



WP/08/274

IMF Working Paper

What Happens During Recessions, Crunches and Busts?

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IMF Working Paper

Research Department

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December 2008

Abstract

This Working Paper should not be reported as representing the views of the IMF.

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We provide a comprehensive empirical characterization of the linkages between key macroeconomic and financial variables around business and financial cycles for 21 OECD countries over the period 1960–2007. In particular, we analyze the implications of 122 recessions, 112 (28) credit contraction (crunch) episodes, 114 (28) episodes of house price declines (busts), 234 (58) episodes of equity price declines (busts) and their various overlaps in these countries over the sample period. Our results indicate that interactions between macroeconomic and financial variables can play major roles in determining the severity and duration of recessions. Specifically, we find evidence that recessions associated with credit crunches and house price busts tend to be deeper and longer than other recessions.

JEL Classification Numbers: E32; E44; E51; F42

Keywords: Business cycles, recessions, credit crunches, house prices, equity prices, busts

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¹ We are grateful for helpful comments from Lewis Alexander, Michael Dooley, Kristin Forbes, Prakash Loungani, and our discussants, Steven Kamin, Desmond Lachman, Vincent Reinhart, and Angel Ubide, and participants at various seminars and conferences where earlier versions of this paper were presented. Dio Kaltis, David Low, Yongjoon Shin and Zhi (George) Yu provided excellent research assistance.

| Contents | Page |
|--|------|
| Executive Summary | 4 |
| Figure A. What Happens During Recessions: Crunches and Busts? | 6 |
| I. Introduction | 7 |
| II. Database and Methodology | 10 |
| A. Database | 10 |
| B. Methodology | 11 |
| III. What Happens During Recessions? | 14 |
| A. Basic Features of Recessions: Duration and Cost..... | 14 |
| B. Changes in Macroeconomic and Financial Variables | 16 |
| C. Dynamics of Recessions..... | 17 |
| D. Synchronization of Recessions, Credit Contractions and Asset Price Declines | 18 |
| IV. What Happens During Credit Contractions and Asset Price Declines? | 20 |
| A. Episodes of Credit Contractions | 20 |
| B. Episodes of Declines in House Prices | 22 |
| C. Episodes of Declines in Equity Prices..... | 23 |
| D. Credit Contractions and Asset Price Declines: A Summary..... | 24 |
| V. What Happens During Recessions Associated with Crunches and Busts?..... | 24 |
| A. Recessions Associated with Credit Crunches | 25 |
| B. Recessions Associated with House Price Busts | 25 |
| C. Recessions Associated with Equity Price Busts..... | 26 |
| D. Recessions Associated with Crunches and Busts: A Summary..... | 27 |
| VI. Recessions Associated with Increases in Oil Prices | 28 |
| VII. Policy Responses During Recessions, Crunches and Busts | 29 |
| VIII. Recession Outcomes and Financial Factors..... | 30 |
| IX. Conclusion | 34 |
| A. A Summary | 34 |
| B. Lessons for Today | 34 |
| C. Caveats and Future Research | 35 |
| References..... | 36 |
| Figures | |
| 1. Associations Between Recessions, Crunches and Busts..... | 43 |
| 2. Recessions: Duration and Amplitude..... | 44 |
| 3. Recessions in OECD Countries | 45 |
| 4. Synchronization of Recessions | 48 |
| 5. Synchronization of Credit Contractions and Asset Price Declines..... | 49 |

| | |
|---|----|
| 6. Credit Crunches in OECD Countries..... | 50 |
| 7. House Price Busts in OECD Countries..... | 52 |
| 8. Equity Price Busts in OECD Countries | 54 |
| Tables | |
| 1A. Recessions: Summary Statistics..... | 56 |
| 1B. Recessions: Summary Statistics..... | 57 |
| 2A. Credit Contractions: Basic Statistics..... | 58 |
| 2B. Credit Contractions: Basic Statistics..... | 59 |
| 3A. House Price Declines: Basic Statistics..... | 60 |
| 3B. House Price Declines: Basic Statistics..... | 61 |
| 4A. Equity Price Declines: Basic Statistics | 62 |
| 4B. Equity Price Declines: Basic Statistics..... | 63 |
| 5. Credit Contractons and Asset Price Declines: Summary Statistics | 64 |
| 6. Leads and Lags: Recessions, Crunches and Busts..... | 65 |
| 7. Recessions Associated with Credit Crunches..... | 66 |
| 8. Recessions Associated with House Price Busts | 67 |
| 9. Recessions Associated with Equity Price Busts | 68 |
| 10. Recessions Associated with Crunches and Busts: Summary Statistics | 69 |
| 11. Recessions Associated with Oil Price Shocks | 70 |
| 12. Changes in Poicy Variables | 71 |
| 13A. Cost of Recessions | 72 |
| 13B. Cost of Recessions | 73 |
| 14A. Cost of Recessions | 74 |
| 14B. Cost of Recessions | 75 |
| Appendix: Database | 41 |

Executive Summary

The current financial turmoil that started in the United States, initially led by sharp declines in house prices, has transformed into a severe credit crunch with substantial losses in equity markets. Moreover, it has now spread to a number of advanced and emerging countries, and become the most severe global financial crisis since the Great Depression. This has led to an intensive debate about how much the crisis will impact the real economy. There are already indications that the spillovers from the difficulties in financial sector to economic activity will not be mild — in fact, activity in the United States and several other advanced economies has been contracting in recent months.

These developments have highlighted a number of questions about the linkages between the financial sector and the real economy during recessions. Two specific questions that have often been raised in the context of this debate are: How do macroeconomic and financial variables behave around recessions, credit crunches and asset (house and equity) price busts? And are recessions associated with credit crunches and asset price busts different than other recessions?

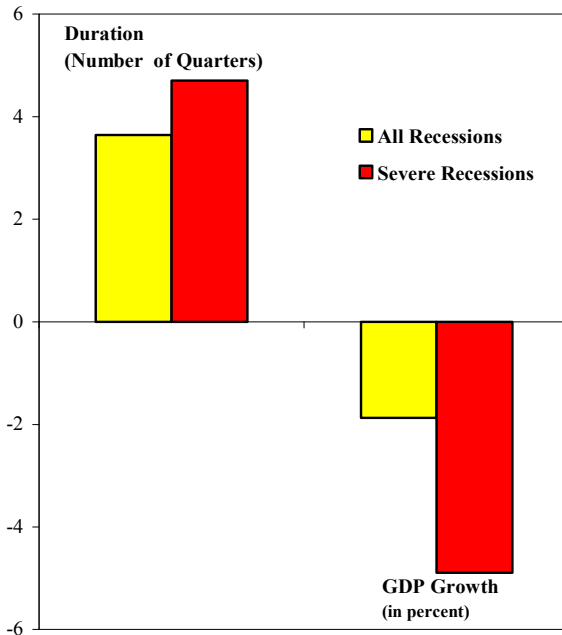
In order to address these questions, we provide a comprehensive empirical characterization of the linkages between key macroeconomic and financial variables around business and financial cycles for 21 OECD countries over the 1960-2007 period. In particular, we analyze the implications of 122 recessions, 112 (28) credit contraction (crunch) episodes, 114 (28) episodes of house price declines (busts), and 234 (58) episodes of equity price declines (busts) in these countries over the sample period, their implications and various overlaps. The main results are as follows:

- The typical recession lasts almost 4 quarters and is associated with an output drop of roughly 2 percent (Figure A). Most macroeconomic and financial variables exhibit procyclical behavior during recessions. While recessions have been becoming shorter and milder over time, they remain highly synchronized across countries. Moreover, recessions often coincide with the episodes of contractions in domestic credit and declines in asset prices.
- Episodes of credit crunches, house price and equity price busts last much longer than recessions do. For example, a credit crunch episode typically lasts two-and-a-half years and is associated with nearly a 20 percent decline in credit. A housing bust tends to persist even longer—four-and-a-half years with a 30 percent fall in real house prices. And an equity price bust lasts some 10 quarters and when it is over, the real value of equities drops by half.
- In one out of six recessions, there is also a credit crunch underway, and in one out of four recessions a house price bust. Equity price busts coincide with one-third of recession episodes. There can be considerable lags between financial market disturbances and real activity. A recession, if one occurs, can start as late as four to five quarters after the onset of a credit crunch or housing bust.

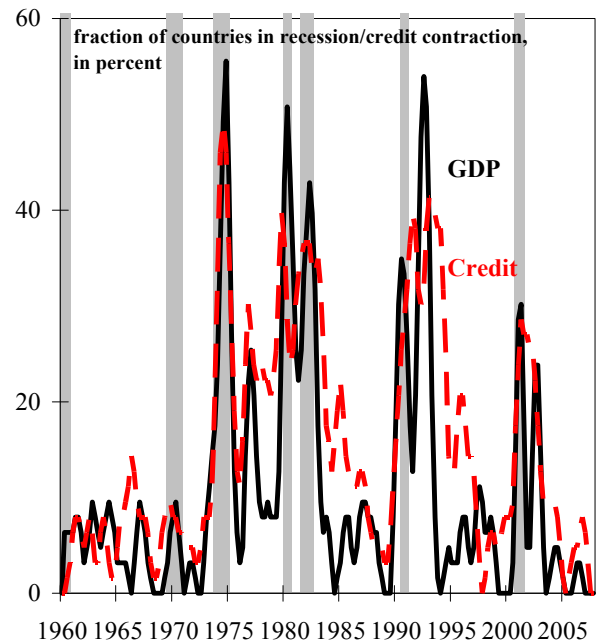
- Most importantly, recessions associated with credit crunches and house price busts are deeper and last longer than other recessions do. In particular, although recessions accompanied with severe credit crunches or house price busts last only three months longer, they typically result in output losses two to three times greater than recessions without such financial stresses. There is also evidence that the extent of declines in house prices appears to influence the depth of recessions, even after accounting for the changes in other financial variables, including credit and equity prices, and various other controls. These findings suggest that the strength of linkages between the financial sector and the real economy can aggravate output losses during recessions.
- The lessons from the earlier episodes of recessions, crunches and busts we examined are sobering, suggesting that recessions following the current crisis will likely be more costly than other recessions because they take place alongside simultaneous credit crunches and asset price busts. Furthermore, although the effects of the current crisis have already been felt around the world, the past evidence suggests that its global dimensions are likely to intensify in the coming months.

Figure A. What Happens During Recessions, Crunches and Busts?

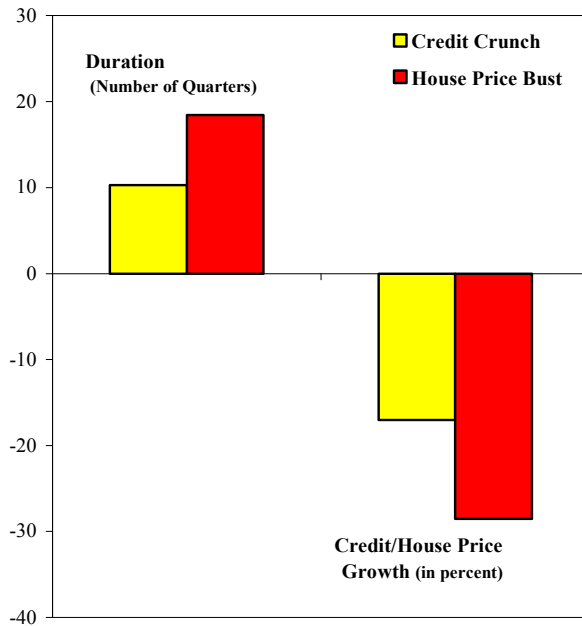
Recessions can be long and deep...



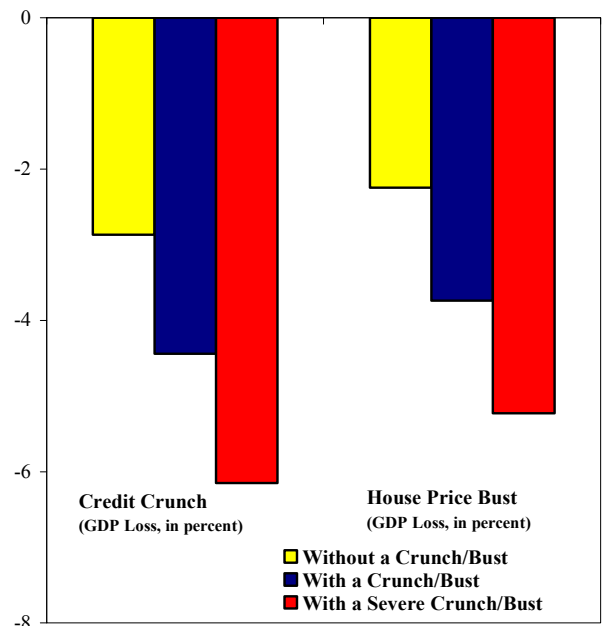
... and highly synchronized across countries and often coincide with credit contractions



Crunches and busts are typically long with substantial declines in credit and house price



Credit-crunch and house-price-bust recessions are usually deeper



Notes: GDP growth is the percent change in the level of output during the recession period. Severe recessions refer to those in which the peak-to-trough decline in output is in the top quartile of all recession-related output declines. Synchronization is measured by the fraction of countries experiencing a recession or a credit contraction at the same time. GDP loss is the total amount of GDP lost between the peak and trough of a recession. Severe credit crunches and house price busts are those that are in the top half of all crunch and bust episodes.

“... recessions that follow swings in asset prices are not necessarily longer, deeper, and associated with a greater fall in output and investment than other recessions...”

Roger W. Ferguson, Vice Chairman of the Federal Reserve Board, January 2005

“If we do end up dating the recession as beginning at the end of last year, it could be a very long recession.”

Martin Feldstein, Member of the NBER Business Cycle Dating Committee, August 2008

I. INTRODUCTION

The financial turmoil that started in the United States last year has now spread to a number of advanced and emerging countries and transformed into the most severe global financial crisis since the Great Depression. This has led to an intensive debate about how much the financial crisis will impact the broader economies. There are already indications that the spillovers from the financial crisis to the real economy will not be mild—in fact, activity in the United States and several other advanced economies has been contracting in recent months.

These developments have highlighted a number of questions about the linkages between the real economy and the financial sector during recessions. Two specific questions that have often been raised in the context of this debate are: How do macroeconomic and financial variables behave around recessions, credit crunches and asset (house and equity) price busts? And are recessions associated with credit crunches and asset price busts different than other recessions? In order to address these questions, we provide a comprehensive empirical characterization of the linkages between key macroeconomic and financial variables around business and financial cycles for 21 OECD countries over the 1960-2007 period.

We first identify turning points in these variables using standard business cycle dating methods. We document 122 recessions, 112 credit contractions, 114 house price declines, and 234 equity price declines for these countries over the sample period. When recessions, credit contractions, house price and equity price declines fall into the top quartiles of all recessions, contractions and declines, we define them as severe recessions, credit crunches, house price busts and equity price busts, respectively. We then analyze the characteristics of these events—in terms of their duration and severity—and the behavior of major macroeconomic and financial variables around the various cycles.

With respect to the first question, we find that the typical recession lasts almost 4 quarters and is associated with an output drop (decline from peak to trough) of roughly 2 percent. Severe recessions are, by construction, much more costly, with a median decline of about 5 percent, and last a quarter longer. While typical recessions tend to result in a cumulative loss of around 3 percent, severe ones cost three times more. As one would expect, most macroeconomic and financial variables exhibit procyclical behavior during recessions. In addition, recessions are characterized by sharp declines in (residential) investment, industrial production, imports, and housing and equity prices, modest declines in consumption and exports, and some decrease in employment rates. Two key policy related variables—short-term interest rates and fiscal expenditures—often behave countercyclical during recessions.

For some observers, the global nature of the current crisis has been unprecedented, as several advanced economies have simultaneously experienced difficulties in their credit markets as well as declines in their house and equity prices. However, these recent phenomena are not unusual because historically recessions, crunches and busts often occur at the same time across countries. Indeed, recessions in many advanced countries were bunched in four periods over the past 40 years—the mid-70s, the early 80s, the early 90s and the early-2000s—and often coincided with global shocks. Just as many countries experience synchronized recessions, countries also go through simultaneous episodes of credit contractions. Moreover, declines in house and equity prices tend to occur at the same time.

Our findings indicate that the episodes of credit crunches, house price and equity price busts last much longer than recessions do. For example, the average duration of a credit crunch is around 10 quarters while an asset price bust is usually even longer, with an average duration of 18 (12) quarters in the case of house (equity) price busts. The dynamics of the main components of domestic absorption around these events are similar to those observed during recessions. A much larger decline in the growth rate of investment compared with that of consumption is a feature of both recessions as well as credit crunches and house price busts. In particular, episodes of credit crunch and house price bust are accompanied with large declines in residential investment. There is also evidence that credit crunches and house price busts are more costly than equity price busts, as equity price busts are less consistently associated with real sector outcomes.

For the second question, we document the coincidence of recessions with credit crunches or asset price busts. In about one out of six recessions, there is also a credit crunch underway and, in about one out of four recessions, also a house price bust. Equity price busts overlap for about one-third of recession episodes. A recession, if one occurs, can start as late as four to five quarters after the onset of a credit crunch or an asset bust.

In terms of duration and severity, we find that recessions associated with housing busts and credit crunches are both deeper and longer-lasting than other recessions are. Differences in total output loss between events with severe crunches and busts and those without typically amount to one percentage point, while the duration is more than one quarter longer in case of a housing bust. In terms of the behavior of key macroeconomic and financial variables, we find that residential investment tends to fall more sharply in recessions with housing busts and in those with credit crunches than in other recessions. Unemployment rates increase notably more in recessions with housing busts.

In addition to our event study of interactions among various macroeconomic and financial variables during recessions accompanied with (or without) credit crunches or asset price busts, we also conduct a more formal analysis of the depth of recessions and the special roles played by changes in financial market conditions during these episodes. In particular, we employ a basic regression framework to examine how the amplitude of a recession is associated with changes in financial variables during recessions. Our results suggest that the changes in house prices tend to be the financial variable most robustly associated with the depth of recessions. Besides by its duration, the extent of decline in output is most influenced by the state of the economy at the onset of the recession.

Our study contributes to a large body of research analyzing the roles played by financial variables in explaining fluctuations in economic activity. Financial and macroeconomic variables closely interact through wealth and substitution effects, and through the impact they have on the balance sheets of firms and households (see, for instance, Blanchard and Fischer, 1989; and Obstfeld and Rogoff, 1999). In particular, asset prices can, by affecting household wealth, influence consumption, and by altering a firm's net worth and the market value of the capital stock relative to its replacement value, influence investment. Perhaps more importantly, the interactions between the financial sector and the real economy can be amplified through the financial accelerator and related mechanisms. According to these mechanisms, an increase in asset prices improves a firm's (or household's) net worth, enhancing its capacities to borrow, invest and spend. This process can in turn lead to further increases in asset prices and have general equilibrium effects.²

Various empirical studies—both macro- and microeconomic—have been able to provide evidence for these channels.³ For example, there is a large empirical literature analyzing the dynamics of business cycles, asset price fluctuations and credit cycles (Bernanke and Gertler, 1989; Borio, Furfine and Lowe, 2001). This literature, however, mainly analyzes the general procyclicality of financial and macroeconomic variables, and less so how interactions between financial and real economic variables vary during recessions, which is our focus.

We also contribute to a branch of the large literature on business cycles which aims to identify the turning points in macroeconomic and financial variables using various methodologies. The classical methodology of dating business cycles we use here finds its roots in the pioneering work of Burns and Mitchell (1946) and has been widely used over the years (Harding and Pagan, 2006). Morsink, Helbling, and Tokarick (2002), for example, employ this methodology to analyze the main features of recessions and recoveries in a number of OECD countries. Fewer studies have conducted cross-country analyses of cycles in asset prices identified by this method.⁴ One example is Helbling and Terrones (2003) which examines the implications of asset price booms and busts in a large set of industrial countries and conclude that house price busts are typically more costly than equity price busts are.

Although the roles played by financial variables in business cycles have thus received much attention from various theoretical and empirical perspectives, most of these studies have considered the topics of business cycle, credit and asset prices independently (or in isolation). Furthermore, the links between real and financial variables during recessions have yet to be

² Some of the seminal models with these general equilibrium dynamics include Bernanke and Gertler (1989) and Kiyotaki and Moore (1997) followed by extensions of these models that also have dynamics which resemble Fisher's (1933) debt-deflation mechanism. Mendoza (2008) uses this framework to examine sudden stops in small open economies.

³ Studies using micro data (banks or corporations) include Bernanke, Gertler and Gilchrist (1996) and Kashyap and Stein (2000).

⁴ Other such studies include Borio and McGuire (2004) and Pagan and Sossounov (2003). Terrones (2004) studies the synchronization of house prices and the interaction between housing markets and the real economy using dynamic factor models.

analyzed using a comprehensive dataset of a large number of countries over a long period of time. Besides analysis that was limited in number of cases and some other, “case-type” studies of individual episodes, or studies that focused specifically on the behavior of real and financial variables surrounding financial crises, notably Reinhart and Rogoff (2008), to the best of our knowledge, there is no comprehensive empirical analysis of these links.⁵

Our paper thus fills three gaps in the literature. First, we examine the implications of episodes of recessions, credit crunches, house and equity price busts for a large set of macroeconomic and financial variables for a sizeable number of countries over a long period of time. Second, our study is the first detailed, cross-country empirical analysis addressing the implications of recessions when they coincide with certain types of financial market difficulties, including credit crunches, house price busts and equity price busts. Third, we provide some preliminary evidence suggesting that the change in house prices during recessions appears to be an important factor influencing the cost of recessions.

The paper is structured as follows. In section II, we briefly present the data and methodology we use. Next, we examine the basic characteristics of recessions in Section III. Then, we consider how the key macroeconomic and financial variables behave around the episodes of credit contractions (and crunches) and asset price declines (and busts) in Section IV. We study the implications of recessions associated with crunches and asset price busts in Section V. In Section VI, we briefly analyze the outcomes of recessions accompanied with large increases in oil prices. This is followed by a short discussion of the changes in policy variables during various episodes of recessions, crunches and busts in Section VII. Section VIII presents a more formal analysis of the roles played by financial factors in determining the cost of recessions using some simple regression models. Section IX concludes.

II. DATABASE AND METHODOLOGY

A. Database

We construct a comprehensive database of macroeconomic and financial variables for 21 OECD countries over the period 1960:1-2007:4, mostly from the IMF International Financial Statistics (IFS) and OECD Analytical Databases.⁶ We focus our analysis on the following macroeconomic variables: output, consumption, investment, residential investment, non-residential investment, industrial production, exports, imports, net exports, current account balance, and the unemployment and inflation rate. The quarterly time series of

⁵ Ferguson (2005) considered, in the aftermath of the collapse of the internet bubble, the links between asset prices, credit and business cycles for three episodes with rapid asset price increases and credit expansions, followed by subsequent recessions: the United Kingdom in 1974, Japan in 1992, and the United States in 2001.

⁶ The countries in our sample are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Switzerland, Sweden, the United Kingdom, and the United States.

macroeconomic variables are seasonally adjusted, whenever necessary, and in constant prices.

The financial variables we consider are credit, house prices and equity prices. Credit series are obtained from the IFS and defined as claims on the private sector by deposit money banks. The main source for house prices is the Bank for International Settlements (BIS). Equity price indices are also from the IFS. All financial variables are converted into real terms by deflating them by the respective consumer price index (CPI).

The “policy” variables we focus on are government consumption, as a proxy for fiscal policy, and short-term interest rates, as a proxy for monetary policy. The series for government consumption are obtained from the OECD Analytical Database. The short-term interest rates are from the IFS, Haver Analytics and Datastream. We consider the short-term interest rates both in nominal and real terms, with the nominal rates deflated using the CPI to arrive at the real rates. Government consumption is also deflated using the CPI. We list the detailed sources and definitions of each of these variables in Appendix I.

B. Methodology

Much research has been devoted to the definition and measurement of business cycles (Harding and Pagan, 2006). Our study is based on the “classical” definition of a business cycle mainly because of its simplicity, but also because it constitutes the guiding principle of the National Bureau of Economic Research (NBER) in determining the turning points of U.S. business cycles. The definition itself 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.

In particular, they define a cycle to “consist[s] 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 this broad 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.”

The classical methodology focuses on changes in the level of economic activity to identify business cycles. As an alternative methodology, one can consider how economic activity fluctuates around a trend by employing a method that extracts this trend in activity and then identify a “growth cycle” as a deviation from this trend (Stock and Watson, 1999). The classical methodology we employ, however, is particularly useful for our purpose since we are interested in business cycles in OECD countries where growth rates have been relatively low. This implies that growth recessions are small in size and can be frequent, while level recessions are more pronounced, but fewer (Morsink, Helbling and Tokarick, 2002). The classical methodology also allows us to focus on a well-defined set of cyclical turning points

rather than having to consider how the characterization of business cycles depends on the specific detrending method used.⁷ The turning points identified by our methodology are also robust to the inclusion of newly available data, whereas new data can affect the estimated trend and thus the identification of a growth cycle.

