How Do Business and Financial Cycles Interact?

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Abstract: This paper analyzes the interactions between business and financial cycles using a comprehensive database of more than 200 business and 1200 financial cycles in 44 countries over the period 1960:1-2009:4. We use output to track business cycles and employ four different measures, including credit, house prices, equity prices, and exchange rates, to analyze financial cycles. We report four main results. First, financial cycles tend to be longer and sharper than business cycles. Second, business cycles are more synchronized with cycles in credit and house prices than with cycles in equity prices and exchange rates. Third, financial cycles appear to play an important role in shaping recessions and recoveries. In particular, recessions associated with financial disruption episodes, notably house price busts, are often longer and deeper than other recessions. Conversely, recoveries associated with rapid growth in credit and house prices tend to be stronger. Our results collectively emphasize the importance of developments in credit and housing markets for the real economy. Using these findings, we review the duration and amplitude of the wave of recessions over the past two years, most of which are associated with credit crunches and house price busts.

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"[Economists] will have to do their best to incorporate the realities of finance into macroeconomics…"

Paul Krugman (September 2, 2009)

"If we knew how to "incorporate the realities of finance into macroeconomics" we would have done so already. We haven't done so, because we don't know how..."

John H. Cochrane (September 16, 2009)

I. Introduction

The past two years have seen recessions in virtually all advanced economies and many emerging markets. A common feature of these recessions is that they have been accompanied by various types of financial disruptions, including contractions in the supply of credit and sharp declines in asset prices. These events have led to an intensive debate in the profession about the links between macroeconomics and finance, and have propelled the study of interactions between business cycles and financial cycles to the forefront of research.

This paper aims to broaden our empirical understanding of the interactions between business and financial cycles. Towards this objective, we ask two interrelated questions: First, how do macroeconomic and financial variables behave over the business and financial cycles? Second, how does the nature of business cycles vary across different phases of financial cycles? We study these questions using a rich database of business and financial cycles for a fairly large number of countries over a long period.

We consider various dimensions of business cycles and financial cycles and uncover many differences. We document, for example, that financial cycles tend to be longer and sharper than business cycles. Besides highlighting differences between business cycles and financial cycles, we analyze the implications of the interactions between them. We show that business cycles are more synchronized with cycles in credit and house prices than with those in equity prices and exchange rates. Our findings also suggest that the interactions between business and financial cycles play an important role in shaping recessions and recoveries. Specifically, recessions associated with financial disruption episodes, notably house price busts, are often longer and deeper than other recessions. Conversely, recoveries associated with rapid growth of credit and house prices tend to be more robust. These findings collectively emphasize the importance of developments in housing and credit markets for the real economy.

As our brief review in Section II highlights, there is an extensive literature, which our work relates to, analyzing the interactions between macroeconomic and financial variables from various theoretical and empirical perspectives. There are strong theoretical linkages between

macroeconomic and financial variables, especially through wealth and substitution effects. Moreover, these linkages can be amplified through various channels, including the financial accelerator and related mechanisms operating through balance sheets of firms, households, and countries. Several theoretical models emphasize the roles played by movements in credit and asset prices (house prices, equity prices, and exchange rates) in shaping the evolution of macroeconomic aggregates over the business cycle.

Prior empirical research mostly explores the procyclical nature of the linkages between financial and macroeconomic variables. In particular, many empirical studies focus on the dynamics of credit and output, or on the properties of asset prices as leading indicators for economic activity. Few studies consider financial cycles and most of those that do, use the data of a single country or a small number of countries or episodes. Some recent studies, notably Reinhart and Rogoff (2009), concentrate on the behavior of real and financial variables surrounding financial crises. However, given their focus on (the aftermath of) crises, these studies are silent about the evolution of macroeconomic and financial variables over the various phases of business and financial cycles.

Our survey shows that the knowledge of the interactions between real and financial sectors during various phases of business and financial cycles has been rather limited. This is in large part as most studies work with a limited set of observations. To date, only a few papers have considered for a broad sample of advanced countries how the interactions between financial and real activity variables vary during selected phases of the business cycles. The multiple phases of the business cycles—recessions and recoveries—and financial cycles—downturns and upturns—have not been studied together for a large sample of countries, including advanced economies and emerging markets. While the literature focusing on the macroeconomic implications of financial crises has used a broader sample of cases, but the identification of crises has some clear disadvantages as it is based on historical records and is often subjective, especially in the case of banking crises.

Our paper attempts to address some of these gaps in the literature. First, our study is the first detailed, cross-country empirical analysis exploring business and financial cycles and the interactions between the different phases of these cycles in a large number of countries over a long period of time. Second, in parallel with the business cycles literature, we use a well established and reproducible methodology for the dating of financial disruptions and booms. Furthermore, since we use quarterly data, rather than the annual data typically used in other cross-country studies, we are able to better identify and document cyclical properties. Third, taking advantage of our large data set and using regression models, we are able to study various factors associated with the duration and depth of recessions and recoveries.

In section III, we introduce our database and explain our approach as to the selection of variables to characterize business and financial cycles. The dataset we constructed comprises a total of 44 countries, including 21 advanced and 23 emerging market economies, over the period 1960:1-

2009:4. The main variable we use to characterize business cycles is output (GDP) since it is the best (available) measure to evaluate economic activity. In addition, we study the behavior of some other macroeconomic variables to get a better sense of the evolution of business cycles. In order to provide a broad characterization of financial cycles, we employ four measures: credit, house prices, equity prices, and exchange rates. Of course, each of these measures represents the dynamics in a different financial market. As our survey documents, various strands of the literature document that these are the financial variables most closely related to movements in macroeconomic variables.

Section IV presents the methodology we use to identify business and financial cycles and provides information on other concepts and models we employ. We rely on the "classical" definition of a cycle since it provides a simple but effective procedure to identify cyclical turning points in macroeconomic and financial variables. Using this methodology, we determine the dates of recessions and recoveries of business cycles, and the corresponding upturns and downturns of financial cycles. Specifically, we identify more than 200 episodes of business cycles and 1200 episodes of financial cycles.

We also study the implications of disruptions and booms in financial markets. In particular, we classify an episode as a financial disruption (boom) if the change in the financial variable falls into the bottom (top) quartile of all changes during the downturn (upturn) phase of the financial cycle. Financial disruptions can take different forms depending on the financial variable under consideration: a credit crunch, a house/equity price bust, or an exchange rate collapse. Similarly, financial booms can be in credit, house and equity prices, and exchange rates. Section IV also introduces the concordance statistic used to assess the extent of synchronization of business and financial cycles and briefly explains the empirical model employed to study the duration and amplitude of recessions and recoveries.

In Section V, we document the main features of business and financial cycles. First, financial cycles are often longer and sharper than business cycles. Second, the downturns and upturns of financial cycles are often more violent than the same phases of business cycles. Third, both business and financial cycles tend to be more pronounced in emerging markets than those in advanced countries. We also analyze the behavior of macroeconomic variables over financial cycles. We find that episodes of financial downturns are associated with slower output growth than average, whereas upturns in financial markets usually correspond to faster economic expansions.

We analyze the implications of the coincidence of business and financial cycles in Section VI. We document that cycles in output tend to display a high degree of synchronization with cycles in credit and house prices whereas they do not feature much commonality with cycles in equity prices and exchange rates. We then examine how the nature of business cycles changes when they coincide with financial disruptions and booms. Our results indicate that recessions associated with financial disruptions, especially credit crunches and house price busts, tend to be

longer and deeper. We also provide evidence indicating that recoveries are slightly shorter and stronger when they coincide with booms in financial markets, especially booms in credit and house prices.

These results set the stage for the more formal empirical analysis in Section VII, where we employ various regression models to analyze the role of financial cycles in determining the main features of business cycles. Using a standard duration model, we find that when recessions are accompanied by house price busts, they tend to become longer. However, other types of financial disruptions do not feature any significant association with the length of recessions. With respect to the amplitude of recessions, our results suggest that recessions associated with house price busts are substantially deeper than those accompanied with other types of financial disruptions.

Our regressions also suggest that while the strength of a recovery is significantly and positively associated with the depth of the prior recession, it is also influenced by financial factors. For example, credit and house price booms help strengthen the recovery whereas there is a negative impact on the recovery's amplitude if the prior recession was accompanied with a house price bust. We also use our regression models to analyze whether the duration and depth of the latest wave of recessions were to be expected based on the extent of concurrent financial market disruptions. Our simple forecasting exercises suggest that the latest recessions are relatively short but more severe than predicted. We conclude in Section VIII with a brief summary of our main results and directions for future research.

II. Interactions between Business and Financial Cycles: A Brief Literature Survey

Theoretical studies

A large body of research has analyzed the interactions between macroeconomic and financial variables. Basic economic theory suggests that, in a frictionless world, macroeconomic and financial variables can interact closely, through wealth and substitution effects. Asset prices can influence consumption through their impact on household wealth, and can affect investment by altering a firm's net worth and the market value of the capital stock relative to its replacement value. Asset prices—equity prices, house prices and exchange rates—can affect the allocation of resources across time and states of nature (see Campbell, 2003; Cochrane, 2006). The extension of credit is the manifestation of these linkages.

In theory, interactions between financial variables and the real economy can be amplified when financial frictions are present.[1] This amplification largely occurs through the financial accelerator and related mechanisms operating through firms, households and countries' balance sheets.

[1] Surveys of this literature can be found in Gertler (1988), Bernanke (1993), Lowe and Rohling (1993), and Bernanke, Gertler, and Gilchrist (1996), Gilchrist and Zakrajsek (2009).

According to these mechanisms, an increase (decrease) in asset prices improves an entity's net worth, enhancing (reducing) its capacities to borrow, invest and spend. This process, in turn, can lead to further increases (decreases) in asset prices and have general equilibrium effects (e.g., Bernanke and Gertler, 1989; Bernanke, Gertler, and Gilchrist, 1999; Kiyotaki and Moore, 1997; and numerous other studies on the role of financial imperfections). Recently, some studies have focused on the role of asset prices as vehicles in transmitting financial cycles (Adrian and Shin, 2009; Brunnermeier and Shin, 2008; Geanakoplos, 2009).[2]

Other studies applying models of frictions to open economies, and emerging markets specifically, has considered how the dynamics of another asset price, exchange rate, relate to business cycles. Cespedes, Chang and Velasco (2004) extend the standard financial accelerator mechanism and show that negative external shocks can have a magnified impact on output because of the balance sheet effects stemming from a (real) devaluation.[3] This line of research also considers how fluctuations in asset prices can affect the value of collateral required for international funding. Mendoza (2010) show that when borrowing levels are high relative to asset values, shocks to collateral constraints can generate an amplification mechanism, like the debt-deflation mechanism of Irving Fisher (1933), and result in large effects on output.

There is also a rich set of theoretical studies analyzing the implications of various types of financial crises for the real economy. Banks are vulnerable to sudden demands for liquidity (the seminal reference being Diamond and Dybvig, 1983). Liquidity and other shocks can lead to systemic financial crises (see Gorton, 2009 as regard to the recent financial crisis). Various models have tried to explain the occurrence and consequences of currency crises, e.g., Krugman (1979), Flood and Garber (1984), and Obstfeld and Rogoff (1986). Other studies have shown how financial system and fiscal problems can interact with exchange rate movements and lead to recessions.[4]

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[2] This literature has recently expanded to show how the state of the financial system can affect business cycles (Gertler and Kyotaki, 2010; Brunnermeier and Sannikov, 2010).

[3] Earlier work includes Krugman (1999) and Aghion, Bacchetta and Banerjee (2000). Caballero and Krishnamurthy (1998) and Schneider and Tornell (2004) also model how because of balance sheet constraints, fluctuations in credit and asset markets translate into boom-bust cycles in emerging market economies.

[4] Chang and Velasco (2000) show how a currency crisis may lead to a banking crisis when there are large foreign currency exposures. Burnside, Eichenbaum, and Rebelo (2001 and 2004) show how currency crises can be self-fulfilling because of fiscal concerns and real exchange rate movements. Calvo and Reinhart (2000) relate disruptions in the supply of external financing, so called sudden stops, to currency crises and adverse real sector consequences.

Empirical studies

Many empirical studies provide evidence regarding the dynamics of business cycles, credit cycles and asset price fluctuations. Most of these studies focus on business cycles and credit dynamics (e.g., Bernanke and Gertler, 1989; Borio, Furfine and Lowe, 2001). Many of these examine the procyclical nature of credit and asset price movements, albeit mostly for single country cases. For example, Bordo and Haubrich (2010) analyze cycles in money, credit and output between 1875 and 2007 in the United States. They show that financial stress events exacerbate cyclical downturns, but their study is limited to a small number of recessions.[5] While most work has used aggregate data, some credit-related studies have been based on micro data (banks or corporations).[6]

Changes in house prices have been found to have a large impact on business cycles. Carrol, Otsuka and Slacalek (2006) report that the propensity to consume from a $1 increase in housing wealth is twice as large as that estimated for equity wealth. This is likely because housing represents a large share of wealth for most households. Moreover, house prices are less volatile than other asset prices, making changes in house prices more likely (perceived to be) permanent (Cecchetti, 2006). With changes in wealth more permanent, households can be expected to undertake sharper reductions in their consumption. Importantly, house prices affect borrowing capacity because housing serves as collateral. House prices in the advanced economies are procyclical and, despite housing being thought the quintessential nontradable asset, highly synchronized across countries (IMF, 2004).

In terms of the relationship between equity (and other asset) prices and business cycles, there is much work considering whether asset prices are leading, coincident, or lagging indicators (Stock and Watson, 2003; Cochrane, 2008; Leamer, 2007). However, the degree and source of causality between asset price changes and future activity are not always clear. Some interpret the relations between asset price changes and output growth as evidence that equity markets are able to anticipate correctly future earnings growth and other fundamentals. Others interpret it as evidence of some form of a "financial accelerator mechanism," where changes in equity and house prices affect access to finance, and thus impact consumption and investment, and thereby help predict future GDP growth.[7]

Many studies focus specifically on financial crises and the behavior of real and financial

[5] They have a total of 27 recession episodes, but some of their regressions use only 7 observations.

[6] See Bernanke, Gertler and Gilchrist, 1996; Kashyap and Stein, 2000; and Kannan, 2010.

[7] For the links between various types of asset prices and the real aggregates, see Engel and West, 2003; Stock and Watson, 2003; Estrella and Mishkin, 1998. Some recent studies consider the implications of equity price movements for the real economy (Barro, 2005; Barro and Ursua, 2009).

variables surrounding such events.[8] The broadest analysis is Reinhart and Rogoff (2009), which documents and reviews various types of financial crises for many countries over a long period. They highlight the commonality of severe asset market collapses, profound declines in output and employment, and sharp increases in the real value of government debt in the aftermath of systemic crises.

Identification of crises can, however, by its very nature, be subjective.[9] For example, Lopez-Salido, and Nelson (2010) provide a chronology of post-war financial crises in the United States which differs from that of Reinhart and Rogoff (2009). In light of their new chronology, they also argue that there need not be a real economic impact of financial crises on the strength of recoveries.[10] Their findings indicate the difficulties with studying financial crises solely. Furthermore, by focusing on crises, these papers are silent on the evolution of macroeconomic and financial variables over different phases of business and financial cycles.

In Claessens, Kose and Terrones (2009), we analyze the implications of episodes of recessions, credit crunches, and asset price busts for the real economy using the data of advanced countries. We reported there that recessions associated with credit crunches and house price busts tend to be deeper and longer than other recessions. Although we considered different macroeconomic and financial variables in that paper, our focus was exclusively on the "down side" of business cycles (recessions) and financial cycles (crunches and busts). This paper extends our earlier work in many dimensions. First, we study linkages over "full" business and financial cycles and examine how these linkages vary across different phases of these cycles. Second, we extend our earlier sample to emerging market economies. Third, in addition to credit, house and equity prices, we analyze a fourth financial variable, exchange rate, to broaden the coverage of financial cycles. Lastly, we undertake a rigorous regression analysis of the duration and amplitude of recessions and recoveries.

