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## Are Recoveries from Banking and Financial Crises Really So Different?

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**Abstract:** This paper studies the behavior of recoveries from recessions across 59 advanced and emerging market economies over the past 40 years. Focusing specifically on the performance of output after the recession trough, we find little or no difference in the pace of output growth across types of recessions. In particular, banking and financial crisis do not affect the strength of the economic rebound, although these recessions are more severe, implying a sizable output loss. However, recovery does change with some characteristics of recession. Recoveries tend to be faster following deeper recessions, especially in emerging markets, and tend to be slower following long recessions. Most recessions are associated with a slowing, if not outright decline in house prices, but recessions with large declines in house prices also tend to have slower recoveries. Long recessions and those associated with poor housing-market outcomes can lead to sustained output losses relative to pre-crisis trends. Consistent with microeconomic studies showing permanent income loss to job-losing workers during recessions, we find that the sustained deviation in output from trend is associated with a reduction in labor input, especially linked to declines in employment and labor-force participation following recessions. On net, our results imply that the output/employment gap following a severe, long recessions is considerably smaller than is typically assumed by standard macro models, which in turn may have substantial implications for macroeconomic policy during recoveries.

**JEL Classifications:** E32 , E20, F44

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More than two years after the date the NBER set for the end of the U.S. recession, U.S. employment growth remains sluggish, the housing market is moribund, and GDP has barely exceeded its pre-recession peak. Thus, attention is increasingly focusing on the determinants and characteristics of recoveries. Although research on the causes and types of recessions is legion, there has been surprisingly little academic work that concentrates on recoveries.<sup>1</sup> That said, two stylized facts have been frequently cited in the current policy discussion. The first is that recoveries from banking and financial crises are typically slow, reflecting impaired financial intermediation and the need for structural adjustment (see Cerra and Saxena (2008) and Reinhart and Reinhart (2010)). The second is that the rate of growth following deep recessions is typically faster than average, given pent-up demand and large stocks of underutilized labor and capital. As the Great Recession was both a banking and financial crisis and associated with a deep decline in output, these stylized facts imply different trajectories for output growth in this recovery.

To address this uncertainty and to gain greater insight into the nature of recoveries, defined as output growth following recession troughs, we examine quarterly data on GDP over the past 40 years for almost 60 countries, split roughly evenly between the advanced and the emerging market economies, resulting in observations on 271 recessions. Classifying recessions according to whether or not they included a banking or financial (B&F) crisis we find, in contrast to earlier work, that there is little distinction in the pace of recovery across recession types. Although recessions associated with B&F crises are typically more severe, the subsequent recoveries are not particularly unusual. Earlier work, finding the opposite, does so because it characterizes the pace of recoveries by averaging growth starting from the pre-recession cyclical peak rather than the recession trough, thus confounding the strength of the recession with the behavior of the recovery.

We do, however, find that, independent of whether a recession is associated with a banking or financial crisis, the depth and duration of the recession do have some predictive power for the pace of recoveries. Deeper recessions are associated with slightly stronger growth during the first three years of recovery. Recessions of greater duration are linked to slower post-

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<sup>1</sup> Notable exceptions being Romer and Romer (1994) and Cerra and Saxena (2008).

trough performance. Also, recessions with large house price declines—a common but not omnipresent feature of long recessions—tend to recover slower than other recessions.

Because banking and financial crises are often both deep and long, these effects on the pace of recovery balance out, leading post-trough growth to be about average and implying that output declines during such severe recessions are not made up quickly. We confirm and extend earlier work showing that severe recessions are associated with sustained negative gaps in the level of output from pre-crisis trend and show that these gaps are attributable to reductions in the utilization of labor – particularly through employment and labor force participation rates.

Until recently in the United States, GDP growth was about on pace with the average recovery in the advanced economies. However, recently the path of output has veered below the average recovery and is well below what would be predicted given the depth and duration of the Great Recession. However, once the impact of the severe decline in housing prices is accounted for, the recovery becomes less surprising. In addition, the composition of the recovery has been unusual.<sup>2</sup> Exports and non-residential investment have outperformed the median recovery so far, but consumption, housing, and employment have languished. Looking more closely at these components, we find surprising strength in consumption of goods, in particular large durable goods such as cars and household furniture which one might think would be particularly restrained in this recovery. On the other hand, services consumption in almost every category is weaker than ever before in a post-war U.S. recovery. Likewise, even compared with other “jobless” recoveries, the weakness in employment is omnipresent and extreme.

Following this introduction, section II of the paper describes the dataset and recession classification system used. Section III presents our results, provides robustness checks, and contrasts our work with previous findings. Section IV focuses on characterizing and comparing the current U.S. recovery with past U.S. experience. Section V concludes.

## **II. Data and methodology**

For our cross-country comparisons, our database contains an unbalanced panel of quarterly GDP data for 59 countries – 26 advanced economies (AEs) and 33 emerging market economies (EMEs) – from 1970 (or whenever we begin to have quarterly GDP data) to present. Most data are from national sources, and a full list of countries can be found in appendix A. For

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<sup>2</sup> The analysis of the U.S. data goes through the third quarter of 2011.

comparability across countries, recessions are classified as two consecutive quarters of negative GDP growth. If a single quarter of positive growth occurs surrounded by a recession on either side, it is included in the recession. The pre-recession peak is defined as the last quarter before the beginning of a recession while the recession trough is the last quarter of the recession. As will be discussed further, we check the robustness of our results using a variety of other recession-dating methodologies found in the literature including the Bry-Boschen procedure for quarterly data (henceforth called the BBQ method) as described by Harding and Pagan (2002).<sup>3</sup>

Using our definition of recession, our sample contains 271 recessions; 137 occurring in the advanced economies and 134 in the emerging market economies (table 1). If the Great Recession is excluded, the sample of recessions is reduced to 224 episodes (116 AE and 108 EME). The greater number of AE recessions reflects the fact that quarterly GDP data are available for those countries earlier than for most of the EMEs. (See appendix B for data range for each country in our sample.)

In our analysis, we divide our sample by the type of economy – emerging market or advanced – and by type of recession. For comparability with earlier work, we match up the list of banking and financial crises found in IMF work by Laeven and Valencia (2008) with the list of recessions from the above procedure to identify if the downturn coincides with a currency, banking, or debt crisis.<sup>4</sup> Laeven and Valencia identify crises in the year of occurrence. For each recession, if a crisis occurred in a year during which the recession began or was ongoing, or if the recession began in the first or second quarter of a year immediately following a crisis, it was classified as being related to that crisis. Using this method, we identify 8 recessions in the advanced economies and 39 recessions in the emerging economies as being related to a crisis.

We also classify housing price slumps for a smaller sample of OECD countries for which we have a long time series of quarterly data on house prices. For these countries, we identify cycles in real house prices. Because the housing market is highly cyclical, most recessions are associated with periods of real house price decline. We identify periods of severe housing market stress as those associated with declines in real house prices above the median. We

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<sup>3</sup> The BBQ method identifies cyclical peaks and troughs as local maxima in the two quarters preceding and the two quarters following. It then eliminates maxima that do not alternate between peaks and troughs or do not have a long enough time span, in this case 2 quarters from a peak to trough and five quarters from a trough to peak. Once these criteria are met, recessions are defined as the time between a peak and a trough. We did not use this method because it requires at least 5 quarters of recovery, which would restrict and potentially bias our sample.

<sup>4</sup> This is similar to the methodology used in the IMF WEO analysis on recessions and recoveries (Terrones et al. 2009).

identify 35 recessions associated with severe housing slumps in the advanced economies. A list of countries, recession dates, and recession types is found in appendix A.

As with other work in this area, much of our analysis will be in the form of butterfly charts, allowing us to compare the behavior of output around cyclical downturns across numerous recessions and countries. In our case, however, instead of indexing the output series for each recession to be 100 at the pre-recession peak, we index the level of GDP to 100 at the date of the recession trough. This allows us to isolate the trajectory of the recovery, which is the key focus of our paper. We typically look at the 12 quarters before and after the trough. Because we have observations on so many recessions, it is not informative to chart individual recessions for most of our analysis. To summarize the cross-country experience, we calculate the mean value of output at each quarter across recession observations to construct the average path of GDP before and after the trough. Our results are not qualitatively different if medians are constructed. Using means allows us to create standard error bands around our average output paths.

### **III. Results**

#### *A. Banking and Financial Crises*

As a first look, we construct the average path of GDP around recession troughs for our entire sample, excluding the Great Recession (figure 1). On average in a recession in our sample, output falls  $4\frac{1}{2}$  percent from the pre-recession peak to the trough.<sup>5</sup> GDP then rises at an average annual pace of  $3\frac{3}{4}$  percent for the next three years, putting the level of output roughly 12 percent higher than at the trough. Splitting the sample between advanced economies and emerging market economies (figure 2), shows, not surprisingly, that the EMEs have more extreme cycles, both in terms of the severity of recessions and the rapidity of recoveries. For the average EME recession, output falls  $6\frac{1}{2}$  percent from peak to trough, compared to  $2\frac{1}{2}$  percent for the AEs. And the average annual pace of EME recovery is 5 percent over the three years following the trough, almost 2 percentage points faster than that in the AEs, leaving the level of output in the EMEs about 6 percentage points higher than that in the advanced economies.

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<sup>5</sup> This decline is measured as the decline in the average GDP path in our sample. Because recessions are of different duration, the average decline from peak to trough across recessions is a different and slightly higher figure.

As mentioned earlier, we have classified recessions by type, depending on whether they were associated with banking and financial crises. Over our sample, excluding the current recession, 8 advanced economies have experienced B&F crises out of a sample of 116 – or roughly 6½ percent of all AE recessions.<sup>6</sup> The frequency of banking and financial crises is a much higher 36 percent (or 39 out of 108) for the emerging market economies. Because of this, and the more pronounced behavior of output around EME recessions, we separate our sample into advanced and emerging market economies throughout the paper so country composition does not distort our conclusions.

As seen in figures 3 and 4, the pace of output growth upon exiting a recession, shown in the region to the right of the recession trough, is remarkably similar for both the advanced and emerging economies. Recoveries from banking and financial crises appear identical in pace to recoveries from other types of recessions. Table 2 presents the results of regressions of the level of GDP one, two, and three years after the trough on a constant and a dummy for whether the crisis was associated with a banking and financial crisis. For both the advanced economies and the emerging markets, the coefficient on banking and financial crises comes in highly insignificant. There appears to be little evidence that the pace of output differs in recovery depending on whether the recession is related to a banking and financial crisis.

This result is surprising given the stylized fact and the standard interpretation of the previous empirical work (Reinhart and Reinhart, 2010; Reinhart and Rogoff, 2009; Claessens et al., 2008 and Terrones et al, IMF WEO, 2009) that finds that recoveries from banking crises are slow.<sup>7</sup> A key reason for the divergence in results is that earlier analysis has indexed the level of GDP to the pre-recession peak, rather than the trough. As can be seen in figures 3 and 4, there are significant differences in the severity of recessions associated with B&F crises. The red lines in the region to the left of the trough are all higher and fall more sharply. Indeed, running similar regressions on the level of GDP one, two, and three years *prior* to the trough show that the coefficient on banking and financial crises is large and significantly positive in most cases – indicating a sharper decline during the recession for B&F crises (table 3). Indexing to the peak confounds the strength of the recession and the behavior of the recovery, as can be seen when we

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<sup>6</sup> B&F recessions include Finland (1990), Iceland (1982), Italy (1982), Japan (1997), Norway (1991), Portugal (1982), Spain (1978), and Sweden (1990).

<sup>7</sup> Complementary to our results, Lopez-Salido and Nelson (2010) find that recoveries are not systemically slower in the aftermath of financial crises in post-war United States.

re-index our data to the pre-recession peak (figures 5 and 6). Our results are consistent with findings that banking and financial crises are associated with greater declines in output and slower returns to pre-crises levels or trends, but this is because the recessions were deeper rather than because of disparities in the pace of recovery.