The methodology we use determines the peaks and troughs of any given series by first searching for maxima and minima over a given period of time. It then selects pairs of adjacent, locally absolute maxima and minima that meet certain censoring rules requiring a certain minimal duration of cycles and phases. In particular, 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 cyclical turning points in the *log-level* of a series.⁸ A complete cycle goes from one peak to the next peak with its two phases, the contraction phase (from peak to trough) and the expansion phase (from trough to peak). The algorithm requires that the minimum duration of the complete cycle and each phase must be at least five and two quarters, respectively.⁹ Specifically, a peak is reached in a quarterly series y_t at time t if:

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

Similarly, a cyclical trough is reached at time t if:

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

We employ this algorithm to identify cycles in a variety of macroeconomic and financial variables. Our main macroeconomic variable is output (GDP) which provides the broadest measure of economic activity. Besides output, we also look at cycles in a number of macroeconomic variables, including consumption and investment. In terms of financial variables, we are interested in cycles in three variables: credit, house prices and equity prices.

The main characteristics of cyclical phases are their duration and amplitude (Harding and Pagan, 2002a). Since we are mainly interested in examining contractions, we define these

⁷ There have been a large number of studies documenting that the features of growth cycles can depend on the detrending method used (Canova, 1998).

⁸ The algorithm we employ is called the BBQ algorithm since it is applicable to quarterly data. It is possible to employ a different algorithm, such as a Markov Switching (MS) model (Hamilton, 1989), to date the turning points. Harding and Pagan (2002b) compare this method with their BBQ algorithm and conclude that their algorithm is preferable because the MS model depends on the validity of the underlying statistical framework (see also Hamilton (2003) on this issue). Also using this methodology, Artis, Kontolemis, and Osborn (1997), Artis, Marcellino, Proietti (2002), Harding and Pagan (2002a), Cotis and Coppel (2005), and Hall and McDermott (2007) analyze the main features of business cycles, including cyclical phases and synchronization.

⁹ In the case of asset prices, the constraint that the contraction phase last at least two quarters is ignored if the quarterly decline exceeds 20 percent. This is because asset prices can have much more intra-quarter variation, making for large differences between peaks and troughs based on end-of-quarter data and those based on higher frequency data.

characteristics for contractions only. The duration of a contraction, D^c , is the number of quarters, k , between a peak and the next trough. The amplitude of a contraction, A^c , measures the change in y_t from a peak (y_0) to the next trough (y_k), i.e., $A^c = y_k - y_0$. For output, we also consider another widely used measure, the cumulative loss. This measure combines information about the duration and amplitude of a phase to proxy the overall cost of a cyclical contraction, likely of particular interest to policy makers. The cumulative loss, F^c , during a contraction, with duration k , is then defined as:

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

We further classify recessions based on the extent of decline in output. In particular, we call recessions mild or severe if the peak-to-trough output drop falls into the bottom or top quartile of all output drops during recessions, respectively. Likewise, declines in asset prices and credit contractions are distinguished according to their severity. An equity (or house) price bust is defined as a peak-to-trough decline which falls into the top quartile of all equity (or house) price declines (Helbling and Terrones, 2003). Similarly, a credit crunch is defined as a peak-to-trough contraction in credit which falls into the top quartile of all credit contractions.¹⁰ We identify 122 recessions in output (30 of which are severe), 112 contractions (28 crunches) in credit, 114 declines (28 busts) in house prices, 234 declines (58 busts) in equity prices.

In line with the way we date events in general, we next use a simple “dating” rule regarding whether or not a specific recession is associated with a credit crunch or asset price bust. In particular, if a recession episode starts at the same time or after the beginning of an ongoing credit crunch or asset price bust, we consider the recession to be associated with the respective credit crunch or asset price bust. This rule, by definition, basically describes a “timing” association (or coincidence) between the two events but does not imply a causal link.¹¹

Among these events, there is a considerable overlap, since there are 18, 34 and 45 recession episodes associated with credit crunches, house price busts and equity price busts, respectively (Figure 1 provides the Venn diagram of the associations of recessions, crunches and busts).¹² In other words, in about one out of six recessions, there is also a credit crunch

¹⁰ 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. An alternative methodology to identify credit crunch episodes would be to consider an interest rate measure, i.e., track changes in the price of credit over time. We plan to explore this in future research.

¹¹ An example of the fact that “association” does not describe causality is when exogenous shocks cause a recession that otherwise would not have happened even when a credit crunch or asset price bust was already occurring.

¹² Although we have 34 recessions associated with housing busts, we have only 28 episodes of housing busts. This is since housing busts last much longer than recessions do, and some housing

underway and in about one out of four recessions, also a house price bust. Equity price busts overlap for about one-third of recession episodes.¹³

Our algorithm closely replicates the dates of U.S. business cycles as determined by the NBER Business Cycle Dating Committee. According to the NBER, the United States has experienced 7 recessions over the 1960-2007 period and our algorithm provides exact matches for 4 out of these 7 peak and trough dates and is only a quarter early in dating the remaining peaks and troughs. The differences between our dates and the NBER ones stem from the fact that the NBER uses monthly data for various activity indicators (including industrial production, employment, personal income net of transfer payments, and the volume of sales of the manufacturing and wholesale retail sectors), whereas we solely employ quarterly series on output to identify the cyclical turning points. Nevertheless, the main features of business cycles based on the turning points we document are quite similar to those of the NBER. The average duration of U.S. business cycles based on our turning points, for example, is the same as that reported by the NBER. In addition, the average amplitude of cycles derived from our methodology is very close to that of the NBER cycles.¹⁴

III. WHAT HAPPENS DURING RECESSIONS?

In this section, we first examine a set of basic stylized facts about recessions, including their duration, amplitude, and cumulative output loss, and how these features vary across countries. We then document the changes in our main macroeconomic and financial variables during recessions. This is followed by an analysis of the temporal behavior of these same variables around recessions. Last, we analyze the synchronization of recessions across countries.

A. Basic Features of Recessions: Duration and Cost

Table 1A presents the main characteristics of recessions for each country in our sample. Throughout the paper, we most often focus on medians because they are less affected by the presence of outliers in our sample. Wherever relevant, however, we also refer to means. A typical OECD country experienced about five recessions over the 1960-2007 period. There is no apparent pattern across countries in the number of recessions, but some countries do stand out. For example, Canada, Ireland, Japan, Norway and Sweden witnessed only three recessions during this period, while Italy and Switzerland had 9 recessions, and New Zealand

busts are associated with multiple recessions. In particular, there are five housing busts that overlap with two recessions each, and two busts that overlap with three recessions each.

¹³ Overlaps of recessions with credit contractions and asset price declines are numerous and we briefly examine the implications of such overlaps in the later sections. The dates of the cyclical turning points are available upon request.

¹⁴ In particular, the average peak-to-trough decline in output during the U.S. recessions is around -1.7 percent based on our dates while it is -1.4 percent based on the NBER dates. We provide a detailed discussion of the implications of recessions in the United States in Claessens, Kose and Terrones (2008).

12, the most.¹⁵ A typical recession lasts about 4 quarters (one year) with relatively small variation across countries—the shortest recession is 2 quarters and the longest 13 quarters. Roughly one-third of all recessions are short with only 2 quarters. The proportion of time spent in recession, defined as the fraction of quarters the economy is in recession over the full sample period, is typically around 10 percent.¹⁶

In addition to duration, we describe the severity of a recession using two other metrics. The median (average) decline in output from peak to trough, the recession's amplitude, is about 1.9 (2.7) percent. It ranges from about 1 percent for the typical recession in Austria, Belgium, Ireland and Spain to more than 6 percent for those in Greece and New Zealand. The cumulative loss of a typical (median) recession is about 3 percent, but the average loss is about 6.4 percent since the distribution is skewed to the right (there is on average a small positive correlation (0.34) between duration and amplitude). This also shows that the overall loss can differ quite a bit from amplitude as durations vary. Country examples further illustrate this difference. For example, while the median amplitude of recessions in Finland and Sweden are not as large as those in Greece and New Zealand, recessions in Finland and Sweden have very large cumulative output losses (23 and 16 percent, respectively) since their recessions are long.

As mentioned, a recession is classified as a severe one when the peak-to-trough decline in output is in the top-quartile of all output declines during recessions, which means a peak-to-trough output decline below -3.2 percent. While many OECD countries, including Austria, Belgium, France, Ireland, Norway, Spain, and the United States, did not experience a severe recession in the sample period, most recessions in Greece and New Zealand fell in this category. The 30 such recessions we document are typically five quarters long, more than a quarter longer than the average recession. They are, by construction, much more costly than other recessions with a median decline of about 5 percent, almost three times that of other recessions, and have a cumulative loss of about 10 percent, five times that of the other recessions. An extremely severe recession, in which the peak-to-trough decline in output exceeds 10 percent, is usually called a depression, of which there are 5 in our sample. The last such depression episode took place in Finland in the early 1990s with an output decline of 14 percent.¹⁷

¹⁵ New Zealand has the highest number of recessions primarily because of the highly volatile nature of its output fluctuations and its large exposure to terms-of-trade shocks. Consistent with this, the number of recessions in other variables of New Zealand, including consumption, investment and industrial production, also is quite high. The dates of New Zealand's business cycles we report are largely consistent with those reported in Morsink, Helbling, and Tokarick (2001) which documents seven recessions over the 1973-2000 period. Hall and McDermott (2006), using unpublished output data, identify 9 recessions for New Zealand during the 1946:1-2005:4 period.

¹⁶ The proportion of time a country spends in recession relates of course closely to the number of recessions the country experienced (the correlation between the two is 0.9). The number and average duration of recessions have, however, a small negative correlation (-0.26) since some countries experienced many short recessions in relatively brief periods. For example, New Zealand had five short recessions during the 1970s and Japan witnessed its three recessions after 1992.

¹⁷ The 5 depressions that occurred are: New Zealand (1966:4-1967:2); New Zealand (1974:3-1975:2); New Zealand (1976:4-1978:1); Greece (1973:4-1974:3); and Finland (1990:1-1993:2). While the

(continued...)

As shown in Figure 2, most recessions lasted 4 quarters or less, and most of these were also mild to moderate in depth, i.e., less than a 3.2 percent output decline.¹⁸ Of the severe recessions in our sample, only 40 percent were long, i.e., lasted more than 5 quarters. There is also a pattern of recessions becoming shorter and milder over time, especially after the mid-1980s. In particular, the amplitude of a typical recession fell from 2.6 percent in 1973-1985 to 1.4 percent in 1986-2007. These patterns are in line with recent empirical work documenting a trend decline in output volatility in industrial countries, the so called “Great Moderation” phenomenon.¹⁹

B. Changes in Macroeconomic and Financial Variables

We next examine how the main macroeconomic and financial variables typically vary during a recession. Table 1B presents the peak-to-trough changes for these variables for all, severe, and other recessions, which are those not in the group of severe ones. We find the expected patterns in recessions in the sense that most macroeconomic variables exhibit procyclical behavior. Not surprisingly, differences between severe and non-severe (other) recessions are often statistically significant in terms of their durations, amplitudes and cumulative output losses. In a severe recession, consumption typically drops by more than 1 percent, compared to almost no change in other recessions. The importance of investment for explaining the business cycle has been stressed in the literature for a long time. Indeed, both residential and total investment tend to decline by double digits in severe recessions, compared to a drop of about 4 percent in other recessions.

Recessions often also overlap with declines in international trade. Exports drop more in severe recessions compared to other recessions (and significantly so). As expected, imports fall, by six times more than exports in a typical recession and by close to 10 percent in severe recessions (statistical significantly more so than in other recessions). While both net exports and the current account balance register improvements during recessions, the changes are not statistical significantly different across the types of recessions.

The fall in industrial production tracks closely the drop in investment in all types of recessions and is larger than that of output. Recessions often coincide with an increase in the unemployment rate (in 90 percent of cases). The unemployment rate typically rises three times as much in severe recessions than in other recessions. Inflation typically drops slightly (in 60 percent of all recessions), as expected given that aggregate demand is often down in recessions, but inflation does not seem to vary between the types of recessions, possibly as some severe recessions have been of the stagflation type—a recession combined with an

depression in Finland was the longest one with 13 quarters, the deepest one was the one in New Zealand leading to roughly 15 percent reduction in output over the 1976:4-1978:1 period. See Kehoe and Prescott (2002) for a discussion of a number of depressions in the 20th century.

¹⁸ To be more specific, around 35 percent of all recessions are short with 2 quarters, 40 percent are medium duration of 3-4 quarters, and 25 percent are long with 5 quarters or more.

¹⁹ Explanations for this decrease are many, ranging from “the new economy” driven changes to the use of effective monetary policy during the recent period (see Blanchard and Simon, 2001; and Stock and Watson, 2003).

acceleration in the rate of inflation. We discuss the implications of such recessions later in the paper.

Next, we examine the changes in our key financial variables during recessions. Although credit typically continues to grow, it does so only at about 1 percent, with its growth rate especially low in the initial stages of recessions. Credit growth does not vary much, however, between severe and other recessions. Both house and equity prices typically contract in recessions, with larger declines in house prices in severe than in other recessions.²⁰ Reflecting the generally more volatile nature of equity prices, the decline in equity prices is more than twice that of house prices as the median equity price decreases by 16 percent in severe recessions, or some 12 percent more than in other recessions.

We also study the quarterly changes in the main macroeconomic variables during recessions and compare them with those during non-recession (expansion) periods. This exercise can be seen as another way of evaluating the cost of recessions relative to the average growth rate of the economy during expansionary periods. The median quarterly decline in output during recessions is around -0.5 percent whereas during expansionary periods it is close to 0.9 percent. This suggests that a typical recession leads to roughly 1.5 percent decline in output per quarter compared with the periods of expansions the countries normally enjoy. The average rate of contraction in consumption was much smaller than that in output with 0.03 percent per quarter, but the rate of growth during expansions was close to 0.75 percent. More volatile variables of national income exhibit sharper differences in growth across the periods of recessions and expansions.

C. Dynamics of Recessions

We next examine how various macroeconomic, trade and financial variables behave around recessions (see Figure 3). We focus on patterns in the year-on-year growth in each variable over a 6-year window—12 quarters before and 12 quarters after a peak.²¹ All panels include the median growth rate, i.e., the typical behavior, along with the top and bottom quartiles. As noted, according to our definition, the bottom quartile includes the severe recessions, while the top quartile contains the mild ones.

The evolution of output growth around a recession is as expected. Following the peak at date 0, output tends to register a negative annual growth rate after 3 quarters, and its growth rate goes down to -1 percent at the end of the fourth quarter after the peak. In severe recessions, the growth rate falls to -2 percent at that time. Although consumption does not decrease on a year-to-year basis in a typical recession, it does fall during the first year of a severe recession. In terms of timing, the evolution of consumption around recessions resembles the behavior of output.

²⁰ Credit declines during recessions in only around 35 percent of cases while house prices fall in around 55 percent of all recessions and equity prices register a fall in about 60 percent of them.

²¹ In our figures, we focus on year-on-year changes in the relevant variables since quarter-to-quarter changes are often quite volatile and provide a noisy presentation of recession dynamics.

Some macroeconomic variables naturally show early signs of a slowdown before the recession starts. For example, residential investment typically declines sharply ahead of the onset of recessions. Moreover, both components of investment (residential and non-residential) often register negative year-to-year changes already in the first quarter of a recession, i.e., three quarters ahead of output, and their growth rates typically stay negative for up to 6 quarters implying that the recovery in investment often starts later than that in output. In severe recessions, recovery of the growth rate of investment can take up to three years.

Industrial production also shows signs of weakness early on and typically registers a sharp decline before a recession starts. During the onset of recessions, inflation is typically still on an increasing path, and unemployment is already starting to rise. After the recession starts, however, the rate of inflation declines while the increase in the unemployment rate accelerates. Unemployment is a good leading indicator of economic activity as it typically begins climbing a quarter ahead of recessions but stays compressed more than a year after the end of the recession.

In terms of trade variables, the growth rates of both exports and imports slow down in a recession, but that of imports much more. The growth rate of imports often tends to fall before the recession starts and can decline to -7 percent in the first year of a severe recession. While both net exports and the current account balance improve during a typical recession, the improvement in net exports is often earlier and more pronounced than that of the current account.

Credit growth also slows down, by some 2 to 3 percentage points before a recession starts, and then by another 2 percentage points over the recession period, typically not returning to pre-recession growth rates for at least three years after the recession started. Recessions are often also preceded by slowdowns in the growth rates of asset prices. In the first year of a typical recession, for example, house and equity prices decline on a year-to-year basis by roughly 3 and 16 percent, respectively. While equity prices often start registering positive growth after about six quarters, house prices typically decline during the two years after the end of a recession.

D. Synchronization of Recessions, Credit Contractions and Asset Price Declines

We next examine the synchronization of recessions, credit contractions and asset price declines across countries. Our synchronization measure is simply the fraction of countries experiencing the same event at the same time.²² For recessions, Figure 4 shows how this fraction evolves over time along with the dates of recessions in the United States. The figure shows recessions bunching in about four periods during 1960–2007. First, a large fraction of

²² Recent research has typically relied on three main measures of synchronization. The first is bilateral output correlations, which capture co-movements in output fluctuations of two countries. The second is the share of output variances that can be attributed to synthetic (unobservable) common factors, as in Kose, Otrok and Prasad (2003). The third one is the concordance statistic (Harding and Pagan, 2002a), which measures the synchronization of turning points.

countries went into recession in the mid-1970s, shortly after the first oil price shock. The fraction of countries in recession also rose during the second oil price shock and the period of highly synchronized contractionary monetary policies across major industrial economies in the early 1980s. In the early 1990s, recessions were again highly synchronized around the world, and in the early 2000s to some degree. In the first three of these four periods, more than 50 percent of countries in our sample were in a recession at the same time. The peak episodes of highly synchronized recessions quickly followed each other in some instances, as shocks spilled from one country to the other. This was, for example, the case in the early 1990s because of the asymmetric shocks hitting countries across major currency areas (see Morsink, Helbling and Tokarick, 2002).²³

We document in the same way the synchronization of turning points in consumption and investment. A well known stylized fact of business cycles is that investment is much more volatile than output and consumption is somewhat less volatile than output (Backus, Kehoe and Kydland, 1995).²⁴ In our sample, indeed, investment declines in three-fourth of all recessions while consumption contracts in only half of all recessions. Consistent with these observations, the fraction of countries experiencing a period of investment (consumption) contraction at any time is much higher (lower) than that of those experiencing recessions. And, while investment contractions are highly synchronized, consumption contractions are much less so. These results are consistent with recent findings suggesting that common factors play a much larger role in explaining fluctuations in investment than they do in consumption (Kose, Otrok and Prasad, 2008).²⁵

Recessions tend to coincide with contractions in domestic credit and declines in asset prices, as documented in Section IIIC. This also shows up in the fraction of countries experiencing recessions around the world being highly correlated with the fractions of those going through credit contractions or bear asset markets (Figure 5). In particular, credit contractions are closely associated with recessions. House price declines are also highly synchronized across countries, despite the fact that housing is a nontradable asset, and the degree of synchronization rises especially during recession episodes.²⁶ Equity prices exhibit the highest degree of synchronization reflecting the extensive integration of financial markets. However,

²³ Kose, Otrok and Whiteman (2008) examine the degree of synchronization of G-7 business cycles using a dynamic factor model. They report that a common factor, on average, explains a larger share of the business cycle variation in G-7 countries since the mid-1980s compared to 1960–1972.

²⁴ For a detailed analysis of the volatility and comovement properties of business cycles for a large set of countries, see Kose, Prasad and Terrones (2003a, 2003b).

²⁵ We also analyze the synchronization of turning points in industrial production, exports and imports. As expected, the proportion of countries experiencing a contraction in industrial production is very closely correlated with that going through a recessionary period. The results indicate that synchronized recessions across countries have particularly adverse effects on global trade flows as evidenced by the higher fraction of countries experiencing contractions in their exports and imports than those witnessing recessions. We also examine the fraction of countries experiencing both real and financial cycles at the same time, such as recessions, credit contractions and/or asset price declines. The results of these additional exercises are consistent with the findings we report here.

²⁶ Terrones (2004) shows that house prices tend to move together across countries and they are procyclical, rising in economic expansions and falling in recessions.

the popular saying that “*Wall Street has predicted nine of the last five recessions*” resonates here as the fraction of countries experiencing bear equity markets frequently exceeds the fraction of countries in a recession.

IV. WHAT HAPPENS DURING CREDIT CONTRACTIONS AND ASSET PRICE DECLINES?

In this section, we study the main features of the episodes of credit contractions and declines in the prices of housing and equity in our sample. As we explained in Section II, credit contractions and asset price declines that fall into the top quartile of all credit contractions and asset price declines are classified as credit crunches and asset price busts, respectively. In particular, when the peak-to-trough decline in credit exceeds 9.5 percent, it is called a crunch episode, and when the decline in house (equity) price is larger than 14.3 (38.7) percent, it qualifies as a house (equity) price bust. In the following sub-sections, we first document the basic stylized facts of each of these credit contraction/crunch and asset price decline/bust events and then examine the temporal patterns of various macroeconomic and financial variables around these episodes.

A. Episodes of Credit Contractions

Table 2A shows the main features of credit contractions and crunches for each country in our sample. There are 112 (28) credit contraction (crunch) episodes. A typical OECD country went through about 6 credit contractions, but there is much variation across countries. Germany, the Netherlands, and Spain witnessed only a few contractions (2 to 3) while Greece, New Zealand and Portugal had the highest number (8). Austria, France, Germany and Switzerland never experienced a credit crunch episode during the 1960-2007 period, but the other countries in our sample had at least one.

The median (average) credit contraction episode lasts 4 (6) quarters. Credit crunches last typically twice as long, 8 quarters, and are statistically significantly longer than non-crunch (other) contraction episodes (Table 2B). Credit contractions usually mean some 4 percent decline in credit from peak to trough. In case of crunches, the decline in credit is 17 percent, significantly more than during the non-crunch episodes.

While output growth slows down, especially early on in a credit contraction or crunch episode (as we show next), output typically is higher at the end than at the beginning of these episodes. The increase in output during contractions and crunches is not surprising since these episodes do not always fully overlap with recessions and last twice as long as recessions do. Output also expands significantly more during crunches than during other contractions, probably because the duration of a typical crunch episode is 5 quarters longer than the duration of a typical non-crunch episode. Still, the average growth rate of output in credit crunch episodes is less than half of that observed during other periods.²⁷

²⁷ In particular, the quarterly growth rate of output is typically around 0.3 percent when there is a credit crunch whereas it is more than 0.8 percent during other contraction episodes.

Credit contractions are associated with visibly strong negative effects on investment. In particular, credit contractions (crunches) are typically accompanied with declines in residential investment of about 1 (6) percent over the period when credit contracts. The unemployment rate is typically flat during a credit contraction, but increases significantly during a credit crunch episode, primarily because of job losses early on in these episodes when economic activity also weakens.

With respect to other financial variables, house prices typically decline significantly more during credit crunches, by some 10 percent versus 1 percent in the typical non-crunch episode. While equity prices usually also decline somewhat during credit contractions, they actually increase over the credit crunch episodes, perhaps anticipating a recovery from the deeper credit slump and the longer duration of these episodes.

We then examine how the various macroeconomic and financial variables behave around credit crunches (Figure 6). As for recessions, we focus on patterns in the year-on-year growth in each variable over a 6-year window—12 quarters before and 12 quarters after a peak of credit expansion. All panels include the median growth rates, i.e., the typical behavior, along with the top and bottom quartiles. As before, the bottom quartile denotes the worst 25 percent of all credit crunches and the top quartile the best 25 percent.

Output growth typically starts declining two quarters before the beginning of a credit crunch and goes down by 2 percentage points after the fifth quarter. Although output growth typically does not become negative on a year-to-year basis in a credit crunch, it does so in at least one-quarter of the crunch episodes as evidenced by the bottom quartile. In a typical credit crunch, the year-on-year growth rate in consumption goes down as well and can fall to -2 percent in about five quarters in some crunch episodes.

As expected, investment weakens before the credit crunch starts. In particular, residential investment typically starts to slow down much before the crunch episode begins, and actually shrinks one quarter ahead of the start of the episode. Growth rates of total investment and residential investment typically stay negative for up to 8 quarters. Moreover, investment can take up to three years and residential investment even longer to recover in some episodes of credit crunches, much longer than the duration of slowdown in output. Inflation is on an increasing path and unemployment is already starting to rise prior to the start of a credit crunch, but as activity slows down after the beginning of a crunch, the rate of inflation declines and the increase in the rate of unemployment accelerates.