III. Database

We employ a comprehensive dataset for a large number of advanced and emerging market countries for the longest possible time coverage of quarterly series of macroeconomic and financial variables. To the best of our knowledge, our paper is the first one to develop and utilize such a detailed database for the analysis of business and financial cycles. In this section, we

[8] See Allen, Babus, Carletti (2009) for a recent review of causes and consequences of financial crises. Cecchetti, Kohler and Upper (2009) study the implications of crises. IMF (2009) analyzes the links between financial crises and business cycles.

[9] Banking crises can be particularly difficult to date, both as to when they start and when they end. Such crises have usually been dated by researchers on the basis of a combination of events—such as the forced closure, merger, or government takeover of many financial institutions, runs on several banks, or the extension of government assistance to one or more financial institutions—or in-depth assessments of financial conditions, as in many case studies (see Laeven and Valencia, 2008).

[10] Their findings are based on nine U.S. recessions and recoveries over the period 1954-2002.

briefly present our dataset and explain our approach to the selection of variables to identify business and financial cycles. We provide additional information about the country coverage, variables in the dataset, and their sources in Appendix I.[11]

Country coverage

Our dataset comprises a total of 44 countries. It includes 21 "advanced" OECD countries and 23 emerging market countries. For the former group, it covers the period 1960:1-2009:4 while for the latter it is for the 1978:1-2009:4 period, since the latter group has less consistent quarterly data series prior to 1978. For most of our analyses, we use data up to 2007:4, i.e., using episodes prior to the recent wave of recessions and financial disruptions. This assures we have complete business and financial cycles and allows, in our last exercise, to present a comparison between the adverse events over the past two years and those earlier. The emerging markets group roughly comprises the economies included in the MSCI Emerging Markets Index. This group includes the most financially open developing countries and accounts for the vast majority of international financial and trade flows between advanced and developing countries.

The database presents a fairly general representation of business and financial cycles around the world as the countries in our sample collectively account for more than 90 percent of global output. However, there are significant differences between advanced countries and emerging markets. For example, per-capita income level is typically much lower in emerging markets, about one-third, than in the typical advanced country. In terms of overall economic size, total (US dollar) GDP is also lower for the typical emerging market. Relative to its size, however, the typical emerging market country in the sample trades more with the rest of the world than the typical advanced economy. In contrast, in terms of financial linkages, the advanced economies are more integrated with global financial markets than emerging countries are.

Given these differences, when we discuss the main features of business and financial cycles, we present how these features differ between the groups of advanced and emerging countries. In our formal empirical analysis later in the paper, we utilize the full sample of countries to examine the interactions between business and financial cycles. Although we do not distinguish between the two groups in our regression analysis, we do control for potential country-specific characteristics.

Macroeconomic and financial variables

Which variables to use in order to study business and financial cycles and their interactions? In the case of business cycles, the natural choice is output (GDP) since it is the single best available measure to track economic activity. Although our turning points of business cycles are based on movements in output, we also consider the changes in other macroeconomic variables that are relevant to analyze business cycles. In particular, we study changes in consumption, investment, industrial production, and unemployment rate over the business cycle. We focus on these variables in addition to output because these variables are often used to analyze the direction of

[11] The Appendix will be available in the next version of the paper.

the business cycle. For example, industrial production is a coincident index, unemployment rate is a lagging index, and various measures of investment are leading indices of business cycles.[12] Moreover, as we document in the following section there are strong associations between these activity variables and financial ones.

We study financial cycles in four distinct market segments, acknowledging that these market segments are interdependent. Specifically, we focus on credit, house prices, equity prices, and exchange rates to analyze the evolution of financial cycles. We briefly discuss our choices in turn. Credit is a natural one to analyze financial cycles as it constitutes the single most important link between savings and investment. Our measure of credit is aggregate claims on the private sector by deposit money banks. This measure is also often used in earlier cross-country studies on credit dynamics (see Mendoza and Terrones, 2008). Although a disaggregated measure of credit, or a measure of the price of credit, would be a useful addition to our aggregate measure, it is nearly impossible to obtain such series at the quarterly frequency for most of the countries in our sample.[13]

The three other financial variables we use are asset prices. In addition to being ideal measures for financial cycles, these asset prices are closely related to movements in macroeconomic variables as our survey showed. House prices 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. Exchange rate series are real effective exchange rates as calculated by the IMF, extended backwards to 1960 using the trade weights of 1980.

All the macroeconomic and financial variables we use are of quarterly frequency, seasonally adjusted whenever necessary, and in constant prices. The macroeconomic series are mostly from the IMF International Financial Statistics (IFS), OECD Analytical Database, DXTime, GDS, DATASTREAM, and country sources. Credit series are collected from the IFS, house price series are mostly from the OECD, equity prices are from the IFS and DATASTREAM, and real exchange rates are from IFS/INS. In addition to these variables, we use a number of other variables in the formal empirical analysis.

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[12] The Conference Board (2009) provides the list of leading, coincident, and lagging indicators of economic activity. Although the NBER Business Cycle Dating Committee notes that they use real GDP, real income, employment, industrial production, and wholesale-retail sales in determining the cyclical turning points, they also utilize other indicators. Specifically, they note that *"although these indicators are the most important measures considered by the NBER in developing its business cycle chronology, there is no fixed rule about which other measures contribute information to the process."*

[13] Some recent studies examining the behavior of aggregate credit measures during recessions or financial crises (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. Similarly, while the extent of credit cycles can be measured using various interest rates, spreads, surveys of senior lending officers, and various indices of financial conditions, these measures are not available for most countries over the long sample period we study. For a smaller set of countries, Duygan-Bump and Grant (2009) provide an analysis of the dynamics of household debt using the European Community Household Panel.

IV. Methodology

The definition and measurement of business cycles have been an intensive field of study in macroeconomics. There have been a number of methodologies developed over the years to characterize business cycles. Our study is based on the "classical" definition of a business cycle which provides a simple but extremely effective procedure to identify cyclical 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. 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.[14]

The classical methodology focuses on changes in levels of economic activity. An alternative methodology would be to consider how economic activity fluctuates around a trend, and then to identify a "growth cycle" as a deviation from this trend (Stock and Watson, 1999). There has been a rich research program using detrended series (and their second moments, such as volatility and correlations) to study various aspects of cycles. We are very sympathetic to this approach. However, our objective here is to produce a well-defined chronology of business and financial cycles, rather than studying the second moments of fluctuations.[15] The advantage of turning points identified by using the classical methodology is that they are robust to the inclusion of newly available data: in other methodologies, the addition of new data can affect the estimated trend, and thus the identification of a growth cycle.

Compared to the financial crisis literature, our dating approach has some advantages. For one, in parallel with the business cycles literature, we use a well-established and reproducible methodology for the dating of financial events, whereas crisis dating is based on historical records and subjective, especially in the case of banking crises (in many cases the ending date of a crisis is selected in an ad hoc way). Related, we consider financial events that are not necessarily crises, yet did create stress in some financial markets with macroeconomic consequences. In addition, we consider four types of financial events, allowing us to investigate different financial cycles and evaluate which of these is more important, whereas a financial crisis dummy often lumps them together.

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[14] Burns and Mitchell (1946) define a cycle as *"consist[ing] of expansions occurring at about the same time in many economic activities, followed by similar general recessions, contractions, and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic; in duration, business cycles vary from more than one year to ten or twelve years."* Following the spirit of their characterization of a business cycle, the NBER (2001) defines a recession as *"a significant decline in activity spread across the economy, lasting more than a few months, visible in industrial production, employment, real income, and wholesale-retail trade." A recession begins just after the economy reaches a peak of activity and ends as the economy reaches its trough."*

[15] Furthermore, it is well-known that the results of studies using detrended series depend very much on the choice of the detrending methodology (see Canova, 1998). Several studies document the features of business fluctuations using the methodology of growth cycles (see Backus and Kehoe, 1992).

Identification of turning points in business and financial cycles

We employ the algorithm 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.[16] We search for maxima and minima over a given period of time. Then, we select pairs of adjacent, locally absolute maxima and minima that meet certain censoring rules, requiring a certain minimal duration for cycles and phases. In particular, the algorithm requires the durations of a complete cycle, and of each phase to be at least five quarters and two quarters respectively. Specifically, a peak in a quarterly series y_t occurs at time t if:

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

Similarly, a cyclical trough occurs at time t if:

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

A complete business cycle typically comprises of two phases, the contraction phase (from peak to trough) and the expansion phase (from trough to the next peak). In addition to these two phases, the recovery from recessions has been widely studied for business cycles (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 the trough to the peak level before the recession. Some others associate recovery with the cumulative growth achieved after a certain time period, such as four or six quarters, following the trough (see Sichel, 1994). Given the complementary nature of these two definitions of the recovery phase, we use both of them in the paper (see also IMF, 2009).

We focus on the contraction (or recession) and recovery phases of cycles because these two phases provide a rather well-defined time window. We do not study expansions, which are typically about five to six years (or some seven times longer than a typical recovery), and are affected by many structural factors other than just cyclical elements. Although we use the same approach to identify business and financial cycles, we use different terminology to describe the phases of financial cycles.[17] In particular, we use downturns and upturns in financial cycles as the equivalent to recessions and recoveries in business cycles.

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[16] 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 commodity prices (Pagan and Sossounov, 2003; Cashin, McDermott, and Scott, 2002). It is possible to use alternative algorithms, such as a Markov Switching (MS) model (Hamilton, 2003). However, these alternative models present a variety of implementation challenges for the large number of countries in our sample. Moreover, Harding and Pagan (2002b) compare the MS and BBQ algorithm and conclude that the BBQ is preferable because the MS model depends on the validity of the underlying statistical framework.

[17] In the case of asset prices, the constraint that the contraction phase must last at least two quarters is ignored if the quarterly decline exceeds 20 percent. Since asset prices can show much greater intra-quarter

(continued)

Main features of business and financial cycles

The main characteristics of cyclical phases are their duration and amplitude. The duration of a recession/downturn (recovery/upturn), D_c, is the number of quarters, k, between a peak (a trough) and the next trough (previous peak). The amplitude of a recession/downturn, A_c, measures the change in y_t from a peak (y_0) to the next trough (y_k), i.e., $A_c = y_k - y_0$. The amplitude of a recovery/upturn, B_c, measures the change in y_t from a trough (y_k) to the level reached in the first four quarters of an expansion (y_{k+4}), i.e., $B_c = y_{k+4} - y_k$.

For recessions only, we consider another widely used measure, cumulative loss, which combines information on duration and amplitude to proxy for the overall cost of a recession. The cumulative loss, F_c, during a recession, with duration k, is defined as:

$$F^c = \sum_{j=1}^{k} (y_j - y_0) - \frac{A^c}{2} .$$

Our algorithm is quite successful in replicating the well-known turning points of U.S. business cycles as determined by the NBER. According to the NBER, the U.S. experienced seven recessions over the 1960-2007 period. Our algorithm matches four out of these seven peak and trough dates and is only a quarter early in dating the remaining peaks and troughs.[18] The main features of our business cycles are quite similar to those of the NBER as well.

Synchronization of cycles

In order to examine the extent of synchronization between business and financial cycles, we use the concordance index developed by Harding and Pagan (2002b).[19] The index, CI_{xy} for variables x and y 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

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variation, making for large differences between peaks and troughs for end-of-quarter data than when using higher frequency data.

[18] For example, the average duration of U.S. business cycles based on our turning points is the same as that reported by the NBER. In addition, the average peak-to-trough decline in output during U.S. recessions is about -1.7 percent based on our dating and -1.4 percent based on NBER dating. The differences between our turning points and those of the NBER are because the NBER uses monthly data for various activity indicators (including industrial production, employment, personal income net of transfer payments, and volume of sales from the manufacturing and wholesale retail sectors), whereas we use only quarterly output series.

[19] A number of other researchers employ the same index to analyze synchronization of various cycles (see Artis, Kontolemis, and Osborn, 1997; Hall, McDermottt, and Tremewan, 2007; Edwards, Biscarri, and Garcia, 2003).

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

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

In other words, C_t^x and C_t^y are binary variables whose values change depending on the phase of the cycle the underlying series are in. Given that T denotes the number of time periods in the sample, CI_{xy} 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 concordance index is equal to unity (zero).

Definition of intense financial cycles

We also study the more intense forms of financial cycles, financial disruptions and booms, and consider their implications. To identify these, we rank the changes in each financial variable during downturns and upturns. We then classify an episode as a financial disruption (boom) if the change in the financial variable during the downturn (upturn) falls into the bottom (top) quartile of all changes. We call financial disruptions a crunch, bust, or collapse depending on the financial variable (i.e., credit crunch, house or equity price bust, and exchange rate collapse).[20] Similarly, for intense upturns, we have credit booms, house, equity price, and exchange rate booms.

In addition, we examine the features of recessions (recoveries) that are associated with financial disruptions (booms). If a recession (recovery) episode starts at the same time or after the beginning of an ongoing financial disruption (boom) episode, we consider that recession (recovery) to be associated with the respective financial disruption (boom). These associations, by definition, imply a coincidence between events, but do not necessarily suggest a causal link.

Models of Duration

A large body of literature studies the duration of business cycles motivated by the objective of predicting the end date of an expansion or a recession. Although most of this literature has used simple parametric and non-parametric duration models with no covariates, recent studies have also examined the importance of different indicators of economic activity (including leading economic indicators, private investment, oil prices, and U.S. recession dates) in explaining the duration of expansions or recessions.[21]

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[20] We rely on the changes in the volume of (real) credit to identify the episodes of credit crunches, which is often defined as an excessive decline in the supply of credit that cannot be explained by cyclical changes (see Bernanke and Lown, 1991). It is difficult to separate the roles played by demand and supply factors in the determination of credit volume in the economy. Exchange rate collapses (booms) of course correspond to episodes of severe deprecations (large appreciations).

[21] For instance, Diebold and Rudebusch (1990) study whether the U.S. business cycle exhibit duration dependence. They find that, in the case of expansions, there is evidence of positive duration dependence during the prewar period (1854-1938), but not so in the post war period (1945-1983). They also find some

(continued)

There is a great variety of parametric duration models, with the Weibull model the most commonly used in the business cycle literature (see Diebold, Rudebusch and Sichel, 1993). We also employ a survival model with the Weibull function. If *D* is a random variable that represents the duration of an expansion or recession, and d is a realization of *D*, then the baseline Weibull survival function is $S_0(d) = \exp\{-\exp(-\beta_0)\, d^p\}$ and the baseline hazard function is $\lambda_0(d) = pd^{p-1}\exp(\beta_0)$. The hazard rate is monotone increasing when $p > 1$, monotone decreasing when $p < 1$, and constant if p=1. Given a set of covariates, $\mathbf{x}_j$, the Weibull survival function is: defined as $S(d|\mathbf{x}_j) = \exp\{-\exp(\beta_0 + \mathbf{x}_j\beta_x)\, d^p\}$ and the Weibull hazard rate is: $\lambda(d|\mathbf{x}_j) = pd^{p-1}\exp(\beta_0 + \mathbf{x}_j\beta_x)$.

V. Business and Financial Cycles

V.1. Business Cycles: Recessions and Recoveries

Frequency of business cycles

We identify 206 recessions and 208 recoveries in our sample (Table 1A). The number of recessions and recoveries differs slightly because of the timing of the events. Of these, 122 recessions and 122 recoveries are in advanced countries, and 84 recessions and 86 recoveries are in emerging markets. The numbers differ across the country groups because our dataset for emerging markets mostly covers the period 1978-2007 whereas the coverage for advanced countries is much longer, 1960-2007.