To confirm that indexing is central to our differences with the previous literature, we also ran robustness tests using the alternative methods of dating recessions and country samples for the AEs used in earlier work. Figures 7 and 8, display the output paths around the trough for the various samples of AE countries experiencing B&F crises found in Reinhart and Rogoff or Terrones et al. for both the two-quarter and the BBQ method of dating recessions. For the Reinhart and Rogoff recessions (excluding the Great Depression), the average path of GDP after a recession for B&F crises follows closely or is even stronger than our own, while the Terrones sample is just a touch weaker. To a first order, differences in recession classification and country sampling do not appear to alter our results. Figures 9 and 10 present similar results for the emerging economies, though only for Reinhart and Rogoff, as Terrones et al. does not cover emerging economies.<sup>8</sup>

### *B. Housing Slowdowns*

Given the collapse in housing markets in a number of countries during the recent recession, we also looked at historical experiences with recoveries associated with severe slumps in housing markets. Our analysis is limited to the 18 advanced economies for which we could obtain reasonable historical data on housing markets and we define housing slumps simply in terms of changes in real house prices using quarterly OECD data starting in 1970.

The quarterly house price data are volatile, so to define a housing price slump we smooth each country's data using an HP filter with the low parameter of 100 and then look for local maxima and minima in the smoothed series. Returning to the unsmoothed data with the dates of the local peaks and troughs, we calculate the duration and depth of house price declines across the sample. Our methodology identifies 57 periods of house price declines, covering a

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<sup>8</sup> Reinhart and Rogoff identify five AE recessions as banking crises. By our dating, the troughs of these recessions occur in: Finland (1992), Japan (1993), Norway (1991), Sweden (1992), and Spain (1979). Terrones et al. add Australia (1991), Denmark (1987), France (1993), Greece (1993), Italy (1993), Japan (1993), New Zealand (1987), the United Kingdom (1974), and the United Kingdom (1991), as well as a crisis in Germany around 1980 which does not correspond to a recession in our sample. In addition to the AEs, Reinhart and Rogoff also identify eight crises in the EMEs, fewer than in our sample: Argentina (2002), Colombia (1999), Hong Kong (1998), Indonesia (1998), Korea (1998), Malaysia (1998), the Philippines (1998), and Thailand (1998).



significant portion of countries and time periods (occasionally across multiple recessions). For the United States (figure 11), this process identified four periods of real house price decline: the mid-1970s, the early 1980s, a brief period around 1990, and the most recent downturn. To classify a severe housing slump, we pick only the more sizable declines, those above the median. (For the United States, only the current housing slump would be classified as severe.) In these cases, the decline in real house prices is greater than 19 percent. They last for an average of 6½ years and fall an average of 33 percent.

Our paper focuses on the cyclicalities of GDP, not real house prices, so our final step is matching housing slumps to recessions. We do this simply: if any quarter of the recession overlaps with any quarter of the housing slump, we classify the recession as associated with a severe housing slump. There are 35 such recessions.

Dividing the OECD sample into recessions associated with severe housing slumps and those without reveals some interesting patterns. In particular, as shown in figure 12, housing-slump recessions tend to be longer and deeper and recoveries from these recessions are significantly slower. Table 4 runs a simple regression showing similar results.

### *C. Depth and Duration*

Our result that the pace of growth after the trough of recessions associated with financial crises are similar to other recessions is somewhat surprising and leads to questions about what we know about recoveries following severe recessions more generally. In particular, how accurate is the second stylized fact that deep recessions are associated with faster bouncebacks? To address the questions, we characterize all recessions in terms of their depth – the decline in the level of GDP from peak to trough – and duration – the number of quarters from peak to trough. Figures 13 and 14 present histograms of the depth of the recessions in our sample for the advanced and emerging market economies, along with selected summary statistics, excluding the Great Recession. As mentioned above, the average decline in output for the AEs is 2.6 percent, with 12 percent of recessions associated with declines of more than 5 percent. The right tail is even more elongated for the EMEs, with the average decline being 6.4 percent, but 17 percent of the sample seeing output loss of 10 percent or greater. Figures 15 and 16 present the same analysis for recession duration. Not surprisingly, for both sets of countries, there is a mass of recessions lasting 2 quarters (the duration of output decline that defines a recession in our work).

For the advanced economies, the average recession length is about 3 quarters with almost 30 percent of the sample experiencing output declines for a year or more. For the EMEs, the duration is more extreme. The average EME recession lasts a year, and 45 percent of recessions last more than a year with one, that for post-Soviet Russia, of almost 6 years.

In Figures 17 through 20, we construct butterfly charts around the trough for recessions that are above the top 25<sup>th</sup> percentile in depth and duration and below the bottom 25<sup>th</sup> percentile for the AFEs and EMEs. In terms of recession depth, the charts certainly suggest that deeper recessions are associated with sharper bouncebacks than shallower recessions for both types of countries. The average level of output is 5 percent higher three years after a deep recession in the AEs and the EMEs. The results are different for long recessions. Here the average recovery appears slightly weaker following long recessions in the advanced economies, especially in the first few years. For the EMEs, there appears little difference between recoveries following long recessions than those following short recessions.

To provide a bit more rigorous look at this, table 5 presents the results of regressions of the level of GDP in the advanced economies one, two, and three years following a recession trough on the depth and duration of the recession, a dummy for whether the recession is associated with a banking or financial crisis, and a constant. Unlike with banking and financial crises, both depth and duration significantly affect the path of recovery, particularly in the first year. For example, for every 1 percentage point increase in recession depth, the level of output one year after the trough is a little over  $\frac{1}{2}$  percentage point greater. In contrast, a recession that is 1 quarter longer is associated with a similar-sized reduction in the pace of recovery. Over time, the drag from a longer recession appears to dissipate while the level of output is still roughly  $\frac{1}{2}$  percentage point higher following deep recessions. The results are even stronger for regressions on EME recessions (table 6). For these economies, a quarter longer recession is associated with a 1 percentage point lower level in output a year after the trough and  $1\frac{1}{2}$  percentage point lower level in output three years later. In contrast, a 1 percentage point greater decline in the level of output during the recession is associated with a  $\frac{1}{2}$  percentage point higher level of output rising to  $\frac{3}{4}$  percentage point greater level by year three of the recovery. In all three versions, the coefficients on length and depth come in statistically significantly and with opposite signs.

In the previous literature, financial and banking crises have been linked to severe recessions – implying both deeper and longer downturns – which may explain why we are failing to get statistically significant effects of banking and financial crises – these impacts may be cancelling each other out. To check this, we take a closer look at the relationship between banking and financial crises and severity of recessions. Figures 21 and 22 present scatterplots of the depth and duration of recessions, again dividing countries by whether they are considered advanced or emerging market economies. Individual banking and financial crises are represented by the yellow dots and all other recessions are captured by the black dots. The vertical and horizontal lines represent the average duration and depth of recessions, respectively—yellow lines capturing the averages for banking and financial crises and black lines the average duration and depth for all other recessions. What was somewhat surprising to us is that banking and financial crises are not universally longer and deeper. Judging by the distance between the yellow and black lines, for the AEs, B&F crises tend to be longer but not much deeper than all other types of recessions. The reverse is true for the EMEs. For these economies, B&F recessions are associated with deeper but not much longer recessions. Table 7 details the summary statistics behind these charts. Prior to the Great Recession, the correlation between length and depth was .36 for the AEs and a much stronger .67 for EMEs.

#### *D. Implications*

What do our results imply should be the pace of the current recovery? To show this, we use the coefficients from our three regressions above to predict the pace of recovery at 4, 8, and 12 quarters past the trough based on observed depth and duration in the current recession<sup>9</sup>. Figures 23 through 24 illustrate the results of this exercise. The solid black line represents the pace of recovery predicted for all AEs and EMEs, respectively, given the average depth and duration of the Great Recession and the red line represents the path of actual average AE or EME GDP in the current recovery. The pace of recovery in the AEs appears to be underperforming while that in the EMEs seems right on track.

Turning to the United States, figure 25 compares the current U.S. recovery to past recoveries in the advanced economies. Although the U.S. Great Recession was longer and

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<sup>9</sup> Housing declines were common but not universal in the most recent recession, so are not included in this part of the analysis. Including the severe housing downturn as an explanatory variable for the pace of the U.S. recovery, the current recovery is still underperforming the model's expectation but by only one percent.

deeper than almost all previous U.S. and advanced economy recessions and was accompanied by extreme financial disruptions, the U.S. recovery aligned well with average AE recoveries until the first half of 2011 when the pace of recovery slowed sharply. However, figure 26 shows that the actual path of recovery is well below what would be predicted by our simple model of depth and duration, suggesting other factors, possibly related to the financial crisis, may be at play this time around.<sup>10</sup> One could ask if generalization from overall AE experience to the U.S. economy is appropriate given its relatively high average growth rate and greater flexibility. In simple tests, however, we were unable to find compelling evidence that U.S. recoveries are typically faster than AE recoveries in general (tables 8 and 9).

#### *E. Permanent versus Transitory, or Does the Economy Ever Actually “Recover”*

Despite the differences in recovery rates we have highlighted above for recessions that are long or deep, recovery rates across recessions are still quite similar. This implies that long and deep recessions are associated with large and sustained losses to output. In particular, the economy will not return to its long-term trend, implying a persistent gap between the pre-crisis trend and the post-crisis level of output. This result is consistent with Cerra and Saxena (2008) which finds that large output losses associated with financial crises are highly persistent.

Our work also suggests that large declines in output over long periods of time can have more permanent effects on the level of output. For example, using the regression results for the advanced economies, the pace of recovery is the same after a recession of 2 quarters duration that results in a 2 percent decline in output and one of twice that length and duration – suggesting a greater potential permanent loss in output from the more severe recession.

To press this result further, we conduct a series of exercises to test whether output returns to pre-recession trend levels. To do this, we face both a conceptual and a practical challenge. Often, macroeconomic data are detrended using HP or Kalman filters. Both of these techniques are two-sided moving average filters. This implies that the view of the past changes as the data evolves. In particular, and of great importance here, these detrending tools cannot accommodate a permanent deviation from trend. For this reason, we choose to use a simple exponential trend which can accommodate such long-lasting deviations. Even with this methodology, determining

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<sup>10</sup> Prior to the annual revision in July, the actual path of the U.S. recovery was very close to what would be predicted by the depth and duration regressions.

the appropriate pre-recession trend is somewhat tricky, to the extent that banking and financial crises are associated with bubbles or positive deviations from trend prior to the crisis. To avoid including the bubble in our trend, we calculate the four-year average growth rate for each country, two years prior to the peak, thus excluding the often rapid period of growth before the crisis. (The results are similar using average growth calculated over different pre-peak intervals.)

Having calculated a pre-recession trend, we then examine GDP as a percentage of this trend (figures 27 and 28) for the average recession and from particularly mild and severe recessions. Average GDP in the advanced economies never recovers to trend, even for short and shallow recessions. However, the average recession in the emerging economies does return to trend, and exceeds trend for short and shallow recessions. But, as for the AE recessions, for deep and long EME recessions, GDP does not drift back toward 100 percent of the pre-crisis trend, even after 10 years. For both AEs and EMEs, deep and long recessions lead to a sustained loss from pre-recession trend of about 8 to 10 percent after 10 years. While varying the specification of our regressions or the definition of pre-crisis trend can modify these loss estimates, these exercises all suggest a more sustained hit to output from severe recessions.

Another way of testing if GDP returns to its pre-crisis trend is to evaluate whether growth rates immediately after recessions differ from long-run average growth. We have examined this, first, by constructing scatterplots for the AE and EME countries of average growth over the sample for each country and average pace of growth three years after a recession trough (figures 29 and 30). If growth in recoveries proceeds at about average pace, then the points should line up close to the 45 degree line, indicating no quick return to pre-recession trend levels. In these charts, average growth seems very close to the pace of growth during recoveries. We also include a variable in our depth and duration regression to capture average pre-recession growth. It is possible that countries with faster trend growth experience faster growth coming out of recoveries. If these countries are also associated with greater propensity (or less) to experience banking and financial crises, then our estimates of post-trough growth may be biased. As seen in table 10, pre-crises growth rates come in statistically insignificant – suggesting the average pace of growth prior to the recession does not affect the post-recession recovery rate.