Credit crunches are generally preceded by a period of rapid expansion in credit, but are most often accompanied by slowdowns in asset prices. The median (year-to-year) credit growth is 5 to 6 percent just before the peak of credit expansion is reached and then slows down sharply over the crunch period, by more than 10 percentage points, falling to -6 percent and not returning to positive levels until 10 quarters after the credit crunch started. The rapid decline in credit during this period likely reflects both lower demand, e.g., decrease in investment, but also a fall in supply due to bank capital shortfalls and other adverse supply side effects. The figure shows the clear spillover effects from tight credit markets to the housing and equity markets. In particular, house prices typically fall in the first year of a

credit crunch and continue to decline for at least three years after the beginning of a crunch episode. Equity prices often decline before a credit crunch episode starts and further weaken during the first year, but then frequently stage a recovery ahead of the pick up in credit.

B. Episodes of Declines in House Prices

Table 3A shows the main features of house price declines and busts for each country in our sample. There are 114 (28) episodes of house price decline (bust) implying that a typical country experienced around 6 such episodes. Australia and Canada had the largest number (9) of decline episodes while Greece had only 1. While the majority of countries had at least one house price bust over the 1960-2007 period, Australia, Belgium, Germany, Greece, Portugal, the United Kingdom, and the United States did not experience any.²⁸ The typical episode of a decline in house prices lasts 6 quarters, but housing busts usually last more than 16 quarters. While the typical (median) decline in house prices is only 6 percent, due to some very large declines in the sample, the average decline is around 11 percent. During a house price bust, prices decline by about 29 percent typically.

Like credit contractions, output typically still expands during episodes of house price declines (Table 3B). As in the case of credit contractions, this mainly reflects that house price declines last a long time during which output still grows, albeit at a much lower rate.²⁹ There appears to be, however, a substantially adverse impact of house price declines on investment (and its components) which is much larger than that in credit contractions. During periods of house price declines (busts), residential investment typically shrinks by 4 (12) percent. Total investment also goes down, typically, by more than 8 percent. While the unemployment rate usually records a statistically significant increase during bust episodes relative to non-bust (other decline) episodes, inflation tends to be much lower at the end of house price busts, by some 3 percentage points. Credit still expands over the episodes of house price declines, but at a slower rate than normal, and equity prices do not change much. These findings suggest that developments in the housing market can have particularly strong links with the overall economy.

Figure 7 presents the dynamics of the key macroeconomic and financial variables around the periods of house price busts. Although the typical slowdown in output around a house price bust is more gradual than that in a credit crunch, the dynamics of house price busts are otherwise quite similar to those of credit crunches. The slowdown in output starts at the time of the house price bust and is associated with a slowdown in consumption growth. Investment declines largely occur after the onset of the house price decline and involve contractions in both residential and nonresidential investment. While residential investment declines less sharply after the first year of the beginning of a house price bust than that of a credit crunch, the recovery of residential investment takes much longer in house price busts.

²⁸ Since our study focuses on the completed events only, current declines in house prices in the United States and some other advanced countries are not included in these calculations.

²⁹ For example, the quarterly growth rate of output during house price busts is typically about one-fourth of that in periods without busts.

After a few quarters, and often following a run-up, inflation typically experiences a sharp decline, and unemployment starts to rise after about two years as the impact of the house price decline is gradually felt more broadly. As noted, house prices remain on the decline for long periods during a bust episode, typically much more than three years. While equity prices start falling before the onset, they usually begin to recover within two years of a house price bust. Credit growth experiences a large slowdown and does not return to the pre-bust levels for at least three years.

C. Episodes of Declines in Equity Prices

Table 4A presents the main features of equity price declines and busts for each country in our sample. Since equity prices are much more volatile than house prices, there are many more episodes, 234 (58), of declines (busts) in equity than in house prices. In a typical country, there were around 11 (3) episodes of equity declines (busts). While Italy had 7 equity bust episodes, Greece, Spain and the United States experienced only one. Episodes of declines vary quite a bit in terms of their durations and amplitudes across countries, but they typically last 5 quarters and are associated with a price drop of 27 percent. Equity busts, however, typically last 10 quarters and are accompanied with a 50 percent price decline.

As in the cases of credit contractions and house price declines, while both output and consumption also continue to grow during episodes of equity price declines, they do so at lower rates than typical (Table 4B).³⁰ However, different than for credit contractions and house price declines, there is no decline in investment over the episodes of equity price declines. While unemployment picks up a little bit, the rate of inflation does not change much during periods of equity price declines. Credit still registers an expansion and house prices typically increase between the peak and trough of the equity price decline episodes. In sum, equity price declines appear somewhat less related to the real economy than credit contractions or house prices declines.

The weak connection between the dynamics of equity prices and economic activity is also reflected in the behavior of the main macroeconomic variables (Figure 8). The growth rate of output slows down, but this usually starts only three quarters after the beginning of the equity bust and is much more limited, with the level of output typically not experiencing a decline. The extent of slowdown in consumption growth associated with an equity price bust is also delayed—until after one year or so, and is weaker than that observed during credit crunches and house price busts. The decline in investment growth follows with a relatively long lag the start of the equity price bust—only after 3 to 4 quarters does investment growth slow down. The growth rate of non-residential investment increases for a few quarters after the start of the bust, before falling at a much faster rate than residential investment growth. Inflation

³⁰ The median quarterly growth rate of output during equity busts is typically around 0.5 percent while it is about 0.8 percent during the periods without such busts. Other variables, including consumption, investment and its components, also register weaker growth during the episodes of equity busts relative to other periods.

typically remains elevated and unemployment experiences only a very small increase after an equity price bust.

The fall in equity prices itself is a sharp and prolonged one as prices do not start to recover within the three year period following the start of the bust. Credit growth experiences a delayed slowdown as well, only to pick up somewhat two years after the beginning of the equity bust. Interestingly, there appears to be also a lag in terms of the behavior of house prices, since their growth rate typically starts to decline only after one year, becoming negative after two years.

These findings suggest that the temporal dynamics of the main components of domestic absorption after credit crunches and house price busts resemble the behavior they exhibit during recessions. For example, the much larger decline in the growth rate of investment compared with that of consumption is a feature of recessions as well, as documented in the previous section. The sharper fall in consumption following house price busts than that following equity price busts is consistent with the result that recessions associated with house price busts are generally more costly than those associated with equity price busts, as we are about to document in the next section.

D. Credit Contractions and Asset Price Declines: A Summary

Table 5 summarizes the implications of the episodes of credit contractions, house prices declines and equity price declines. In terms of duration, the episodes of declines and busts of house prices last longer than credit contractions/crunches or equity price declines/busts. While less persistent than house price declines, drops in equity prices are much larger. In particular, a typical episode of house price decline (bust) leads to a 6 (29) percent drop in house prices, while an episode of equity price decline (bust) tends to result in a 27 (50) percent fall in equity prices. Both credit crunches and house price busts have adverse effects on the growth rate of investment, its components, and unemployment. House price busts, in particular, are associated with larger drops in investment and the rate of employment. Residential investment, for example, declines by 6 and 12 percent during credit crunches and house busts, respectively.

V. WHAT HAPPENS DURING RECESSIONS ASSOCIATED WITH CRUNCHES AND BUSTS?

We now analyze the features of recessions that are associated with credit crunches, house price busts and equity price busts. As we explained in section II, if a recession episode starts at the same time or after the beginning of an ongoing credit crunch or asset price bust, we consider that recession to be associated with the respective credit crunch or asset price bust. We identified 18, 34 and 45 recession episodes associated with credit crunches, house price busts and equity price busts, respectively. The association we focus on, by definition, implies a coincidence between the two events, but does not suggest a causal link. To provide a sense of distributions, we also examine the features of recessions coinciding with severe credit crunches or asset price busts. These severe crunch/bust episodes consist of the top 12.5 percent of all credit contractions or asset price declines (or the top half of all credit crunches or asset price busts).

A. Recessions Associated with Credit Crunches

We first examine the number of lags between the start of a credit crunch and the beginning of the corresponding recession. If a recession is associated with a credit crunch, it typically starts 4-5 quarters after the onset of the credit crunch (Table 6). Since credit crunches last longer than do recessions, the latter tend to end 2 quarters before their corresponding credit crunch episodes. These findings suggest that the phenomenon of “creditless recoveries” is not specific to sudden stop episodes observed in emerging markets (see Calvo, Izquierdo and Talvi, 2006) but is also a feature of business cycles in industrial countries.

Table 7 presents the main features of recessions associated with or without credit crunches. The average duration of a recession associated with a (severe) credit crunch slightly exceeds that without a crunch, but the difference is not statistically significant. Interestingly, recessions ended before their corresponding credit crunch episodes completed in all except four cases. There is typically a larger output decline in those recessions associated with a credit crunch compared to other recessions, -2.2 versus -1.8 percent, or a 0.4 percentage points difference (although this is again not statistically significant). For recessions with a severe credit crunch though, the difference in output decline is larger, 0.9 percentage points, and statistically significant.

The cumulative output loss of recessions associated with (severe) crunches is typically significantly larger than those without crunches. In particular, the average (median) cumulative loss of a recession associated with a severe crunch is two times that of without a crunch. Recessions with crunches are generally associated with greater contractions in consumption, investment, industrial production, employment, exports and imports, compared to those recessions without crunches. Except for industrial production, however, these differences are not significant.

Credit, by construction, registers much larger (and statistically significant) declines in recessions with crunches than those without crunches (Dell’ Ariccia and Garibaldi, 2005). 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). In contrast, equity prices actually decrease less in recessions with crunches and even record increases in recessions with severe crunches. This may reflect that equity prices decline more in the onset of recessions and that markets anticipate a recovery during these types of recessions.

B. Recessions Associated with House Price Busts

There are a number of statistically significant differences between recessions coinciding with house price busts and those without busts (Table 8). In particular, recessions associated with house price busts are on average over a quarter longer than those without busts. Moreover, output declines (and corresponding cumulative losses) are typically much larger in recessions with busts, 2.2 (3.7) percent versus 1.5 (2.3) percent in those without busts. These sizeable differences also extend to the other macroeconomic variables, including consumption, investment and the unemployment rate. For example, although consumption typically does

not decrease much in recessions (as documented in Section III.A), there is a statistically significant decline in consumption in recessions associated with house price busts and in case of severe busts a more than 1 percentage points decline. The large fall likely reflects the substantial effects of housing wealth on consumption.³¹ These findings collectively suggest that recessions with house price bust have the potential to result in more adverse macroeconomic outcomes than do those without such busts.

In terms of trade variables, there are also substantial differences between the recessions coinciding with house price busts and other types of recessions. In part reflecting the substantial decline in domestic demand, and thus imports, along with an increase in exports, both the net exports and the current account balance improve significantly more in recessions with house price busts.

With respect to financial outcomes, by construction, house prices fall much more in recessions with housing busts (by some 6 percentage points more), but credit also contracts more, with both differences statistically significant. Equity prices also decline during all types of recessions, but less so during recessions with housing busts—again, as markets may already be pricing in a recovery (these differences are, however, not statistically significant). These comparisons collectively suggest that the more adverse effects of a recession with a (severe) house price bust arise in part due to compressed credit markets, in turn leading to a considerable reduction in consumption and (residential) investment.³²

Similar to those associated with credit crunches, recessions associated with house price busts tend to begin 3-4 quarters after the start of their respective house price busts. However, they also end 9 quarters ahead of the corresponding house price busts because house price busts typically last three times longer than recessions (see Table 6). Moreover, when a recession is associated with a house price bust, residential investment stays depressed for a prolonged period of time and typically recovers only 3 to 5 quarters after the end of that recession.

C. Recessions Associated with Equity Price Busts

Although recessions associated with equity price busts tend to be longer and deeper than those without equity busts, these differences are not statistically significant (Table 9). This might reflect that equity price busts have a less tight relationship with developments in the real economy compared to credit crunches and house price busts. Nevertheless, nonresidential and total investment, and industrial production fall significantly more in recessions with equity price busts vis-à-vis recessions without equity busts. Imports also

³¹ Housing wealth is often found to have a larger effect on consumption than financial assets wealth does. Carroll, Otsuka and Slacalek (2006) report that the propensity to consume from a \$1 increase in housing wealth ranges between 2 (short-run) and 9 (long-run) cents, twice as large as that estimated for equity wealth.

³² There is a large literature suggesting that housing market developments play an important role in driving business cycles (see Leamer, 2007; and Muellbauer, 2007).

decline significantly more and net exports improve much more in recessions with equity price busts.

With respect to financial variables, differences are, by construction, pronounced for equity prices, typically a 12 percentage points greater drop in equity price bust recessions. There is also a pattern of house prices declining 3 percent more in recessions with severe equity price busts. Overall, these comparisons confirm that, while in normal times declines in equity prices are not necessarily associated with large changes in output, when they take place at the same time as recessions, such declines tend to coincide with relatively larger movements in both real and financial variables.

After the onset of an equity price bust, it takes around 5 quarters before the corresponding recession begins (see Table 6). The duration of a typical equity price bust is two times longer than that of a recession, but a recession tends to end at the same with its corresponding equity bust.

D. Recessions Associated with Crunches and Busts: A Summary

When associated with a credit crunch or asset price bust, which type of recession is the most painful? To facilitate such a comparison, Table 10 provides the duration, amplitude and cumulative loss for each type of recession. 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 as costly as recessions with house price busts, and both are slightly more costly than recessions with equity price busts. However, if the cumulative loss measure is the relevant metric, then the recessions associated with credit crunches are slightly more painful than those with house price busts. Recessions with equity price busts are the least costly ones on this metric as well.

We also study the implications of recessions that are accompanied by combinations of a credit crunch and an asset (house or equity price) bust at the same time. Although the number of observations for such cases is often small, a recession associated with both a crunch and a bust often leads to a larger cumulative output loss than that with only a crunch or a bust.³³ For example, the median cumulative loss of 13 recessions associated with both a credit crunch and a house price bust is -6.7 percent. And the average duration of these episodes is slightly longer, at more than 5 quarters.³⁴

³³ There are five recessions associated with both a credit crunch and an equity price bust. Seven recessions are accompanied with a credit crunch and a house price bust at the same time. There are only four recessions in our sample that are accompanied by a trilogy of a credit crunch, a house price, and an equity price bust. While these cases are also associated with larger cumulative output losses, we can not claim that they are statistically significantly different than the others we examined.

³⁴ We also examine the implications of recessions associated with different combinations of a credit contraction/crunch and an asset price decline/bust episodes. The results of these additional exercises are similar to those we report in the paper, in the sense that recessions associated with financial market difficulties are generally more severe than those without such problems.

VI. RECESSIONS ASSOCIATED WITH INCREASES IN OIL PRICES

A large number of recessions in advanced countries have been preceded by sharp increases in oil prices. In the United States, for example, nine out of ten “modern” recessions started in the aftermath of an oil price shock (Hamilton, 2005). These observations have led to a voluminous literature studying the implications of sharp fluctuations in oil prices for the behavior of various macroeconomic variables over the business cycle (Kilian, 2008).³⁵ In theory, the links between oil price and economic fluctuations arise for a variety of reasons. For example, through their impact on consumption and investment, oil price shocks affect on output. Some also argue that recessions that followed an oil price shock are primarily due to contractionary monetary policies employed to curb inflationary effects (Bernanke, Gertler, and Watson, 1997).

We therefore briefly analyze how the outcomes of a recession vary depending on whether it coincides with a large increase in the price of oil. As in earlier sections, we simply examine how various macroeconomic and financial variables behave during recessions associated with increases in oil prices. Towards this objective, using our standard demarcation of event spaces, we call an oil price increase an oil price “shock” (severe oil price shock) if the increase in oil price is in the top quartile (12.5 percent) of all price increases. With this definition, we find that almost half of the recessions in our sample are associated with an oil price shock.

Differences between recessions that coincide with oil price shocks and those without appear to be significant for several key macroeconomic variables (Table 11). The output drop, for example, is significantly larger for those recessions associated with a severe oil price shock, 2.6 percent versus 1.8 percent for those recessions without an oil price increase. Likewise, consumption, residential investment and industrial production all register noticeably greater declines during recessions associated with oil price shocks. Both imports and exports fall significantly during these types of recessions, but the changes in equity and house prices are not much different than those of recessions without jumps in oil prices. While the rate of inflation falls in a typical recession, recessions coinciding with oil price shocks are accompanied by significantly higher inflation rates, suggesting these are mainly recessions of the stagflationary type.

Inflation was usually high, and in some cases even accelerating, during most of the recessions associated with oil price shocks.³⁶ We also study the recession outcomes

³⁵ Blanchard and Gali (2007) analyze how the relationship between oil price shocks and macroeconomy has evolved since the 1970s. Crucini, Kose and Otrok (2008) report that the correlation of the common G-7 business cycle and the relative price of oil has gradually shifted from negative to positive since 1960. Claessens, Kose and Terrones (2008) provide a review of the role played by various factors, including abrupt changes in oil prices, driving recessions in the United States.

³⁶ In particular, we examine the changes in the rate of inflation during the recession periods and categorize those that fall in the top quartile of all changes as inflation “shocks”. In over one third of
(continued...)

associated with spikes in inflation to check whether there are large differences between stagflationary recessions—recessionary periods accompanied by a pick up in the inflation rate—and other recessions. The results indicate that these stagflationary recessions are quite similar to those of recessions with oil price shocks as they also witness a significantly larger decline in output and, by construction, a much larger jump in the rate of inflation compared to other recessions. While equity prices fall significantly more in recessions with an acceleration in inflation, the changes in other financial variables are not statistically significantly different from other recessions.

VII. POLICY RESPONSES DURING RECESSIONS, CRUNCHES AND BUSTS

There are many ways in which policy makers can respond to a recession, credit crunch or asset price bust, including, besides monetary and fiscal policies, interventions in the financial and corporate sectors, quasi-fiscal operations, changes in exchange rate management practices, structural reforms etc. To keep matters manageable, and for the sake of comparability across the diverse set of countries and events under consideration, this section briefly discusses only two narrow aspects of policy responses: monetary policies, proxied by changes in (short-term) interest rates, and fiscal policies, captured by changes in government consumption. Although we are well aware of the problems in associating these variables to the rather broad concepts of fiscal and monetary policies, we do think that this exercise can be useful to see general patterns across different types of recessions.³⁷

Table 12 reports the medians of peak-to-trough changes in short-term nominal and real rates and real government consumption for the nine different sets of events (combinations) we have studied in the previous sections. Policy responses vary across events under consideration as well as depending on the severity of these events. Both monetary and fiscal policies tend to be countercyclical during recessions, credit contractions and asset price declines. Moreover, fiscal policy appears to be more accommodative when the episodes are severe recessions, credit crunches and asset price busts.³⁸

In episodes involving credit crunches, house price and equity price busts, government consumption rises significantly more than in other contraction and bust episodes. This suggests a more aggressive countercyclical fiscal policy at work in recessions with credit crunches, possibly because monetary policy can be less effective in these circumstances. During house price busts, the decline in nominal interest rates is also statistically significantly larger than those episodes without house price busts. However, other differences are not statistically significant. For example, while government consumption increases more

recessions in our sample, there is an increase in the rate of inflation. The results about recessions associated with inflation shocks are available upon request.

³⁷ Romer and Romer (1994) argue that monetary policy plays a particularly important role to end recessions in the United States while fiscal policy appears to have only a limited impact. Perry and Schultze (1992) also consider the roles played by various policies during the U.S. recessions.

³⁸ Morsink, Helbling, and Tokarick (2002) report that the extent of declines in interest rates during recessions does not change much across decades and does not appear to be influenced by either the amplitude of recession or the peak level of interest rate during recession.

in severe recessions than it does in other recessions, the difference is not statistically significant.

With respect to recessionary episodes coinciding with crunches and busts, while most of the changes in policy responses across recessions associated with different types of financial market difficulties are intuitively appealing, they are not statistically significant. The only significant difference is for government consumption during recessions with credit crunches since its growth rate increases to twice that in recessions without crunches.

We also examine whether policy responses differ depending on whether recessions overlap with oil price shocks or with large increases in inflation. We find that the drops in short-term real interest rates are larger in recessions with oil price shocks as well as in those with a jump in inflation, with differences statistically significant. At the same time, the nominal short-term interest rate stays constant in the case of recessions with a large increase in inflation, while decreasing in other recessions; this difference is also statistically significant. This opposite pattern of real interest rate declines and a constant nominal interest rate reflects that during these episodes of stagflationary recessions, nominal interest rate increases did not keep up with inflation increases.

VIII. RECESSION OUTCOMES AND FINANCIAL FACTORS

In previous sections, we examined how recessions associated with credit crunches and asset price busts are different from those without such financial market difficulties. We now turn to a preliminary analysis of the empirical links between output losses and changes in financial market conditions during these episodes. In particular, we employ basic regression models to examine how the amplitude of a recession is associated with changes in financial variables during recessions, considering at the same time the fiscal and monetary policies in place, and domestic and global economic conditions. This exercise deepens our analysis of the earlier sections as it provides some insights about the roles played by various financial factors influencing the severity of recessions, while at the same considering other variables.

What are the determinants of the costs of recessions? A number of distinct factors can of course affect the recession outcomes, but we focus on a small set of variables in our regressions based on the findings in the previous sections and earlier literature.³⁹ Our analysis in the previous sections suggests that changes in financial variables are important in

³⁹ Our objective here is *not* to analyze the sources of business cycles, but is simply to correlate some financial factors to the cost of recessions. The sources of business cycles have traditionally been a topic of intense discussion (see, for instance, Zarnowitz (1985, 1998); Blanchard, 1993; Blanchard and Watson, 1984; Cochrane, 1994; Stock and Watson, 1999; and Romer, 1999). While some economists argue that cycles are originated by changes in demand or supply conditions, others emphasize the importance of shocks stemming from economic policies. Some others claim that the main sources of business cycles are productivity shocks (Kydland and Edward, 1982; Plosser, 1989). In recent work, Crucini, Kose and Otrok (2008) examine the roles played by various shocks, including to productivity, fiscal policy, monetary policy, terms of trade and oil, in explaining international business cycles.

determining recession outcomes as recessions associated with credit crunches and house prices busts are more costly than those without such episodes. In order to examine their roles, we include therefore as regressors the changes in credit, housing and equity prices during recessions.

In addition to these financial variables, we analyze how general economic conditions prevailing at the onset of recessions are associated with recession outcomes. As a simple proxy for the state of the domestic economy, we use the cumulative growth of output over the two years preceding the recession. This variable allows us to examine whether the strength of the expansionary phase of the cycle plays any role in determining the depth of the ensuing recession. We also control for global economic conditions with a variable capturing the strength of external demand. In particular, we include in the regressions the change in exports during recessions since global demand can be a buffer to downturns in domestic demand in open economies. Since fluctuations in oil prices also appear to be associated with different recession outcomes, we include as an additional regressor the growth rate of oil prices in the two years preceding the recession.

Fiscal and monetary policies are often employed to mitigate the cost of recessions. While several observers argue that these policies can help moderate recessions, some others claim that they can worsen recession outcomes. To examine the roles of fiscal and monetary policies in determining the cost of recessions, we simply include in our regressions the changes in government expenditures and short-term real interest rates during recessions. Of course, these variables also respond to recessions themselves, and as such our regressions pick up associations, not necessarily causalities.

As reported earlier, there is evidence that recessions have become milder over time, especially since the mid-1980s, an observation coined the “Great Moderation” in the volatility of business cycles. We therefore include a “Great Moderation” dummy (which takes the value of one after 1986:2, and zero otherwise) to take into account the changes in the amplitude of recessions over time. We also control for the adverse effects of financial crises by including a crisis dummy (which takes the value of one if the country experiences a banking crisis, a currency crisis, or both crises during a recession or in the year prior to a recession; and zero otherwise) to determine whether recessions associated with such crises lead to different outcomes.

We then regress the amplitude of recessions on these financial variables, initial conditions, and other controls, using a large sample of recessions over the period 1960:1-2007:4. Table 13A reports the results of our baseline OLS regressions. Each of the financial variables enters into the regressions separately in the first three columns. The coefficients on financial variables are positive implying that the extent of the decline in credit, house prices and equity prices are positively associated with the depth of recessions, with house and equity prices statistically significant. Perhaps more importantly, a decline in housing prices appears to be more influential in determining the cost of recessions than does a contraction in credit or a drop in equity prices.

In the fourth column, the role played by house prices is considered along with credit, and the fifth column reports the results when all financial variables are included in the regression. The coefficient on housing prices remains statistically significant and positive while the coefficient on equity prices loses its significance, and the coefficient on credit is now significant, but its sign changes.⁴⁰ The sixth column augments this regression by adding the duration of recessions. Changes in house prices once again have a significantly positive influence on the cost of recessions, but the other financial variables do not. These results collectively suggest that the findings for the changes in house prices are robust and do not reflect the effects of other financial variables.