A good metric to analyze the frequency of recessions and recoveries is the proportion of time a country is in a recession or recovery. The typical country is in a recession for about 25 percent of the time, and in recovery for about 26 percent. Since this metric adjusts for the length of data series, we can compare how it changes across countries. In the case of advanced countries, the recession intensity is typically about 20 percent, much less than that for emerging markets, which is about 33 percent. In terms of recoveries, the numbers are 17 and 28 percent, respectively. These findings suggest that emerging market economies spend relatively more time in recessions and recoveries than advanced countries.

Duration and amplitude of business cycles

We next briefly analyze the main features of recessions and recoveries. Although we most often focus on medians because they are less affected by the presence of outliers, we also refer to means wherever relevant. A typical recession lasts close to 4 quarters while a recovery often takes about 5 quarters. There is no noticeable difference across advanced and emerging market

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evidence of positive duration dependence in the case of postwar recessions. Diebold, Rudebusch and Sichel (1993) extend this analysis to examine duration dependence in the business cycles of France, Germany and Great Britain during the prewar period. They also find evidence of positive duration dependence in expansions only. Ohn et al. (2004), using discrete time tests for duration dependence, find evidence of positive duration dependence in the U.S. prewar and postwar recessions. Castro (2008) analyzes the importance of other potential factors in explaining duration dependence.

countries in terms of the duration of recessions, but it takes about 2 quarters longer for emerging economies to recover than advanced countries do.[22] Most recessions in advanced countries and emerging markets are 4 quarters or less and a substantial fraction of recoveries take less than 4 quarters (Figure 1). However, recessions can be quite long. Altogether, roughly 30 (40) percent of all recessions (recoveries) last 2 quarters, 40 (30) percent last 3-4 quarters, and 30 (25) percent last 5 quarters or more.

In terms of output, the typical decline in output from peak to trough, the recession's amplitude, is about 2.5 percent for the full sample, and the typical cumulative output loss is around 4 percent. The slope (violence) of a recession, the ratio of its amplitude to duration, tends to be about 0.7. The amplitude of a recovery, defined as the increase in the first four quarters following the trough, is around 4.5 percent. Although the majority of recessions (recoveries) are associated with moderate declines (increases) in output, these events can result in much larger changes as well (Figure 1). The absolute value of the slope of a typical recovery is larger than that of a recession, i.e., the pace of expansion during recoveries tends to exceed that of contraction during recessions (in absolute terms).

Investment declines more than output during recessions, but it recovers at a slower pace than output during recoveries. Industrial production tends to register larger changes during recessions and recoveries than output. In a typical recession, unemployment rises by about 0.7 percentage points. Recoveries in advanced countries tend to be "jobless" ones in the sense that the unemployment rate continues to pick up during these episodes.

Business cycles in emerging markets are more pronounced than in advanced economies. In particular, the decline in output during recessions is much smaller in advanced countries (1.9 percent) than in emerging markets (4.8 percent), though recoveries in advanced countries appear to be two times weaker than those in emerging markets. In terms of the cumulative loss, recessions in emerging market economies are almost three times more costly than those in advanced countries. The slope of recessions is typically much larger in emerging economies than in advanced countries, -1.2 versus -0.5, suggesting that recessions in emerging economies are more intense. In a similar fashion, recoveries in emerging markets tend to feature a larger slope than those in advanced countries. The declines in consumption, industrial production and investment, and the increase in the rate of unemployment are much larges in emerging markets than in advanced countries. Similarly, investment, industrial production, and employment feature more vibrant recoveries in emerging markets than in advanced countries.

These results echo the findings of a number of earlier studies using second moments of detrended data that business cycles in emerging markets are more volatile than advanced countries (see Kose, Prasad, and Terrones, 2006). Both duration and amplitude distributions of recessions and recoveries are more skewed to the right for emerging markets than for advanced countries, confirming that the former group displays a much wider variation with respect to these statistics.

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[22] There is no difference across recessions in terms of median duration. There is no noticeable difference between advanced and emerging market countries in terms of median duration of recessions, but recoveries take longer in emerging markets than in advanced economies.

Behavior of financial variables during business cycles

In terms of financial variables, although credit typically continues to grow, it does so at a slower rate during recessions (Table 1B). Credit growth does vary significantly though between advanced countries and emerging markets. While it grows in advanced countries, it contracts in emerging markets during recessions. Both house and equity prices fall in recessions, with much sharper declines in emerging markets than in advanced countries. Exchange rate tends to appreciate slightly in advanced countries whereas it depreciates in emerging ones. During recoveries, both credit and equity prices tend to grow, but house prices continue to decline. The increase in equity prices is three times larger in emerging markets than in advanced countries. The greater volatility in asset prices reflects, in large part, the more incipient level of financial markets development in the emerging economies, with often weak banking systems and thin equity markets. It also reflects their greater sensitivity to developments in international financial markets, including being more exposed to the volatility of capital flows.[23]

V.2. Financial Cycles: Upturns and Downturns

Frequency of financial cycles

We identify more than 1200 full financial cycles (1213 financial downturns and 1269 upturns). In particular, our full sample features 218 downturns in credit, 141 in house prices, 384 equity prices, and 470 in exchange rates. In parallel, the full sample includes 225, 145, 398, and 501 upturns in credit, house prices, equity prices, and exchange rates, respectively (Table 2A). Since exchange rates and equity prices are more volatile than credit and house prices, they feature more upturns and downturns than the latter ones. Advanced economies have more episodes than emerging markets since we have a longer series for the former. In the case of house prices, for example, the number of upturns (downturns) in advanced countries is 114 (114) whereas it is only 27 (31) in emerging markets because of their scarce coverage of house prices. The sample of equity cycles in emerging markets is roughly half that of advanced countries since active equity markets have only been in existence for the past two decades in many emerging markets.

Duration and amplitude of financial cycles

In terms of duration, downturns (upturns) of financial cycles tend to be longer than recessions (recoveries). Episodes of house price downturns, for instance, persist for about 8 quarters and other financial variables typically feature downturns lasting about five to seven quarters.

[23] We also examine the temporal behavior of a select set of macroeconomic and financial variables around recessions and recoveries. Around a recession, the evolution of output growth is as expected. Both investment and industrial production start slowing down ahead of the beginning of a recession. Credit growth also slows down, by some two or three percentage points before a recession starts, and then by another two percentage points over the recession period, typically not returning to pre-recession growth rates for at least three years after its onset. Recessions are often also preceded by slowdowns in the growth rates of asset prices. During a recovery, both output and industrial production start registering positive growth after 2-3 quarters following the trough. These results are available from the authors upon request.

Financial upturns are often longer than downturns, i.e., it takes a longer period of time for a financial variable to reach its previous peak after it touches its trough. For example, credit recoveries on average last about 10 quarters. House price recoveries typically last a long time with the mean of 13 quarters, which suggests a skewed distribution. Equity prices and exchange rates also take a long time to recover, 18 and 12 quarters, respectively.

Financial cycles are often more pronounced than business cycles, with financial downturns in particular being deeper and more intense than recessions. A typical credit downturn episode corresponds to about a 6 percent decline in credit. Episodes of house and exchange rate downturns mean falls of about 6-7 percent in the respective asset price. Equity price downturns are often the deepest among the financial downturns, typically 28 percent for the full sample. The strength of upturns differs across financial markets. Equity prices' upturns are the sharpest, some 25 percent. Credit recoveries imply only a 6 percent increase and increases in house prices and exchange rates about 4 percent.

Measuring the speed of an episode by its slope, downturns and upturns in financial cycles are often much faster than those in business cycles, confirming that financial variables adjust much more quickly than real ones do. Equity price downturns tend to be three to four times faster than downturns in other financial variables. Conversely, credit recoveries, house prices and exchange rates imply a 1.3 to 1.6 percent per quarter rate of recovery, while equity prices typically recover at a rate of 6 percent per quarter.

There are some differences in the main features of financial downturns across advanced and emerging market countries. Noticeable, while not necessarily longer, financial downturns are much sharper in emerging markets than in advanced countries. The mean duration of credit contractions, for example, is about the same, but contractions in advanced countries are only one-third as deep compared to those in emerging markets. Periods of equity declines and recoveries in advanced countries last as long as those in emerging markets do, but declines and recoveries are much less in advanced countries. Consistent with the more volatile nature of capital flows, downturns and upturns of exchange rates in emerging markets are twice as large as those in advanced countries.

Not all financial variables move in the same way during financial downturns or upturns (Table 2B). During downturns of credit and house prices, most other financial variables also decline. However, during house price downturns credit continues to expand probably because of the longer duration of housing downturns than credit ones. Downturns in equity prices and exchange rates, in contrast, are not associated with declines in other financial variables.

Behavior of macroeconomic variables during financial cycles

We also examine changes in macroeconomic variables during financial cycles (Table 2C). Episodes of financial downturns are associated with a slightly slower growth in the real sector,

but not necessarily with an outright contraction.[24] This is in part due to financial downturns typically lasting longer than recessions do, so that even if a recession overlaps with the financial downturn, the real economy registers an expansion over the course of the financial downturn. However, the labor market stays depressed during these episodes and some components of GDP experience declines. Credit contractions, for example, do coincide with a decline in investment (typically 1.2 percent over the course of a credit contraction episode, with the decline even sharper in emerging markets, 5.8 percent). As expected, upturns in financial markets tend to correspond to expansions in the real economy.[25] However, as we discuss later in the paper, when recessions (recoveries) coincide with financial disruptions (booms), they tend to become much deeper (stronger).

VI. Implications of Coincidence of Business and Financial Cycles

The previous section presented a summary of the main features of business and financial cycles in our sample. Although we briefly described how macroeconomic and financial variables behave over the course of business and financial cycles, we have yet to discuss the degree of synchronization of these cycles and the implications of coincidence in business and financial cycles. In this section, we first examine the synchronization of business and financial cycles. Next, we analyze the implications of intense episodes of financial cycles, i.e., financial disruptions and booms. This is followed by a brief analysis of the main features of the recessions and recoveries when they are accompanied by disruptions and booms, respectively.

VI.1. Synchronization of Business and Financial Cycles

Table 3 presents the degree of synchronization between business and financial cycles by reporting the concordance statistics for cycles in output and those in each of the four financial variables. Here we first compute the concordance between business and financial cycles of each country in our sample, and then calculate several summary statistics of the concordance.

Cycles in output and credit appear to be the most highly synchronized. The extent of synchronization between output and credit ranges from a low of 0.45 to a high of 0.94 with a median (mean) of 0.80 (0.78), i.e., cycles in output and credit are typically in the same phase about 80 percent of the time. The concordance statistic for cycles in output and house prices is slightly lower than that for output and credit. Cycles in output and exchange rates tend to display the lowest degree of concordance: between 0.36 and 0.72 with a median (mean) of 0.54 (0.55). For equity prices, the median (mean) concordance is 0.58 (0.60). We also check for the statistical significance of the concordance index at the country level. These tests show cycles in credit and output to be statistically significantly concordant in 60 percent of the countries, cycles in output

[24] For example, the average quarterly growth rate of output is typically around 0.4 (0.4) percent when there is an episode of credit (house price) downturn whereas it is around 0.9 (0.8) percent for the full sample.

[25] The average quarterly growth rate of output is typically around 1 percent when there is an episode of house price upturns whereas it is around 0.8 percent for the full sample.

and house prices in 53 percent, and cycles in output and exchange rates (equity prices) in less than 45 (25) percent.[26]

There are differences in concordance between advanced and emerging market countries. Advanced countries typically display a higher degree of synchronization between cycles in output and credit and between cycles in output and house prices than emerging markets do. This may reflect the greater financial development in advanced countries, and the associated greater importance of the supply of credit for the real economy. The relative importance of housing for advanced countries is no surprise, since few emerging markets have well developed housing finance markets. Furthermore, data on house prices is more scarce for emerging markets. In contrast, emerging markets feature a stronger degree of synchronization between cycles in output and equity prices. This could be because equity markets in emerging markets are more affected by external financial markets, which at the same time also drive more of emerging markets' real economies.

These results are broadly consistent with those based on different measures of synchronization. For example, when we use simple correlations between cycles using the growth rates of each series, we find that the correlations between output and credit (and output and house prices) exceed those between output and equity prices or exchange rates. Irrespective of the methodology used, the extent of the synchronization between output and exchange rates is the lowest consistent with the weak association between activity and exchange rate movements.

VI.2. Intense Financial Cycles: Financial Disruptions and Booms

We now turn our attention to the more intense forms of financial cycles: financial disruptions and booms. As we explain in section IV, financial disruptions (booms) correspond to the bottom (top) quartile of all events in financial downturns (upturns). Financial disruptions can take different forms: a credit crunch, a house/price bust, or a collapse in exchange rate. Similarly, financial booms can take the form of a boom in credit, house/equity price, and exchange rate. Our sample of financial disruptions and booms is the combination of the samples of financial disruptions and booms from the groups of advanced and emerging market countries.[27]

Table 4 summarizes the main features of financial disruptions. We identify 54 credit crunches, 34 house price busts, 95 equity price busts, and 116 exchange rate collapses. By design, compared with downturns, financial disruptions tend to last longer and result in much larger declines in financial variables. Disruptions in credit, house and equity prices, for example, are two to three times longer than other downturns in these variables. The amplitude of financial disruptions is also significantly greater. Credit crunches and house price busts, for example, lead to roughly seven times larger drops than other downturns. Moreover, disruption episodes are not only much longer, they are also more violent with much faster declines per quarter.

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[26] The results at the country level are available from the authors upon request.

[27] If we use the full sample to identify the episodes of financial disruptions and booms, we will end up with a biased sample, since financial cycles in emerging markets are more pronounced than advanced economies. The results we present here are preserved in the subsamples of advanced and emerging market countries as well.

In terms of duration, the episodes of downturns (busts) of house prices last the longest of all financial variables. The duration of a typical house price bust is about 18 quarters whereas a credit crunch (or an equity bust) lasts about 11 quarters. While less persistent than house price downturns, drops in equity prices are much larger. In particular, a typical episode of a house price downturn (bust) leads to a 6 (30) percent drop in house prices, while an equity price downturn (bust) tends to result in a 28 (58) percent fall in equity prices. Downturns in equity prices are much more violent than those in other financial variables with a much higher slope.

Although output often slows down during financial downturns, it does not necessarily contract, since these episodes do not always overlap with recessions and last much longer than recessions do. As for credit and house price downturns, while output continues to grow during episodes of equity price and exchange rate downturns, they do so at lower rates than typical. Both credit crunches and house price busts are associated with negative investment growth, but there is no decline in investment during downturns of equity prices and exchange rates. The rate of unemployment rises during financial downturns, with house price busts associated with especially large increases in unemployment rates.

We next analyze the main implications of financial boom episodes (Table 5). Our sample of financial booms includes 44 credit booms, 35 booms in house prices, 99 booms in equity prices, and 118 booms in exchange rates. By design, episodes of financial booms are typically associated with much larger increases in financial variables over relatively shorter time periods than other upturns are. The change in a financial variable over the course of a boom is about three to five times larger than it is during other upturns. Similarly, the slope of a typical boom episode is three times higher than that of other financial upturns.