Shifting back to our comparison with Cerra and Saxena, they find that B&F crises lead to permanent losses in output. Given our results on depth and duration, one might ask whether their

result is purely a reflection of the depth and duration of the downturns associated with financial crises or is there something special about financial crises above and beyond the contour of the downturn which leads to permanently lower output? There are differences in methodology and data between the two studies – Cerra and Saxena restrict their analysis to the initial shock stemming from the first year of a banking crisis, focus solely on banking crises (treating currency and debt crises as separate), use simulations from VAR analysis to estimate the impact of banking crises, and compare banking crises to non-crisis growth performance whereas we draw comparisons to other recessions. Despite these differences, we can shed some light on this question.

Using the sample of non-crisis recessions, we regress the level of post-trough GDP on the depth and duration of the crisis, similar to table 5, but with a sample restricted to non-crisis recessions and of course without the B&F crisis explanatory variable. This gives us a prediction for the recovery given a recession of a certain depth and duration. We use the model to create a prediction for a recovery after a non-B&F related recession that has the same depth and duration of an average B&F crisis. Finally, we compare the prediction to the average of actual outcomes of B&F crises. Figures 31 and 32 show that the average recovery and the prediction are almost identical. There appears to be nothing inherently special about banking and financial crises that creates more of an output loss than similarly sized recessions unassociated with crises. Combining this simple experiment with our earlier results, we conclude that any recession of similar magnitude to a B&F crisis may lead to sustained losses in the level of output.

#### *F. A simple look at what doesn't recover*

Our work above suggests that the level of GDP, particularly after long and deep recessions, does not recover to its pre-crisis trend even five years after the start of a recession, thus it is important to understand what is driving this sustained output loss. In general, even for the advanced economies, it is a challenge to get comparable quarterly time series data across countries to allow a more granular look at post-recession behavior. One exception is a dataset developed by and detailed in Ohanian and Raffo (2011) which contains quarterly information on total hours, labor-force participation, employment, and average weekly hours for 15 OECD

countries from 1960 to the 2010.<sup>11</sup> With these data we can examine the broad supply-side components of output – total hours and output per hour – to see where the weakness in overall GDP lies following a recession. Figure 33 shows, for the smaller sample used here, the average behavior of the level of GDP as a percentage of pre-recession trend – divided into those that were particularly severe (in the top 25<sup>th</sup> percentile of depth and duration) and all others. In both cases, the level of output fails to return to the pre-recession trend, with the gap being particularly sizable (about 7½ percent) for severe recessions. Figures 34 and 35 break output down into total hours and output per hour for both sets of recessions. Interestingly, for typical recessions, the loss in output is a reflection of declines in both productivity and labor input. In contrast, for severe recessions, the sustained deviation in the level of output from trend is more than entirely accounted for by a loss in total hours – productivity actually increases relative to trend.

We next decompose total hours into labor-force participation, the employment rate, and average weekly hours (figure 36 through 38). Interestingly, whereas the workweek returns and even exceeds its pre-recession trend relatively quickly, employment and labor-force participation rates remain depressed – particularly after long and deep recessions. These results suggest the decline in output relative to pre-crisis trend, especially after severe recessions, is importantly concentrated in a reduction in the utilization of labor. For particularly bad recessions, the reduction in the employment and labor force participation rates is sustained even five years after the pre-recession peak.

#### **IV. The Current U.S. Recovery in More Detail**

With the general knowledge of the features of recoveries in hand, we can now turn to characterizing the current U.S. recovery in more detail. The butterfly chart in figure 39 shows the evolution of U.S. GDP around the trough of every recession since 1947, separating the 1980s downturn into two recession periods.<sup>12</sup> The thick black line denotes the current recession. Only the downturn in 1980 had a more sluggish pace of recovery two years after the trough.

This anemic post-recession performance is not a reflection of weak outcomes in the manufacturing sector. After falling dramatically in the recent recession industrial production

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<sup>11</sup> The countries included are Australia, Austria, Canada, Finland, France, Germany, Ireland, Italy, Japan, Korea, Norway, Spain, Sweden, the UK, and the US.

<sup>12</sup> This section of the paper uses recession dating by the NBER in order to include the 2001 recession. The only other notable change is that NBER classifies the pre-recession peak of the Great Recession as 2007 Q3 instead of 2008 Q1.

(figure 40) has since climbed at an about-average pace and real exports (figure 41) have surged nearly 25 percent. Non-residential investment (shown in figure 42) tells a similar story. The fall in investment was larger than in any previous recession, leaving a tremendous gap between the current level and the peak, but the pace of investment growth during the recovery has been on the high end of the more recent historical experiences.

On the other hand, unusually poor recovery is evident in consumption and housing. The level of real private consumption (figure 43) has fallen behind every recession except the 1980 double dip. Residential investment remains below its level at the trough of the recession (figure 44) and house prices have underperformed all previous recoveries (figure 45).

A number of factors appear to be contributing to these areas. Credit growth, even outside of mortgage lending, has fallen further since the recession trough (figure 46) – undoubtedly reflecting tighter lending conditions but also weak demand. Consumer sentiment has also improved little over the past two years (figure 47) as income growth has been particularly slow (figure 48) and employment has languished (figure 49). Consumption performance has shown some variation – with goods consumption, especially for durables and motor vehicles, picking up at about on average pace (figures 50 to 52) but services consumption is markedly weaker than in previous recoveries (figure 53). Employment growth has been weak across the board but like consumption, relatively worse in the services industries than the goods industries (figure 54 and 55). Also of note is the unusual behavior of state and local employment which was rising at a relatively slow pace prior to the recession and has shown declines matched only by the recession in 1980, with little hope of improvement going forward (figure 56).

The policy response in this recovery has been mixed. Monetary policy, even excluding long-term asset purchases and other non-traditional programs, has been larger than in most previous recoveries with the real federal funds rate (figure 57) remaining in negative territory two years after the recession trough. In contrast, government expenditures (figure 58), which had risen sharply during the recession, has leveled off noticeably since then especially compared with earlier recoveries. Further, although revenue fell more than in other recessions, the revenue growth following the recession is on the high end of previous recoveries (figure 59).



Finally, we apply similar supply-side analysis to the United States as above to the OECD countries.<sup>13</sup> Re-indexing to the peak and taking deviations from a simple exponential pre-recession trend, shows that 2½ years after the recession trough the level of output in the United States is strikingly below trend (figure 60). This gap is driven entirely by a lack of hours (figure 61), as labor productivity has returned to trend (figure 62). As with the OECD results more generally, this hours gap reflects a downshift in labor force participation and employment rather than the workweek (figure 63 to 65).

## **V. Conclusion**

We take away several key points from our work on recoveries. First, whether a recession is associated with a banking or financial crisis does not have a statistically significant effect on the pace of growth following recession troughs. This result surprised us and raises questions for future research about the exact channels through which banking and financial crises affect growth. In comparison, as might be expected, recoveries from recessions associated with severe housing downturns are found to be slower.

Second, the depth and duration of a recession does matter for recovery speed. Deeper recessions are associated with faster post-trough recoveries, in line with the view that pent-up demand and underutilized resources can contribute to a sharp snapback. In contrast, longer recessions are associated with slower post-trough growth, possibly reflecting skill and capital deterioration as recessions drag on. Banking and financial crises are associated with more severe recessions – deeper in the case of emerging market economies and longer in the case of the advanced economies – but do not appear to impose additional restraint to recoveries beyond the depth and duration. Currently, the emerging market economies are recovering as would be predicted given the depth and duration of their Great Recession experiences, but the advanced economies, including the United States, are lagging.

Third, we expand on earlier work in the literature that finds evidence that recessions, especially severe recessions, are associated with persistent negative deviations in the level of GDP from pre-crisis trend. This deviation appears to importantly reflect the lower utilization of labor, particularly a decline in employment and labor force participation rates from earlier trend

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<sup>13</sup> For individual recessions, we use the trend based on the average growth in the five years prior to the pre-recession peak because the four-year average two years prior to the peak introduces too much noise. Without the benefit of an average over a large sample, the results are much more difficult to interpret.

levels. Going forward, it will be important to examine these results in line with what we know from the micro labor literature about skill deterioration, hysteresis, and long-term unemployment. Finally, we may need to reexamine the assumptions in many of our macro models that output levels eventually return to trend or reevaluate the concept of trend.

For the United States, the current recovery has been weaker than would have predicted based on the depth and duration of the recession alone. Without question, the labor market has performed particularly weakly – with especially tepid employment growth and a sharp decline in labor force participation. These developments raise questions about the financial and fiscal channels that affect labor demand and about the role of policy in the face of long and deep recessions.

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Table 1

	Total	Advanced Economies	Emerging Market Economies
All Recessions	271	137	134
Excluding Great Recession of which...	224	118	104
Banking or Financial Crisis	47	8	39
Housing Related	---	35	---

Table 2

Advanced Economies	One year after		Two years after		Three years after	
	Coefficient	Std Error	Coefficient	Std Error	Coefficient	Std Error
B&F	-1.05	1.23	-0.28	1.57	1.30	1.78
Constant	103.99		106.48		108.75	
R-squared	0.00		-0.01		0.00	

Emerging Economies	One year after		Two years after		Three years after	
	Coefficient	Std Error	Coefficient	Std Error	Coefficient	Std Error
B&F	0.17	1.09	0.20	1.85	1.25	2.58
Constant	106.78		110.90		114.51	
R-squared	-0.01		-0.01		-0.01	

Table 2 is based on a simple linear regression of the form

$$\frac{GDP_{trough+x}}{GDP_{trough}} = \beta_0 + \beta_1 D_{B\&F} + \epsilon$$

where x is one, two, or three years, and  $D_{B\&F}$  is a dummy variable for whether the recession was associated with a banking or financial crisis.

A \* indicates confidence at the 95 percent level, and a \*\* indicates confidence at a 99 percent level.

Table 3

Advanced Economies	One year prior		Two years prior		Three years prior	
	Coefficient	Std Error	Coefficient	Std Error	Coefficient	Std Error
B&F	0.84	1.11	3.20 *	1.30	3.98 *	1.67
Constant	101.28		98.76		95.67	
R-squared	0.00		0.04		0.04	

Emerging Economies	One year prior		Two years prior		Three years prior	
	Coefficient	Std Error	Coefficient	Std Error	Coefficient	Std Error
B&F	4.96 **	1.25	8.30 **	1.94	7.84 **	2.72
Constant	102.96		98.67		96.05	
R-squared	0.08		0.11		0.05	

Table 3 is based on a simple linear regression of the form

$$100 \frac{GDP_{trough-x}}{GDP_{trough}} = \beta_0 + \beta_1 D_{B\&F} + \epsilon$$

Table 4

Advanced Economies	One year after		Two years after		Three years after	
	Coefficient	Std Error	Coefficient	Std Error	Coefficient	Std Error
Housing	-1.57 *	0.71	-1.98 *	0.83	-1.32	0.95
Constant	104.52		107.15		109.20	
R-squared	0.04		0.05		0.01	

Table 4 is based on a simple linear regression of the form

$$100 \frac{GDP_{trough-x}}{GDP_{trough}} = \beta_0 + \beta_1 D_H + \epsilon$$

where  $D_H$  is a dummy variable for whether the recession was associated with a housing slump.

Table 5

Advanced Economies	One year after		Two years after		Three years after	
	Coefficient	Std Error	Coefficient	Std Error	Coefficient	Std Error
Depth	0.64 **	0.11	0.61 **	0.15	0.42 **	0.18
Duration	-0.62 **	0.20	-0.52 *	0.27	-0.19	0.32
B&F	-0.40	1.17	0.18	1.58	1.27	1.87
Constant	104.20		106.45		108.23	
R-squared	0.20		0.10		0.02	

Tables 5 and 6 are based on a simple linear regression of the form

$$100 \frac{GDP_{trough+x}}{GDP_{trough}} = \beta_0 + \beta_1 D_{B\&F} + \beta_2 Depth + \beta_3 Duration + \epsilon$$

where Depth is a positive number measuring the fall in GDP during the recession as a percentage of peak GDP and Duration is the number of quarter from peak to trough.