Why do changes in house prices appear to be so important in determining the cost of recessions? Some insights on this question can be gained through mechanically examining changes in the main components of output during recessions associated with credit crunches and house price busts. In the earlier sections, we reported that consumption and investment usually register much sharper declines leading to more pronounced drops in employment during recessions coinciding with house price busts than during those recessions coinciding with credit crunches. In particular, the decline in consumption during recessions associated with house price busts is larger, likely reflecting the effects of the substantial loss of housing wealth on households.

In addition to the changes in house prices, some other factors also appear to influence the cost of recessions. For example, the state of the economy is positively associated with the extent of declines in output during recessions. This is an intuitively appealing result as it suggests that the higher the growth during the expansionary phase of the cycle, the larger the contraction during the recessionary phase. Reflecting the synchronous nature of recessions across countries, the decline in exports is positively correlated with the depth of recessions, and this finding is significant in almost all specifications.

The period of Great Moderation witnesses indeed milder recessions in most specifications.⁴¹ Neither the change in oil prices nor the presence of a financial crisis appear to affect in a statistically significant way the severity of recessions. One interpretation of the latter result is that the changes in financial variables already capture the effect of financial crises on the cost of recessions, but as we discuss below this may not be a robust explanation as the result changes in some specifications.⁴² As one would expect, the amplitude of a recession is positively associated with its duration.

⁴⁰ One possible explanation why credit does not appear to be a robust determinant of the cost of recessions could be that the volume of credit starts declining after banks tighten their lending standards. Credit standards (more than the volume of credit) are negatively correlated with economic activity (Lown and Morgan, 2006).

⁴¹ Hall (2008) documents that the “Great Moderation” mainly applies to the volatility of total output, but, in terms of employment, there is no difference between modern and earlier recessions.

⁴² We also examine whether (or not) the simultaneous occurrence of a currency or banking crises makes a difference as to the nature of recessions in our event study. Our preliminary results indicate that while there are some expected differences, e.g., the length of a recession when there is also a banking or currency crisis is typically longer, very few of these differences are statistically

(continued...)

In summary, across the different specifications we employ, the change in house prices tends to be the most robust financial variable associated with the depth of recessions.⁴³ Among the control variables we use, the state of the economy at the onset of the recession and the duration of the recession tend to influence most consistently the extent of the decline in output during recessions. The results also indicate that recessions that take place during the period of Great Moderation are indeed associated with milder contractions in real activity.

We next study the roles played by fiscal and monetary policies during recessions. As already discussed in earlier sections, the policy options we consider reflect only two narrow aspects of policy choices available during recessions. Moreover, there are various problems in associating our policy measures to the rather broad concepts of fiscal and monetary policies. However, our simple objective here is to examine whether the inclusion of these factors changes the results of our baseline regressions, rather than making general statements about the potency of policies in mitigating the cost of recessions.

The regression results (Table 13B) suggest that, while the measures of fiscal and monetary policies we consider do not appear to have a significant impact on the depth of recessions, the inclusion of these factors does not change our main results either. While the no impact findings with respect to policies seem to be surprising at first sight, they could be rationalized on multiple grounds. First, as explained above, the measures we consider are rather coarse proxies of fiscal and monetary policies. Second, it is known that macroeconomic policies tend to have an effect on output with a lag. Moreover, while fiscal and monetary policies have often been countercyclical in advanced countries, there have been instances in which procyclical monetary policies were in place to combat inflation.

We next examine whether these findings are driven by outliers in our sample.⁴⁴ Tables 14A-14B report the results of quantile regressions. Reassuringly, our main findings are preserved. In particular, the changes in housing prices remain significantly positively correlated with the costs of recessions. Our findings with respect to the other controls are also consistent with the ones reported earlier; however, the coefficient on the crisis dummy becomes positive and statistically significant in one specification, suggesting that there is a positive association between the presence of financial crises and the cost of recessions. This result echoes the

significant. One notable statistically significant difference, however, is that residential investment falls more during recessions that overlap with banking crises. Reinhart and Rogoff (2008) and Cardarelli, Elekdag and Lall (2008) examine macroeconomic developments around the episodes of financial stress.

⁴³ A number of recent papers examine the links between house price fluctuations and macroeconomic outcomes. For example, Cecchetti (2006) also reports that house price booms have adverse effects on growth prospects. Using various methodologies, Cardarelli, Monacelli, Rebucci, and Sala (2008) examine the interactions between house prices and business cycles in OECD countries.

⁴⁴ For this purpose, we simply use the quantile regressions, a widely used methodology to control for the impact of outliers. We have also experimented with other robust methodologies to account for the roles played by outliers, but our main results are preserved.

findings by Bordo, et al. (2001) who report that banking, currency and twin crises are positively correlated with the severity of recessions (see also Cerra and Saxena, 2008).⁴⁵

IX. CONCLUSION

A. A Summary

Our analysis of the interactions between macroeconomic and financial variables around various episodes of business and financial cycles suggests that these interactions play key roles in determining the severity and duration of recessions. In particular, recessions associated with credit crunches and house price busts appear to be deeper and last longer than other recessions do. The durations of credit crunches and house price busts tend to be longer than those of typical recessions, while the dynamics of the main components of domestic absorption around these events are similar to those observed during recessions. In terms of their impact on investment and the unemployment rate, credit crunches and house price busts are more costly than equity price busts are, and equity price busts appear to be less consistently associated with real sector outcomes.

We also provide a preliminary analysis of the determinants of the costs of recessions and the special roles played by changes in financial variables during these episodes. In particular, we employ basic regression models to examine how the amplitude of a recession is associated with changes in financial variables. Our results suggest that the extent of declines in house prices appears to most consistently influence the depth of recessions, even after taking account for the changes in other financial variables, including credit and equity prices, and various other controls.

B. Lessons for Today

The global economy has been experiencing a financial storm of historic proportions. What are the lessons of our work for the implications of this crisis? The lessons from the earlier episodes of recessions, crunches and busts we examined are sobering, suggesting that recessions following this financial storm will likely be more costly than other recessions, because they take place alongside simultaneous credit crunches and asset price busts. Furthermore, although the effects of the current crisis have already been felt gradually around the world, the past evidence suggests that its global dimensions are likely to intensify in the coming months. Nevertheless, the nature of a recession in a particular country can be shaped by many factors, including the financial health of its firms, banks, and households prior to the recession and what policy measures authorities employ to mitigate its adverse effects. Continued decisive policy actions at both the national and global levels could help meet the evolving challenges.

⁴⁵ We undertake some additional sensitivity tests to check the robustness of our regression results. For example, we examine the inclusion of fixed effects to control for country-specific and time invariant characteristics not included in our models. In addition, we consider the shape of the distribution of our dependent variable and its possible impact on the nature of errors. Additional regressions to address such considerations do not change the main messages from the baseline regression.

C. Caveats and Future Research

While our broad cross-country study sheds much new light on the implications of recessions, crunches, and busts, it does come with its caveats. Being primarily an event study, no causal inferences are made (or intended) as to how recessions come about, whether financial variables affect macroeconomic outcomes or vice-versa, and how policies affect economic and financial outcomes. Moreover, as mentioned before, an important caveat to our analysis is that initial conditions, external developments in terms of both demand and supply, and policy responses will affect the path an economy follows during a recession. We attempt to control for some of these factors in our preliminary regressions, but nevertheless our analysis makes clear that more work is needed to get a better grasp of the important macroeconomic and financial linkages so as to be better informed on how to adjust policies and institutional environments to lower the costs of recessions, and to make better forecasts on the shape of economic outcomes.

For example, our analysis does not yet explore the channels through which financial and real variables interact. As noted by a diverse set of theoretical studies, besides general wealth and substitution effects, financial variables will impact the balance sheets of financial institutions, firms and households, and thereby affect the extension of credit and thus the performance of the real economy. While there has been some empirical work documenting the importance of these channels in normal times, little is known about how they operate in a recession, which could include Fisherian deflations.

This points to an exciting future research agenda. One additional approach to shed more light on the channels would be to use individual firm data for a similarly large sample of countries. For instance, we plan to examine the evolution of firm financial variables, especially credit use, inventory and liquidity, by classes of firms, including firm size, degree of leverage and other measures capturing the likely degree of firms being financially constrained. This will allow one to investigate whether firms that are more dependent on external finance are hit harder during recessions with credit contractions and housing busts than during normal recessions.

In our future research, we also plan to focus on alternative metrics of economic activity, such as various measures of output gap, studying whether there are different patterns in recessions associated with financial stress or crisis episodes, and how various types of recessions interact with global and emerging market cycles. Lastly, it would be useful to expand the sample of countries by including emerging market economies to examine the global dimensions of recessions.

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Appendix: Database

| Variable | Variable Definition | Source |
|-----------------------------|---|--|
| Output | Gross domestic product, volume; 1960:1-2007:4* | OECD |
| Consumption | Private final consumption expenditure, volume; 1960:1-2007:4 | OECD |
| Government Consumption | Government final consumption expenditure, volume; 1960:1-2007:4 (except Spain: 1961:1-2007:4) | OECD |
| Investment | Gross fixed capital formation, volume; 1960:1-2007:4 | OECD |
| Residential FCF | Private residential fixed capital formulation, volume; 1960:1-2007:4 (except Canada: 1961:1-2007:4, France: 1963:1-2007:4, New Zealand: 1961:3-2007:4, Portugal: 1988:1-2007:4) | OECD |
| Nonresidential FCF | Private nonresidential fixed capital formulation, volume; 1960:1-2007:4 (except Canada: 1961:1-2007:4, France: 1963:1-2007:4, UK: 1962:1-2007:4, Denmark: 1971:1-2007:4, New Zealand: 1961:3-2007:4, Norway: 1962:1-2007:4, Portugal: 1988:1-2007:4, Switzerland: 1961:1-2007:4) | OECD |
| Total FCF | Private total fixed capital formulation, volume; 1960:1-2007:4 (except Canada: 1961:1-2007:4, Denmark: 1971:1-2007:4, France: 1963:1-2007:4, New Zealand: 1961:3-2007:4, Norway: 1962:1-2007:4, Portugal: 1977:1-2007:4, Spain: 1964:1-2007:4, Switzerland: 1961:1-2007:4, UK: 1962:1-2007:4) | OECD |
| Industrial Production | Industrial production; 1960:1-2007:4 Generally, the coverage of industrial production indices comprises mining and quarrying, manufacturing and electricity, and gas and water, according to the UN international Standard Industrial Classification (ISIC). For most OECD countries, the data come from the OECD database. | IFS |
| Exports | Exports of good and services, volume; 1960:1-2007:4 | OECD |
| Imports | Imports of good and services, volume; 1960:1-2007:4 | OECD |
| Export Prices | Export unit values; 1960:1-2007:4 (except Portugal: 1983:1-2007:4, Switzerland: 1961:1-2007:4) Indices for Unit Value of Exports are Laspeyres, with weights derived from the data for transactions. | IFS |
| Import Prices | Import unit values; 1960:1-2007:4 (except Belgium: 1993:1-2007:4, France: 1989:4-2007:4, Greece: 1961:1-2007:4, Switzerland: 1961:1-2007:4) Indices for Unit Value of Exports are Laspeyres, with weights derived from the data for transactions. | IFS |
| Net Export-GDP ratio | Net exports/GDP; 1960:1-2007:4 (except France: 1963:1-2007:4) | Both net exports and GDP are from OECD. |
| Current Account - GDP Ratio | Current account balances/GDP; 1960:1-2007:4 (except Austria: 1970:1-2007:4, Belgium: 1975:1-2007:4, Denmark: 1988:1-2007:4, Finland: 1975:1-2007:4, France: 1975:1-2007:4, Germany: 1971:1-2007:4, Greece: 1975:1-2007:4, Ireland: 1975:1-2007:4, Italy: 1971:1-2007:4, Japan: 1968:1-2007:4, Netherlands: 1967:1-2007:4, New Zealand: 1971:1-2007:4, Norway: 1975:1-2007:1, Portugal: 1975:1-2007:4, Spain: 1975:1-2007:4, Sweden: 1975:1-2007:4, Switzerland: 1972:1-2007:4) | (1) Current account balances are from OECD and GDS; (2) GDP is from OECD. |

Appendix: Database

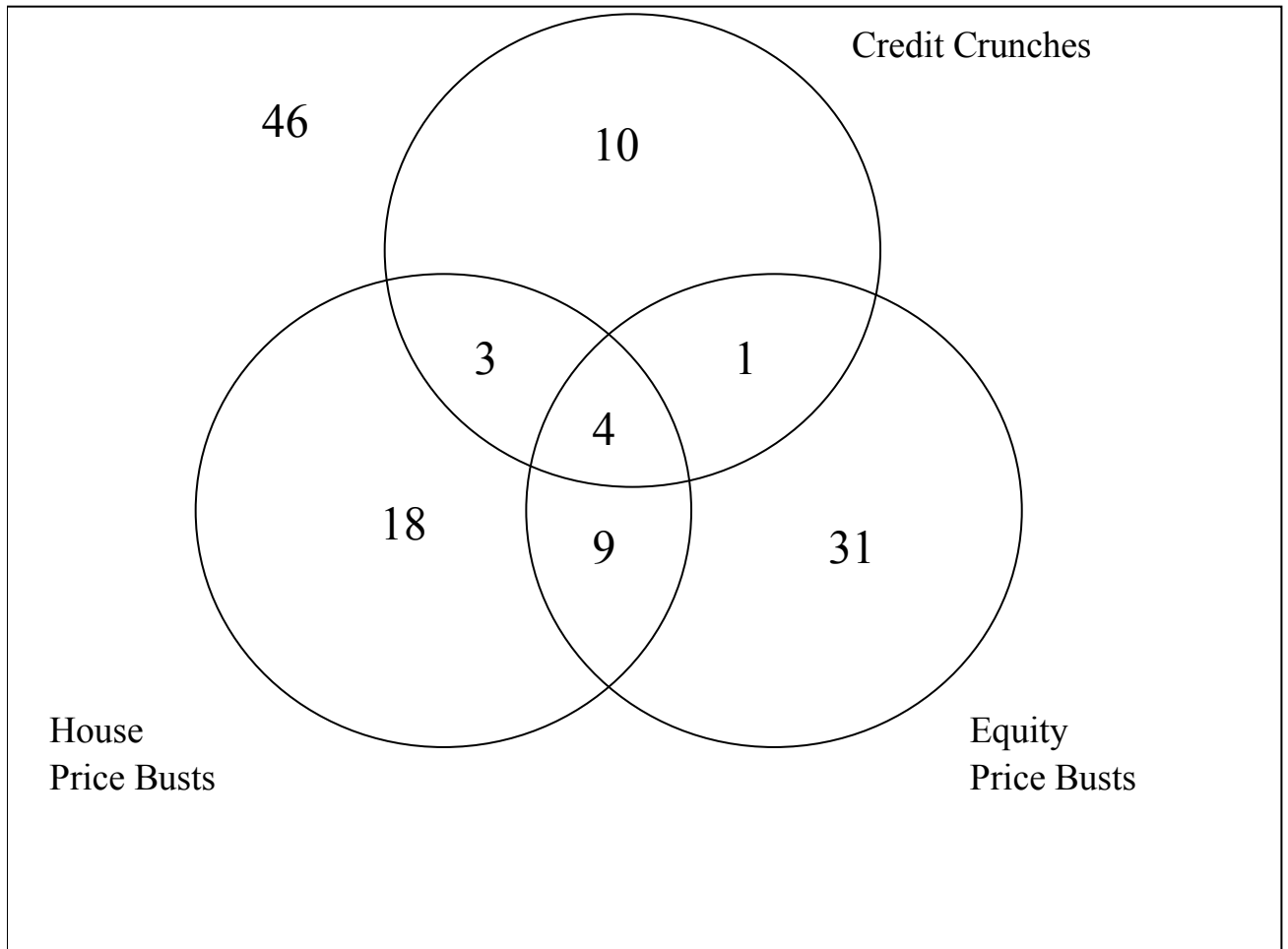
contd

| Variable | Variable Definition | Source |
|-------------------------------|---|--|
| NEER | Nominal effective exchange rate; 1960:1-2007:4 (except Australia 1975:1-2007:4, New Zealand 1975:1-2007:4, Portugal 1975:1-2007:4) A nominal effective exchange rate index represents the ratio (expressed on the base 2000=100) of an index of a currency's period-average exchange rate to a weighted geometric average of exchange rates for the currencies of selected countries and the euro area. | IFS |
| REER | Real effective exchange rate; 1980:1-2007:4 A real effective exchange rate index represents a nominal effective exchange rate index adjusted for relative movements in national price or cost indicators of the home country, selected countries, and the euro area. | IFS |
| House Prices | Nominal house prices deflated using CPI (BIS data only); 1970:1-2007:4 (except Austria: 1986:3-2007:4, Belgium: 1988:1-2007:4, Greece: 1993:4-2007:4, Portugal: 1988:1-2007:4, Spain: 1971:1-2007:4) | OECD and BIS (Austria, Belgium, Greece and Portugal) |
| Stock Prices | Share Price (Index) deflated using Consumer Price Index; 1960:1-2007:4 1960:1-2007:4 (except Denmark: 1970:1-2007:4, Greece: 1994:1-2007:4, New Zealand: 1961:1-2007:4, Portugal: 1988:1-2007:4, Spain: 1961:1-2007:4) Indices shown for Share Prices generally relate to common shares of companies traded on national or foreign stock exchanges. All reported indices are adjusted for changes in quoted nominal capital of companies. Indices are, in general, base-weighted arithmetic averages with market value of outstanding shares as weights. | Both Share Price (Index) and Consumer Price Index are from IFS. |
| Real Credit | Nominal credit deflated using Consumer Price Index; 1960:1-2007:4 (except Italy: 1970:1-2007:4, UK: 1963:1-2007:4, Spain:1972:1-2007:4, Sweden: 1969:4-2007:4, Switzerland: 1964:1-2007:4) Nominal credit from IFS is generally titled "Claims on Private Sector", "Claims on Other Resident Sector", etc. Nominal credit from Datastream is generally titled "Loans to Resident Private Sector", "Lending to Enterprises and Individuals", etc. | (1) Nominal credit is from IFS and Datastream; (2) Consumer Price Index is from IFS. |
| Short-term Real Interest Rate | Treasury bill rate deflated using inflation rate; 1960:1-2007:4 Treasury Bill Rate is the rate at which short-term securities are issued or traded in the market. (except Australia 1969:3-2007:4) | (1) Short-term nominal interest rate is from IFS; (2) Inflation rate is the annual growth rate of CPI (from IFS). |
| Long-term Real Interest Rate | Government bond yield deflated using inflation rate; 1960:1-2007:4 Government Bond Yield refers to one or more series representing yields to maturity of government bonds or other bonds that would indicate longer -term rates. (except Austria 1970:1-2007:4, Finland 1970:1-2007:4, Greece 1992:4-2007:4, Spain 1970:1-2007:4) | (1) Long-term nominal interest rate is from IFS; (2) Inflation rate is the annual growth rate of CPI (from IFS). |
| Unemployment Rate | Unemployment rate; 1960:1-2007:4 The unemployment rate is the ratio of number of persons unemployed and the number of persons in the labour force. The labour force is the sum of the numbers of persons employed and unemployed. The criteria for a person to be considered as unemployed or employed are defined by the ILO guidelines. | OECD, GDS, HAVER, DATASTREAM and BLOOMBERG |
| Inflation Rate | Inflation rate; 1960:1-2007:4 Inflation rate is calculated as $[CPI(\text{quarter } i, \text{ year } t) / CPI(\text{quarter } i, \text{ year } t-1)] * 100$, where $i=1,2,3,4$. | CPI is from IFS. |

* The series for US is from 1960:1-2008:1; same for all other series.

Figure 1. Associations between Recessions, Crunches and Busts
(number of events in each event category)

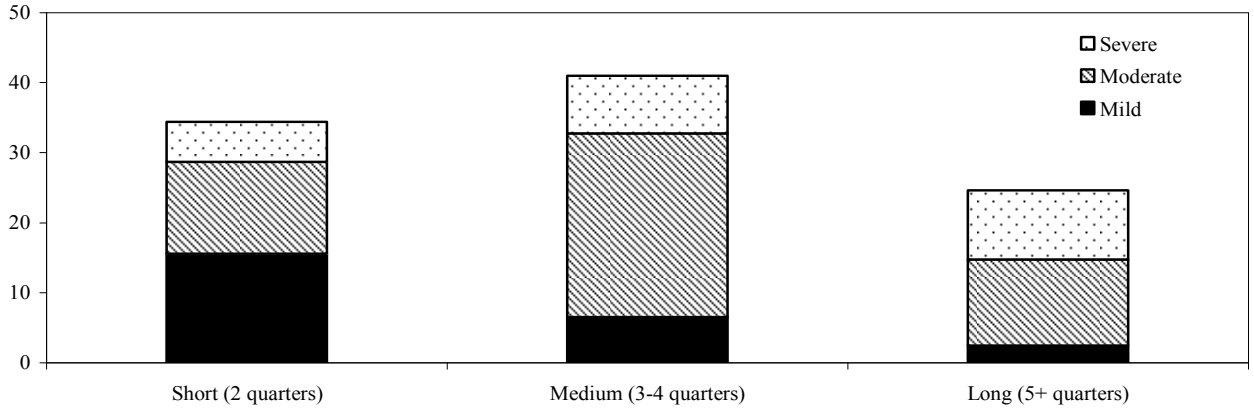
Recessions



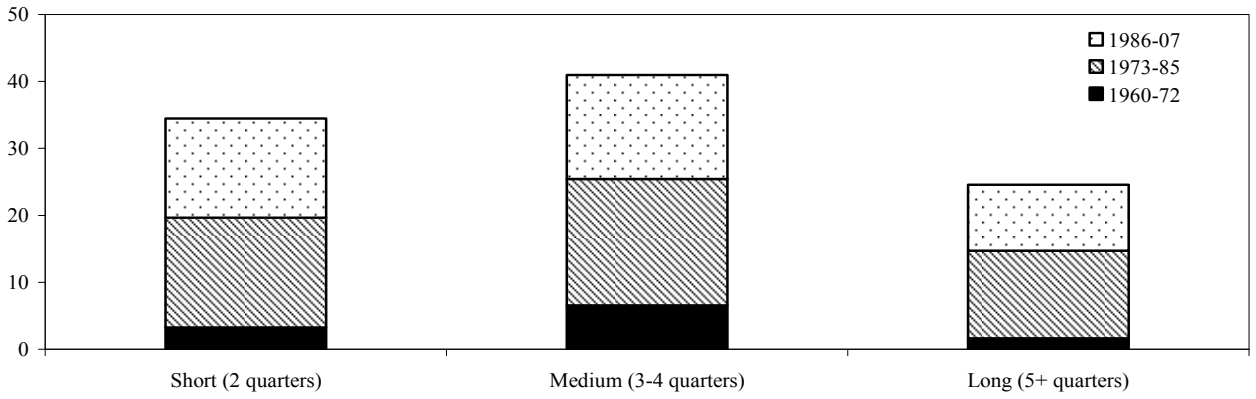
Notes: The rectangle shows the distribution of 122 recession episodes in the sample into those associated with crunches and busts (76) and those associated with none (46). Out of 122 recessions, 18 are associated with credit crunches, 34 are with house price busts, and 45 are with equity price busts. 46 recessions are not associated with either a crunch or bust episode.