Compared with booms in other financial variables, house prices take the longest time to reach their previous peak, while equity prices register the largest gain during boom periods (about 63 percent compared to around 13-18 percent for the other financial variables). Importantly, the real economy tends to grow much faster during episodes of credit and house price booms than during other upturns. For example, both output and consumption register typically much higher growth rates during credit and house prices booms than during typical upturns in these financial variables.[28]

VI.3. Business Cycles Coinciding with Financial Disruptions and Booms

We now analyze the features of recessions and recoveries that are associated with financial disruptions and booms, respectively. As we explain in section IV, if a recession (recovery) episode starts at the same time or after the beginning of an ongoing financial disruption (boom) episode, we consider that recession (recovery) to be associated with the respective financial disruption (boom). To provide a sense of distributions, we also examine those recessions (recoveries) coinciding with severe financial disruptions (strong financial booms). These severe disruption (strong boom) episodes consist of the bottom (top) 12.5 percent of all downturns

[28] For example, the average quarterly growth rate of output is around 1.1 (1.3) percent when there is an episode of credit (house price) boom whereas it is around 0.9 (0.8) percent for the full sample.

(upturns) in financial variables, or, in other words, the bottom (top) half of all disruptions (booms).

Before we present the implications of recessions and recoveries associated with financial disruptions and booms, we briefly examine how the likelihood of the former set of episodes changes conditional on having the latter ones. The unconditional probability of being in a recession or a recovery in any given quarter is around 20 percent (Table 6). However, if there is a financial disruption (or a boom) episode in the same quarter, the probability of having a recession (or a recovery) increases substantially. For example, the likelihood of a recession taking place goes up to 35 to 40 percent if there is also a disruption episode in credit, housing or equity markets. Similarly, if a credit (house price) boom is already underway, the probability of having a recovery rises to roughly 56 (41) percent. Neither rapid growth in equity prices nor a strong appreciation of exchange rates is, however, associated with a pick up in the likelihood of a recovery in the real economy.

Recessions associated with disruptions

A major advantage of our database is that we have a large number of recessions accompanied by various forms of financial disruptions (Table 7A). Specifically, we identify 36, 40, 72 and 42 recession episodes associated with credit crunches, house price busts, equity price busts, and exchange rate collapses, respectively. In other words, in about one out of six recessions, there is also a credit crunch underway, and, in about one out of three recessions, also a house price bust. Equity price busts overlap for about one-third of recession episodes whereas exchange rate collapses coincide with recessions for one-fifth of episodes.

Recessions accompanied with financial disruptions tend to be longer and deeper than other recessions. In particular, recessions associated with house price busts are significantly longer than recessions without such disruptions. Recessions with house price busts as well as credit crunches result in significantly larger drops in output, and correspondingly greater cumulative output losses relative to those without such episodes. Investment declines significantly along with a substantial pick up in the rate of unemployment during recessions coinciding with house price busts. Although recessions associated with equity busts or exchange rate collapses also tend to cause larger cumulative output losses, these adverse affects are not significantly larger than those without such episodes. Moreover, the durations of recessions associated with these types of disruptions are no different than those without.

When associated with a credit crunch or house price bust, which type of recession is more costly? The answer depends in part on the metric used to measure the cost of recessions. If we use amplitude as the relevant metric, then recessions associated with credit crunches appear to be more costly than those with house price busts. However, if we consider the duration of recessions, the decline in investment, or the rise in the rate of unemployment during recessions, then the recessions with house price busts are slightly more painful than those with credit crunches.

A recession associated with one type of financial disruption is often accompanied with stress in other financial markets (Table 7B). Recessions accompanied with credit crunches mean not only

a significant decline in credit, but they also coincide with substantial drops in both house and equity prices.[29] There are also recessions accompanied by various combinations of a credit crunch and an asset (house, equity price or exchange rate) bust at the same time. Although the number is small, a recession associated with both a credit crunch and an asset price bust often results in a larger cumulative output loss than that with only a crunch or a bust.[30]

Recoveries associated with booms

We find altogether 15, 13, 43, and 30 recovery episodes associated with booms in credit, house prices, equity prices, and exchange rates, respectively (Table 8A). As financial disruptions appear to make recessions longer and deeper, so do financial booms tend to coincide with shorter and stronger recoveries. For example, recoveries associated with credit or house price booms are associated with stronger output growth. In addition, these episodes experience much larger growth in consumption, investment, and industrial production. In the case of recoveries associated with equity price and exchange rate booms, output growth is also higher but the duration of recovery can be longer as well. Only recoveries associated with house price booms translate into a significant decline in the rate of unemployment. With respect to duration, recoveries coinciding with house price booms tend to be significantly shorter, whereas recoveries overlapping with exchange rate booms are typically much longer than those without such episodes.

Recoveries with financial booms are not necessarily accompanied with rapid growth in every financial variable (Table 8B). For example, house prices rarely register growth during recoveries associated with other types of financial market booms, probably because of the unusually long nature of downturns in house prices. Exchange rates also stay depressed during recoveries associated with other types of financial booms. In contrast, both credit and equity prices increase during recoveries associated with any type of financial boom.

VII. Interactions between Business and Financial Cycles: A Formal Analysis

We next conduct regression analyses to understand better the role of financial and other factors in shaping recessions and recoveries. As reported earlier, financial cycles appear to play a key role in shaping the recessions and recoveries. In particular, recessions associated with financial disruptions, especially credit crunches and house price busts, tend to be longer and deeper, and recoveries slightly shorter and stronger when combined with booms in financial markets. These findings do not, however, control for other factors that potentially influence business cycles. One is the strength of the global economy. Second are a number of country factors, such as country

[29] House prices also fall statistically significantly more in recessions with crunches than those without. This might stem from the high sensitivity of housing activity to credit conditions (Kiyotaki and Moore, 1997; Mendoza and Terrones, 2008).

[30] There are 11 recessions associated with both a credit crunch and an equity price bust. 6 recessions are accompanied with a credit crunch and a house price bust at the same time. There are only 4 recessions in our sample that are accompanied by a trilogy of a credit crunch, a house price, and an equity price bust. The median cumulative loss of the 6 recessions associated with both a credit crunch and a house price bust is -4.7 percent. The average duration of these episodes is about 4.2 quarters.

size, openness to trade and financial flows, policies, institutional development, that all could have an impact on the evolution of business cycles. In our regressions, we use our financial cycle variables together with these other factors to examine the main determinants of the duration and amplitude of recessions, and the factors explaining the amplitude of recoveries. In light of our findings, we then study whether the most recent recessions are exceptional in terms of their duration or amplitude.

VII. Duration and Amplitude of Recessions

Duration of recessions

The large variation in duration of recessions across countries reported earlier may reflect a variety of country-specific factors. For example, some countries may be more prone to severe and/or long-lasting recessions reflecting the levels of their development, quality of institutions, country size, etc. Since we have multiple recession observations for each country, we can use panel regressions with fixed-effects to capture all country-specific factors, both observed and latent.

The first column of Table 9A reports the estimation results of the Weibull duration model with only country fixed-effects. For this model, fixed-effects have a proportional impact on the baseline hazard function, common to all countries in the sample. The estimate of p, the Weibull distribution parameter, is 2.4 implying that we can reject the H_o: p=1 against H_1: p >1. In other words, there is evidence of positive duration dependence—that is, recessions are more likely to end, the longer they have gone on.[31]

We next examine the impact of financial disruptions. For this, we include dummy variables—which take the value of one, if the recession coincides with a credit crunch or an asset price (i.e. house, equity and exchange rate) bust and zero otherwise—as explanatory variables. Of the four types of financial disruptions we examine, only house price busts have a negative and statistically significant effect (columns (2)-(5)). This confirms that recessions associated with house price busts tend to last longer than other recessions do.[32]

We also check whether including other factors change our main finding of the importance of house price busts. These factors include global conditions—as proxied by the growth rate of world output in the first year of the recession, and the growth rate of oil prices in the run-up to the recession. In addition, we control for two country-specific features: the extent of growth in house prices prior to the recession and the degree of a country's trade openness. Since data for some of these variables are not available for all countries, our sample size reduces to 108

[31] This finding is consistent with the evidence provided by Diebold and Rudebusch (1991) and Ohn, Taylor and Pagan (2004) for the postwar U.S. recessions and by Castro (2008) for recessions in13 advanced economies.

[32] In other words, a house price bust reduces the hazard of ending a recession to almost 0.6 of what it would be otherwise (calculated as $e^{\widehat{\beta_1}}$, where $\widehat{\beta_1}$ is the house price bust coefficient).

observations in some cases. To be consistent across different specifications, we estimate all of our regressions using this smaller set of observations (columns 6-12).

We first run the model without any other explanatory variables (column 6). The estimate of the Weibull distribution parameter is positive, i.e., recessions are characterized by positive duration dependence, and actually rises slightly to 2.6. We next introduce the four financial disruption dummies together. We confirm that the simultaneous occurrence of a house price bust tends to reduce the hazard of ending of a recession (column 7), while the other three financial disruption dummies are not statistically significantly related to the length of a recession (columns 8-10). When we consider all four dummies together (column 11), housing busts is again statistically significantly negative. While the credit bust dummy is positive and statistically significant, this likely reflects the large overlap between house price busts and credit crunches discussed in the previous section.

When we introduce both global and country factors (column 12), we find that greater buoyancy in world output helps countries to emerge faster from recessions. In particular, if the growth rate of world output rises by 1 percentage points, the hazard shifts down by 1.75 percent, and the effect is statistically significant. There is also evidence that greater trade openness is associated with shorter recessions.[33] In addition, an increase in the world oil price in the run-up to the recession is associated with shorter recessions. This effect, while statistically significant, is fairly small economically.

Robustness of results: duration of recessions

We check whether these results are robust to the introduction of other potential factors by augmenting our baseline specification (column 1 in Table 9B) with a set of factors, one at a time. We find our baseline results not to change significantly with the inclusion of these additional variables. In terms of financial indicators, neither financial openness nor financial sector development has a statistically significant effect on the hazard function, either independently (columns 2-3) or when considered jointly (column 4). Similar results are obtained when we include three financial variables: the growth in equity prices, the increase in credit and the degree of real effective exchange rate appreciation in the run-up to the recession. None of these variables is statistically significant, either on their own (columns 5-7) or jointly (column 8). When we consider whether either the occurrence of a banking crisis or a severe financial crisis (as proxied by Reinhart and Rogoff's episodes of the big five banking crises) makes a difference, we find that they reduce the hazard rate, but not in a statistically significant way (columns 9-10).[34]

[33] In particular, if a country's trade openness increases by 1 percentage points, then the hazard rate falls by 1.05 percent, suggesting that it is more likely for more open economies to export their way out of recessions.

[34] Most of these results are also robust to using alternative regression techniques. Specifically, we also estimated the Weibull duration model without fixed effects (not reported here for the sake of brevity).

Amplitude of recessions

We next study the determinants of the amplitude of recessions, the decline in GDP from the peak to the trough of a recession, using the same parsimonious set of explanatory variables and again including country-fixed effects (Table 10A). The first set of regressions confirms our basic findings that recessions associated with financial disruptions are deeper than those without (columns 1-4). All four financial disruption dummies are positive, but only the collapse of exchange rates is statistically significant. When we next use the sample that gives us the richest set of explanatory variables, results change (columns 5-8). In particular, we find that recessions associated with house and equity price busts are statistically significantly deeper, but those with a credit crunch or an exchange rate collapse are not. This finding is also preserved when all four financial disruptions dummies are introduced together (column 9).

We next include the same set of additional explanatory variables used before to explain the duration of recessions: the growth in house prices prior to recessions, the growth of oil price prior to recessions, the extent of trade openness, and the average growth of world output in the first year of the recession. When adding these variables, we find that the dummy for recessions associated with equity price busts is no longer significant (column 10). However, house prices are still positively associated with the amplitude of recessions as the dummy for recessions coinciding with house price busts and the growth in house prices are both significantly positive. Trade openness is significantly associated with less severe recessions, but neither the growth of oil price prior to the recession nor the growth of world output is statistically significant (but the signs of their coefficients are as expected).

Finally, we consider the importance of house prices along with our core set of controls (column 11). Here house price busts and the growth of house prices prior to recessions are both significantly and positively associated with the amplitude of recessions. Results are economically large as well. For example, the amplitude of a recession is on average 1.6 percentage points larger for a recession that coincides with a house price bust than it would be otherwise. Similarly, a 10 percent increase in house prices in the run-up to the recession means a 1 percentage point increase in the amplitude of a recession. Being open to trade flows as well as higher growth in world output help reduce the severity of recessions, likely as external demand can supplant the contractions in domestic demand. In particular, a 1 percent increase in world growth reduces the amplitude of a recession by about 0.4 percentage points. Although the growth of oil price prior to the recession has a positive sign, i.e., it contributes to deeper recessions, it is not significant.

Robustness of results: amplitude of recessions

We examine the robustness of our main finding that recessions associated with house price busts are significantly deeper than other types of recessions by controlling for other variables that potentially affect the amplitude of recessions (Table 10B). Since we focus on the role of financial variables, we first study how the growth rates of credit, equity prices and exchange rates prior to recessions affect the severity of these events. Surprisingly, none of these financial variables is

significant in explaining the amplitude of recessions (columns 2-4).[35] Important for our main result, however, the coefficients on the dummy representing recessions combined with house price busts and on house price growth prior to the recession remain positive and significant.
Next, we consider whether structural characteristics, such as financial openness and financial development, help explain the depth of recessions (columns 5-6). Both of these explanatory variables are not significant while our main findings are preserved. We also examine whether controlling for recessions associated with banking crises changes any of our findings (column 7). These recessions appear to be deeper than others, but the coefficient is not statistically significant. Again, our main results do not change. These results suggest that changes in house prices are important in terms of the costs of recessions, as argued by Cecchetti (2006) among others.[36]

We conclude our robustness tests by controlling for the role of policies. We measure fiscal policy by the change in the growth rate of government expenditure following the beginning of the recession. Monetary policy is measured by the change in the short-term nominal rate during the same period. We include these policy measures separately first, and then together in the regressions (columns 8-10). We find these measures not to be significantly associated with the amplitude of recessions and our benchmark findings to be robust to their inclusion.[37]

VII.2. Amplitude of Recoveries

We next study the factors correlated with the amplitude of recoveries, that is, the increase in output within the first four quarters after the trough of a recession.[38] We again employ panel regressions with country fixed effects (Table 11A). The core set of explanatory variables is very similar to the ones we employed in our earlier models above, but we now also include the depth

[35] Credit does not emerge as a robust determinant of the costs of a recession possibly because the volume of credit starts to decline only after the banks tighten their lending standards. Credit standards (more than the volume of credit) are negatively correlated with economic activity (Lown and Morgan, 2006).

[36] See Leamer (2007) and Muellbauer (2007) about the important role of housing in explaining business cycles. This importance extends to changes in the main components of output in recessions associated with house price busts. As reported, consumption and investment usually register sharp declines during recessions coinciding with house price busts. The larger decline in consumption likely reflects the effects on households of the substantial loss of housing wealth. These sharper declines, in turn, are accompanied by more pronounced drops in employment.

[37] There might be several reasons for the insignificant role of economic policies in our regressions. First, the measures of policies we use might be rather rough approximations since we focus on only two narrow aspects of the policy choices. Second, the impact of policies on output takes time to materialize implying that there are lags between the implementation of policy and its outcome. Third, these policies are potentially endogenous. The last suggests the use of instrumental variables. However, this raises the issue of identifying the proper instruments to use.

[38] We do not study the duration of recoveries since the amplitude of a recovery is measured over a fixed period of four quarters.

of the preceding recession to allow us to test whether economies tend to bounce-back from deeper recessions as argued by some earlier studies.[39]

Results indicate that the deeper the preceding recession, the strongest the recovery (column 1), consistent with earlier results reported in other studies for the United States. The nature of this relation does not change when we include other controls (columns 2-9). In addition, the regression results highlight the importance of external demand to help lift the economy from a recession as the growth of world output is statistically significantly positive in all specifications.