Table 6

Emerging Economies	One year after		Two years after		Three years after	
	Coefficient	Std Error	Coefficient	Std Error	Coefficient	Std Error
Depth	0.57 **	0.09	0.62 **	0.17	0.85 **	0.24
Duration	-1.07 **	0.21	-1.30 **	0.39	-1.61 **	0.55
B&F	-1.59	0.98	-1.60	1.85	-1.34	2.61
Constant	107.95		112.68		116.31	
R-squared	0.19		0.11		0.07	

Table 7

Advanced Economies	Depth		Duration	
	Mean	Std Dev	Mean	Std Dev
B&F	3.66	4.07	5.13	2.75
Others	2.58	2.49	2.97	1.36
	p=.26		p=.00	

Emerging Economies	Depth		Duration	
	Mean	Std Dev	Mean	Std Dev
B&F	9.41	7.31	4.47	2.71
Others	4.92	5.94	3.71	2.80
	p=.00		p=.20	

Table 8

Advanced Economies	One year after		Two years after		Three years after	
	Coefficient	Std Error	Coefficient	Std Error	Coefficient	Std Error
U.S. Dummy	-0.24	1.72	0.37	2.18	2.80	2.46
Constant	103.93		106.45		108.74	
R-squared	-0.01		-0.01		0.00	

Table 8 is based on a simple linear regression of the form

$$100 \frac{GDP_{trough-x}}{GDP_{trough}} = \beta_0 + \beta_1 D_{US} + \epsilon$$

where  $D_{US}$  is a dummy variable for whether the recession occurred in the United States.

Table 9

Advanced Economies	One year after			Two years after			Three years after		
	Coefficient		Std Error	Coefficient		Std Error	Coefficient		Std Error
Depth	0.64	**	0.11	0.61	**	0.15	0.42	**	0.18
Duration	-0.65	**	0.19	-0.51	*	0.26	-0.11		0.30
U.S. Dummy	-0.32		1.52	0.34		2.06	2.87		2.42
Constant	104.25			106.41			107.95		
R-squared	0.20			0.10			0.03		

Table 9 is based on a simple linear regression of the form

$$100 \frac{GDP_{trough+x}}{GDP_{trough}} = \beta_0 + \beta_1 D_{US} + \beta_2 Depth + \beta_3 Duration + \epsilon$$

Table 10

Advanced Economies	One year later			Two years later			Three years later		
	Coefficient		Std Error	Coefficient		Std Error	Coefficient		Std Error
Depth	0.50	**	0.13	0.45	*	0.20	0.27		0.24
Duration	-0.49	**	0.19	-0.41		0.28	-0.11		0.34
Pre-crisis Growth	-0.05		0.13	0.18		0.19	0.27		0.24
B&F	0.04		1.02	0.55		1.51	1.70		1.85
Constant	103.77			105.46			106.95		

Emerging Economies	One year later			Two years later			Three years later		
	Coefficient		Std Error	Coefficient		Std Error	Coefficient		Std Error
Depth	0.56	**	0.09	0.64	**	0.17	0.83	**	0.26
Duration	-1.11	**	0.21	-1.36	**	0.39	-1.71	**	0.58
Pre-crisis Growth	0.06		0.12	0.36		0.23	0.52		0.34
B&F	-0.15		1.01	1.78		1.91	2.56		2.84
Constant	106.96			110.00			112.77		

Tables 5 and 6 are based on a simple linear regression of the form

$$100 \frac{GDP_{trough+x}}{GDP_{trough}} = \beta_0 + \beta_1 D_{B\&F} + \beta_2 Depth + \beta_3 Duration + \beta_4 Trend + \epsilon$$

where Trend is the 4 year average annual growth in the two years prior to the peak.

