bivariate regressions.

[4/] Range values obtained from the bivariate regressions.

[5/] As defined by Laeven and Valencia