Since our earlier results suggest that recessions accompanied with house price busts are significantly deeper than other types of recessions, it is logical to ask whether recoveries following such recessions with house price busts are different from other recoveries. To address this question we include a dummy variable that takes the value of 1 if the preceding recession is associated with a house price bust and zero otherwise (column 3). The coefficient associated with this dummy variable is statistically significantly negative. In economic terms, the result means that the amplitude of recoveries following recessions with house price busts is on average 1.4 percentage points lower than that of other recoveries.

We next introduce dummy variables representing recoveries associated with financial booms to examine whether financial booms are positively correlated with the strength of recoveries (columns 4-7). The presence of a simultaneous house price boom or a credit boom tends to have a statistically significant and positive impact on the amplitude of the recovery. Simultaneous booms in equity prices or exchange rates during recoveries, however, do not appear to influence the strength of recoveries. When we use all four dummies capturing financial booms together, only the presence of a credit boom during a recovery is statistically significant, along with the amplitude of the preceding recession and the strength of global recovery (column 8).

The last specification (column 9) excludes booms in equity and exchange rates and focuses only on the set of controls that are statistically significantly correlated with the amplitude of recoveries. The results suggest that recoveries from recessions are characterized by a bounce-back effect and that recoveries from recessions associated with housing price busts are relatively weaker. Global growth also helps strengthen recoveries. Moreover, the strength of a recovery depends on financial factors, namely the presence of booms in credit and house prices.

Robustness of results: amplitude of recoveries

We study the sensitivity of our findings to the addition of other variables that potentially affect the amplitude of recoveries (Table 11B). Our main results are broadly unchanged to the inclusion of these additional controls. Although neither openness to trade and financial flows nor financial development appears to be important in shaping recoveries (columns 2-4), a dummy for rapid exchange rate depreciation during a recovery is positive and statistically significant, suggesting

[39] There could be many factors leading an economy to bounce back faster from a deeper recession, such as rapid productivity growth possibly because of the "cleansing" effects of recessions. This issue has been studied in many papers (Friedman, 1993; Sichel, 1994; and Wynne and Balke, 1993).

that a weaker currency might help recovery through stronger net exports (column 5). If the preceding recession is associated with a banking crisis, then the recovery tends to be weaker (column 6), presumably as the supply of external financing is impaired. The dummy for a severe financial crisis is also negative, but not statistically significant (column 7). The effect of a house price boom on the strength of the recovery is always positive, however, in some specifications not statistically significant.[40]

VII.3. Duration and Amplitude of the Latest Recessions

We lastly use our regression models to study the duration and amplitude of the latest wave of recessions around the world. These recessions are in most cases rather unique episodes at both the national and global level. At the national level, the latest recessions have often been much longer and deeper than those in the past. Dubbed the "Great Recession" by many, the recession in the United States, for example, has been one of the most severe and longest of the modern era. At the global level, 2009 saw the deepest and the most synchronized global recession in the post-World War II period.[41] Although multiple factors explain the severity of the latest recessions, it is obvious that financial market disruptions played important roles prior to and during these episodes.

The question arises whether the severity of these recessions was to be expected based on the extent of financial market disruptions. To shed light on this question, we use our baseline specifications explaining the duration and amplitude of recessions (column 12 in Table 9A and column 10 in Table 10A). Employing these models, we obtain out-of-sample forecasts of the duration and amplitude of each country's latest recession. Since quite a few countries still have recessions ongoing and some other countries did not experience a recession, the out-of-sample forecast does not include all the countries used in the regression analysis. Importantly, to avoid any bias, we did not include the latest observations in the exercise nor did we go back to revise our model on the basis of the (lack of) accuracy of the forecasts obtained.

Figure 2 depicts the mean of the actual and predicted duration and severity of these recessions. It shows that the latest recessions are on average relatively short, but more severe than predicted by our simple model. This finding of over-predicting duration and under-predicting amplitude is also the case for most countries. What might explain this result? While the financial market disruptions were particularly viral during this period, government interventions (fiscal, monetary and financial) were also unprecedented. This suggests that, although policy makers may have under-estimated the implications of various financial disruptions for the real economy—and the severity of the most recent recessions could thus not be undone, they were able (or forced by

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[40] We also check the robustness of our results when recovery is measured by the amplitude over 6 quarters after the trough (instead of four quarters in our baseline regressions). Although all of our headline results are preserved, the presence of a credit boom during the recovery is no longer statistically significant. These results are available from authors upon request.

[41] Kose, Loungani, and Terrones (2009) identify four global recessions over the past fifty years—1975, 1982, 1991 and 2009. The 2009 recession was easily the most severe and the most synchronized one among these four episodes.

events) to respond in a timely manner with robust policies to mitigate the adverse effects in duration.[42]

VIII. Conclusion

As recent events have made clear once again, our empirical knowledge of the interactions between real and financial sectors during different phases of business and financial cycles is still rather limited. This is in large part as most studies have a limited set of observations to work with, using often a single or limited set of countries. Although the literature focusing on the macroeconomic implications of financial crises has used a broader sample of cases, that approach has some clear disadvantages as well. The importance of studying these interactions though can no longer be ignored—the huge costs of recent events being the latest.

Our paper addresses some of these gaps in the literature. By studying business and financial cycles in a large number of countries over a long period of time, we are able to better identify their properties, including how cycles in advanced countries differ from those in emerging markets. By using a well established methodology for the classification of events, we avoid the subjective dating common to the crisis literature, and consider financial events that create stress with possible macroeconomic consequences, but not necessarily crises. In addition, we consider four types of financial events separately, which the crisis literature often lumps together, allowing us to investigate which financial event is more important. Most importantly, our study analyzes the implications when a business cycle phase (recession or recovery) coincides with certain financial market events (disruption or bust) for a number of macroeconomic and financial outcomes. Using our large data set and applying various regression approaches, we conclude that financial disruption and booms, in particular those related to housing and credit markets, are associated with the duration and depth of recessions and the intensity of recoveries.

There are important insights and challenges from our study for future research. While we have discovered quite stark regularities in how the interactions between business and financial cycles can affect macroeconomic and financial outcomes, the current theoretical literature appears still far from either being able to explain these regularities or from capturing them in models useful for policy making. Models of the real sector with realistic forms of financial intermediation are still in their infancy. For policy makers, the current state of dynamic stochastic general equilibrium models is still limited in characterizing financial intermediation in normal times, let alone modeling the type of non-linear behavior observed during financial disruptions and booms. Our identification of what types of financial cycles are the most important from a macroeconomic perspective and their various properties can help guide this future research agenda.

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[42] By design, our (simple) models imply some large forecast errors. Since the models we use have fixed effects, there is a tendency to over-predict (or under-predict) the duration (amplitude) of the latest recession episodes if the specific country has had a history of very deep or long (shallow or short) recessions (note that the country specific-history could be limited to a very few recessions). We observe indeed that the forecasts for countries such as Thailand, which had very few, but mostly severe and long recessions, imply much deeper recessions than actually happened. Otherwise, there are no strong patterns in the forecast errors across countries.

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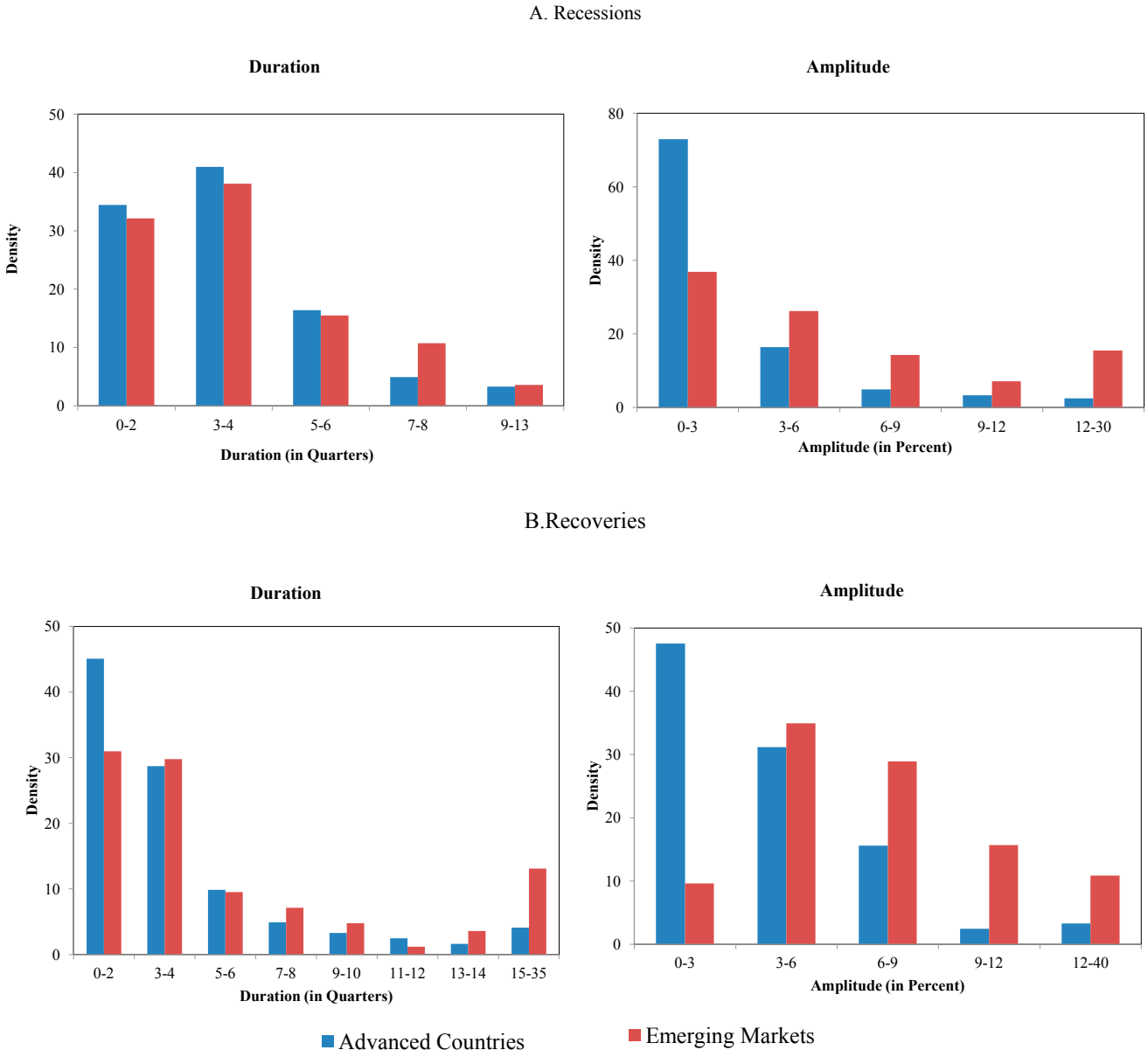
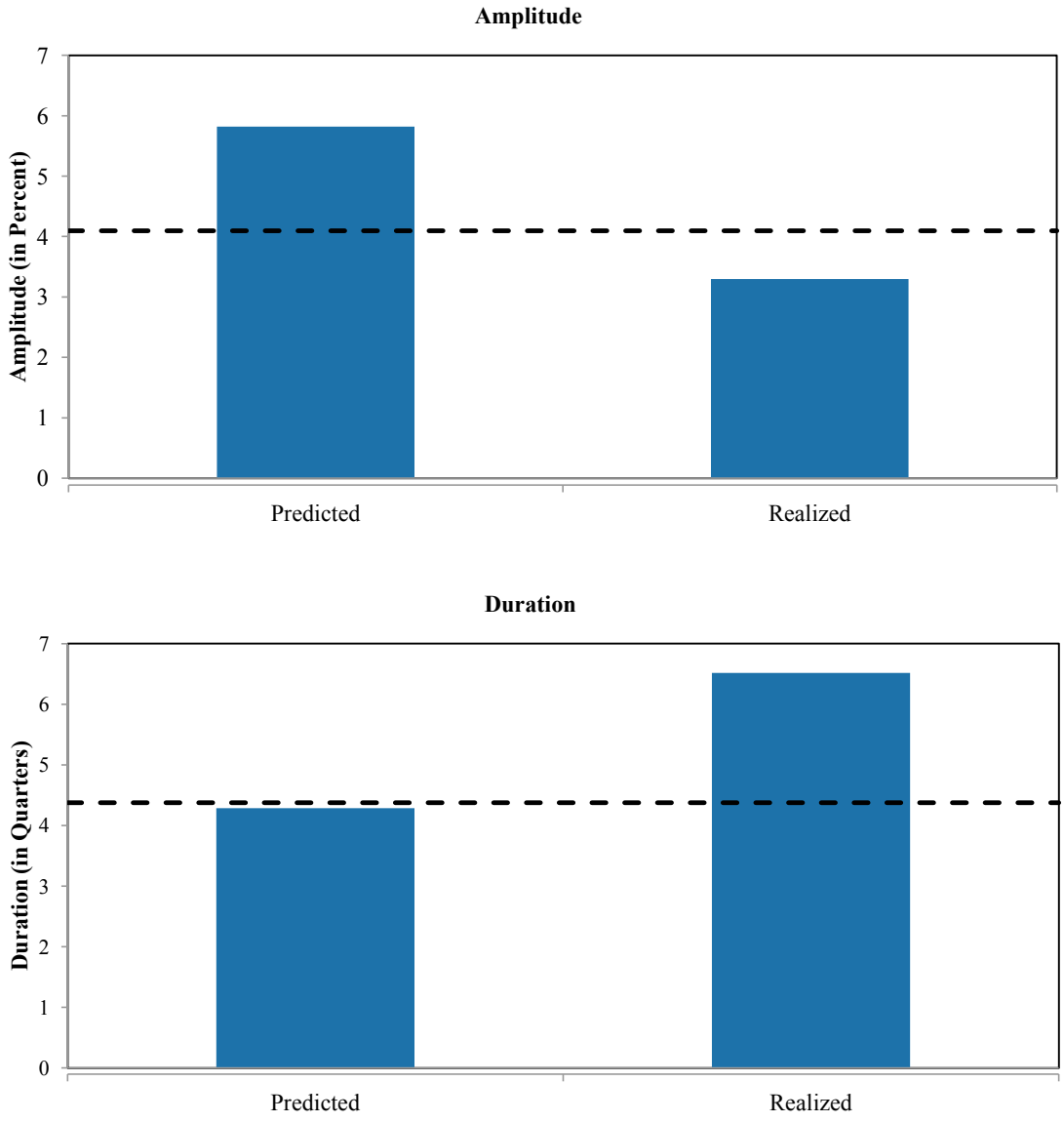
Figure 1. Distributions of Duration and Amplitude



Notes : Duration for the recessions is calculated as the time from peak to trough in output. For recoveries, the duration is calculated as the time it takes for output to attain the level it reached at the previous peak. The amplitude for recessions is the peak to trough decline in output. The amplitude of a recovery is calculated as the percentage change in amplitude for the four quarters after the trough in output. The x-axis for each graph provides the ranges of values for duration and amplitude, respectively. The y-axis is the density of each range as a part of the total, i.e. the height of the bar represents the percentage of observations for which the duration or amplitude falls within the range specified on the x-axis. The last of the sample subsets on the x-axis is larger than the rest and shows the percentage of extreme values.

Figure 2. Amplitude and Duration of Latest Recessions



Notes: Means of forecasted and observed amplitude and duration of recent recessions shown. Dashed line represents the mean of the amplitude and duration of recessions associated with severe house price busts in the sample.