Figure 1. Recoveries in the entire sample

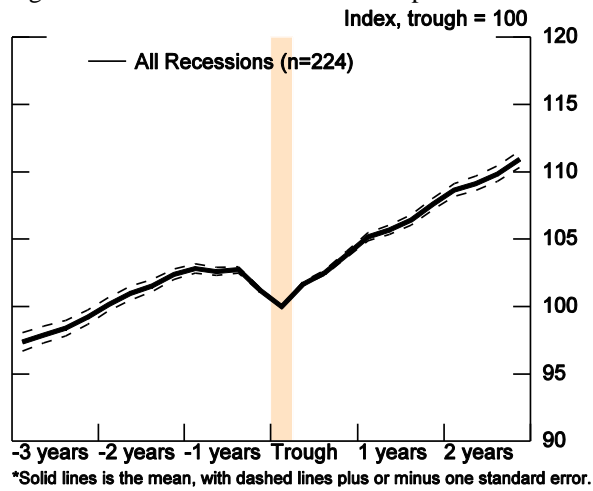


Figure 2. Recoveries

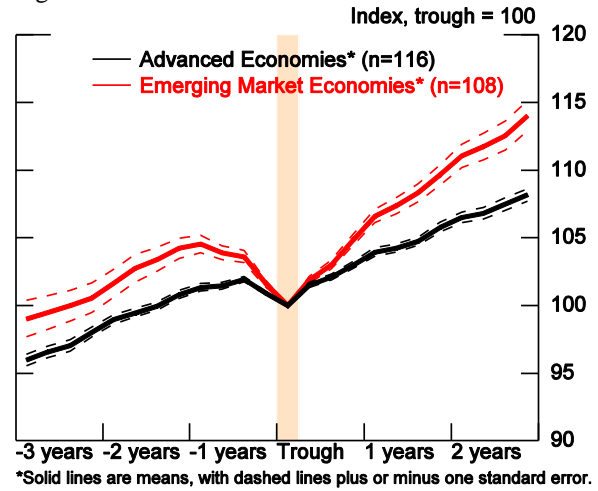


Figure 3. Recoveries in the Advanced Economies

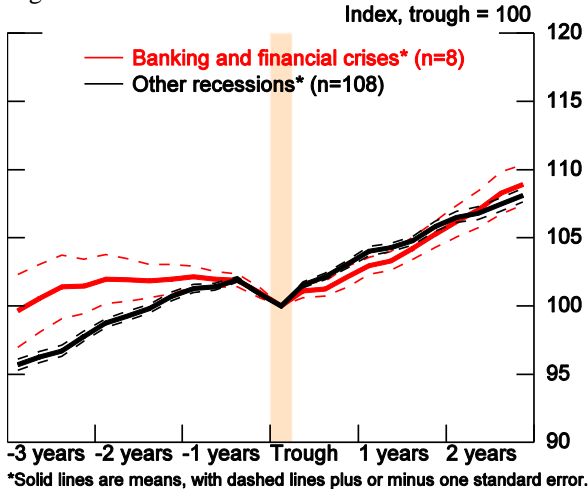


Figure 4. Recoveries in the Emerging Economies

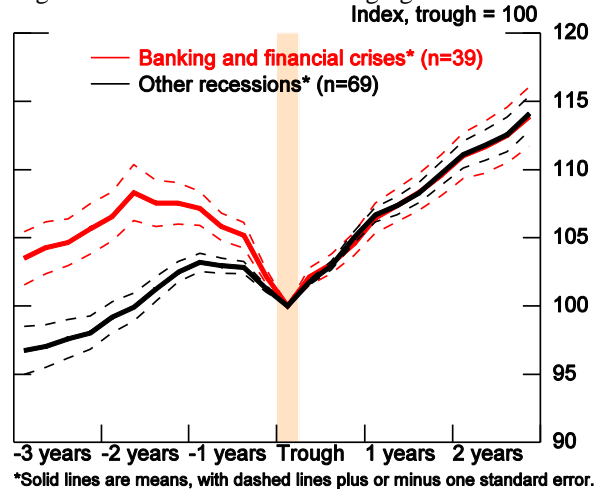


Figure 5. Recessions in the AEs, indexed to peak

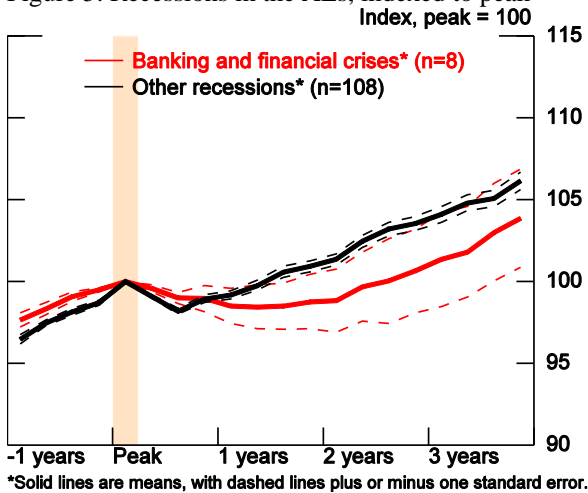


Figure 6. Recessions in the EMEs, indexed to peak

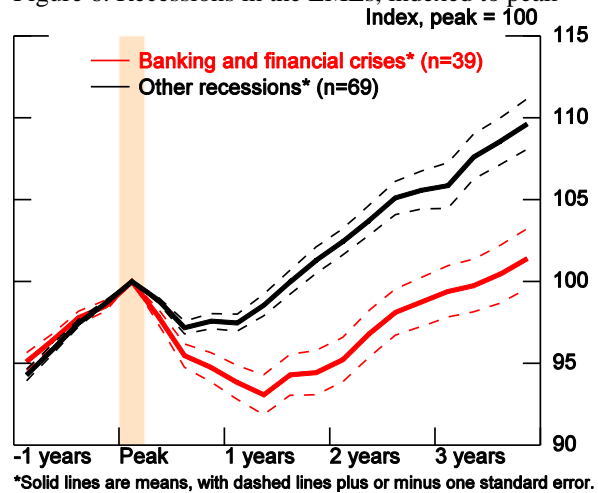




Figure 7. Two-quarter method of dating AE recessions

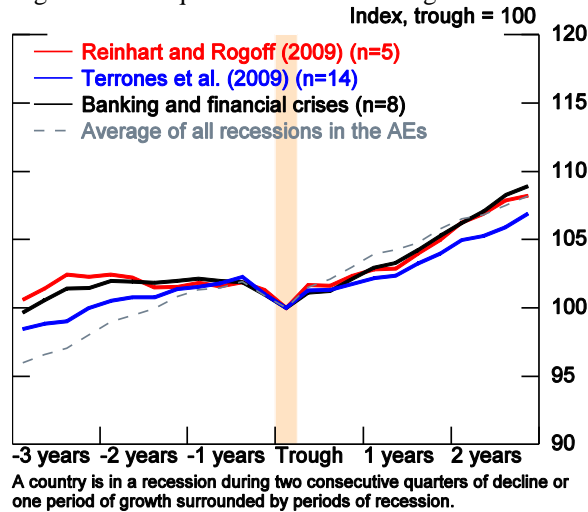


Figure 8. BBQ Method of dating AE recessions

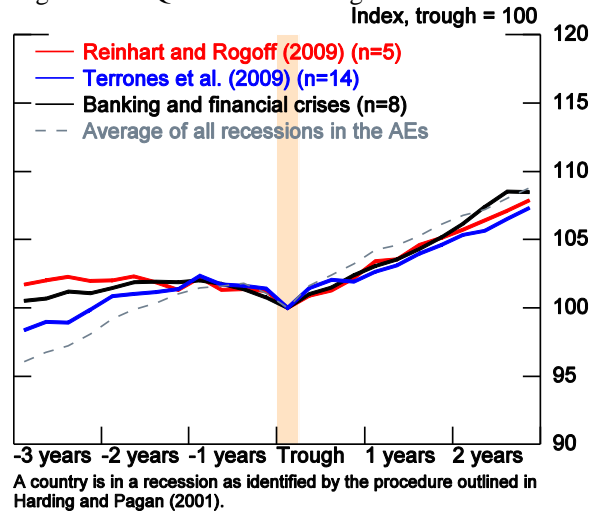


Figure 9. Two-quarter method of dating EME recessions

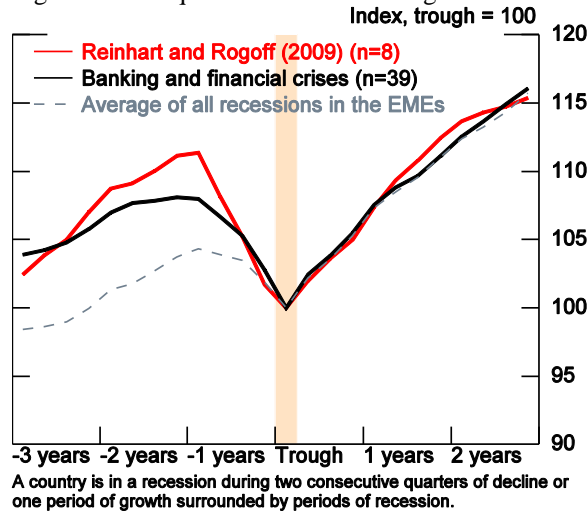


Figure 10. BBQ Method of dating EME recessions

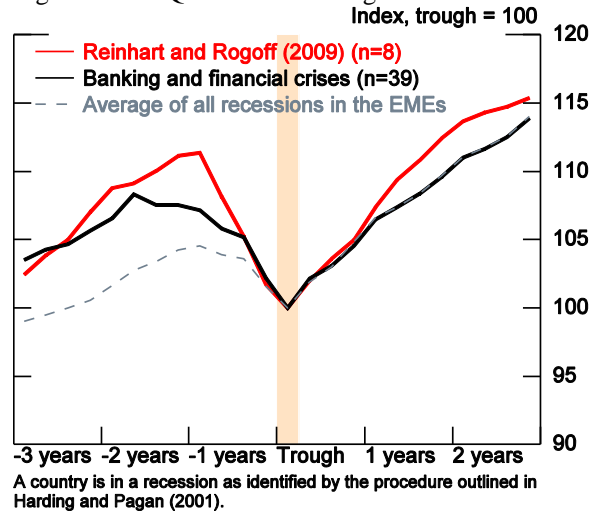


Figure 11. U.S. House Prices

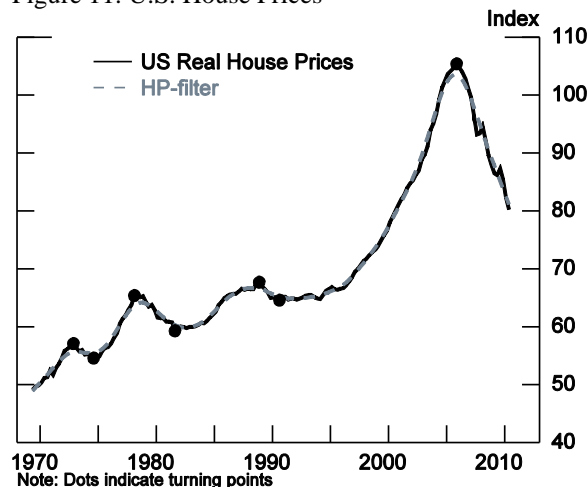


Figure 12. GDP in Select Advanced Economies

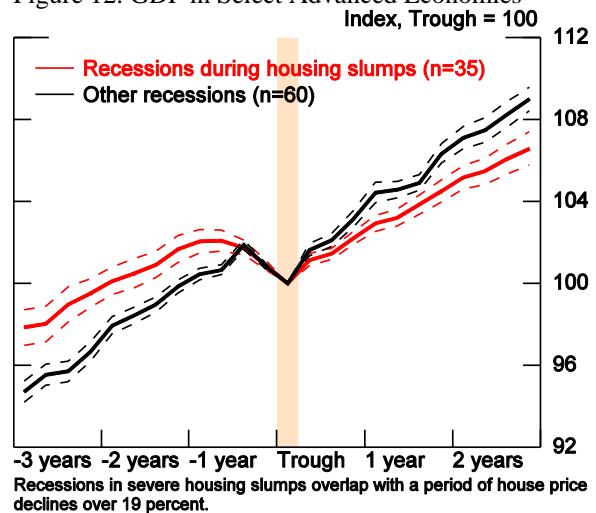


Figure 13. Recessions in the Advanced Economies  
Number of Countries

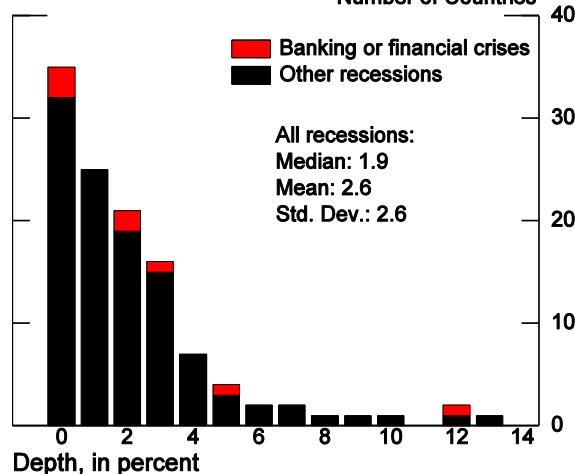


Figure 14. Recessions in the Emerging Economies  
Number of Countries

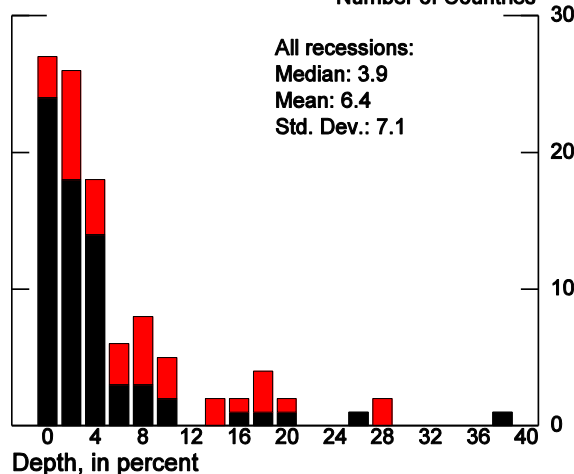


Figure 15. Recessions in the Advanced Economies  
Number of Countries

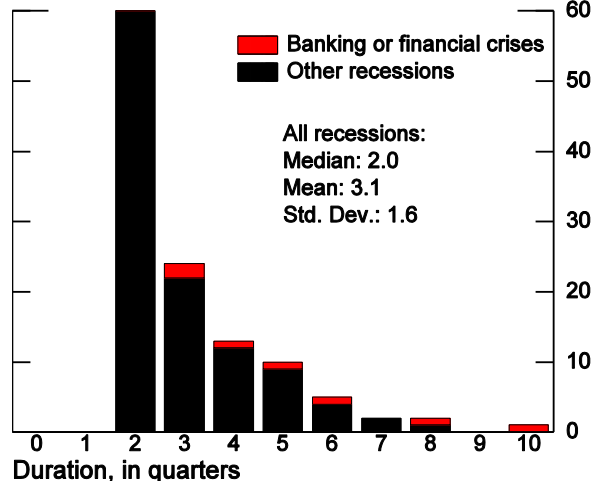


Figure 16. Recessions in the Emerging Economies  
Number of Countries

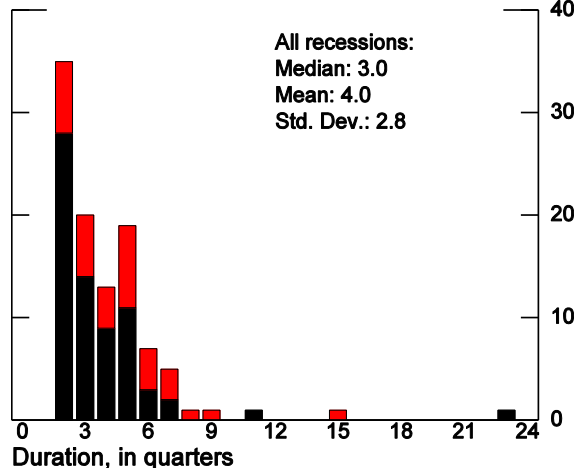
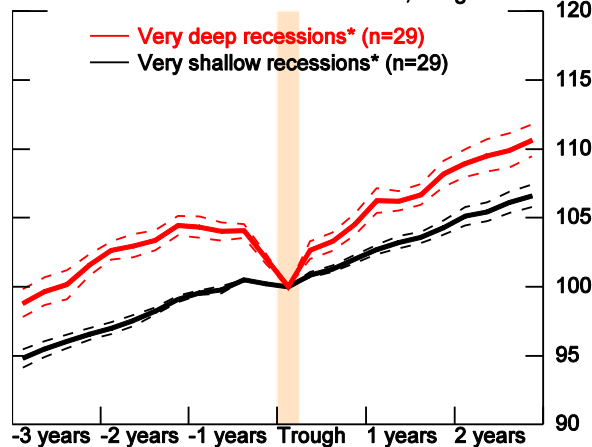
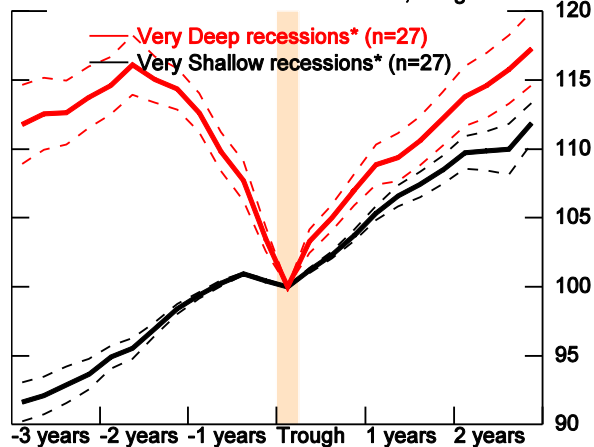


Figure 17. Recoveries in the Advanced Economies  
Index, trough = 100



\*Solid lines are means, with dashed lines plus or minus one standard error  
Extreme recessions are in the top 25% or bottom 25% of observed recessions.

Figure 18. Recoveries in the Emerging Economies  
Index, trough = 100



\*Solid lines are means, with dashed lines plus or minus one standard error  
Extreme recessions are in the top 25% or bottom 25% of observed recessions.

Figure 19. Recoveries in the Advanced Economies  
Index, trough = 100

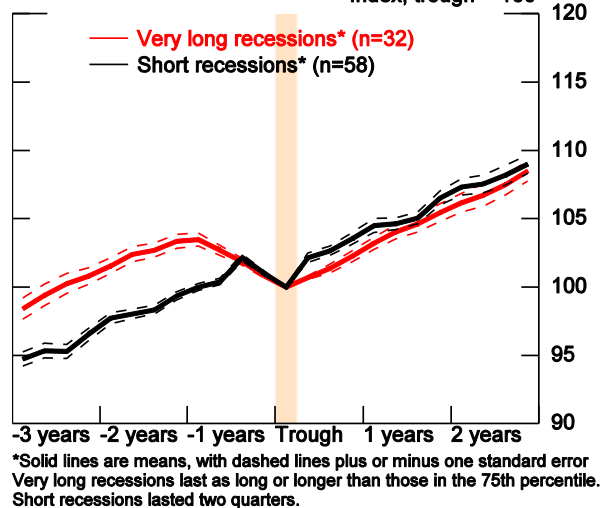


Figure 20. Recoveries in the Emerging Economies  
Index, trough = 100

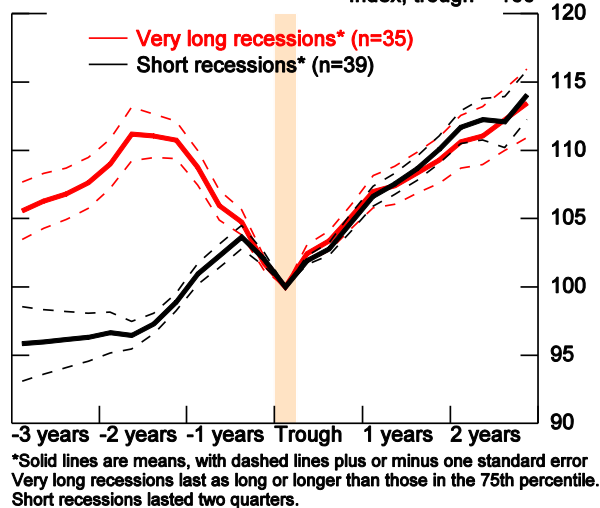


Figure 21. Recessions in the Advanced Economies  
Length in quarters of recession