Figure 2. Recessions: Duration and Amplitude
(share of total sample, percent)

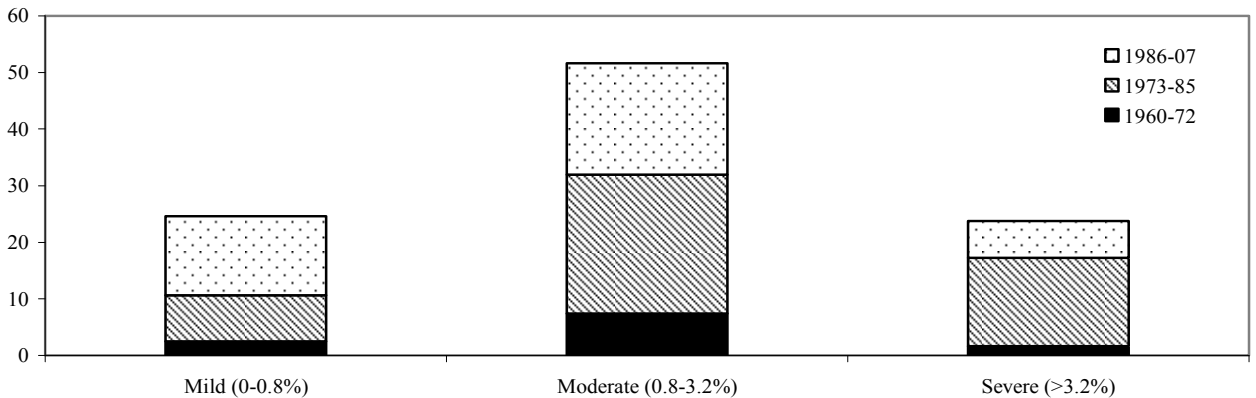
a. Duration and Amplitude: Full Period (1960:1-2007:4)



b. Duration: Sub-periods



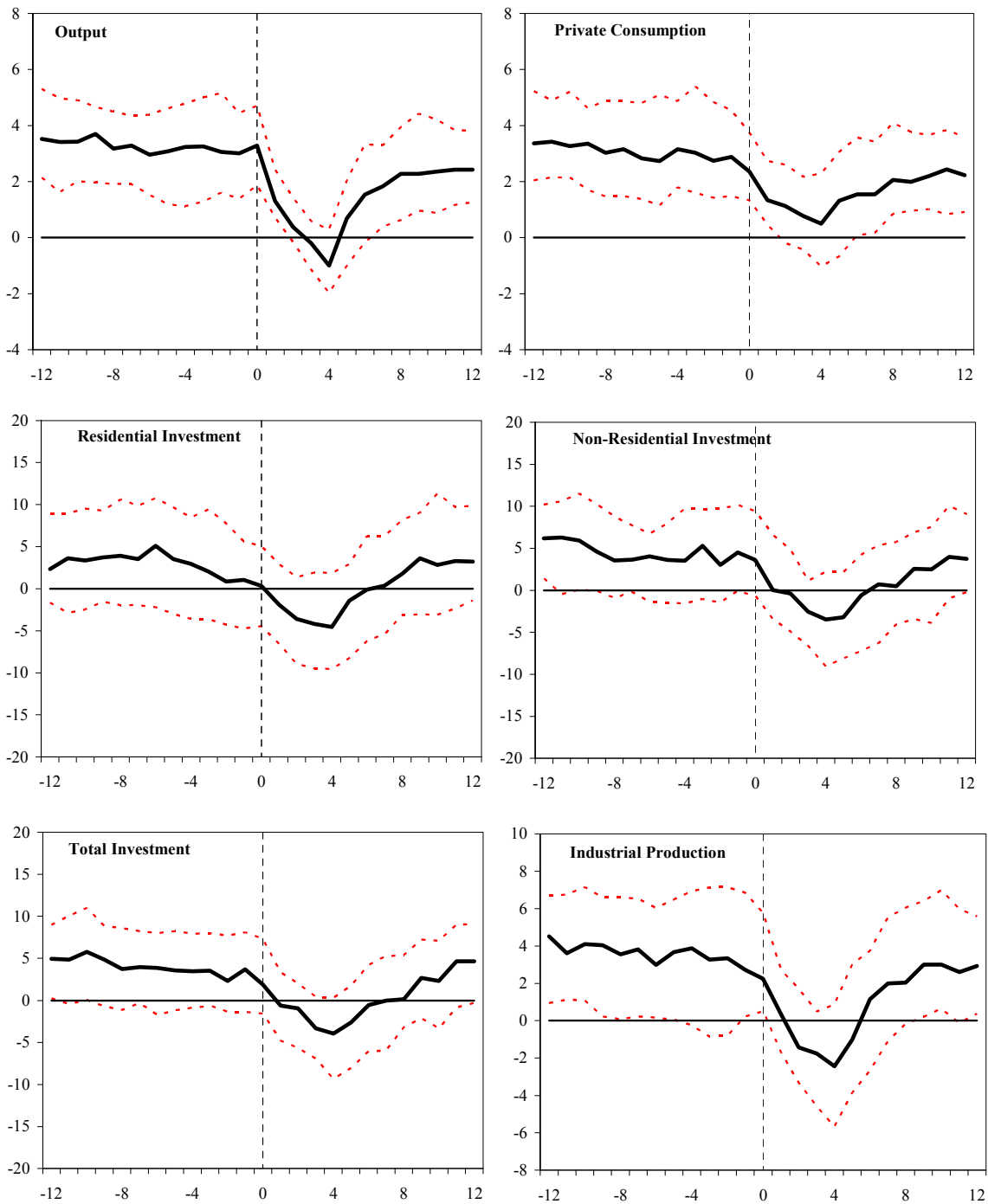
c. Amplitude: Sub-periods



Notes: Share of total number of recessions falling in particular categories. Duration is the number of quarters from a peak to the next trough of a recession. Amplitude is the percent change in output from a peak to the next trough of a recession.

Figure 3. Recessions in OECD Countries

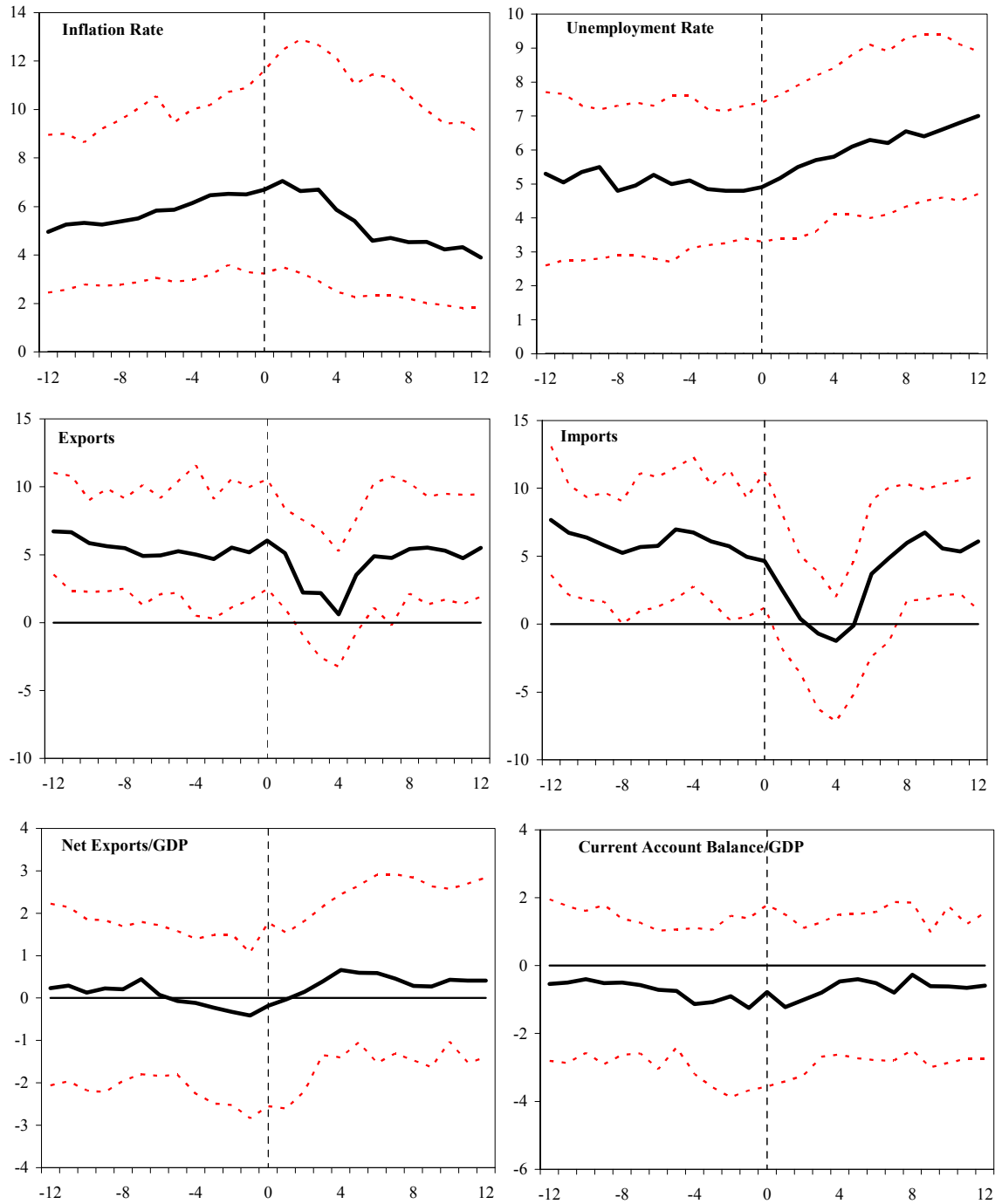
(Percent change from a year earlier unless otherwise noted; zero denotes peak; x-axis in quarters)



Notes: The solid line denotes the median of all observations while the dotted lines correspond to upper and lower quartiles. Zero is the quarter after which a recession begins (peak in the level of output).

Figure 3. Recessions in OECD Countries (continued)

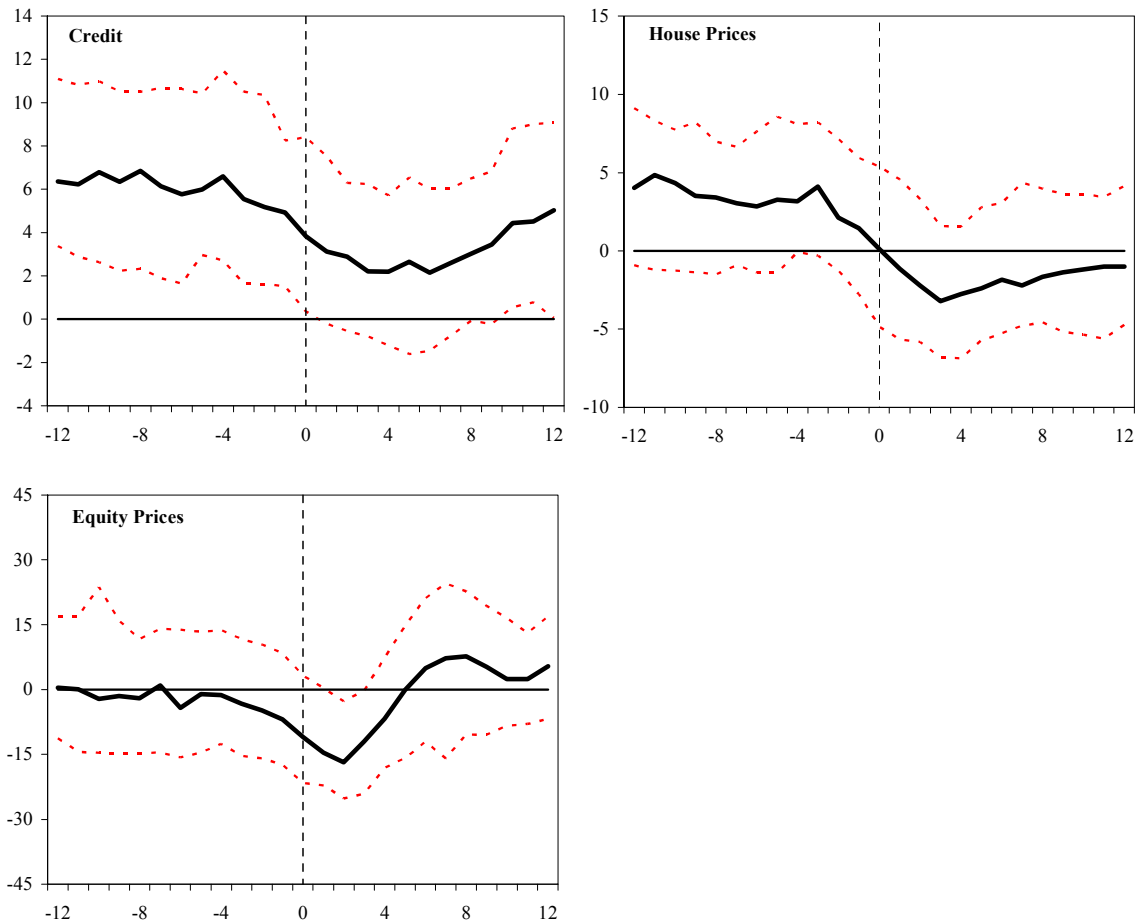
(Percent change from a year earlier unless otherwise noted; zero denotes peak; x-axis in quarters)



Notes: The solid line denotes the median of all observations while the dotted lines correspond to upper and lower quartiles. Zero is the quarter after which a recession begins (peak in the level of output). Inflation rate, unemployment rate, net exports/GDP, and current account balance are the level of the respective variable in percent.

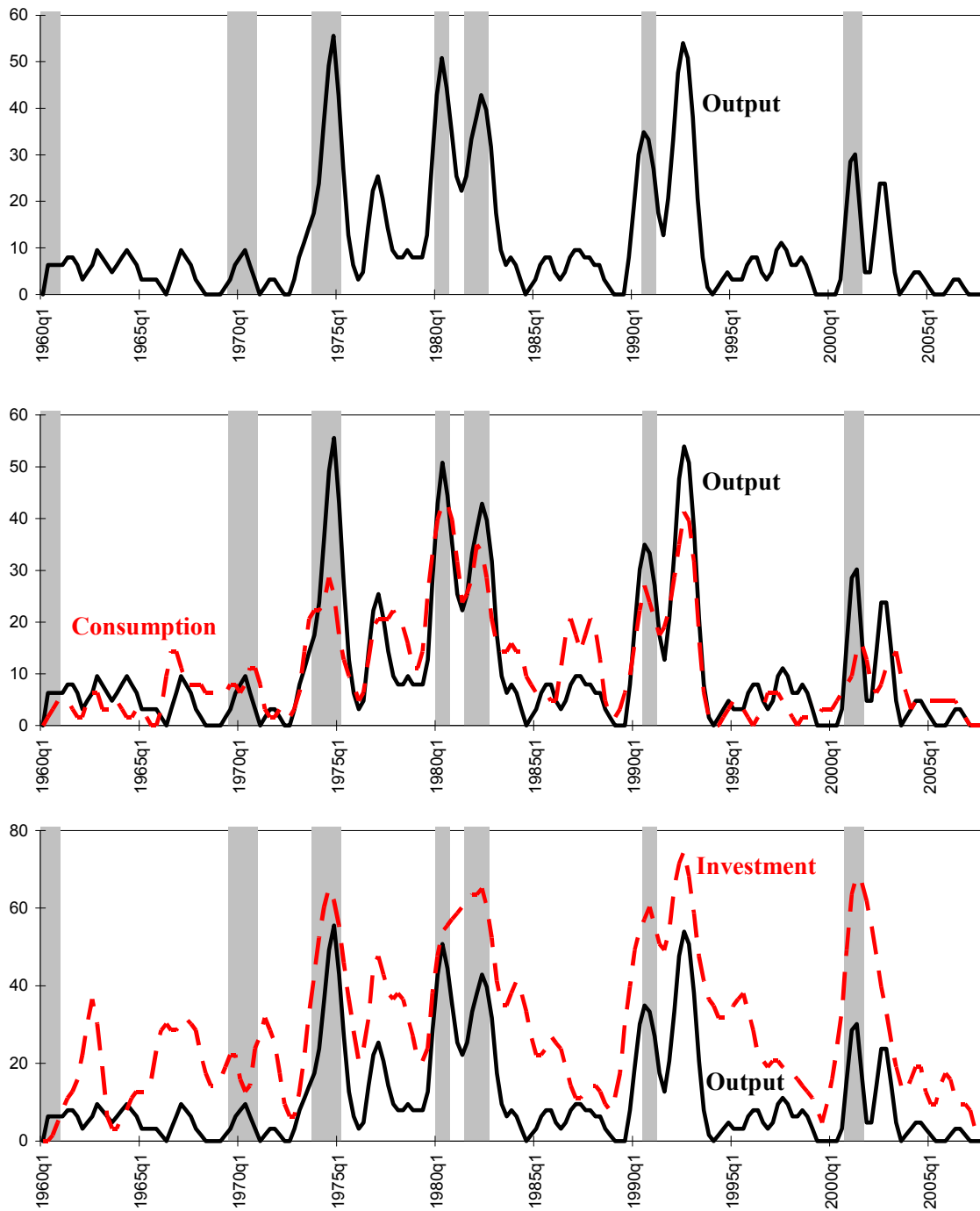
Figure 3. Recessions in OECD Countries (continued)

(Percent change from a year earlier unless otherwise noted; zero denotes peak; x-axis in quarters)



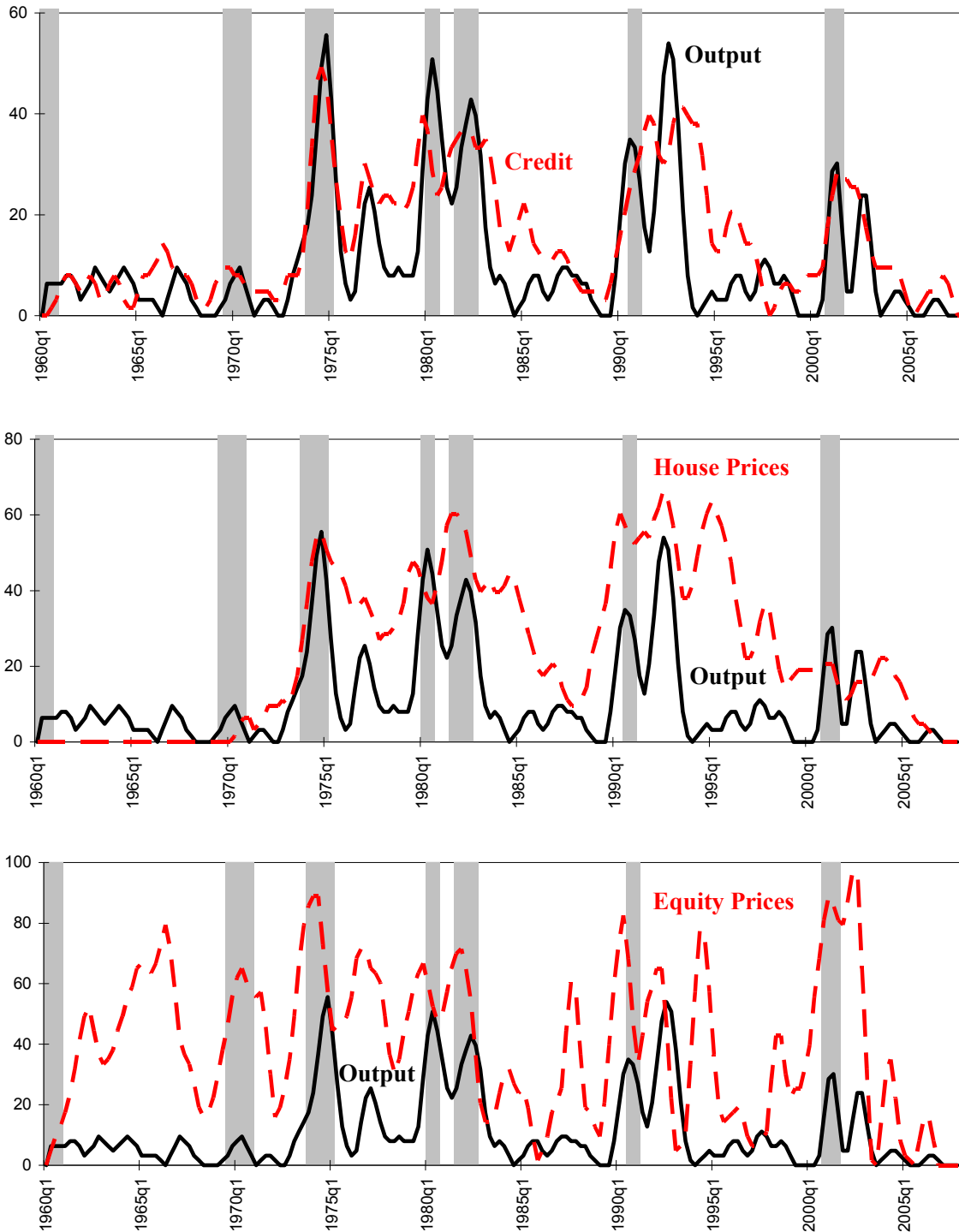
Notes: The solid line denotes the median of all observations while the dotted lines correspond to upper and lower quartiles. Zero is the quarter after which a recession begins (peak in the level of output).

Figure 4. Synchronization of Recessions
(Share of countries experiencing recessionary episodes of output, consumption and investment, percent)



Notes: Share of countries experiencing recessions in output, consumption and investment. Shaded bars indicate periods of U.S. recessions.

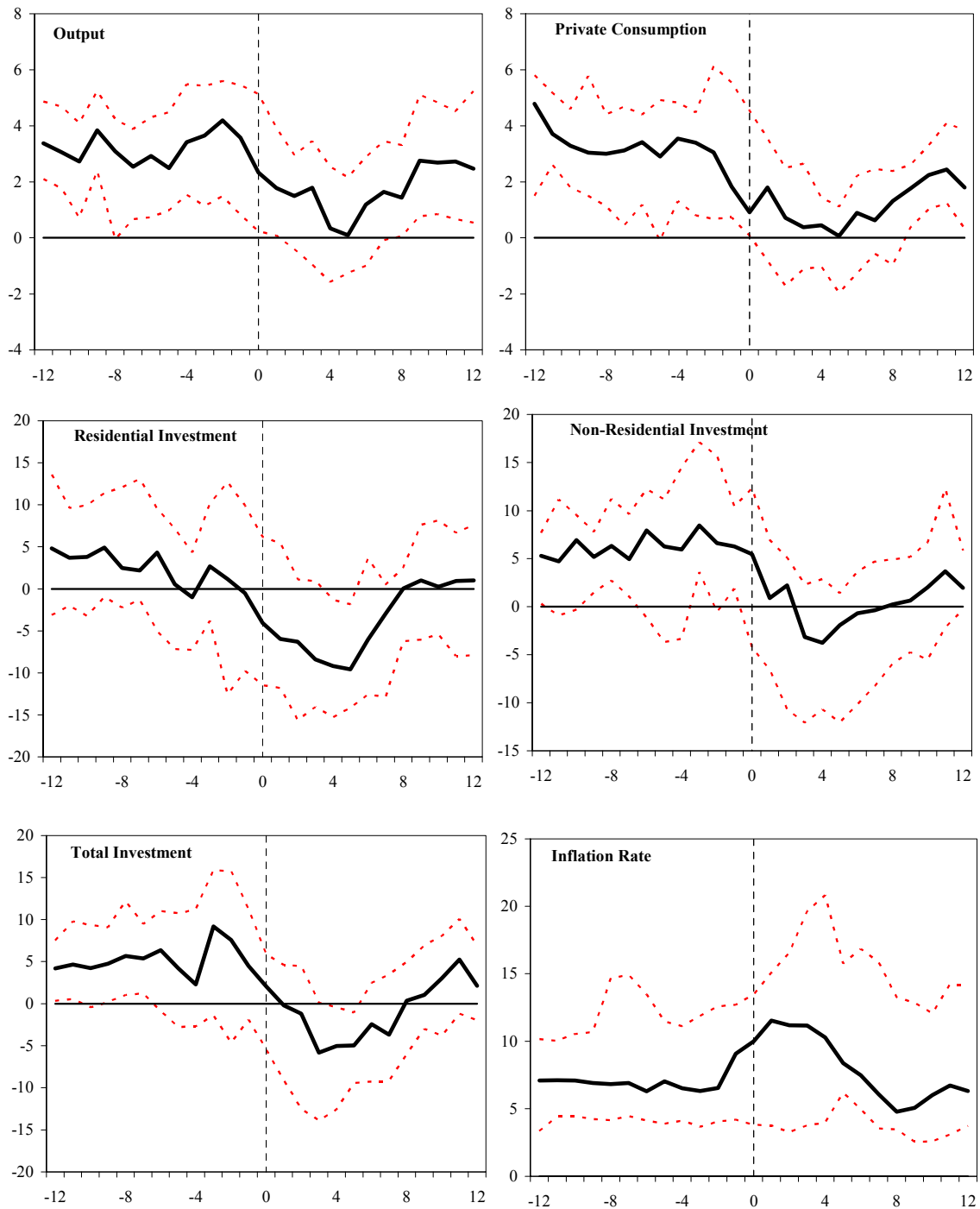
Figure 5. Synchronization of Credit Contractions and Asset Price Declines
(Share of countries experiencing credit contractions or asset price declines, percent)



Notes: Share of countries experiencing episodes of credit contractions, house price declines and equity price declines. Shaded bars indicate periods of U.S. recessions.