Table 1A. Business Cycles: Basic Features

		Output					Macroeconomic Variables			
	Number of Events	Time in Event	Duration [1/]	Amplitude	Cumulative Loss	Slope	Consumption	Investment	Industrial Production	Unemployment Rate [2/]
Recessions										
Full Sample	206	0.25	3.75	-2.48	-3.91	-0.71	-0.37	-6.12	-5.22	0.71
		[0.21]	*[3.00]*	*[-4.22]*	*[-10.75]*	*[-1.15]*	*[-1.13]*	*[-10.10]*	*[-5.14]*	*[1.22]*
Advanced Countries	122	0.20**	3.64	-1.87***	-3.04***	-0.50***	-0.07***	-4.15***	-4.14***	0.57
		*[0.17***]*	*[3.00]*	*[-2.63***]*	*[-6.40***]*	*[-0.78***]*	*[-0.16]*	*[-5.93***]*	*[-3.99**]*	*[1.09]*
Emerging Markets	84	0.33	3.92	-4.81	-8.93	-1.24	-2.78	-13.13	-8.11	1.01
		[0.29]	*[3.00]*	*[-6.53]*	*[-17.08]*	*[-1.69]*	*[-2.80]*	*[-17.09]*	*[-6.93]*	*[1.51]*
Recoveries										
Full Sample	208	0.26	5.16	4.39	…	1.13	3.21	3.53	5.38	0.26
		[0.24]	*[3.00]*	*[5.23]*	…	*[1.65]*	*[4.24]*	*[5.31]*	*[6.26]*	*[0.27]*
Advanced Countries	122	0.17**	4.28**	3.09***	…	0.78***	2.26***	2.80***	4.57***	0.40***
		[0.13]*	*[3.00**]*	*[4.04***]*	…	*[1.40**]*	*[2.76***]*	*[2.65***]*	*[4.67***]*	*[0.48***]*
Emerging Markets	86	0.28	6.43	6.41	…	1.56	5.49	7.33	8.36	-0.31
		[0.29]	*[4.00]*	*[6.93]*	…	*[2.02]*	*[6.76]*	*[9.63]*	*[8.64]*	*[-0.16]*

Notes : All statistics except "Duration" and "Time in Event" correspond to sample medians. Means are in brackets. For the statistics "Time in Event" and "Duration" means are shown with medians in brackets. Time in Event refers to the ratio of the number of quarters in which the economy is in recession or recovery over the full sample period. Duration for recessions is the number of quarters between peak and trough. Duration for recoveries is the time it takes to attain the level of output at the previous peak after the trough. The amplitude for the recessions are calculated based on the decline in each respective variable during the peak to trough decline in output. The amplitude for the recoveries are calculated based on the one year change in each respective variable after the trough in output. Cumulative loss combines information about the duration and amplitude to measure the overall cost of a recession and is expressed in percent. The slope of the recession is the amplitude from peak to trough divided by the duration. The slope of the recoveries is the amplitude from the trough to the period when output 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 emerging and advanced country means or medians.

[1/] Number of quarters.

[2/] Change in levels.

Table 1B. Business Cycles: Financial Variables

	Credit	House Price	Equity Price	Exchange Rate
Recessions				
Full Sample	0.33	-2.93	-9.21	0.09
	[-1.18]	*[-4.96]*	*[-0.23]*	*[-2.11]*
Advanced Countries	0.75***	-2.31***	-5.93***	1.09***
	*[1.07**]*	*[-3.57**]*	*[-4.43]*	*[1.00***]*
Emerging Markets	-2.07	-9.22	-17.21	-2.92
	[-4.39]	*[-12.32]*	*[6.39]*	*[-6.60]*
Recoveries				
Full Sample	2.37	-1.09	10.07	-0.18
	[2.40]	*[-0.16]*	*[20.77]*	*[1.50]*
Advanced Countries	2.97	-1.09	5.39**	-0.70**
	[3.20]	*[-0.34]*	*[9.01**]*	*[-1.00**]*
Emerging Markets	1.97	-0.47	15.89	2.01
	[1.28]	*[0.82]*	*[38.82]*	*[5.02]*

Notes: All statistics correspond to sample medians. Means are in brackets. The amplitude for the recessions are calculated based on the decline in each respective variable during the peak to trough decline in output. The amplitude for the recoveries are calculated based on the one year change in each respective variable after the trough in output. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between emerging and advanced country means or medians.

Table 2A. Financial Cycles: Basic Features

	Downturns					Upturns				
	Number	Time in Downturn	Duration [1/]	Amplitude	Slope	Number	Time in Upturn	Duration [1/]	Amplitude	Slope
Credit										
Full Sample	218	0.35	6.03	-6.00	-1.37	225	0.35	10.10	5.81	1.64
		[0.36]	*[4.00]*	*[-13.38]*	*[-2.16]*		*[0.32]*	*[4.00]*	*[9.54]*	*[2.81]*
Advanced Countries	114	0.30	5.50	-4.03***	-0.93***	115	0.26	8.00**	4.36***	1.23***
		[0.30]	*[4.00**]*	*[-6.68***]*	*[-1.25***]*		*[0.27]*	*[4.00*]*	*[6.44***]*	*[2.01***]*
Emerging Markets	104	0.37	6.61	-11.83	-1.94	110	0.31	12.66	9.73	2.29
		[0.38]	*[5.00]*	*[-20.73]*	*[-3.15]*		*[0.21]*	*[5.50]*	*[12.76]*	*[3.79]*
House Price										
Full Sample	141	0.45	8.37	-6.22	-1.12	145	0.45	13.25	3.95	1.25
		[0.43]	*[6.00]*	*[-11.73]*	*[-1.39]*		*[0.48]*	*[6.00]*	*[6.31]*	*[1.72]*
Advanced Countries	114	0.41**	8.47	-5.99	-1.06***	114	0.42**	14.25**	3.62**	1.19**
		*[0.40***]*	*[6.00]*	*[-10.85]*	*[-1.22**]*		*[0.46**]*	*[6.50]*	*[5.64*]*	*[1.54*]*
Emerging Markets	27	0.61	7.93	-8.27	-1.30	31	0.23	8.24	7.29	2.13
		[0.57]	*[6.00]*	*[-15.49]*	*[-2.10]*		*[0.26]*	*[5.00]*	*[8.86]*	*[2.60]*
Equity Price										
Full Sample	384	0.44	6.38	-28.42	-4.78	398	0.60	18.61	24.53	6.10
		[0.44]	*[5.00]*	*[-31.23]*	*[-5.66]*		*[0.65]*	*[7.00]*	*[38.64]*	*[8.42]*
Advanced Countries	245	0.45	6.64	-23.70***	-4.07***	251	0.63**	21.93***	20.09***	4.75***
		[0.44]	*[5.00]*	*[-27.38***]*	*[-4.70***]*		*[0.66***]*	*[7.00]*	*[24.08***]*	*[5.99***]*
Emerging Markets	139	0.43	5.93	-36.63	-6.29	147	0.47	12.32	38.48	8.54
		[0.43]	*[5.00]*	*[-38.03]*	*[-7.33]*		*[0.49]*	*[7.00]*	*[63.67]*	*[13.02]*
Exchange Rate										
Full Sample	470	0.46	5.95	-7.15	-1.32	501	0.42	12.20	4.44	1.30
		[0.46]	*[5.00]*	*[-11.40]*	*[-2.08]*		*[0.37]*	*[5.00]*	*[6.88]*	*[2.03]*
Advanced Countries	279	0.44	5.81	-5.14***	-1.06***	291	0.48**	13.38*	3.23***	1.00***
		[0.45]*	*[5.00]*	*[-7.63***]*	*[-1.37***]*		*[0.47***]*	*[5.50]*	*[4.32***]*	*[1.35***]*
Emerging Markets	191	0.48	6.14	-10.99	-1.87	210	0.31	9.93	6.71	2.11
		[0.47]	*[5.00]*	*[-16.91]*	*[-3.12]*		*[0.27]*	*[5.00]*	*[10.45]*	*[3.37]*

Notes: All statistics except "Duration", "Time in Downturn", and "Time in Upturn" correspond to sample medians. Means are in brackets. For the statistics "Time in Downturn", "Time in Upturn", and "Duration" means are shown with medians in brackets. Time in Upturn (Downturn) refers to the ratio of the number of quarters in which the economy is in an upturn (downturn) over the full sample period. 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 are calculated based on the decline in each respective variable during the peak to trough decline in the financial variable The amplitude for the recoveries are calculated based on the one year change in each respective variable after the trough in each respective financial variable. 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 period where 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 emerging and advanced country means or medians.

[1/] Number of quarters.

Table 2B. Financial Cycles: Financial Variables

	Downturns				Upturns			
	Credit	House Price	Equity Price	Exchange Rate	Credit	House Price	Equity Price	Exchange Rate
Credit								
Full Sample	-6.00	-3.13	-2.79	0.88	5.81	-0.50	7.20	0.33
	[-13.38]	*[-4.40]*	*[7.57]*	*[1.42]*	*[9.54]*	*[0.99]*	*[16.49]*	*[-0.32]*
Advanced Countries	-4.03***	-2.76	-3.60	0.89	4.36***	-0.55	5.78	-0.02
	*[-6.68***]*	*[-3.73]*	*[-1.49**]*	*[1.36]*	*[6.44***]*	*[0.52]*	*[8.57*]*	*[-1.20]*
Emerging Markets	-11.83	-4.98	1.09	0.79	9.73	-0.44	14.56	0.84
	[-20.73]	*[-6.64]*	*[18.82]*	*[1.49]*	*[12.76]*	*[2.57]*	*[25.61]*	*[0.60]*
House Price								
Full Sample	4.05	-6.22	-0.54	-0.36	5.18	3.95	9.21	-0.12
	[5.47]	*[-11.73]*	*[4.92]*	*[-0.29]*	*[5.82]*	*[6.31]*	*[15.61]*	*[-0.06]*
Advanced Countries	3.53	-5.99	-0.29	-0.11	4.87	3.62**	7.76**	-0.01
	[4.00]*	*[-10.85]*	*[6.82]*	*[-0.46]*	*[5.72]*	*[5.64*]*	*[12.27*]*	*[0.22]*
Emerging Markets	5.10	-8.27	-4.58	-1.06	6.65	7.29	25.21	-1.08
	[11.70]	*[-15.49]*	*[-3.12]*	*[0.44]*	*[6.18]*	*[8.86]*	*[28.28]*	*[-1.15]*
Equity Price								
Full Sample	6.18	0.81	-28.42	0.36	5.64	1.34	24.53	0.56
	[8.99]	*[0.77]*	*[-31.23]*	*[0.14]*	*[6.29]*	*[2.59]*	*[38.64]*	*[0.18]*
Advanced Countries	5.51	1.31***	-23.70***	1.06***	5.22	1.39	20.09***	0.20*
	[9.62]	*[2.19**]*	*[-27.38***]*	*[1.21**]*	*[5.68]*	*[2.44]*	*[24.08***]*	*[0.15]*
Emerging Markets	8.20	-3.82	-36.63	-0.85	6.55	1.29	38.48	1.63
	[7.93]	*[-6.38]*	*[-38.03]*	*[-1.74]*	*[7.30]*	*[3.33]*	*[63.67]*	*[0.24]*
Exchange Rate								
Full Sample	7.49	1.36	4.61	-7.15	5.76	1.36	5.66	4.44
	[10.09]	*[2.32]*	*[18.16]*	*[-11.40]*	*[5.44]*	*[2.10]*	*[10.92]*	*[6.88]*
Advanced Countries	6.73	2.09**	6.42***	-5.14***	5.37	1.73*	2.86***	3.23***
	[10.10]	*[3.11*]*	*[12.80]*	*[-7.63***]*	*[5.32]*	*[2.27]*	*[5.21***]*	*[4.32***]*
Emerging Markets	9.74	-1.66	-3.66	-10.99	6.91	-1.77	11.71	6.71
	[10.07]	*[-1.67]*	*[27.29]*	*[-16.91]*	*[5.6]*	*[1.28]*	*[20.08]*	*[10.45]*

Notes: All statistics correspond to sample medians. Means are in brackets. The amplitude for the downturns are calculated based on the decline in each respective variable during the peak to trough decline in the financial variable. The amplitude for the recoveries are calculated based on the one year change in each respective variable after the trough in each respective financial variable. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between emerging and advanced country means or medians.

Table 2C. Financial Cycles: Macroeconomic Variables

	Downturns					Upturns				
	Output	Consumption	Investment	Industrial Production	Unemployment Rate [1/]	Output	Consumption	Investment	Industrial Production	Unemployment Rate [1/]
Credit										
Full Sample	1.58	1.26	-1.24	1.48	0.32	3.67	3.86	5.60	4.42	-0.02
	[2.08]	*[2.27]*	*[-3.60]*	*[1.75]*	*[0.80]*	*[3.89]*	*[4.12]*	*[6.24]*	*[5.04]*	*[0.05]*
Advanced Countries	1.46	1.09*	-0.79	0.68	0.48*	2.49***	2.69***	3.72***	2.94***	0.10***
	[1.87]	*[1.36]*	*[-2.30]*	*[0.92]*	*[0.94]*	*[2.70***]*	*[2.90***]*	*[3.96***]*	*[3.36***]*	*[0.25***]*
Emerging Markets	2.22	2.66	-5.79	2.30	0.19	5.48	5.60	7.97	6.72	-0.28
	[2.40]	*[3.76]*	*[-5.66]*	*[2.87]*	*[0.52]*	*[5.44]*	*[5.96]*	*[9.50]*	*[7.16]*	*[-0.26]*
House Price										
Full Sample	3.17	2.46	1.01	2.27	0.47	3.93	3.62	5.73	4.15	-0.15
	[4.16]	*[3.66]*	*[-0.08]*	*[3.38]*	*[1.09]*	*[4.07]*	*[3.82]*	*[4.98]*	*[4.28]*	*[-0.07]*
Advanced Countries	2.78***	2.34**	0.72	2.33	0.53	3.41***	3.14***	5.73	3.87*	-0.09*
	*[3.24**]*	*[2.79*]*	*[-0.58]*	*[2.63]*	*[1.13]*	*[3.52***]*	*[3.28**]*	*[4.91]*	*[3.78]*	*[0.00*]*
Emerging Markets	4.81	4.04	2.42	1.64	0.20	5.80	5.71	5.53	5.16	-0.25
	[8.18]	*[7.47]*	*[2.15]*	*[6.78]*	*[0.90]*	*[6.14]*	*[5.88]*	*[5.23]*	*[6.24]*	*[-0.34]*
Equity Price										
Full Sample	3.47	3.02	3.68	2.88	0.10	3.60	3.66	4.29	3.63	0.09
	[4.57]	*[5.07]*	*[3.67]*	*[4.25]*	*[0.42]*	*[3.72]*	*[3.86]*	*[4.01]*	*[3.87]*	*[0.18]*
Advanced Countries	3.46	2.82	3.68	3.10	0.05*	2.96***	3.16***	3.39***	3.02***	0.10
	[4.83]	*[4.59]*	*[4.08]*	*[4.60]*	*[0.30**]*	*[3.04***]*	*[3.21***]*	*[3.17**]*	*[3.03***]*	*[0.25*]*
Emerging Markets	3.47	3.86	3.38	2.63	0.15	5.23	4.79	6.62	5.11	0.02
	[4.05]	*[6.13]*	*[2.80]*	*[3.56]*	*[0.72]*	*[5.01]*	*[5.20]*	*[5.72]*	*[5.45]*	*[0.01]*
Exchange Rate										
Full Sample	4.29	4.19	4.88	4.53	0.11	3.95	3.46	5.53	4.14	-0.08
	[5.48]	*[5.50]*	*[5.68]*	*[6.04]*	*[0.25]*	*[4.31]*	*[4.26]*	*[5.77]*	*[4.57]*	*[-0.10]*
Advanced Countries	3.74	3.62***	4.40	4.26	0.08	3.30***	2.94***	4.78***	3.13***	-0.04
	[5.31]	*[4.74**]*	*[5.38]*	*[5.71]*	*[0.19]*	*[3.18***]*	*[2.89***]*	*[4.23***]*	*[3.18***]*	*[-0.06]*
Emerging Markets	5.38	5.91	5.80	5.38	0.18	6.13	5.80	7.35	6.41	-0.11
	[5.77]	*[6.93]*	*[6.21]*	*[6.61]*	*[0.39]*	*[6.27]*	*[6.81]*	*[8.52]*	*[6.89]*	*[-0.17]*

Notes: All statistics correspond to sample medians. Means are in brackets. The amplitude for the downturns are calculated based on the decline in each respective variable during the peak to trough decline in the financial variable The amplitude for the recoveries are calculated based on the one year change in each respective variable after the trough in each respective financial variable. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between emerging and advanced country means or medians.