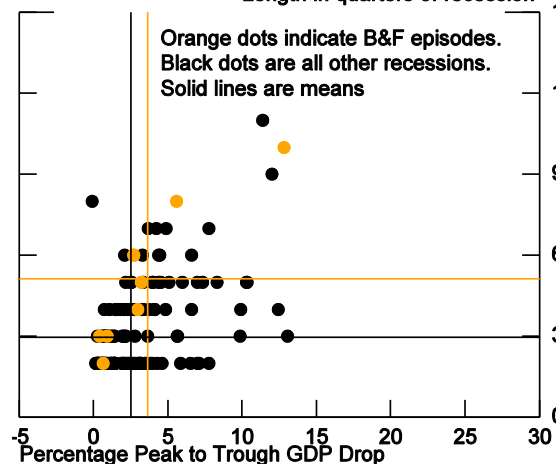


Figure 22. Recessions in the Emerging Economies  
Length in quarters of recession

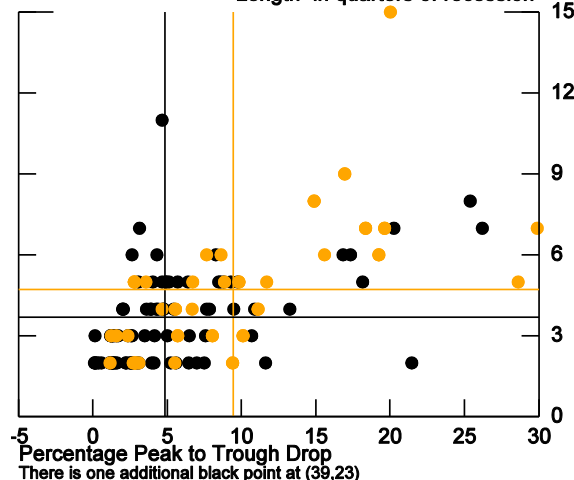


Figure 23. The Current AE recovery

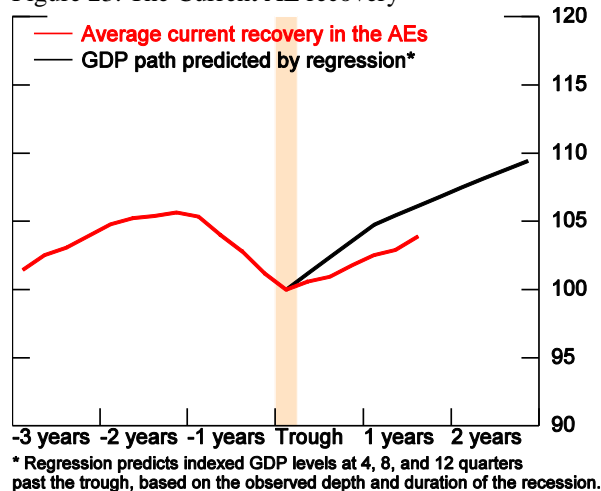


Figure 24. The Current EME Recovery

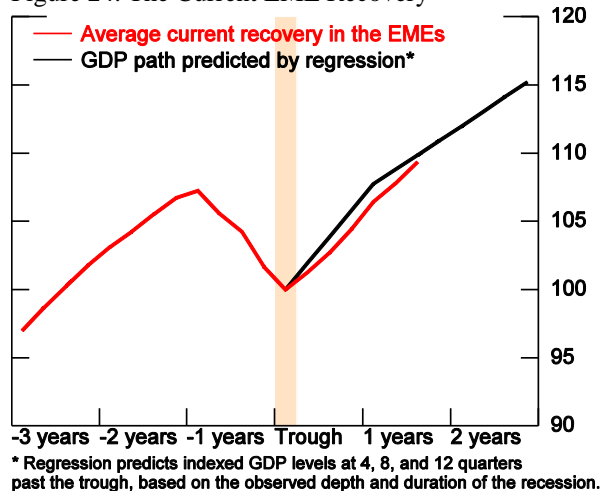


Figure 25. Recoveries in the Advanced Economies

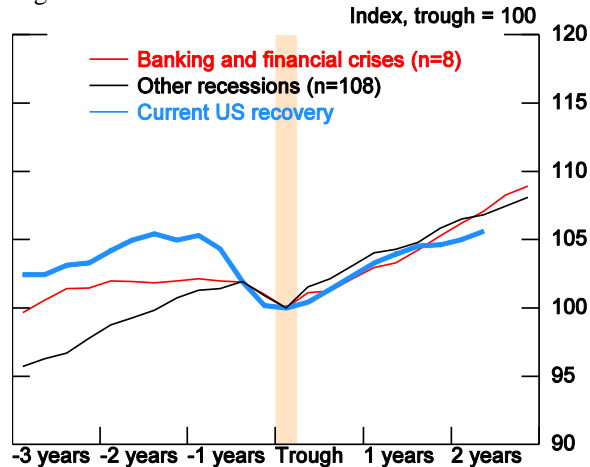


Figure 26. The Current U.S. recovery

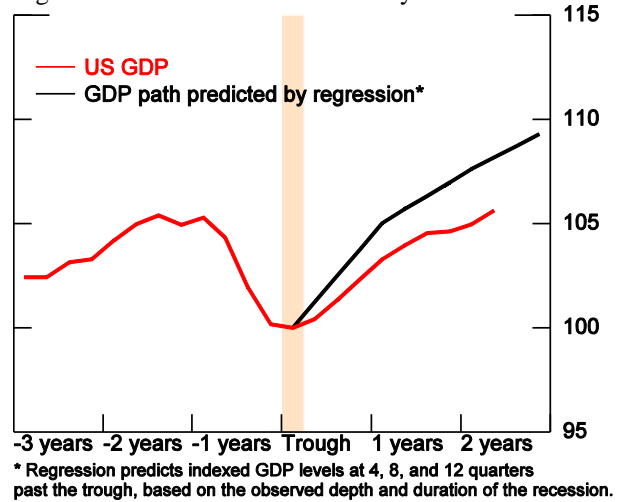
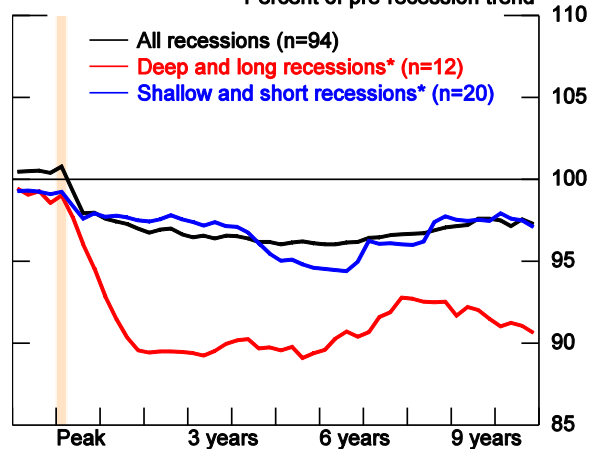
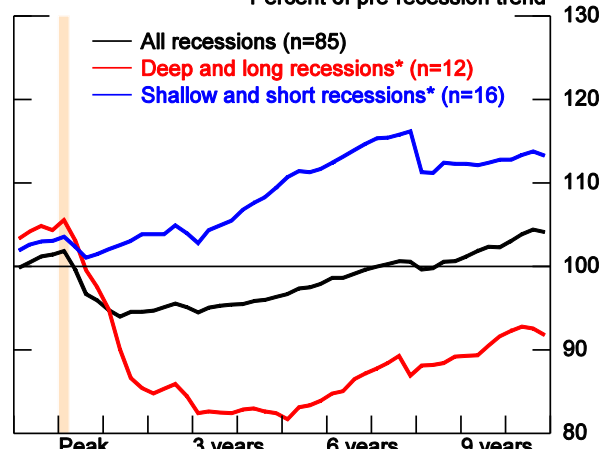


Figure 27. Recoveries in the Advanced Economies



Trend calculated as exponential function growing at the four-year average two years prior to the peak  
\* Deep and long recessions are in the top 25th percent of recessions as measured by both depth and duration. Similarly, shallow and short recessions are in the bottom 25th percentile of each category.

Figure 28. Recoveries in the Emerging Economies



Trend calculated as exponential function growing at the four-year average two years prior to the peak  
\* Deep and long recessions are in the top 25th percent of recessions as measured by both depth and duration. Similarly, shallow and short recessions are in the bottom 25th percentile of each category.