Figure 6. Credit Crunches in OECD Countries

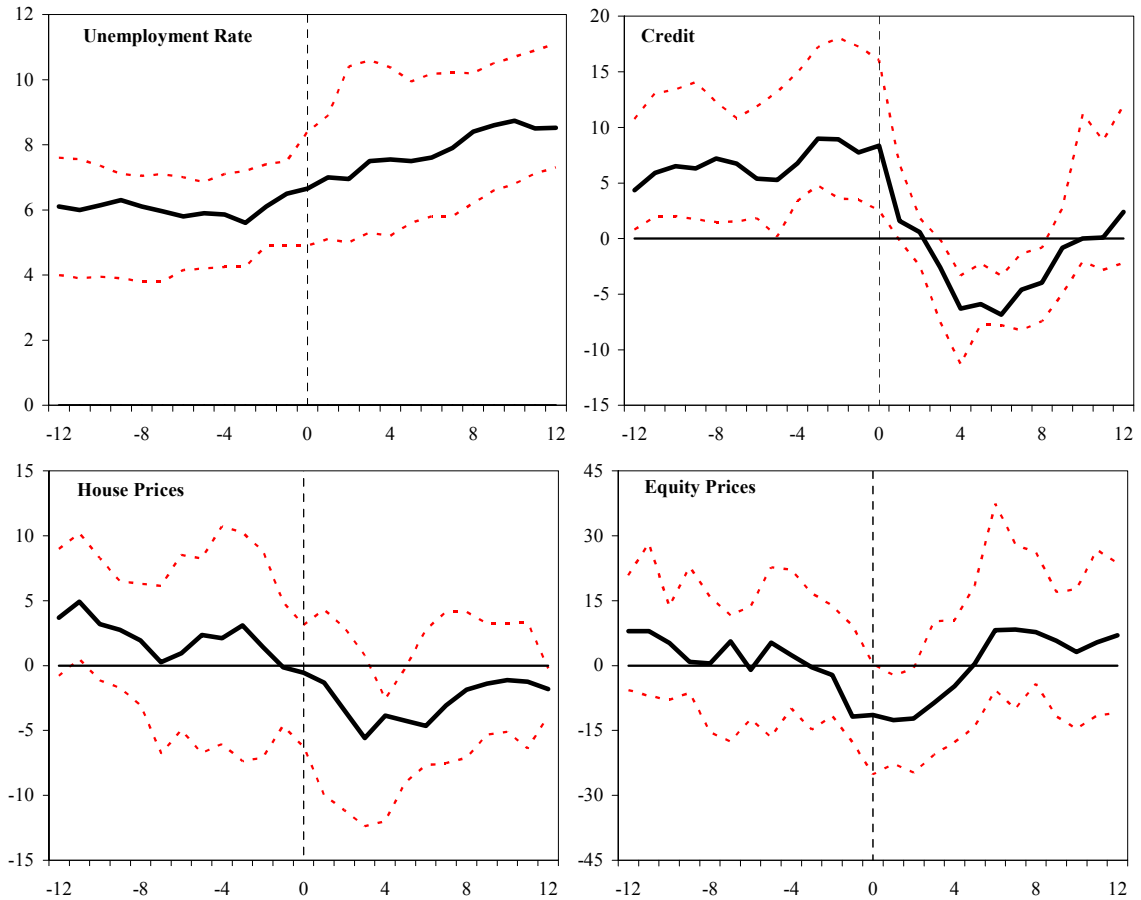
(Percent change from a year earlier unless otherwise noted; zero denotes peak; x-axis in quarters)



Notes: The solid line denotes the median of all observations while the dotted lines correspond to upper and lower quartiles. Zero is the quarter after which a crunch begins (peak in the level of credit). Inflation rate is the level of the inflation rate in percent.

Figure 6. Credit Crunches in OECD Countries (continued)

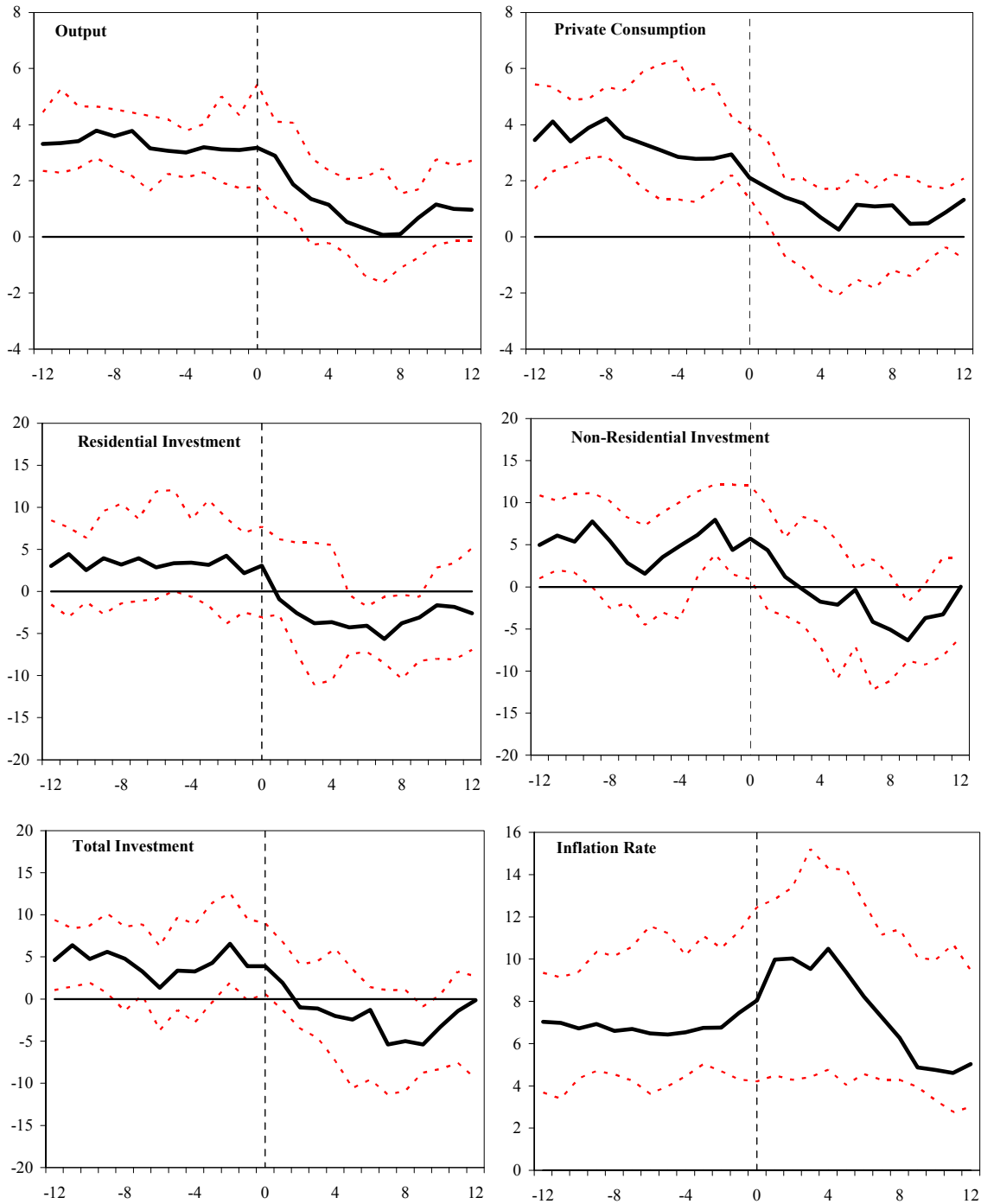
(Percent change from a year earlier unless otherwise noted; zero denotes peak; x-axis in quarters)



Notes: The solid line denotes the median of all observations while the dotted lines correspond to upper and lower quartiles. Zero is the quarter after which a crunch begins (peak in the level of credit). Unemployment rate is the level of the unemployment rate in percent.

Figure 7. House Price Busts in OECD Countries

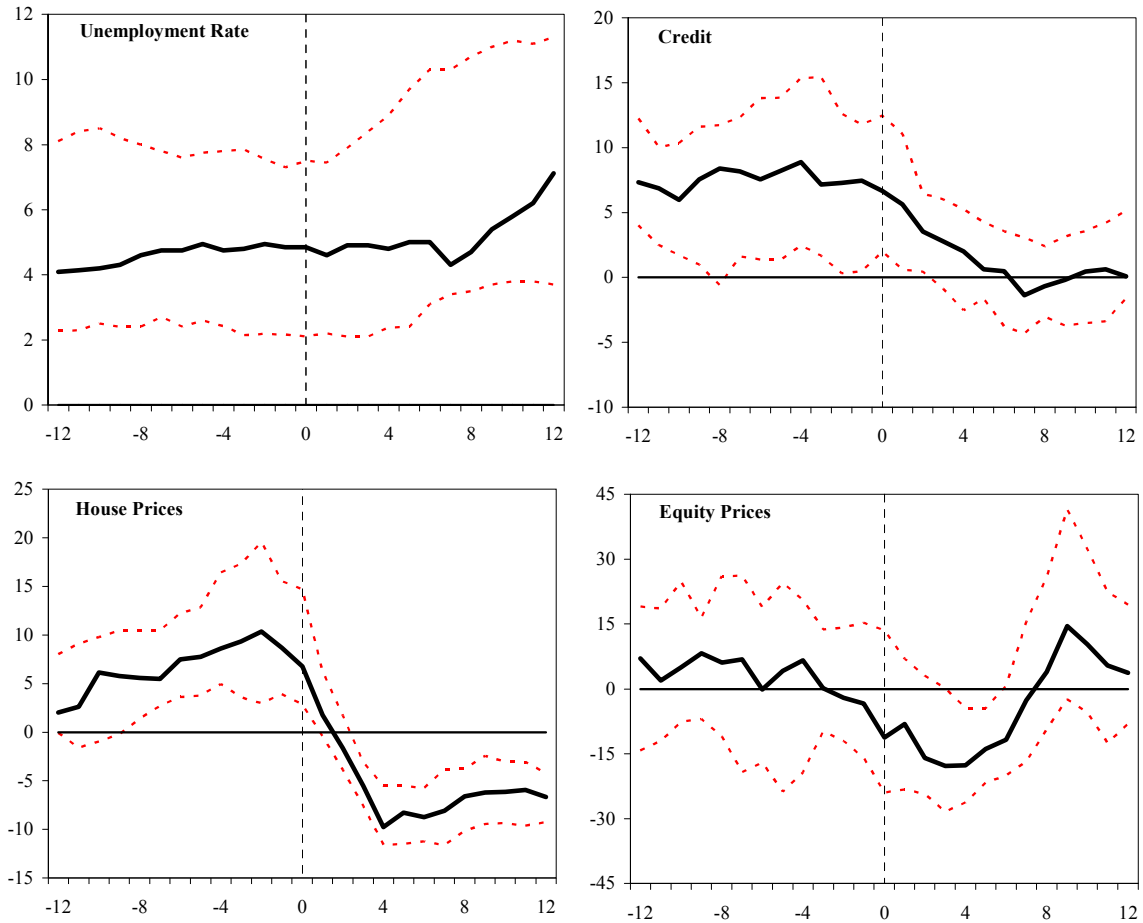
(Percent change from a year earlier unless otherwise noted; zero denotes peak; x-axis in quarters)



Notes: The solid line denotes the median of all observations while the dotted lines correspond to upper and lower quartiles. Zero is the quarter after which a bust begins (peak in the level of house price). Inflation rate is the level of the inflation rate in percent.

Figure 7. House Price Busts in OECD Countries (continued)

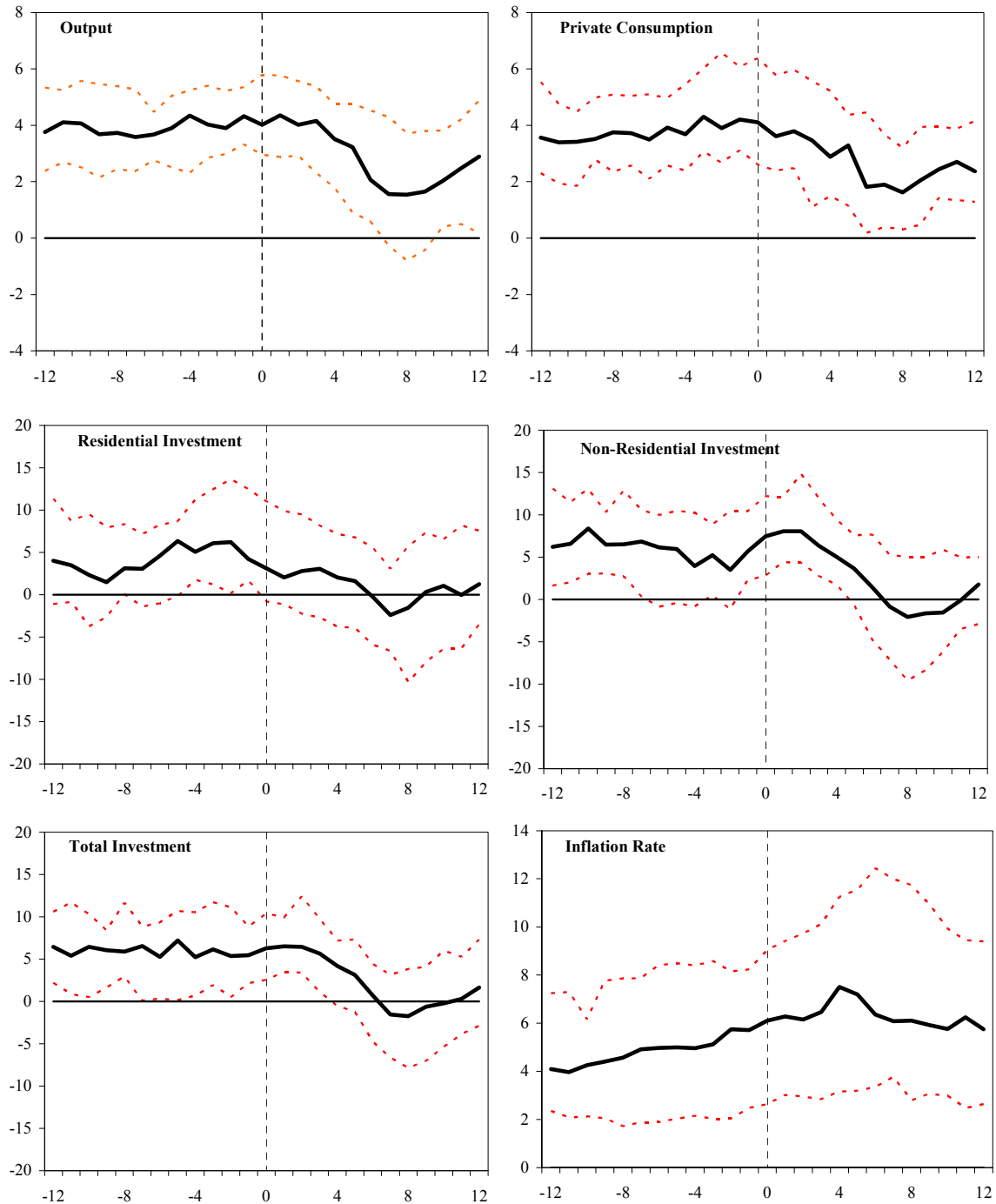
(Percent change from a year earlier unless otherwise noted; zero denotes peak; x-axis in quarters)



Notes: The solid line denotes the median of all observations while the dotted lines correspond to upper and lower quartiles. Zero is the quarter after which a bust begins (peak in the level of house price). Unemployment rate is the level of the unemployment rate in percent.

Figure 8. Equity Price Busts in OECD Countries

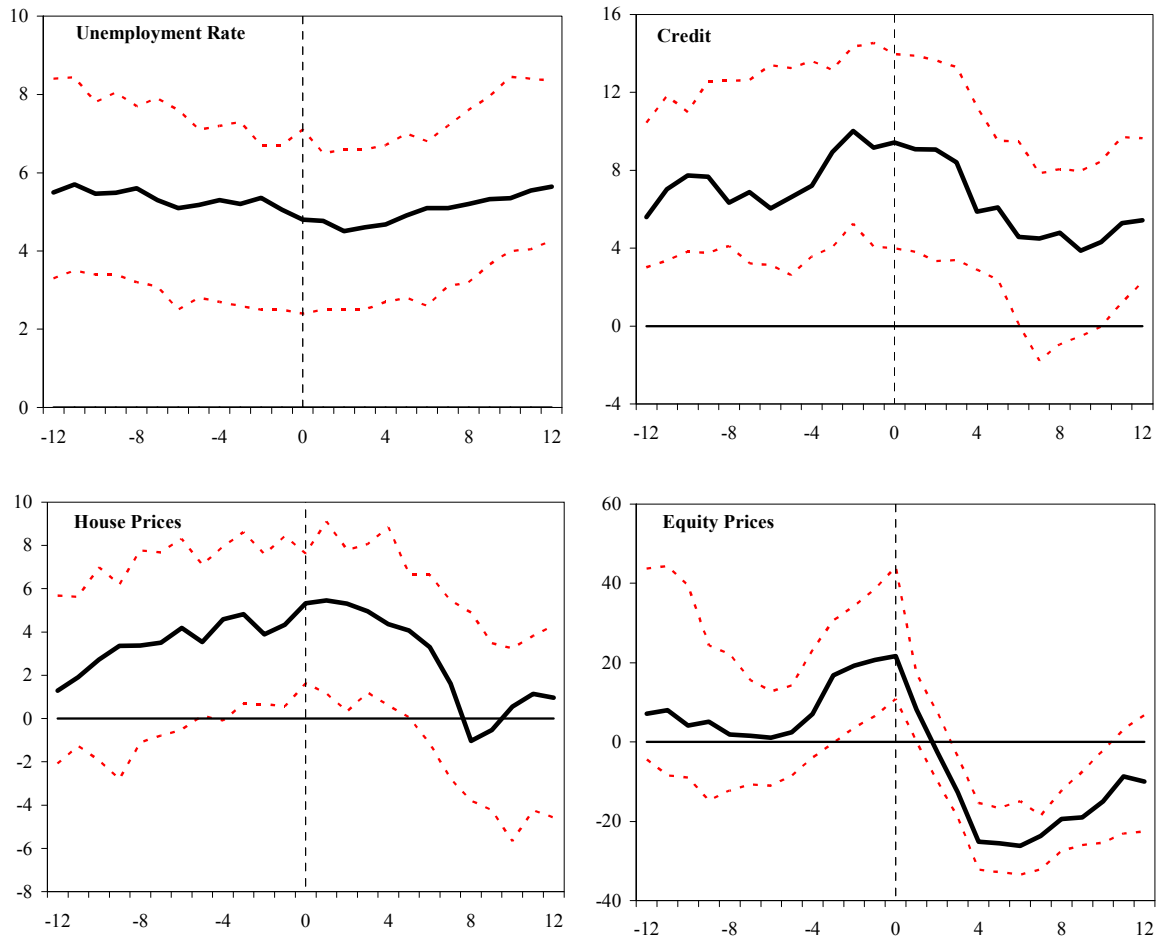
(Percent change from a year earlier unless otherwise noted; zero denotes peak; x-axis in quarters)



Notes: The solid line denotes the median of all observations while the dotted lines correspond to upper and lower quartiles. Zero is the quarter after which a bust begins (peak in the level of equity price). Inflation rate is the level of the inflation rate in percent.

Figure 8. Equity Price Busts in OECD Countries (continued)

(Percent change from a year earlier unless otherwise noted; zero denotes peak; x-axis in quarters)



Notes: The solid line denotes the median of all observations while the dotted lines correspond to upper and lower quartiles. Zero is the quarter after which a bust begins (peak in the level of equity price). Unemployment rate is the level of the unemployment rate in percent.

Table 1.A. Recessions: Summary Statistics

| Country | All Recessions | | | | | Severe Recessions | | | |
|----------------------|----------------------|----------|---------------------------------|-----------|-----------------|-----------------------------|----------|-----------|-----------------|
| | Number of Recessions | Duration | Proportion of time in Recession | Amplitude | Cumulative Loss | Number of Severe Recessions | Duration | Amplitude | Cumulative Loss |
| G-7 | | | | | | | | | |
| Canada | 3 | 4.00 | 0.06 | -2.84 | -6.45 | 2 | 5.00 | -4.13 | -9.50 |
| France | 4 | 3.50 | 0.07 | -1.27 | -2.57 | ... | ... | ... | ... |
| Germany | 8 | 3.25 | 0.13 | -1.41 | -2.56 | 1 | 4.00 | -3.37 | -4.90 |
| Italy | 9 | 3.11 | 0.15 | -1.34 | -2.67 | 1 | 3.00 | -3.84 | -7.94 |
| Japan | 3 | 4.67 | 0.07 | -2.38 | -7.39 | 1 | 8.00 | -3.35 | -15.38 |
| United Kingdom | 5 | 4.20 | 0.11 | -3.11 | -8.44 | 2 | 5.00 | -4.77 | -13.42 |
| United States | 7 | 3.43 | 0.12 | -1.67 | -3.16 | ... | ... | ... | ... |
| Other | | | | | | | | | |
| Australia | 7 | 3.43 | 0.12 | -1.65 | -3.50 | 1 | 7.00 | -3.89 | -12.70 |
| Austria | 6 | 2.50 | 0.08 | -1.08 | -1.60 | ... | ... | ... | ... |
| Belgium | 7 | 2.86 | 0.10 | -1.00 | -1.53 | ... | ... | ... | ... |
| Denmark | 7 | 4.14 | 0.15 | -1.76 | -4.11 | 1 | 7.00 | -3.17 | -9.58 |
| Finland | 5 | 4.60 | 0.12 | -3.93 | -22.51 | 1 | 13.00 | -12.75 | -102.76 |
| Greece | 8 | 3.50 | 0.15 | -6.45 | -11.83 | 6 | 3.67 | -7.87 | -14.63 |
| Ireland | 3 | 2.67 | 0.04 | -0.90 | -1.41 | ... | ... | ... | ... |
| Netherlands | 5 | 4.00 | 0.10 | -2.20 | -0.82 | 2 | 2.50 | -3.37 | -4.32 |
| New Zealand | 12 | 3.83 | 0.24 | -5.94 | -14.74 | 9 | 3.11 | -7.31 | -12.04 |
| Norway | 3 | 2.67 | 0.04 | -1.99 | -2.99 | ... | ... | ... | ... |
| Portugal | 4 | 4.50 | 0.09 | -3.38 | -6.68 | 1 | 5.00 | -6.03 | -12.19 |
| Spain | 4 | 3.00 | 0.06 | -1.12 | -2.76 | ... | ... | ... | ... |
| Sweden | 3 | 7.33 | 0.11 | -3.87 | -15.17 | 1 | 12.00 | -5.64 | -24.23 |
| Switzerland | 9 | 3.56 | 0.17 | -2.28 | -6.86 | 1 | 7.00 | -9.81 | -42.81 |
| Country Group | | | | | | | | | |
| OECD | | | | | | | | | |
| Median | 5.00 | 3.00 | 0.11 | -1.87 | -3.04 | 1.00 | 4.00 | -4.89 | -9.94 |
| Mean | 5.81 | 3.64 | 0.11 | -2.63 | -6.40 | 2.14 | 4.70 | -6.31 | -16.10 |
| G-7 | | | | | | | | | |
| Median | 5.00 | 3.00 | 0.11 | -1.59 | -2.99 | 1.00 | 4.00 | -3.46 | -7.94 |
| Mean | 5.57 | 3.56 | 0.10 | -1.83 | -4.12 | 1.40 | 5.00 | -4.05 | -10.58 |
| Other | | | | | | | | | |
| Median | 5.50 | 3.00 | 0.11 | -2.01 | -3.08 | 1.00 | 4.00 | -6.03 | -10.29 |
| Mean | 5.93 | 3.67 | 0.11 | -3.01 | -7.47 | 2.56 | 4.61 | -7.00 | -17.79 |

Notes: Duration is the number of quarters between a peak and the next trough of a recession. Proportion of time in recession refers to the ratio of the number of quarters in which the economy is in recession over the full sample period. Amplitude is the percent change in output from a peak to the next trough of a recession. Cumulative loss combines information about the duration and amplitude to measure the overall cost of a recession and is expressed in percent. Severe recessions are those in which the peak-to-trough decline in output is in the top 25 percent of all recession-related output declines. Country-specific data are means. Country-group data are means/medians.