[1/] Change in levels.

Table 3. Synchronization of Business and Financial Cycles

	All Countries	Advanced Countries	Emerging Markets
Output and Credit Cycles			
Mean	0.78	0.82 **	0.74
Median	0.80	0.83	0.76
Max	0.94	0.91	0.94
Min	0.45	0.70	0.45
Standard Deviation	0.11	0.06	0.13
Output and House Price Cycles			
Mean	0.64	0.69 **	0.54
Median	0.68	0.70	0.50
Max	0.84	0.84	0.74
Min	0.30	0.46	0.30
Standard Deviation	0.13	0.10	0.15
Output and Equity Price Cycles			
Mean	0.60	0.57 ***	0.63
Median	0.58	0.57 ***	0.64
Max	0.81	0.64	0.81
Min	0.45	0.48	0.45
Standard Deviation	0.07	0.04	0.08
Output and Exchange Rate Cycles			
Mean	0.55	0.54	0.56
Median	0.54	0.53	0.57
Max	0.72	0.72	0.72
Min	0.36	0.42	0.36
Standard Deviation	0.09	0.08	0.10

Notes: Each cell represents the concordance statistic for the corresponding two cycles. Concordance is calculated as the fraction of time that the two cycles are in the same phase. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between emerging and advanced country means or medians.

Table 4. Financial Dowturns and Disruptions: Basic Features

	Financial Variable				Macroeconomic Variables				
	Number of Events	Duration [1/]	Amplitude	Slope	Output	Consumption	Investment	Industrial Production	Unemployment Rate [2/]
A. Credit Downturns	218	6.03	-6.00	-1.37	1.58	1.26	-1.24	1.48	0.32
Credit Crunch	54	11.00***	-28.67***	-3.02***	2.30	1.19	-9.30***	1.37	1.02***
Other Credit Downturns	164	4.39	-4.10	-1.06	1.41	1.30	-0.30	1.48	0.23
B. House Price Downturns	141	8.37	-6.22	-1.12	3.17	2.46	1.01	2.27	0.47
House Price Busts	34	17.56***	-30.44***	-1.90***	5.97***	3.47	-6.23***	2.33	2.80***
Other House Price Downturns	107	5.45	-4.37	-0.93	2.80	2.36	2.13	2.22	0.21
C. Equity Price Downturns	384	6.38	-28.42	-4.78	3.47	3.02	3.68	2.88	0.10
Equity Price Busts	95	10.95***	-57.72***	-5.56***	4.40**	3.92*	0.04***	1.98	0.65***
Other Equity Price Downturns	289	4.88	-21.50	-4.33	3.41	2.92	4.06	3.10	0.00
D. Exchange Rate Downturns	470	5.95	-7.15	-1.32	4.29	4.19	4.88	4.53	0.11
Exchange Rate Collapses	116	8.68***	-23.86***	-2.87***	4.07	3.52	0.60***	4.12	0.40***
Other Exchange Rate Downturns	354	5.05	-4.76	-1.07	4.40	4.21	5.52	4.58	0.04

Notes: All statistics except "Duration" correspond to sample medians. For "Duration" means are shown. Duration is the number of quarters between peak and trough. The amplitudes are calculated based on the decline in each respective variable during the downturn. The slope of the recession is the amplitude from peak to trough divided by the duration. Disruptions (Crunches, Busts, and Collapses) are the worst 25% of downturns calculated by the amplitude. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between emerging and advanced country means or medians.

[1/] Number of quarters.

[2/] Change in levels.

Table 5. Financial Upturns and Booms: Basic Features

	Financial Variable				Macroeconomic Variables				
	Number of Events	Duration [1/]	Amplitude	Slope	Output	Consumption	Investment	Industrial Production	Unemployment Rate [2/]
A. Credit Upturns	186	10.85	5.59	1.61	3.58	3.85	5.31	4.16	-0.02
Credit Booms	44	8.03	18.74***	3.99***	5.02**	5.01***	6.48	4.41	-0.07
Other Credit Upturns	142	11.68	3.99	1.24	3.15	3.21	5.07	4.02	0.00
B. House Price Upturns	137	13.81	4.40	1.23	3.92	3.62	6.06	4.33	-0.11
House Price Booms	35	12.15	13.25***	2.67***	4.75***	4.37**	6.97	4.59	-0.18
Other House Price Upturns	102	14.44	2.50	0.98	3.59	3.19	5.73	4.15	-0.07
C. Equity Price Upturns	396	18.68	24.27	6.10	3.59	3.66	4.29	3.59	0.09
Equity Price Booms	99	8.66***	62.29***	11.42***	2.93**	2.89**	3.36*	3.39	0.22
Other Equity Price Upturns	297	21.98	17.92	4.59	3.75	3.88	4.75	3.64	0.03
D. Exchange Rate Upturns	469	12.81	4.45	1.30	3.94	3.45	5.43	4.06	-0.06
Exchange Rate Booms	118	7.79***	14.10***	2.62***	3.15***	2.94	4.76	2.33**	-0.03
Other Exchange Rate Upturns	351	14.69	3.05	0.99	4.15	3.68	5.57	4.52	-0.06

Notes: All statistics except "Duration" correspond to sample medians. For "Duration" means are shown. Duration for upturns is the time it takes to attain the level at the previous peak after the trough. The amplitude for the upturns are calculated based on the one year change in each respective variable after the trough in the financial variable. The slope of the upturns is the amplitude from the trough to the period where the financial variable has reached the level at its last peak, divided by the duration. Booms are the top 25% of upturns calculated by the amplitude. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between emerging and advanced country means or medians.

[1/] Number of quarters.

[2/] Change in levels.

Table 6. Likelihood of Recessions and Recoveries

Recessions	Probability
Unconditional	21.32
Conditional on a credit crunch	39.82
Conditional on a house price bust	35.17
Conditional on an equity price bust	34.62
Conditional on an exchange rate collapse	27.52
Recoveries	
Unconditional	21.15
Conditional on a credit boom	55.84
Conditional on a house price boom	40.82
Conditional on an equity price boom	18.03
Conditional on an exchange rate boom	21.54

Notes: The unconditional probability of a recession (recovery) are based on the percentage of time that a recession (recovery) ocurred during the sample. The conditional probabilities are the percentage of time that there is a recession (recovery) given a financial disruption (boom) in a particular variable.

Table 7A. Recessions Associated with Financial Disruptions: Macroeconomic Variables

	Output					Other Macroeconomic Variables			
	Number of Events	Duration [1/]	Amplitude	Cumulative Loss	Slope	Consumption	Investment	Industrial Production	Unemployment Rate [2/]
A. Recessions without Credit Crunches	173	3.77	-2.29	-3.54	-0.67	-0.15	-5.42	-4.55	0.56
Recessions with Credit Crunches	36	3.75	-4.22***	-7.80**	-1.05**	-1.32***	-8.67*	-6.21*	0.94
Recessions with Severe Credit Crunches	19	3.74	-4.38**	-9.78*	-1.21**	-1.03**	-7.77	-7.75**	0.94
B. Recessions without House Price Busts	78	3.27	-1.51	-2.43	-0.51	0.00	-3.82	-4.75	0.43
Recessions with House Price Busts	40	4.28**	-2.35*	-3.57**	-0.52	-0.88***	-8.75*	-4.58	1.25***
Recessions with Severe House Price Busts	24	4.38*	-2.64**	-5.23***	-0.72	-1.16***	-9.82**	-4.99	1.16***
C. Recessions without Equity Price Busts	116	3.55	-2.08	-3.49	-0.57	-0.25	-4.15	-4.17	0.48
Recessions with Equity Price Busts	72	3.88	-2.18	-3.35	-0.67	-0.22	-9.57***	-5.34**	0.81**
Recessions with Severe Equity Price Busts	40	3.95	-2.55	-5.09	-0.79	-0.57	-7.46**	-5.54**	0.78
D. Recessions without Exchange Rate Collapses	168	3.75	-2.27	-3.50	-0.66	-0.04	-5.19	-4.43	0.71
Recessions with Exchange Rate Collapses	42	3.76	-2.96*	-5.42	-0.89	-2.06***	-14.49***	-6.21**	0.46
Recessions with Severe Exchange Rate Collapses	24	3.75	-3.27	-5.78	-0.83	-1.54	-14.17**	-6.90*	0.44

Notes: All statistics except "Duration" correspond to sample medians. For "Duration" means are shown. Duration for recessions is the number of quarters between peak and trough. The amplitude for the recessions are calculated based on the decline in each respective variable during the peak to trough decline in output. Cumulative loss combines information about the duration and amplitude to measure the overall cost of a recession and is expressed in percent. The slope of the recession is the amplitude from peak to trough divided by the duration. Disruptions (Crunches, Busts, and Collapses) are the worst 25% of downturns calculated by the amplitude. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between emerging and advanced country means or medians.

[1/] Number of quarters.

[2/] Change in levels.

Table 7B. Recessions Associated with Financial Disruptions: Financial Variables

	Financial Variables			
	Credit	House Price	Equity Price	Exchange Rate
A. Recessions without Credit Crunches	0.86	-2.10	-8.64	0.00
Recessions with Credit Crunches	-8.35***	-4.76*	-7.34	-0.72
Recessions with Severe Credit Crunches	-14.19***	-5.95	-1.76	-1.03
B. Recessions without House Price Busts	1.19	-0.91	-9.79	0.64
Recessions with House Price Busts	-0.57***	-8.72***	-5.30	0.23
Recessions with Severe House Price Busts	-2.06***	-10.60***	-9.10	-1.01
C. Recessions without Equity Price Busts	0.72	-1.93	-0.61	-0.08
Recessions with Equity Price Busts	-0.31**	-4.30*	-18.14***	0.64
Recessions with Severe Equity Price Busts	0.32	-6.21**	-16.71***	0.05
D. Recessions without Exchange Rate Collapses	0.33	-2.19	-8.75	0.69
Recessions with Exchange Rate Collapses	-2.22**	-3.59	-7.34	-6.42***
Recessions with Severe Exchange Rate Collapses	0.52	-3.59	-9.89	-6.42***

Notes: All statistics correspond to sample medians. The amplitude for the recoveries are calculated based on the one year change in each respective variable after the trough in output. Disruptions (Crunches, Busts, and Collapses) are the worst 25% of downturns calculated by the amplitude. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between emerging and advanced country means or medians.

Table 8A. Recoveries Associated with Financial Booms: Macroeconomic Variables

	Output				Other Macroeconomic Variables			
	Number of Events	Duration [1/]	Amplitude	Slope	Consumption	Investment	Industrial Production	Unemployment Rate [2/]
A. Recoveries without Credit Booms	191	5.26	4.20	1.08	2.99	3.32	5.20	0.24
Recoveries with Credit Booms	15	4.14	8.84***	1.67***	7.14***	15.78**	10.65***	0.30
Recoveries with Strong Credit Booms	8	4.38	7.90***	1.67*	8.41**	19.97***	9.01**	0.52
B. Recoveries without House Price Booms	102	4.79	2.97	0.75	2.02	2.76	3.62	0.41
Recoveries with House Price Booms	13	2.08***	6.25***	1.45***	4.82***	6.81	5.49*	-0.15**
Recoveries with Strong House Price Booms	8	2.13***	7.36***	1.59***	5.70**	10.31***	7.64**	-0.25**
C. Recoveries without Equity Price Booms	142	4.95	4.18	1.09	3.01	3.23	4.28	0.30
Recoveries with Equity Price Booms	43	4.67	4.49**	1.13	3.74	5.34	8.00***	0.19
Recoveries with Strong Equity Price Booms	25	5.32	4.49*	1.24	2.65	4.35	9.34***	0.19
D. Recoveries without Exchange Rate Booms	177	4.55	4.14	1.08	2.96	3.23	5.03	0.30
Recoveries with Exchange Rate Booms	30	8.80**	6.13**	1.37	5.43***	7.31**	7.21*	0.15
Recoveries with Strong Exchange Rate Booms	18	7.33	7.16**	1.50*	8.44***	5.66	7.62*	0.15

Notes: All statistics except "Duration" correspond to sample medians. For "Duration" means are shown. Duration for recoveries is the time it takes to attain the level of output at the previous peak after the trough. The amplitude for the recoveries are calculated based on the one year change in each respective variable after the trough in output. The slope of the recoveries is the amplitude from the trough to the period where output has reached the level at its last peak, divided by the duration. Booms are the top 25% of upturns calculated by the amplitude. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between emerging and advanced country means or medians.

[1/] Number of quarters.

[2/] Change in levels.

Table 8B. Recoveries Associated with Financial Booms: Financial Variables

	Financial Variables			
	Credit	House Price	Equity Price	Exchange Rate
A. Recoveries without Credit Booms	2.10	-1.48	10.06	-0.19
Recoveries with Credit Booms	8.86***	4.53*	23.02	2.04
Recoveries with Strong Credit Booms	16.58***	4.76	40.61**	1.29
B. Recoveries without House Price Booms	1.52	-2.05	10.06	-0.49
Recoveries with House Price Booms	6.05**	8.02***	12.67	-1.62
Recoveries with Strong House Price Booms	6.39	6.96***	20.55	-0.60
C. Recoveries without Equity Price Booms	3.00	-0.89	1.01	0.08
Recoveries with Equity Price Booms	0.65	-1.77	42.75***	-0.26
Recoveries with Strong Equity Price Booms	0.48	-1.77	49.79***	-1.38
D. Recoveries without Exchange Rate Booms	2.53	-1.20	10.06	-0.88
Recoveries with Exchange Rate Booms	0.72	0.58	16.84	7.41***
Recoveries with Strong Exchange Rate Booms	-1.31	-0.69	19.17	12.09***

Notes: All statistics correspond to sample medians. The amplitude for the recoveries are calculated based on the one year change in each respective variable after the trough in output. Booms are the top 25% of upturns calculated by the amplitude. *** implies significance at the 1% level, ** implies significance at the 5% level, * implies significance at the 10% level. Significance refers to the difference between emerging and advanced country means or medians.