Figure 29. Growth Rates in the Advanced Economies

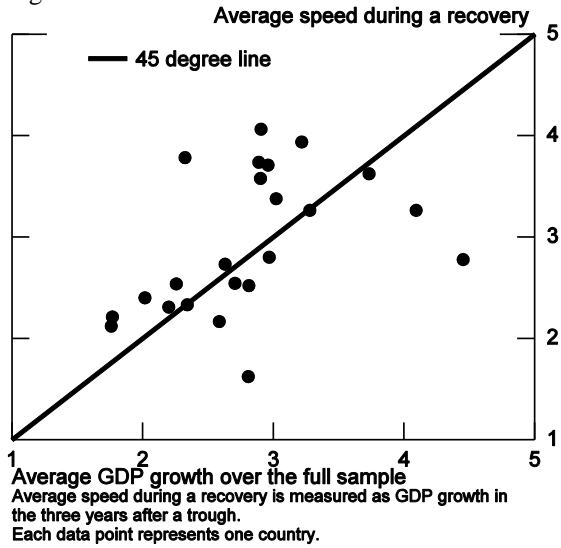


Figure 30. Growth Rates in the Emerging Economies

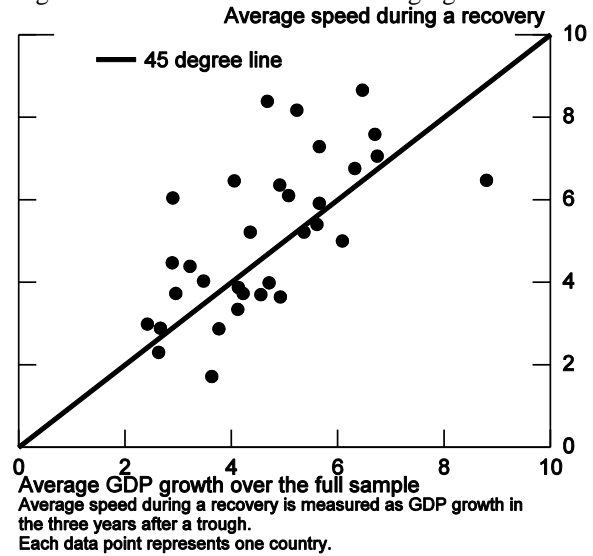


Figure 31. B&F crises in the Advanced Economies

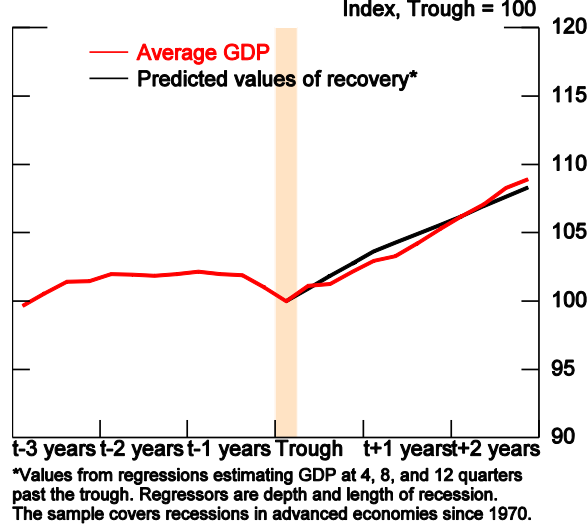


Figure 32. B&F crises in the Emerging Economies

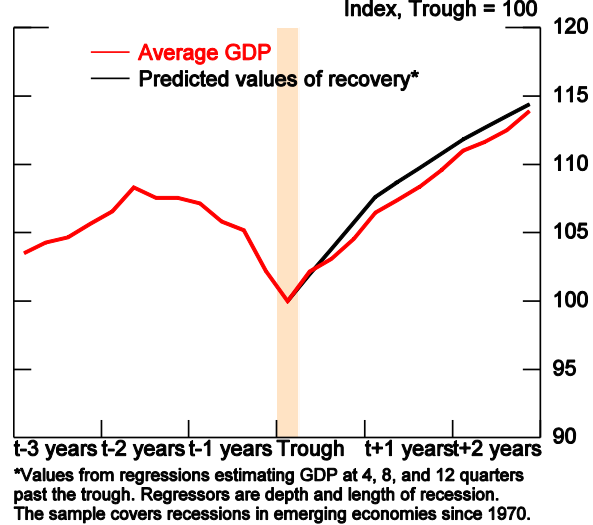


Figure 33. GDP in Select Advanced Economies  
Percent of pre-recession trend

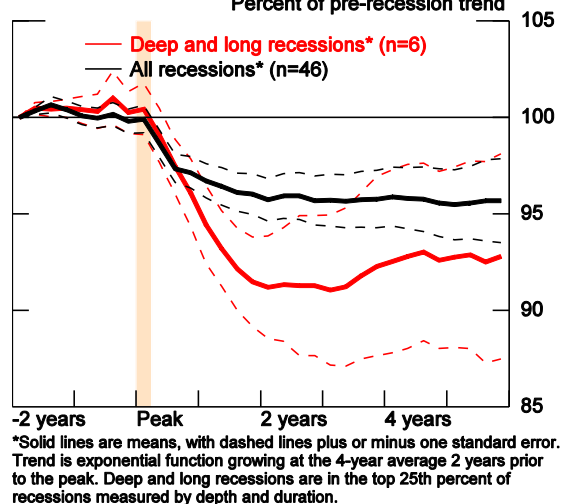


Figure 34. Total Hours in Select Advanced Economies  
Percent of pre-recession trend

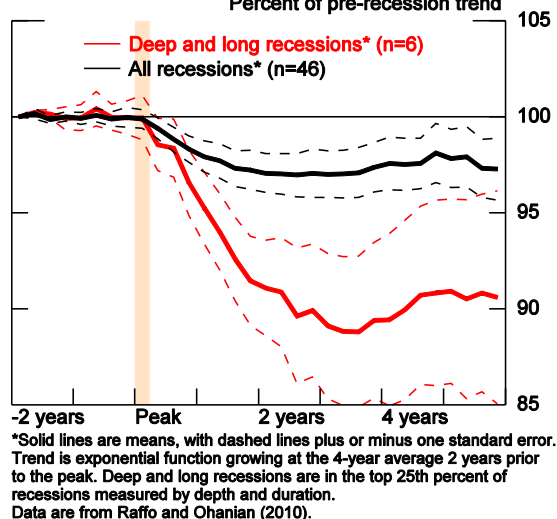


Figure 35. Output per Hour in Select AEs  
Percent of pre-recession trend

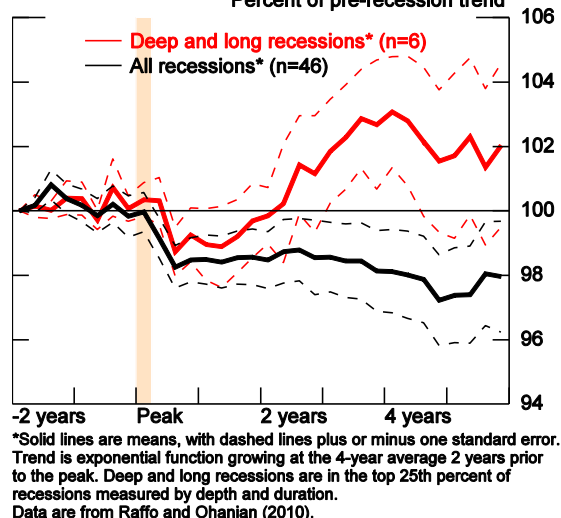


Figure 36. Labor Force Participation in Select AEs  
Percent of pre-recession trend