Table 1.B. Recessions: Summary Statistics
(Percent change unless otherwise indicated)

| | Median Values | | | Mean Values | | |
|--|----------------|-------------------|------------------|----------------|-------------------|------------------|
| | All Recessions | Severe Recessions | Other Recessions | All Recessions | Severe Recessions | Other Recessions |
| A. Output | | | | | | |
| Duration ^{1/} | 3.00 | 4*** | 3.00 | 3.64 | 4.7** | 3.29 |
| Amplitude | -1.87 | -4.89*** | -1.33 | -2.63 | -6.31*** | -1.43 |
| Cumulative Loss | -3.04 | -9.94*** | -2.05 | -6.40 | -16.1*** | -1.43 |
| B. Components of Output | | | | | | |
| Consumption | -0.07 | -1.19* | 0.05 | -0.16 | -1.21* | 0.18 |
| Total Investment | -4.15 | -9.73** | -3.65 | -5.93 | -11.35** | -4.19 |
| Residential Investment | -4.08 | -12.6*** | -2.56 | -6.64 | -15.52*** | -3.78 |
| Non-residential Investment | -3.63 | -7.38* | -3.19 | -5.10 | -9.11* | -3.78 |
| Exports | -0.65 | -4.11*** | 0.50 | -0.74 | -6.33*** | 1.08 |
| Imports | -3.82 | -9.18*** | -2.58 | -4.20 | -9.41** | -2.50 |
| Net Export (% of GDP) ^{2/} | 0.62 | 1.61 | 0.48 | 0.76 | 0.79 | 0.75 |
| Current Account (% of GDP) ^{2/} | 0.47 | 0.98 | 0.45 | 0.56 | 0.70 | 0.51 |
| C. Other Macroeconomic Variables | | | | | | |
| Industrial Production | -4.14 | -7.01*** | -2.89 | -3.99 | -7.35*** | -3.07 |
| Unemployment Rate ^{2/} | 0.60 | 1.7*** | 0.50 | 1.10 | 2.88** | 0.77 |
| Inflation Rate ^{2/} | -0.29 | 0.01 | -0.31 | -0.27 | -0.13 | -0.32 |
| D. Financial Variables | | | | | | |
| House Prices | -2.31 | -4.53 | -2.00 | -3.57 | -7.15* | -2.49 |
| Equity Prices | -5.49 | -15.64*** | -5.07 | -4.25 | -13.55** | -1.85 |
| Credit | 0.99 | 0.89 | 0.99 | 1.66 | 1.95 | 1.57 |

Notes: Severe recessions are those in which the peak-to-trough decline in output is in the top 25 percent of all recession-related output declines. Other recessions refer to episodes that are not severe recessions. In each cell, the mean (median) change in the respective variable from peak to trough of recessions is reported, unless otherwise indicated. The symbols *, **, and *** indicate that the difference between means (medians) of severe recessions and other recessions is significant at the 10 percent, 5 percent, and 1 percent levels, respectively.

^{1/} Number of quarters.

^{2/} Change in levels.

Table 2.A. Credit Contractions: Basic Statistics

| Country | Credit Contractions | | | | Credit Crunches | | |
|----------------------|------------------------|----------|-----------------------------------|-----------|--------------------|----------|-----------|
| | Number of Contractions | Duration | Proportion of time in Contraction | Amplitude | Number of Crunches | Duration | Amplitude |
| G-7 | | | | | | | |
| Canada | 6 | 3.33 | 0.10 | -5.31 | 2 | 4.50 | -10.40 |
| France | 5 | 4.80 | 0.12 | -5.42 | ... | ... | ... |
| Germany | 3 | 7.67 | 0.12 | -2.20 | ... | ... | ... |
| Italy | 6 | 6.00 | 0.19 | -5.89 | 1 | 15.00 | -11.87 |
| Japan | 5 | 7.80 | 0.20 | -4.61 | 1 | 25.00 | -11.24 |
| United Kingdom | 7 | 3.29 | 0.12 | -9.12 | 2 | 4.00 | -21.36 |
| United States | 5 | 7.80 | 0.20 | -8.03 | 2 | 13.50 | -15.11 |
| Other | | | | | | | |
| Australia | 5 | 3.40 | 0.09 | -6.02 | 1 | 8.00 | -20.17 |
| Austria | ... | ... | ... | ... | ... | ... | ... |
| Belgium | 6 | 5.33 | 0.17 | -4.73 | 1 | 13.00 | -13.32 |
| Denmark | 6 | 8.67 | 0.27 | -11.82 | 3 | 14.33 | -19.42 |
| Finland | 4 | 8.25 | 0.17 | -10.23 | 1 | 22.00 | -33.91 |
| Greece | 8 | 4.50 | 0.19 | -7.17 | 2 | 6.00 | -13.97 |
| Ireland | 5 | 6.00 | 0.16 | -9.52 | 1 | 5.00 | -13.71 |
| Netherlands | 2 | 4.50 | 0.05 | -10.54 | 1 | 7.00 | -20.79 |
| New Zealand | 8 | 5.13 | 0.21 | -10.14 | 4 | 6.25 | -17.21 |
| Norway | 4 | 4.00 | 0.08 | -4.38 | 1 | 8.00 | -13.80 |
| Portugal | 8 | 5.50 | 0.23 | -8.51 | 2 | 8.00 | -22.03 |
| Spain | 3 | 9.67 | 0.15 | -7.40 | 1 | 11.00 | -9.52 |
| Sweden | 7 | 6.71 | 0.24 | -8.71 | 1 | 24.00 | -39.55 |
| Switzerland | 7 | 4.43 | 0.16 | -3.07 | ... | ... | ... |
| Country Group | | | | | | | |
| OECD | | | | | | | |
| Median | 5.50 | 4.00 | 0.16 | -4.22 | 1.00 | 8.00 | -17.03 |
| Mean | 5.50 | 5.65 | 0.15 | -7.23 | 1.59 | 10.30 | -17.80 |
| G-7 | | | | | | | |
| Median | 5.00 | 4.00 | 0.12 | -4.12 | 2.00 | 10.00 | -11.86 |
| Mean | 5.29 | 5.51 | 0.15 | -6.16 | 1.60 | 10.50 | -14.60 |
| Other | | | | | | | |
| Median | 6.00 | 4.00 | 0.16 | -4.54 | 1.00 | 8.00 | -17.12 |
| Mean | 5.62 | 5.71 | 0.15 | -7.78 | 1.58 | 10.21 | -19.15 |

Notes: Duration is the number of quarters between a peak and the next trough of a contraction. Proportion of time in contraction refers to the ratio of the number of quarters in which credit is experiencing a contraction episode over the full sample period. Amplitude is the percent change in credit from a peak to the next trough of a contraction. Credit crunches correspond to peak-to-trough declines in credit that are in the top 25 percent of all episodes of credit declines. Country-specific data are means. Country-group data are means/medians.

Table 2.B. Credit Contractions: Summary Statistics
(Percent change unless otherwise indicated)

| | Median Values | | | Mean Values | | |
|---------------------------------|------------------|-----------------|--------------------|------------------|-----------------|--------------------|
| | All Contractions | Credit Crunches | Other Contractions | All Contractions | Credit Crunches | Other Contractions |
| A. Credit | | | | | | |
| Duration ^{1/} | 4.00 | 8*** | 3.00 | 5.65 | 10.3*** | 4.13 |
| Amplitude | -4.22 | -17.03*** | -3.40 | -7.23 | -17.8*** | -3.79 |
| B. Macroeconomic Variables | | | | | | |
| Output | 1.82 | 2.64** | 1.58 | 2.19 | 3.6* | 1.73 |
| Consumption | 1.18 | 1.49 | 1.15 | 1.34 | 1.75 | 1.21 |
| Total Investment | -0.70 | -5.63*** | 0.19 | -2.17 | -6.67** | -0.73 |
| Residential Investment | -1.39 | -5.92** | -0.09 | -4.69 | -13.22** | -1.96 |
| Non-residential Investment | 0.02 | -2.51* | 0.21 | -0.74 | -3.16 | 0.04 |
| Unemployment Rate ^{2/} | 0.37 | 1.65*** | 0.20 | 0.92 | 2.01** | 0.59 |
| Inflation Rate ^{2/} | 0.08 | -0.37 | 0.23 | 0.77 | -0.09 | 1.05 |
| C. Other Financial Variables | | | | | | |
| House Prices | -1.98 | -10.28** | -0.85 | -3.46 | -9.07** | -1.58 |
| Equity Prices | -2.65 | 6.28** | -5.93 | -1.12 | 15.02* | -6.28 |

Notes: Credit crunches correspond to peak-to-trough declines in credit that are in the top 25 percent of all episodes of credit declines. Other contractions refer to episodes that are not credit crunches. In each cell, the mean (median) change in the respective variable from peak to trough of the episodes of credit declines/crunches is reported, unless otherwise indicated. The symbols *, **, and *** indicate that the difference between means (medians) of credit crunches and other contractions is significant at the 10 percent, 5 percent, and 1 percent levels, respectively.

^{1/} Number of quarters.

^{2/} Change in levels.

Table 3.A. House Price Declines: Basic Statistics

| Country | House Price Declines | | | | House Price Busts | | |
|----------------------|----------------------|----------|-------------------------------|-----------|-------------------|----------|-----------|
| | Number of Declines | Duration | Proportion of time in Decline | Amplitude | Number of Busts | Duration | Amplitude |
| G-7 | | | | | | | |
| Canada | 9 | 6.00 | 0.28 | -7.82 | 1 | 16.00 | -20.80 |
| France | 3 | 13.33 | 0.21 | -12.85 | 2 | 18.50 | -18.13 |
| Germany | 7 | 7.57 | 0.27 | -4.52 | ... | ... | ... |
| Italy | 7 | 8.86 | 0.32 | -15.09 | 3 | 14.00 | -24.66 |
| Japan | 3 | 26.33 | 0.41 | -25.04 | 2 | 38.50 | -37.20 |
| United Kingdom | 4 | 11.25 | 0.23 | -19.24 | 2 | 16.50 | -30.25 |
| United States | 7 | 6.00 | 0.22 | -4.62 | ... | ... | ... |
| Other | | | | | | | |
| Australia | 9 | 6.56 | 0.31 | -6.75 | ... | ... | ... |
| Austria | 3 | 13.67 | 0.21 | -12.63 | 2 | 17.00 | -16.75 |
| Belgium | 2 | 3.00 | 0.03 | -1.67 | ... | ... | ... |
| Denmark | 5 | 10.80 | 0.28 | -18.15 | 2 | 21.50 | -36.23 |
| Finland | 6 | 9.00 | 0.28 | -16.33 | 2 | 18.50 | -40.00 |
| Greece | 1 | 3.00 | 0.02 | -3.37 | ... | ... | ... |
| Ireland | 8 | 4.75 | 0.20 | -7.66 | 2 | 10.00 | -16.86 |
| Netherlands | 5 | 6.80 | 0.18 | -12.54 | 1 | 18.00 | -47.17 |
| New Zealand | 6 | 8.83 | 0.27 | -9.79 | 1 | 25.00 | -37.83 |
| Norway | 5 | 11.40 | 0.30 | -12.53 | 1 | 25.00 | -40.48 |
| Portugal | 5 | 7.00 | 0.18 | -4.93 | ... | ... | ... |
| Spain | 6 | 7.67 | 0.24 | -12.62 | 2 | 13.00 | -24.85 |
| Sweden | 6 | 8.50 | 0.26 | -12.93 | 2 | 16.00 | -31.02 |
| Switzerland | 7 | 8.57 | 0.31 | -11.90 | 3 | 17.00 | -25.07 |
| Country Group | | | | | | | |
| OECD | | | | | | | |
| Median | 6.00 | 6.00 | 0.26 | -5.99 | 2.00 | 16.50 | -28.52 |
| Mean | 5.43 | 8.47 | 0.24 | -10.80 | 1.87 | 18.43 | -28.50 |
| G-7 | | | | | | | |
| Median | 7.00 | 6.00 | 0.27 | -6.81 | 2.00 | 16.00 | -26.43 |
| Mean | 5.71 | 9.38 | 0.28 | -10.77 | 2.00 | 20.50 | -26.59 |
| Other | | | | | | | |
| Median | 5.50 | 5.50 | 0.25 | -5.45 | 2.00 | 17.00 | -29.61 |
| Mean | 5.29 | 7.99 | 0.22 | -10.82 | 1.80 | 17.28 | -29.56 |

Notes: Duration is the number of quarters between a peak and the next trough of a decline. Proportion of time in decline refers to the ratio of the number of quarters in which house prices are experiencing a decline episode over the full sample period. Amplitude is the percent change in house prices from a peak to the next trough of a contraction. House price busts correspond to peak-to-trough declines in house prices that are in the top 25 percent of all episodes of house price declines. Country-specific data are means. Country-group data are means/medians.

Table 3.B. House Price Declines: Summary Statistics
(Percent change unless otherwise indicated)

| | Median Values | | | Mean Values | | |
|---------------------------------|---------------|-------------------|----------------|--------------|-------------------|----------------|
| | All Declines | House Price Busts | Other Declines | All Declines | House Price Busts | Other Declines |
| A. House Prices | | | | | | |
| Duration ^{1/} | 6.00 | 16.5*** | 4.00 | 8.47 | 18.43*** | 5.23 |
| Amplitude | -5.99 | -28.52*** | -4.14 | -10.80 | -28.5*** | -5.04 |
| B. Macroeconomic Variables | | | | | | |
| Output | 2.78 | 5.97*** | 2.46 | 3.24 | 4.84 | 2.72 |
| Consumption | 2.34 | 3.77 | 2.21 | 2.79 | 3.53 | 2.56 |
| Total Investment | 0.72 | -8.36*** | 2.22 | -0.58 | -7.98*** | 1.82 |
| Residential Investment | -4.08 | -11.55*** | -0.96 | -6.31 | -16.4*** | -2.99 |
| Non-residential Investment | 2.00 | -7.79*** | 2.72 | 1.85 | -4.22** | 3.85 |
| Unemployment Rate ^{2/} | 0.50 | 2.65*** | 0.30 | 1.11 | 3.15*** | 0.50 |
| Inflation Rate ^{2/} | 0.02 | -3.05*** | 0.22 | -0.49 | -2.9*** | 0.30 |
| C. Other Financial Variables | | | | | | |
| Equity Prices | 0.30 | -1.90 | 0.30 | 7.34 | 23.33 | 2.14 |
| Credit | 3.93 | 2.11 | 4.23 | 4.96 | 4.58 | 5.08 |

Notes: House price busts correspond to peak-to-trough declines in house prices that are in the top 25 percent of all episodes of house price declines. Other declines refer to episodes that are not house price busts. In each cell, the mean (median) change in the respective variable from peak to trough of house price declines/busts is reported, unless otherwise indicated. The symbols *, **, and *** indicate that the difference between means (medians) of house price busts and other declines is significant at the 10 percent, 5 percent, and 1 percent levels, respectively.

^{1/} Number of quarters.

^{2/} Change in levels.

Table 4.A. Equity Price Declines: Basic Statistics

| Country | Equity Price Declines | | | | Equity Price Busts | | |
|----------------|-----------------------|----------|-------------------------------|-----------|--------------------|----------|-----------|
| | Number of Declines | Duration | Proportion of time in Decline | Amplitude | Number of Busts | Duration | Amplitude |
| G-7 | | | | | | | |
| Canada | 16 | 4.25 | 0.35 | -20.85 | 2 | 6.50 | -44.13 |
| France | 11 | 6.64 | 0.38 | -32.30 | 5 | 10.80 | -48.40 |
| Germany | 14 | 6.71 | 0.49 | -25.59 | 2 | 11.00 | -53.33 |
| Italy | 10 | 10.70 | 0.55 | -41.84 | 7 | 12.57 | -53.02 |
| Japan | 15 | 5.93 | 0.46 | -24.58 | 3 | 12.00 | -45.02 |
| United Kingdom | 15 | 5.27 | 0.41 | -22.61 | 2 | 12.50 | -60.80 |
| United States | 14 | 5.21 | 0.38 | -20.42 | 1 | 8.00 | -47.90 |
| Other | | | | | | | |
| Australia | 13 | 5.69 | 0.38 | -25.60 | 3 | 7.00 | -48.92 |
| Austria | 9 | 14.67 | 0.68 | -28.38 | 2 | 30.00 | -58.13 |
| Belgium | 14 | 6.14 | 0.45 | -23.50 | 3 | 9.00 | -43.35 |
| Denmark | 10 | 5.90 | 0.31 | -29.82 | 3 | 10.67 | -48.45 |
| Finland | 8 | 8.75 | 0.36 | -36.91 | 3 | 17.33 | -61.16 |
| Greece | 3 | 6.00 | 0.09 | -30.39 | 1 | 13.00 | -74.42 |
| Ireland | 11 | 7.00 | 0.40 | -35.29 | 4 | 9.25 | -55.36 |
| Netherlands | 11 | 6.00 | 0.34 | -28.50 | 3 | 10.33 | -50.04 |
| New Zealand | 10 | 7.70 | 0.40 | -31.10 | 3 | 12.33 | -61.69 |
| Norway | 12 | 6.50 | 0.40 | -33.75 | 2 | 6.50 | -52.64 |
| Portugal | 4 | 9.00 | 0.19 | -43.18 | 2 | 12.00 | -61.17 |
| Spain | 13 | 7.77 | 0.52 | -25.93 | 1 | 28.00 | -90.24 |
| Sweden | 10 | 8.00 | 0.41 | -29.96 | 2 | 5.50 | -41.45 |
| Switzerland | 11 | 7.18 | 0.41 | -31.31 | 4 | 12.75 | -55.30 |
| Country Group | | | | | | | |
| OECD | | | | | | | |
| Median | 11.00 | 5.00 | 0.40 | -26.58 | 3.00 | 10.00 | -50.27 |
| Mean | 11.14 | 6.91 | 0.40 | -28.34 | 2.76 | 11.78 | -53.23 |
| G-7 | | | | | | | |
| Median | 14.00 | 5.00 | 0.41 | -23.63 | 2.00 | 10.00 | -47.75 |
| Mean | 13.57 | 6.14 | 0.43 | -25.89 | 3.14 | 11.18 | -50.57 |
| Other | | | | | | | |
| Median | 10.50 | 5.00 | 0.40 | -29.58 | 3.00 | 9.50 | -53.16 |
| Mean | 9.93 | 7.43 | 0.38 | -30.02 | 2.57 | 12.14 | -54.86 |

Notes: Duration is the number of quarters between a peak and the next trough of a contraction. Proportion of time in decline refers to the ratio of the number of quarters in which equity prices are experiencing a decline episode over the full sample period. Amplitude is the percent change in equity prices from a peak to the next trough of a contraction. Equity price busts correspond to peak-to-trough declines in equity prices that are in the top 25 percent of all episodes of equity price declines. Country-specific data are means. Country-group data are means/medians.

Table 4.B. Equity Price Declines: Summary Statistics
(Percent change unless otherwise indicated)

| | Median Values | | | Mean Values | | |
|-------------------------------------|---------------|--------------------|----------------|--------------|--------------------|----------------|
| | All Declines | Equity Price Busts | Other Declines | All Declines | Equity Price Busts | Other Declines |
| A. Equity Prices | | | | | | |
| Duration ^{1/} | 5.00 | 10*** | 4.00 | 6.91 | 11.78*** | 5.30 |
| Amplitude | -26.58 | -50.27*** | -19.80 | -28.34 | -53.23*** | -20.14 |
| C. Macroeconomic Variables | | | | | | |
| Output | 3.40 | 4.44*** | 3.03 | 4.99 | 7.37** | 4.20 |
| Consumption | 2.59 | 4.15*** | 2.33 | 4.61 | 6.92** | 3.86 |
| Total Investment | 3.54 | 0.56** | 4.04 | 3.79 | 1.03* | 4.69 |
| Residential Investment | 2.93 | 1.61 | 3.03 | 2.56 | -0.31 | 3.47 |
| Non-residential Investment | 4.24 | 2.69 | 4.58 | 4.86 | 2.79 | 5.52 |
| Unemployment Rate ^{2/} | 0.10 | 0.7*** | 0.00 | 0.30 | 1.14*** | 0.04 |
| Inflation Rate ^{2/} | 0.29 | 0.41 | 0.21 | 0.64 | 1.10 | 0.49 |
| B. Other Financial Variables | | | | | | |
| House Prices | 1.25 | 4.66 | 0.84 | 1.98 | 3.76 | 1.33 |
| Credit | 5.15 | 9.62*** | 4.46 | 9.66 | 17.16*** | 7.23 |

Notes: Equity price busts correspond to peak-to-trough declines in equity prices that are in the top 25 percent of all episodes of equity price declines. Other declines refer to episodes that are not equity price busts. In each cell, the mean (median) change in the respective variable from peak to trough of equity price declines/busts is reported, unless otherwise indicated. The symbols *, **, and *** indicate that the difference between means (medians) of equity price busts and other declines is significant at the 10 percent, 5 percent, and 1 percent levels, respectively.

^{1/} Number of quarters.

^{2/} Change in levels.

Table 5. Credit Contractions and Asset Price Declines: Summary Statistics
(Percent change unless otherwise indicated)

| Events | Duration ^{1/} | Amplitude | Total Investment | Residential Investment | Non-Residential Investment | Unemployment ^{2/} |
|-----------------------------|------------------------|-----------|------------------|------------------------|----------------------------|----------------------------|
| | (Mean) | (Median) | (Median) | (Median) | (Median) | (Median) |
| A. Credit Contractions | 5.65 | -4.22 | -0.70 | -1.39 | 0.02 | 0.37 |
| Credit Crunches | 10.3*** | -17.03*** | -5.63*** | -5.92** | -2.51* | 1.65*** |
| Other Credit Contractions | 4.13 | -3.40 | 0.19 | -0.09 | 0.21 | 0.20 |
| B. House Price Declines | 8.47 | -5.99 | 0.72 | -4.08 | 2.00 | 0.50 |
| House Price Busts | 18.43*** | -28.52*** | -8.36*** | -11.55*** | -7.79*** | 2.65*** |
| Other House Price Declines | 5.23 | -4.14 | 2.22 | -0.96 | 2.72 | 0.30 |
| C. Equity Price Declines | 6.91 | -26.58 | 3.54 | 2.93 | 4.24 | 0.10 |
| Equity Price Busts | 11.78*** | -50.27*** | 0.56** | 1.61 | 2.69 | 0.7*** |
| Other Equity Price Declines | 5.30 | -19.80 | 4.04 | 3.03 | 4.58 | 0.00 |

Notes: Credit crunches and asset price busts correspond to peak-to-trough declines in credit and asset prices that are in the top 25 percent of all episodes of credit contractions and asset price declines, respectively. In each cell, the mean (median) change in the respective variable from peak to trough of the episodes of credit declines/crunches, house price declines/busts, and equity price declines/busts is reported, unless otherwise indicated. The symbols *, **, and *** indicate that the difference between means (medians) of crunches/busts and other contractions/declines is significant at the 10 percent, 5 percent, and 1 percent levels, respectively.

^{1/} Number of quarters.

^{2/} Change in levels.

Table 6. Leads and Lags: Recessions, Crunches and Busts
(Number of Quarters)

| | Median Values | Mean Values |
|------------------------|---------------|-------------|
| A. Leads ^{1/} | | |
| Credit Crunches | 4.00 | 4.53 |
| House Price Busts | 3.00 | 4.08 |
| Equity Price Busts | 5.00 | 5.71 |
| B. Lags ^{2/} | | |
| Credit Crunches | 2.00 | 2.29 |
| House Price Busts | 9.00 | 10.67 |
| Equity Price Busts | 0.00 | 3.10 |

^{1/} Number of quarters between the start of a crunch/bust and the start of a recession.

^{2/} Number of quarters between the end of a recession and the end of a crunch/bust.

Table 7. Recessions Associated with Credit Crunches
(Percent change unless otherwise indicated)

| | Median Values | | | Mean Values | | |
|--|---------------------|------------------|----------------------------|---------------------|------------------|----------------------------|
| | Without Crunches | With Crunches | With Severe Crunches | Without Crunches | With Crunches | With Severe Crunches |
| A. Output | | | | | | |
| Duration ^{1/} | 3.00 | 3.00 | 3.00 | 3.64 | 3.78 | 4.33 |
| Amplitude | -1.82 | -2.19 | -2.7* | -2.47 | -3.71 | -4.05 |
| Cumulative Loss | -2.87 | -4.44* | -6.15** | -6.05 | -8.85 | -12.38 |
| B. Components of Output | | | | | | |
| Consumption | -0.04 | -0.41 | -0.58 | -0.19 | -0.16 | 0.79 |
| Total Investment | -3.98 | -4.97 | -3.83 | -5.90 | -5.61 | -4.70 |
| Residential Investment | -3.72 | -7.42 | -8.16 | -6.38 | -8.92 | -10.04 |
| Non-residential Investment | -3.58 | -4.25 | -1.66 | -5.12 | -4.00 | -1.40 |
| Exports | -0.53 | -1.82 | -1.13 | -0.65 | -2.22 | -2.01 |
| Imports | -3.64 | -4.53 | -5.23 | -3.81 | -6.08 | -7.07 |
| Net Export (% of GDP) ^{2/} | 0.48 | 1.06 | 1.17 | 0.67 | 1.10 | 1.48 |
| Current Account (% of GDP) ^{2/} | 0.45 | 0.88 | 1.39 | 0.57 | 0.42 | 1.65 |
| C. Other Macroeconomic Variables | | | | | | |
| Industrial Production | -4.02 | -5.68 | -6.48** | -3.84 | -5.30 | -6.58** |
| Unemployment Rate ^{2/} | 0.55 | 0.90 | 1.00 | 1.14 | 0.89 | 0.83 |
| Inflation Rate ^{2/} | -0.31 | -0.33 | 0.53 | -0.38 | 0.20 | 0.79 |
| D. Financial Variables | | | | | | |
| House Prices | -1.82 | -4.04** | -4.88 | -3.08 | -6.38 | -8.11 |
| Equity Prices | -6.28 | -2.47 | 7.88** | -4.50 | -1.19 | 6.78** |
| Credit | 1.54 | -4.25*** | -4.85*** | 2.82 | -4.9*** | -5.73** |

Notes: Severe credit crunches are those that are in the top half of all crunch episodes. In each cell, the mean (median) change in the respective variable from peak to trough of recessions associated with credit crunches is reported, unless otherwise indicated. The symbols *, **, and *** indicate that the difference between means (medians) of recessions with credit crunches and recessions without credit crunches is significant at the 10 percent, 5 percent, and 1 percent levels, respectively.