Table 9A. Determinants of the Duration of Recessions

(Percent change in real variables unless otherwise indicated)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Recession with a House Price Bust		-0.513*					-0.888***				-1.110***	-1.268***
		[0.283]					[0.315]				[0.325]	[0.415]
Recession with an Equity Price Bust			-0.033					-0.352			-0.393	
			[0.186]					[0.271]			[0.290]	
Recession with a Credit Crunch				-0.186					0.446		0.757**	
				[0.237]					[0.348]		[0.385]	
Recession with an Exchange Rate Collapse					0.023					0.354	0.367	
					[0.207]					[0.361]	[0.372]	
World output growth (1-year average following the peak)												0.559***
												[0.165]
Oil price growth (3-year average before the peak)												0.015**
												[0.007]
Trade Openness (at the peak)												0.041***
												[0.009]
House price growth (3-year average before the peak)												-0.063***
												[0.023]
Constant	-3.201***	-3.220***	-3.191***	-3.168***	-3.208***	-3.238***	-3.350***	-3.111***	-3.465***	-3.249***	-3.710***	-5.064***
	[0.324]	[0.327]	[0.325]	[0.341]	[0.331]	[0.456]	[0.470]	[0.417]	[0.480]	[0.457]	[0.524]	[0.703]
P (Weibull distribution parameter)	2.444	2.457	2.444	2.449	2.444	2.575	2.655	2.598	2.602	2.583	2.758	3.371
	[0.104]	[0.103]	[0.101]	[0.100]	[0.101]	[0.145]	[0.171]	[0.166]	[0.174]	[0.165]	[0.189]	[0.379]
Number of Observations	217	217	217	217	217	108	108	108	108	108	108	108
Log Likelihood	-141	-139	-141	-141	-141	-66	-62	-65	-66	-66	-59	-42

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 recession. A recession associated with a financial disruption (credit crunch, equity price bust, house price bust, exchange rate collapse) dummy variable takes on a value of 1 when a disruption is ongoing when the recession begins or ended at most on quarter before the recession began. World output growth is the PPP weighted annualized quarterly output growth from OECD countries. Growth is the annualized quarterly growth rate. Trade openness is defined as (exports+import) as percent of GDP. *** implies coefficent is significant at 1% level, ** implies coefficent is significant at 5% level, * implies coefficent is significant at 10% level.

Table 9B. Determinants of the Duration of Recessions: Robustness

(Percent change in real variables unless otherwise indicated)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Recession with a House Price Bust	-1.268***	-1.294***	-1.317***	-1.387***	-1.355***	-1.281***	-1.288***	-1.413***	-1.211***	-1.139***
	[0.415]	[0.441]	[0.412]	[0.436]	[0.429]	[0.400]	[0.419]	[0.431]	[0.424]	[0.432]
World output growth (1-year average following the peak)	0.559***	0.564***	0.544***	0.553***	0.522***	0.556***	0.559***	0.527***	0.576***	0.549***
	[0.165]	[0.172]	[0.168]	[0.174]	[0.176]	[0.170]	[0.164]	[0.186]	[0.166]	[0.166]
Oil price growth-3 year average (3-year average before the peak)	0.015**	0.015**	0.018***	0.017**	0.013*	0.016**	0.016**	0.015*	0.014**	0.012*
	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.006]	[0.008]	[0.007]	[0.007]
Trade Openness (at the peak)	0.041***	0.046**	0.033***	0.044**	0.043***	0.041***	0.043***	0.043***	0.041***	0.041***
	[0.009]	[0.020]	[0.011]	[0.019]	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]	[0.009]
House price growth (3-year average before the peak)	-0.063***	-0.061***	-0.073***	-0.070***	-0.063***	-0.066**	-0.068***	-0.068*	-0.058**	-0.055**
	[0.023]	[0.024]	[0.027]	[0.027]	[0.023]	[0.031]	[0.024]	[0.039]	[0.025]	[0.022]
Financial Openness (at the peak)		0.000		-0.001						
		[0.001]		[0.001]						
Financial Development (at the peak)			0.008	0.009						
			[0.006]	[0.006]						
Equity price growth (3-year average before the peak)					-0.010			-0.008		
					[0.010]			[0.012]		
Credit growth (3-year average before the peak)						0.005		0.015		
						[0.031]		[0.032]		
Exchange rate growth (3-year average before the peak)							0.024	0.016		
							[0.028]	[0.030]		
Recession with a banking crisis									-0.627	
									[0.385]	
Recession with a severe financial Crisis										-0.872
										[0.703]
Constant	-5.064***	-5.134***	-5.905***	-6.189***	-5.059***	-5.073***	-5.088***	-4.984***	-4.853***	-5.053***
	[0.703]	[0.791]	[0.954]	[1.001]	[0.703]	[0.696]	[0.706]	[0.705]	[0.716]	[0.706]
P (Weibull distribution parameter)	3.371	3.377	3.388	3.404	3.377	3.37	3.374	3.381	3.418	3.404
	[0.379]	[0.387]	[0.372]	[0.384]	[0.376]	[0.380]	[0.377]	[0.377]	[0.393]	[0.384]
Number of Observations	108	108	108	108	108	108	108	108	108	108
Log Likelihood	-42	-42	-42	-41	-42	-42	-42	-42	-42	-42

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 recession. A recession associated with a financial disruption (credit crunch, equity price bust, house price bust, exchange rate collapse) dummy variable takes on a value of 1 when a disruption is ongoing when the recession begins or ended at most on quarter before the recession began. World output growth is the PPP weighted annualized quarterly output growth from OECD countries. Growth is the annualized quarterly growth rate. Trade openness is defined as (exports+import) as percent of GDP. Financial development is defined as credit as a 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.

Table 10A. Determinants of the Amplitude of Recessions

(Percent change in real variables unless otherwise indicated)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Recession with a House Price Bust	0.670				1.516**				1.725***	1.647**	1.609**
	[0.675]				[0.602]				[0.530]	[0.618]	[0.621]
Recession with an Equity Price Bust		1.045				1.406**			1.551**	0.626	
		[0.799]				[0.678]			[0.612]	[0.525]	
Recession with a Credit Crunch			2.130				0.470		-0.215		
			[1.394]				[0.513]		[0.599]		
Recession with an Exchange Rate Bust				1.449*				-0.447	-0.422		
				[0.841]				[0.485]	[0.462]		
World Output growth (1-year average following the peak)										-0.324	-0.363*
										[0.229]	[0.212]
Oil price growth (3-year average before the peak)										0.015	0.019
										[0.015]	[0.017]
Trade Openness (at the peak)										-0.049**	-0.052**
										[0.022]	[0.020]
House price growth (3-year average before the peak)										0.099**	0.107**
										[0.040]	[0.040]
Constant	4.542***	4.356***	4.301***	4.387***	2.185***	2.201***	2.700***	2.848***	1.598***	5.526**	5.993***
	[0.134]	[0.243]	[0.244]	[0.167]	[0.228]	[0.270]	[0.066]	[0.094]	[0.382]	[2.112]	[1.879]
Number of Observations	217	217	217	217	108	108	108	108	108	108	108
Number of Countries	42	42	42	42	30	30	30	30	30	30	30
Adjusted R-Squared	-0.003	0.002	0.014	0.006	0.064	0.072	-0.005	-0.004	0.143	0.302	0.296

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 recession. A recession associated with a financial disruption (credit crunch, equity price bust, house price bust, exchange rate collapse) dummy variable takes on a value of 1 when a disruption is ongoing when the recession begins or ended at most on quarter before the recession began. World output growth is the PPP weighted annualized quarterly output growth from OECD countries. Growth is the annualized quarterly growth rate. Trade openness is defined as (exports+import) as percent of GDP. *** implies coefficent is significant at 1% level, ** implies coefficent is significant at 5% level, * implies coefficent is significant at 10% level.

Table 10B. Determinants of the Amplitude of Recessions: Robustness

(Percent change in real variables unless otherwise indicated)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Recession with a House Price Bust	1.609**	1.593**	1.725**	1.648**	1.604**	1.687**	1.449**	1.617**	1.656**	1.664**
	[0.621]	[0.632]	[0.659]	[0.646]	[0.623]	[0.621]	[0.657]	[0.639]	[0.653]	[0.668]
World Output growth (1-year average following the peak)	-0.363*	-0.373	-0.354	-0.364*	-0.363*	-0.347	-0.390*	-0.371*	-0.376*	-0.384*
	[0.212]	[0.238]	[0.213]	[0.205]	[0.213]	[0.216]	[0.212]	[0.210]	[0.204]	[0.203]
Oil price growth-3 year average (3-year average before the peak)	0.019	0.018	0.018	0.018	0.019	0.015	0.021	0.016	0.020	0.017
	[0.017]	[0.019]	[0.017]	[0.017]	[0.018]	[0.015]	[0.018]	[0.017]	[0.018]	[0.018]
Trade Openness (at the peak)	-0.052**	-0.051**	-0.049**	-0.055***	-0.051	-0.039	-0.052**	-0.054***	-0.053**	-0.055***
	[0.020]	[0.019]	[0.020]	[0.018]	[0.039]	[0.029]	[0.020]	[0.020]	[0.020]	[0.020]
House price growth (3-year average before the peak)	0.107**	0.108**	0.134**	0.120**	0.108**	0.121***	0.098**	0.116**	0.107**	0.115**
	[0.040]	[0.041]	[0.053]	[0.047]	[0.041]	[0.042]	[0.043]	[0.044]	[0.039]	[0.044]
Equity price growth (3-year average before the peak)		-0.003								
		[0.011]								
Credit growth (3-year average before the peak)			-0.041							
			[0.057]							
Exchange rate growth (3-year average before the peak)				-0.058						
				[0.067]						
Financial Openness (at the peak)					-0.013					
					[0.226]					
Financial Development (at the peak)						-0.012				
						[0.013]				
Recession with a banking crisis							1.216			
							[0.824]			
Government expenditure growth (1-year average following the peak)								0.051		0.050
								[0.032]		[0.032]
Short term nominal interest rate change (1-year average following the peak)									0.009	0.01
									[0.123]	[0.125]
Constant	5.993***	5.967***	5.841***	6.221***	5.906**	5.986***	5.936***	5.865***	5.860***	5.885***
	[1.879]	[1.844]	[1.901]	[1.711]	[2.745]	[1.877]	[1.897]	[1.854]	[1.885]	[1.857]
Number of Observations	108	108	108	108	108	108	108	107	106	106
Number of Countries	30	30	30	30	30	30	30	29	29	29
Adjusted R-Squared	0.296	0.289	0.293	0.299	0.289	0.304	0.304	0.301	0.294	0.3

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 recession. A recession associated with a financial disruption (credit crunch, equity price bust, house price bust, exchange rate collapse) dummy variable takes on a value of 1 when a disruption is ongoing when the recession begins or ended at most on quarter before the recession began. World output growth is the PPP weighted annualized quarterly output growth from OECD countries. Growth is the annualized quarterly growth rate. Trade openness is defined as (exports+import) as percent of GDP. Financial development is defined as credit as a 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.

Table 11A. Determinants of the Amplitude of Recoveries

(Percent change in real variables unless otherwise indicated)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Amplitude of Preceeding Recession	0.738***	0.741**	0.745**	0.746**	0.736**	0.745**	0.774**	0.772**	0.737**
	[0.267]	[0.279]	[0.279]	[0.279]	[0.285]	[0.285]	[0.306]	[0.319]	[0.285]
Amplitude of Recovery in World Output		0.669**	0.672**	0.670**	0.628*	0.672*	0.691**	0.661*	0.630*
		[0.307]	[0.307]	[0.306]	[0.320]	[0.337]	[0.311]	[0.350]	[0.319]
Preceeding Recession with a House Price Bust			-1.374*	-1.358*	-1.270*	-1.377*	-1.401*	-1.241	-1.266*
			[0.716]	[0.725]	[0.712]	[0.767]	[0.725]	[0.760]	[0.717]
Recovery with a House Price Boom				1.505***				1.343	1.040*
				[0.496]				[0.820]	[0.606]
Recovery with a Credit Boom					2.383**			2.213**	2.220**
					[1.003]			[1.070]	[1.063]
Recovery with an Equity Price Boom						0.014		-0.274	
						[1.018]		[0.938]	
Recovery with an Exchange Rate Boom							-1.422	-1.554	
							[1.604]	[1.685]	
Constant	2.851**	0.803	1.049	0.958	0.984	1.048	1.086	0.955	0.926
	[1.246]	[2.175]	[2.148]	[2.152]	[2.152]	[2.137]	[2.057]	[2.066]	[2.164]
Number of Observations	217	217	217	217	217	217	217	217	217
Number of Countries	42	42	42	42	42	42	42	42	42
Adjusted R-Squared	0.217	0.227	0.227	0.225	0.229	0.223	0.226	0.222	0.226

Notes: All regressions include country fixed effects. The dependent variable is the amplitude of output for four quarters after the trough in output. Coefficents shown along with robust standard errors in brackets below respective coeffient estimate. A recession associated with a financial disruption (credit crunch, equity price bust, house price bust, exchange rate collapse) dummy variable takes on a value of 1 when a disruption is ongoing when the recession begins or ended at most on quarter before the recession began. A recovery is said to be associated with a boom if the the boom is ongoing as the recovery begins (and started at most four quarters before the recovery) or starts at most two quarters after the recovery begins. A boom occurs if the 4 quarter change in the variable from the trough is in the top 25% percentile. World output growth is the PPP weighted annualized quarterly output growth from OECD countries. *** implies coefficent is significant at 1% level, ** implies coefficent is significant at 5% level, * implies coefficent is significant at 10% level.

Table 11B. Determinants of the Amplitude of Recoveries: Robustness

(Percent change in real variables unless otherwise indicated)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Amplitude of Preceeding Recession	0.737**	0.753**	0.757***	0.725**	0.730**	0.780***	0.739**
	[0.285]	[0.281]	[0.278]	[0.274]	[0.276]	[0.286]	[0.287]
Amplitude of Recovery in World Output	0.630*	0.572*	0.502	0.404	0.590*	0.639*	0.636*
	[0.319]	[0.306]	[0.372]	[0.272]	[0.309]	[0.326]	[0.323]
Preceeding Recession with a House Price Bust	-1.266*	-1.397*	-1.236	-0.995	-1.276*	-1.000	-1.137
	[0.717]	[0.748]	[0.882]	[0.930]	[0.729]	[0.777]	[0.724]
Recovery with a House Price Boom	1.040*	1.255	1.287**	1.25	0.931	0.824	0.956
	[0.606]	[0.957]	[0.607]	[0.852]	[0.726]	[0.654]	[0.584]
Recovery with a Credit Boom	2.220**	2.182*	2.506**	1.797	2.116*	2.093**	2.233**
	[1.063]	[1.174]	[1.099]	[1.143]	[1.067]	[1.021]	[1.057]
Trade Openness (at the trough)		-0.01					
		[0.021]					
Financial Openness (at the trough)			-0.014				
			[0.217]				
Financial Development (at the trough)				-0.052			
				[0.032]			
Recovery with an Exchange Rate Depreciation					1.311*		
					[0.711]		
Preceeding Recession with a banking crisis						-3.340*	
						[1.825]	
Preceeding Recession a severe financial crisis							-1.566
							[1.366]
Constant	0.926	1.594	1.104	4.745***	0.444	1.053	0.911
	[2.164]	[1.777]	[2.192]	[1.593]	[2.304]	[2.059]	[2.174]
Number of Observations	217	208	205	209	217	217	217
Number of Countries	42	41	42	41	42	42	42
Adjusted R-Squared	0.226	0.23	0.231	0.234	0.228	0.233	0.223

Notes: All regressions include country fixed effects. The dependent variable is the amplitude of output for four quarters after the trough in output. Coefficents shown along with robust standard errors in brackets below respective coeffient estimate. A recession associated with a financial disruption (credit crunch, equity price bust, house price bust, exchange rate collapse) dummy variable takes on a value of 1 when a disruption is ongoing when the recession begins or ended at most on quarter before the recession began. A recovery is said to be associated with a boom if the the boom is ongoing as the recovery begins (and started at most four quarters before the recovery) or starts at most two quarters after the recovery begins. A boom occurs if the 4 quarter change in the variable from the trough is in the top 25% percentile. World output growth is the PPP weighted annualized quarterly output growth from OECD countries. Trade openness is defined as (exports+import) as percent of GDP. Financial development is defined as credit as a 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.