^{1/} Number of quarters.

^{2/} Change in levels.

Table 8. Recessions Associated with House Price Busts
(Percent change unless otherwise indicated)

| | Median Values | | | Mean Values | | |
|--|---------------|------------|-------------------|---------------|------------|-------------------|
| | Without Busts | With Busts | With Severe Busts | Without Busts | With Busts | With Severe Busts |
| A. Output | | | | | | |
| Duration ^{1/} | 3.00 | 3.00 | 3.00 | 3.20 | 4.47** | 4.6** |
| Amplitude | -1.52 | -2.18 | -2.64** | -1.98 | -3.16* | -4.05** |
| Cumulative Loss | -2.25 | -3.74*** | -5.23*** | -3.53 | -10.38** | -13.9* |
| B. Components of Output | | | | | | |
| Consumption | 0.09 | -0.73*** | -1.16*** | 0.14 | -1.68*** | -2.25*** |
| Total Investment | -3.98 | -6.92* | -6.92 | -4.65 | -9.24** | -9.59 |
| Residential Investment | -2.68 | -6.64** | -7.47** | -4.74 | -10.92** | -13.65** |
| Non-residential Investment | -3.65 | -6.82* | -6.82 | -4.04 | -8.75* | -7.83 |
| Exports | -1.09 | 0.66* | 0.67 | -1.02 | 0.96* | 1.20 |
| Imports | -2.55 | -5.27 | -5.3* | -2.18 | -5.29* | -6.13** |
| Net Export (% of GDP) ^{2/} | 0.39 | 1.29*** | 1.29** | 0.06 | 1.52*** | 1.48** |
| Current Account (% of GDP) ^{2/} | 0.01 | 0.7** | 0.6* | 0.01 | 1.24** | 1.23** |
| C. Other Macroeconomic Variables | | | | | | |
| Industrial Production | -4.55 | -4.21 | -4.99 | -4.20 | -4.21 | -4.73 |
| Unemployment Rate ^{2/} | 0.50 | 1.3** | 1.24** | 0.78 | 1.82* | 1.78 |
| Inflation Rate ^{2/} | -0.27 | -0.73 | -0.59 | -0.35 | -0.86 | -0.14 |
| D. Financial Variables | | | | | | |
| House Prices | -0.82 | -6.28*** | -7.05*** | -0.32 | -9.39*** | -11.17*** |
| Equity Prices | -7.12 | -2.13 | -5.58 | -6.62 | -0.47 | -1.54 |
| Credit | 2.42 | -0.5*** | -0.94*** | 3.62 | -2.3*** | -3.07*** |

Notes: Severe house price busts are those that are in the top half of all bust episodes. In each cell, the mean (median) change in the respective variable from peak to trough of recessions associated with house price busts is reported, unless otherwise indicated. The symbols *, **, and *** indicate that the difference between means (medians) of recessions with house price busts and recessions without house price busts is significant at the 10 percent, 5 percent, and 1 percent levels, respectively.

^{1/} Number of quarters.

^{2/} Change in levels.

Table 9. Recessions Associated with Equity Price Busts
(Percent change unless otherwise indicated)

| | Median Values | | | Mean Values | | |
|--|---------------|------------|-------------------|---------------|------------|-------------------|
| | Without Busts | With Busts | With Severe Busts | Without Busts | With Busts | With Severe Busts |
| A. Output | | | | | | |
| Duration ^{1/} | 3.00 | 3.00 | 3.00 | 3.48 | 3.82 | 3.61 |
| Amplitude | -1.63 | -1.98 | -2.05 | -2.00 | -2.79 | -3.16 |
| Cumulative Loss | -2.64 | -3.08 | -3.20 | -4.67 | -7.83 | -9.36 |
| B. Components of Output | | | | | | |
| Consumption | -0.05 | -0.09 | -0.27 | 0.23 | -0.89** | -1.33** |
| Total Investment | -3.17 | -6.17** | -6.12* | -3.72 | -9.02*** | -9.07** |
| Residential Investment | -3.74 | -5.21 | -5.57 | -4.55 | -9.8** | -9.41 |
| Non-residential Investment | -3.19 | -5.18** | -4.95* | -3.04 | -8.56** | -9.04** |
| Exports | 0.48 | -0.80 | 0.76 | 0.48 | 0.11 | 1.28 |
| Imports | -0.53 | -5.29*** | -5.44*** | -0.97 | -6.35*** | -6.79*** |
| Net Export (% of GDP) ^{2/} | 0.39 | 1.36** | 1.63*** | 0.15 | 1.34** | 1.74*** |
| Current Account (% of GDP) ^{2/} | 0.48 | 0.41 | 0.83 | 0.19 | 0.98 | 1.35* |
| C. Other Macroeconomic Variables | | | | | | |
| Industrial Production | -3.79 | -5.06** | -4.75* | -3.24 | -5.3** | -5.14** |
| Unemployment Rate ^{2/} | 0.60 | 0.60 | 0.60 | 0.97 | 1.33 | 1.06 |
| Inflation Rate ^{2/} | -0.32 | -0.32 | -0.55 | -0.35 | -0.53 | -0.46 |
| D. Financial Variables | | | | | | |
| House Prices | -1.93 | -3.17 | -4.97** | -2.14 | -5.53* | -6.85* |
| Equity Prices | -0.80 | -13.05*** | -11.52*** | 1.21 | -12.39*** | -8.89*** |
| Credit | 1.06 | 1.00 | 1.39 | 2.63 | 0.2* | 1.10 |

Notes: Severe equity price busts are those that are in the top half of all bust episodes. In each cell, the mean (median) change in the respective variable from peak to trough of recessions associated with equity price busts is reported, unless otherwise indicated. The symbols *, **, and *** indicate that the difference between means (medians) of recessions with equity price busts and recessions without equity price busts is significant at the 10 percent, 5 percent, and 1 percent levels, respectively.

^{1/} Number of quarters.

^{2/} Change in levels.

Table 10. Recessions Associated with Crunches and Busts: Summary Statistics

| Events | Duration ^{1/} (Mean) | Amplitude ^{2/} (Median) | Cumulative Loss ^{2/} (Median) |
|---|----------------------------------|-------------------------------------|---|
| A. Recessions without Credit Crunches | 3.64 | -1.82 | -2.87 |
| Recessions with Credit Crunches | 3.78 | -2.19 | -4.44* |
| Recessions with Severe Credit Crunches | 4.33 | -2.7* | -6.15** |
| B. Recessions without House Price Busts | 3.20 | -1.52 | -2.25 |
| Recessions with House Price Busts | 4.47** | -2.18 | -3.74*** |
| Recessions with Severe House Price Busts | 4.60** | -2.64** | -5.23*** |
| C. Recessions without Equity Price Busts | 3.48 | -1.63 | -2.64 |
| Recessions with Equity Price Busts | 3.82 | -1.98 | -3.08 |
| Recessions with Severe Equity Price Busts | 3.61 | -2.05 | -3.20 |

Notes: Severe credit crunches and equity/house price busts are those that are in the top half of all crunch and bust episodes. In each cell, the mean (median) change in the respective variable from peak to trough of recessions associated with equity price busts is reported, unless otherwise indicated. The symbols *, **, and *** indicate that the difference between means (medians) of recessions with equity price busts and recessions without equity price busts is significant at the 10 percent, 5 percent, and 1 percent levels, respectively.

^{1/} Number of quarters.

^{2/} Percent change.

Table 11. Recessions Associated with Oil Price Shocks
(Percent change unless otherwise indicated)

| | Median Values | | | Mean Values | | |
|--|--------------------|-----------------|------------------------|--------------------|-----------------|------------------------|
| | Without Oil Shocks | With Oil Shocks | With Severe Oil Shocks | Without Oil Shocks | With Oil Shocks | With Severe Oil Shocks |
| A. Output | | | | | | |
| Duration ^{1/} | 3.00 | 3.00 | 3.00 | 3.67 | 3.62 | 3.91 |
| Amplitude | -1.78 | -2.05 | -2.57** | -2.38 | -2.91 | -3.52* |
| Cumulative Loss | -2.94 | -3.14 | -4.23** | -5.42 | -7.44 | -9.32* |
| B. Components of Output | | | | | | |
| Consumption | 0.19 | -0.24* | -0.54** | 0.40 | -0.73** | -1** |
| Total Investment | -3.19 | -5.16 | -6.17 | -4.69 | -7.24 | -8.92** |
| Residential Investment | -2.90 | -5.64 | -6.53** | -3.62 | -9.42** | -11.97** |
| Non-residential Investment | -2.85 | -4.35 | -5.67 | -4.42 | -6.05 | -7.42 |
| Exports | 0.07 | -1.26 | -1.43* | 0.16 | -2.16 | -2.66* |
| Imports | -3.35 | -4.77* | -6.47*** | -2.07 | -6.01** | -7.83** |
| Net Export (% of GDP) ^{2/} | 0.75 | 0.45 | 1.17 | 0.77 | 0.66 | 0.98 |
| Current Account (% of GDP) ^{2/} | 0.50 | 0.35 | 0.28 | 0.58 | 0.42 | 0.39 |
| C. Other Macroeconomic Variables | | | | | | |
| Industrial Production | -3.55 | -4.25** | -5.71*** | -3.01 | -4.82** | -5.73*** |
| Unemployment Rate ^{2/} | 0.60 | 0.55 | 0.90 | 1.05 | 1.15 | 1.45 |
| Inflation Rate ^{2/} | -0.90 | 0.29*** | 0.53*** | -0.88 | 0.37** | 0.44** |
| D. Financial Variables | | | | | | |
| House Prices | -2.93 | -1.83 | -3.09 | -2.73 | -4.26 | -5.97 |
| Equity Prices | -5.48 | -4.56 | -5.30 | -3.94 | -4.36 | -5.19 |
| Credit | 0.93 | 1.07 | 0.52 | 2.63 | 0.77 | 0.16 |

Notes: Oil price shocks (severe oil price shocks) correspond to increases in oil prices that are in the top 25 percent (12.5 percent) of all annual oil price increases. In each cell, the mean (median) change in the respective variable from peak to trough of recessions associated with oil price shocks (severe oil price shocks) is reported, unless otherwise indicated. The symbols *, **, and *** indicate that the difference between means (medians) of recessions with equity price busts and recessions without equity price busts is significant at the 10 percent, 5 percent, and 1 percent levels, respectively.

^{1/} Number of quarters.

^{2/} Change in levels.

Table 12. Changes in Policy Variables
(Recessions, credit contractions and asset price declines; median values)

| Events | Short-Term Nominal Interest Rate ^{1/} | Short-Term Real Interest Rate ^{2/} | Government Consumption ^{3/} |
|---|--|---|---|
| A. Recessions | -0.79 | -0.70 | 1.79 |
| Severe Recessions | 0.00 | -1.11 | 2.16 |
| Other Recessions | -0.94 | -0.66 | 1.61 |
| B. Credit Contractions | -0.28 | -1.03 | 3.04 |
| Credit Crunches | -1.50 | -0.09 | 6.33*** |
| Other Credit Contractions | 0.00 | -1.32 | 2.38 |
| C. House Price Declines | -0.70 | -0.64 | 3.39 |
| House Price Busts | -3.16*** | 0.21 | 9.07*** |
| Other House Price Declines | -0.20 | -0.80 | 2.59 |
| D. Equity Price Declines | 0.09 | -0.10 | 3.65 |
| Equity Price Busts | 0.28 | -0.57 | 7.72*** |
| Other Equity Price Declines | 0.07 | 0.07 | 2.93 |
| E. Recessions without Credit Crunches | -0.87 | -0.67 | 1.60 |
| Recessions with Credit Crunches | -0.84 | -0.78 | 3.84*** |
| Recessions with Severe Credit Crunches | -0.73 | -0.79 | 4.57*** |
| F. Recessions without House Price Busts | -0.91 | -0.76 | 1.70 |
| Recessions with House Price Busts | -1.21 | -0.64 | 1.95 |
| Recessions with Severe House Price Busts | -1.04 | -0.78 | 2.12 |
| G. Recessions without Equity Price Busts | -0.80 | -0.67 | 1.49 |
| Recessions with Equity Price Busts | -1.04 | -0.77 | 2.14 |
| Recessions with Severe Equity Price Busts | -0.95 | -0.71 | 2.16 |
| H. Recessions without Oil Price Shocks | -0.79 | -0.61 | 1.85 |
| Recessions with Oil Price Shocks | -0.76 | -0.82* | 1.53 |
| Recessions with Severe Oil Price Shocks | -0.95 | -1.11** | 2.14 |

Notes: Severe recessions are those in which the peak-to-trough decline in output is in the top 25 percent of all recession-related output declines. Credit crunches and asset price busts correspond to peak-to-trough contractions in credit and declines in asset prices that are in the top 25 percent of all episodes of credit contractions and asset price declines, respectively. Severe credit crunches and equity/house price busts are those that are in the top half of all crunch and bust episodes. Other contractions and declines refer to episodes that are not crunches and busts, respectively. In each cell, the mean (median) change in the respective variable from peak to trough of relevant episodes is reported, unless otherwise indicated. The symbols *, **, and *** indicate that the difference between means (medians) of crunches/busts/shocks and other contractions/declines is significant at the 10 percent, 5 percent, and 1 percent levels, respectively.

^{1/} Treasury bill interest rate. Change in levels.

^{2/} Ex-post real interest rate. Deflated with each country's CPI. Change in levels.

^{3/} Percent change.

Table 13.A. Cost of Recessions
(Percent change in real variables unless otherwise indicated)

| | OLS | | | | | |
|------------------------|---------------------|---------------------|--------------------|----------------------|----------------------|---------------------|
| | Regressions | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Credit | 0.036 [0.034] | ... | ... | -0.090*** [0.033] | -0.088*** [0.033] | -0.060 [0.040] |
| House Price | ... | 0.174*** [0.043] | ... | 0.224*** [0.049] | 0.220*** [0.046] | 0.167*** [0.052] |
| Equity Price | ... | ... | 0.023* [0.013] | ... | 0.016 [0.010] | 0.011 [0.011] |
| Exports | 0.109*** [0.039] | 0.073* [0.042] | 0.035 [0.051] | 0.087** [0.040] | 0.083* [0.042] | 0.081* [0.042] |
| Initial Output | 0.177** [0.074] | 0.192** [0.074] | 0.163** [0.080] | 0.173** [0.084] | 0.165* [0.086] | 0.163* [0.083] |
| Oil Price | -0.006 [0.005] | -0.008* [0.005] | -0.002 [0.005] | -0.007 [0.004] | -0.006 [0.004] | -0.004 [0.004] |
| Great Moderation | -0.803 [0.560] | -0.981** [0.482] | -0.742 [0.546] | -1.010** [0.467] | -1.002** [0.462] | -0.952** [0.456] |
| Financial Crisis | 0.133 [0.507] | -0.231 [0.432] | 0.413 [0.428] | -0.068 [0.385] | -0.034 [0.373] | -0.209 [0.369] |
| Duration of Recession | ... | ... | ... | ... | ... | 0.261** [0.125] |
| Constant | 1.888*** [0.650] | 1.292* [0.689] | 1.478** [0.693] | 1.039 [0.679] | 1.001 [0.667] | 0.280 [0.769] |
| Adjusted R-squared | 0.191 | 0.355 | 0.095 | 0.404 | 0.412 | 0.432 |
| Number of observations | 117 | 95 | 109 | 95 | 95 | 95 |

Notes: The dependent variable is the amplitude of a recession, measured as the change in output from the peak to the next trough of a recession. Credit, house price, equity price and exports refer to the changes in the respective variable during recessions. Initial output is the level of output at the onset of the recession minus the level of output two years before. Oil price is the price of oil at the onset of the recession minus the oil price two years before. Great Moderation and Financial Crisis refer to the dummy variables associated with the relevant periods. Robust standard errors are in brackets. The symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

^{1/} Number of quarters.

Table 13.B. Cost of Recessions
(Percent change in real variables unless otherwise indicated)

| | OLS | | | | | |
|--------------------------|---------------------|---------------------|--------------------|---------------------|---------------------|---------------------|
| | Regressions | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Credit | 0.036 [0.033] | ... ... | ... ... | -0.087** [0.035] | -0.083** [0.034] | -0.052 [0.041] |
| House Price | ... ... | 0.165*** [0.043] | ... ... | 0.216*** [0.052] | 0.209*** [0.047] | 0.157*** [0.055] |
| Equity Price | ... ... | ... ... | 0.028** [0.014] | ... ... | 0.021** [0.009] | 0.015 [0.011] |
| Exports | 0.109*** [0.041] | 0.063 [0.047] | 0.014 [0.054] | 0.079* [0.045] | 0.070 [0.047] | 0.076 [0.047] |
| Initial Output | 0.191* [0.100] | 0.198** [0.087] | 0.200** [0.099] | 0.179* [0.094] | 0.169* [0.097] | 0.171* [0.096] |
| Oil Price | -0.007 [0.005] | -0.008* [0.005] | -0.003 [0.004] | -0.007 [0.004] | -0.005 [0.004] | -0.003 [0.004] |
| Great Moderation | -0.885* [0.525] | -1.001** [0.456] | -0.842* [0.502] | -1.024** [0.441] | -1.008** [0.435] | -0.941** [0.422] |
| Financial Crisis | -0.015 [0.558] | -0.240 [0.456] | 0.241 [0.459] | -0.077 [0.408] | -0.009 [0.387] | -0.097 [0.361] |
| Government Consumption | 0.008 [0.149] | 0.062 [0.164] | 0.157 [0.169] | 0.050 [0.154] | 0.080 [0.145] | 0.135 [0.153] |
| Short-Term Interest Rate | 0.088 [0.154] | 0.082 [0.116] | 0.246 [0.151] | 0.061 [0.111] | 0.071 [0.107] | 0.009 [0.100] |
| Duration of Recession | ... ... | ... ... | ... ... | ... ... | ... ... | 0.297** [0.128] |
| Constant | 1.831*** [0.697] | 1.294* [0.693] | 1.312* [0.754] | 1.055 [0.693] | 1.039 [0.685] | 0.316 [0.744] |
| Adjusted R-squared | 0.186 | 0.334 | 0.149 | 0.381 | 0.396 | 0.419 |
| Number of observations | 115 | 94 | 107 | 94 | 94 | 94 |

Notes: The dependent variable is the amplitude of a recession, measured as the change in output from the peak to the next trough of a recession. Credit, house price, equity price, exports, government consumption, and short-term interest rate refer to the changes in the respective variable during recessions. Initial output is the level of output at the onset of the recession minus the level of output two years before. Oil price is the price of oil at the onset of the recession minus the oil price two years before. Great Moderation and Financial Crisis refer to the dummy variables associated with the relevant periods. Robust standard errors are in brackets. The symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

^{1/} Number of quarters.

Table 14.A. Cost of Recessions
(Percent change in real variables unless otherwise indicated)

| | Quantile Regressions | | | | | |
|------------------------|-------------------------|---------------------|--------------------|---------------------|----------------------|---------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Credit | 0.005 [0.029] | ... ... | ... ... | -0.054** [0.025] | -0.055*** [0.017] | -0.044** [0.020] |
| House Price | ... ... | 0.113*** [0.021] | ... ... | 0.141*** [0.029] | 0.148*** [0.019] | 0.092*** [0.025] |
| Equity Price | ... ... | ... ... | 0.004 [0.012] | ... ... | 0.010 [0.006] | 0.005 [0.007] |
| Exports | 0.114*** [0.026] | 0.052* [0.029] | 0.059* [0.034] | 0.057* [0.033] | 0.057** [0.022] | 0.049** [0.023] |
| Initial Output | 0.169*** [0.055] | 0.138*** [0.042] | 0.127** [0.056] | 0.116** [0.048] | 0.132*** [0.032] | 0.106*** [0.033] |
| Oil Price | -0.005 [0.005] | -0.006* [0.003] | -0.002 [0.004] | -0.003 [0.004] | -0.003 [0.002] | 0.001 [0.003] |
| Great Moderation | -1.177** [0.504] | -0.849** [0.335] | -0.647 [0.449] | -0.633* [0.376] | -0.651** [0.251] | -0.504* [0.255] |
| Financial Crisis | 0.561 [0.679] | 0.390 [0.426] | 0.748 [0.576] | 0.560 [0.475] | 0.537 [0.333] | 0.568* [0.338] |
| Duration of Recession | ... ... | ... ... | ... ... | ... ... | ... ... | 0.265*** [0.075] |
| Constant | 1.395** [0.536] | 1.156*** [0.392] | 1.069** [0.505] | 0.908** [0.442] | 0.835*** [0.292] | 0.127 [0.364] |
| Pseudo R-squared | 0.132 | 0.232 | 0.010 | 0.273 | 0.288 | 0.323 |
| Number of observations | 117 | 95 | 109 | 95 | 95 | 95 |

Notes: The dependent variable is the amplitude of a recession, measured as the change in output from the peak to the next trough of a recession. Credit, house price, equity price and exports refer to the changes in the respective variable during recessions. Initial output is the level of output at the onset of the recession minus the level of output two years before. Oil price is the price of oil at the onset of the recession minus the oil price two years before. Great Moderation and Financial Crisis refer to the dummy variables associated with the relevant periods. Standard errors are in brackets. The symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

^{1/} Number of quarters.

Table 14.B. Cost of Recessions
(Percent change in real variables unless otherwise indicated)

| | Quantile Regressions | | | | | |
|--------------------------|----------------------|---------------------|---------------------|----------------------|----------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Credit | -0.001 [0.032] | ... ... | ... ... | -0.075*** [0.019] | -0.060*** [0.017] | -0.028 [0.018] |
| House Price | ... ... | 0.097*** [0.015] | ... ... | 0.154*** [0.022] | 0.150*** [0.020] | 0.085*** [0.022] |
| Equity Price | ... ... | ... ... | 0.010 [0.012] | ... ... | 0.016** [0.007] | 0.005 [0.006] |
| Exports | 0.110*** [0.028] | 0.028 [0.020] | 0.032 [0.034] | 0.063** [0.024] | 0.041* [0.021] | 0.059*** [0.021] |
| Initial Output | 0.121* [0.065] | 0.145*** [0.030] | 0.152*** [0.057] | 0.123*** [0.037] | 0.162*** [0.035] | 0.120*** [0.031] |
| Oil Price | -0.003 [0.005] | -0.006** [0.002] | 0.000 [0.004] | -0.003 [0.003] | -0.003 [0.003] | 0.001 [0.002] |
| Great Moderation | -1.025* [0.531] | -0.441** [0.220] | -0.413 [0.453] | -0.446* [0.267] | -0.353 [0.253] | -0.606*** [0.220] |
| Financial Crisis | 0.501 [0.719] | 0.371 [0.284] | 0.861 [0.558] | 0.729** [0.365] | 0.582* [0.338] | 0.493* [0.294] |
| Government Consumption | -0.051 [0.088] | -0.035 [0.052] | 0.070 [0.083] | 0.101 [0.064] | 0.052 [0.058] | 0.159*** [0.058] |
| Short-Term Interest Rate | 0.052 [0.092] | 0.096** [0.044] | 0.167* [0.090] | 0.043 [0.056] | 0.083* [0.050] | 0.020 [0.045] |
| Duration of Recession | ... ... | ... ... | ... ... | ... ... | ... ... | 0.344*** [0.075] |
| Constant | 1.283** [0.571] | 0.703*** [0.260] | 0.720 [0.505] | 0.710** [0.318] | 0.428 [0.298] | 0.061 [0.320] |
| Pseudo R-squared | 0.135 | 0.243 | 0.111 | 0.273 | 0.288 | 0.330 |
| Number of observations | 115 | 94 | 107 | 94 | 94 | 94 |

Notes: The dependent variable is the amplitude of a recession, measured as the change in output from the peak to the next trough of a recession. Credit, house price, equity price, exports, government consumption, and short-term interest rate refer to the changes in the respective variable during recessions. Initial output is the level of output at the onset of the recession minus the level of output two years before. Oil price is the price of oil at the onset of the recession minus the oil price two years before. Great Moderation and Financial Crisis refer to the dummy variables associated with the relevant periods. Standard errors are in brackets. The symbols *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

^{1/} Number of quarters.