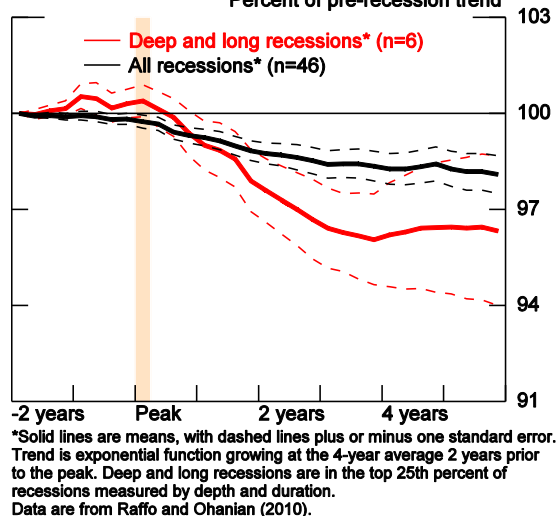


Figure 37. Employment Rate in Select AEs  
Percent of pre-recession trend

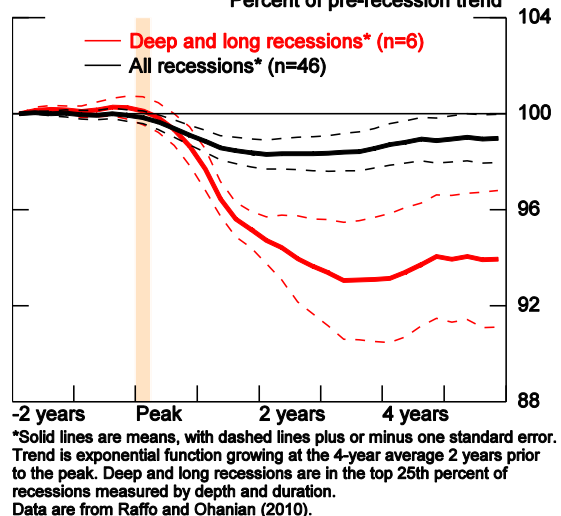


Figure 38. Average Weekly Hours in Select AEs  
Percent of pre-recession trend

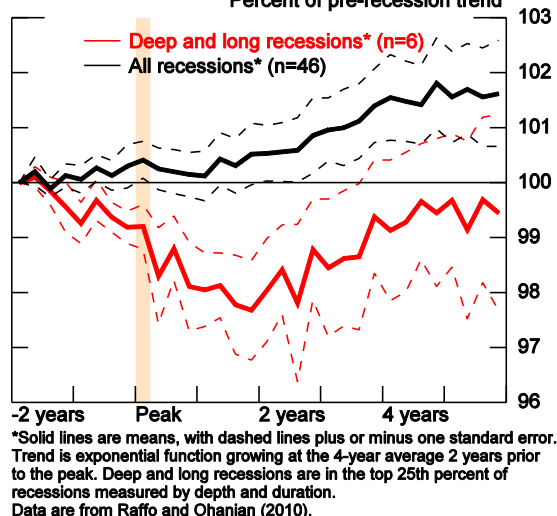


Figure 39. GDP During U.S. Recessions

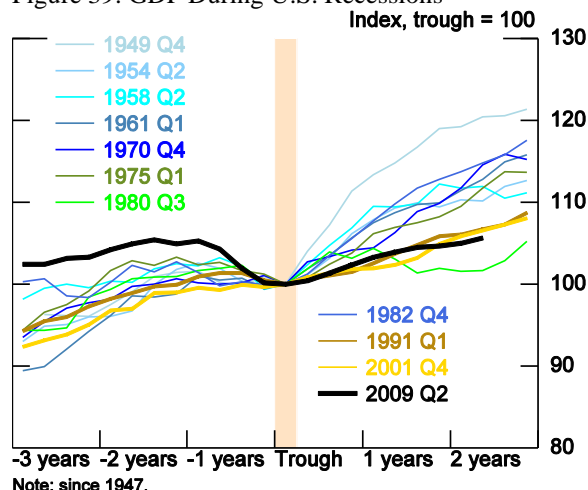


Figure 40. Industrial Production

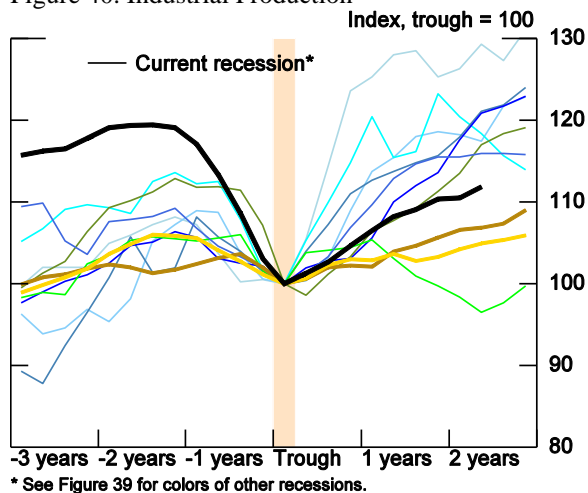


Figure 41. Real Exports

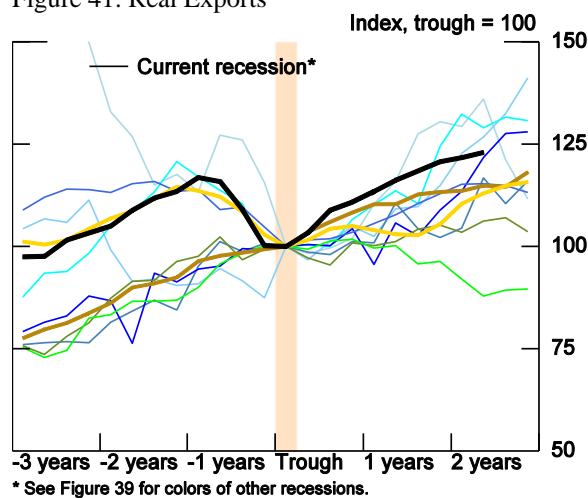


Figure 42. Non-residential Investment

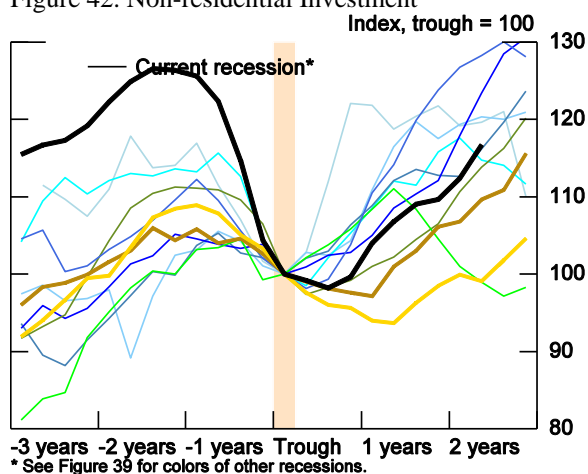


Figure 43. Private Consumption

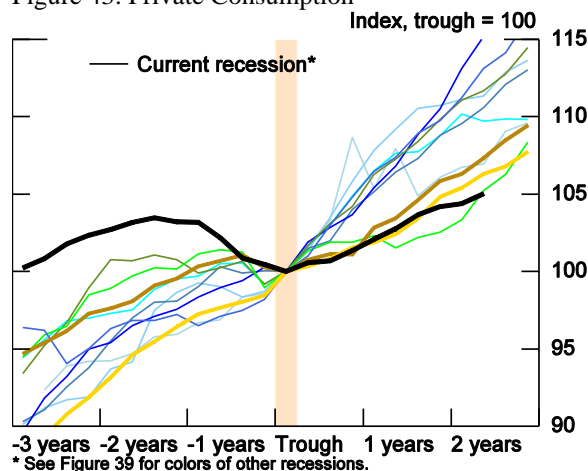


Figure 44. Residential Investment

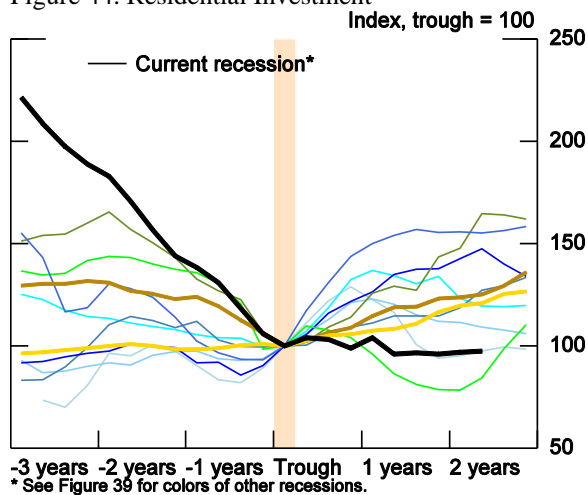


Figure 45. Housing Prices

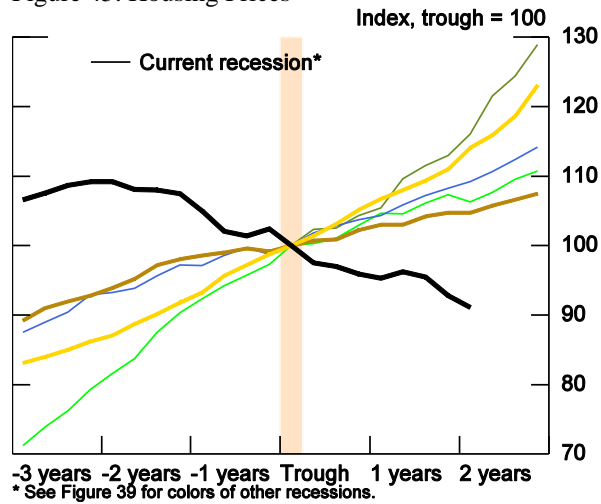


Figure 46. Consumer Credit

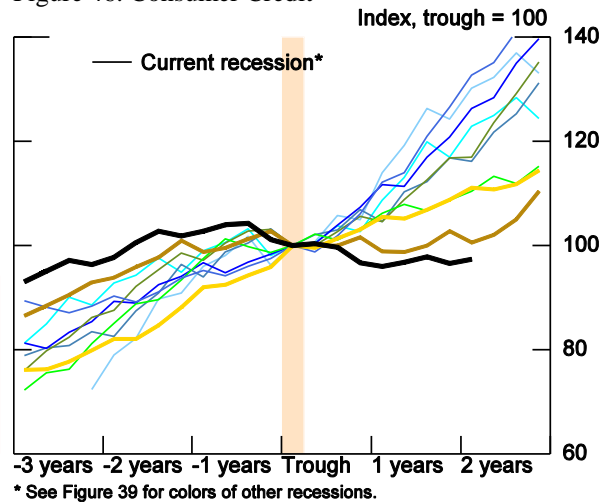


Figure 47. Consumer Sentiment (Michigan Index)

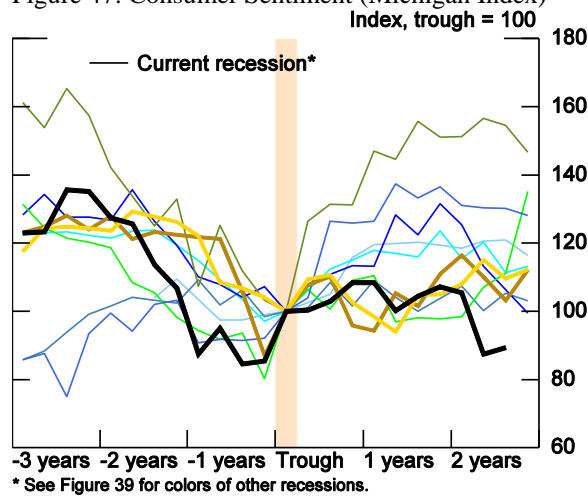


Figure 48. Personal Income

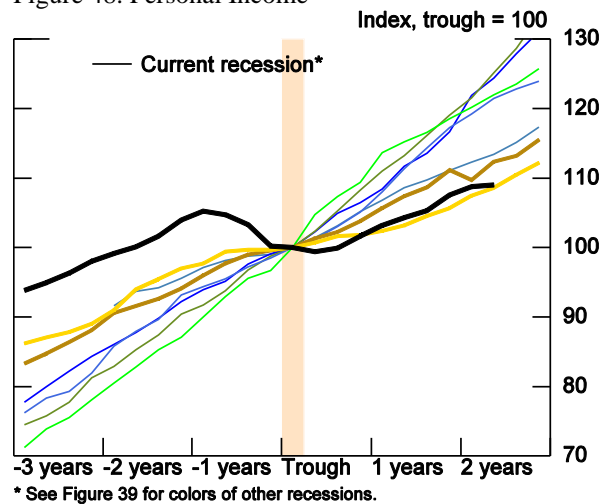


Figure 49. Employment

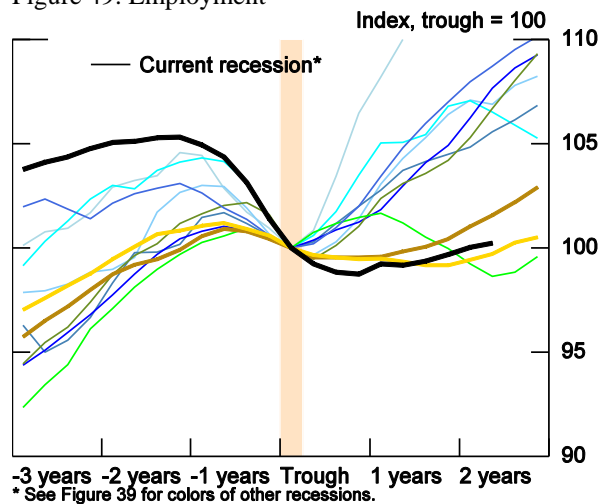


Figure 50. Goods consumption

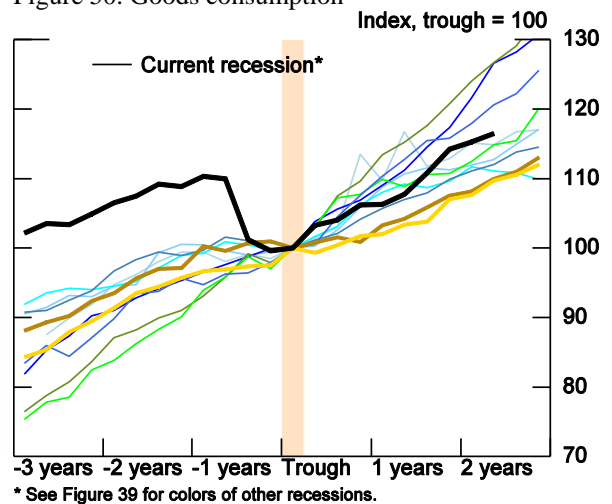




Figure 51. Household Durable Consumption  
Index, trough = 100

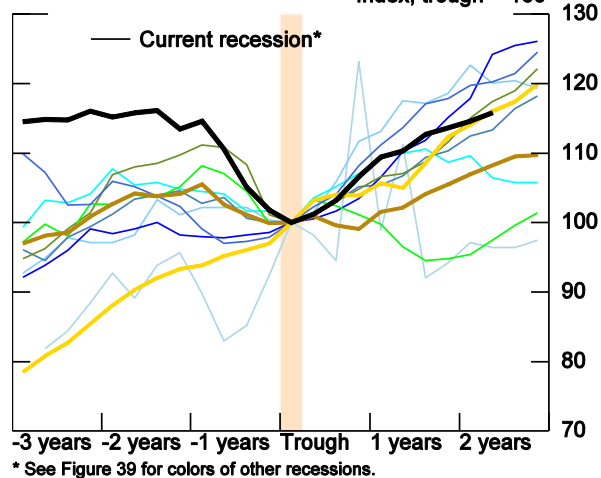


Figure 52. Motor Vehicle Consumption  
Index, trough = 100

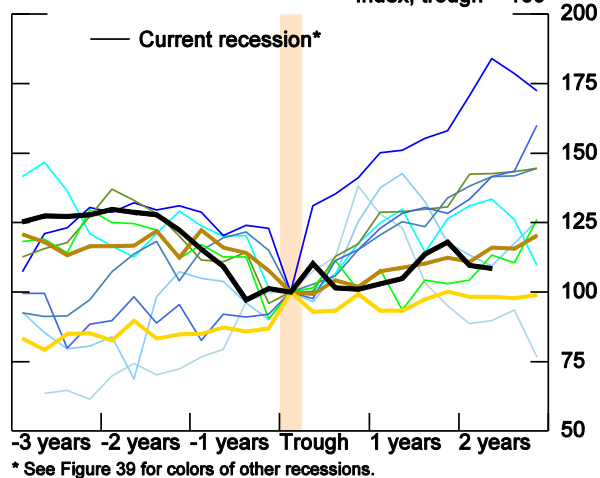


Figure 53. Service Consumption  
Index, trough = 100

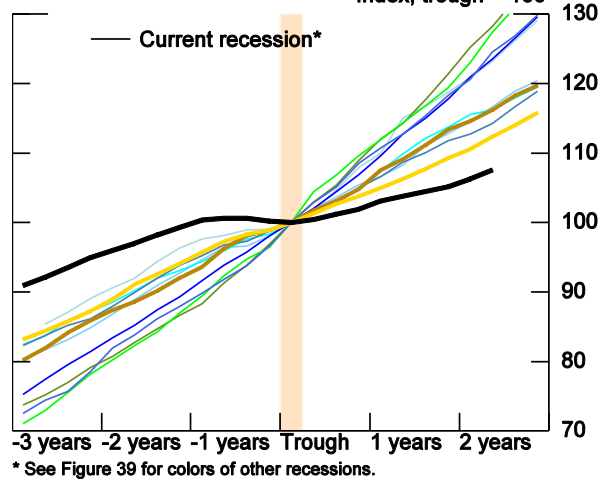


Figure 55. Private Service Providing Employment  
Index, trough = 100

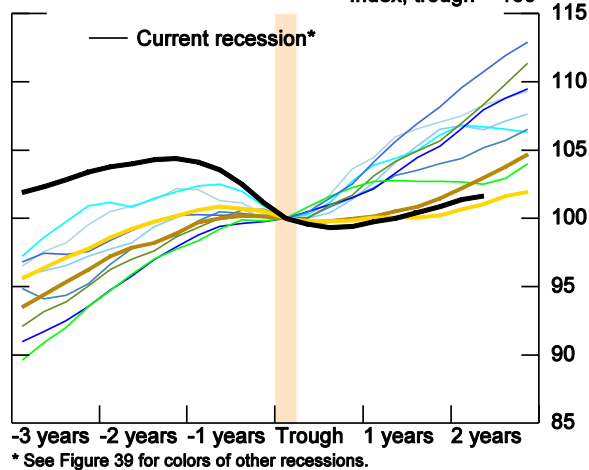


Figure 54. Goods-Producing Employment  
Index, trough = 100

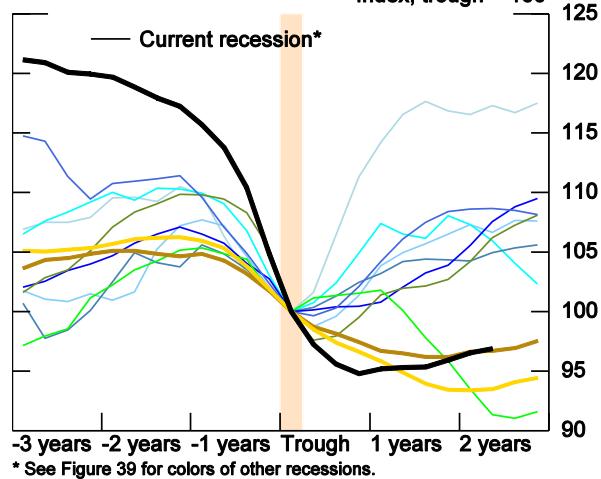


Figure 56. State and Local Government Employment  
Index, trough = 100

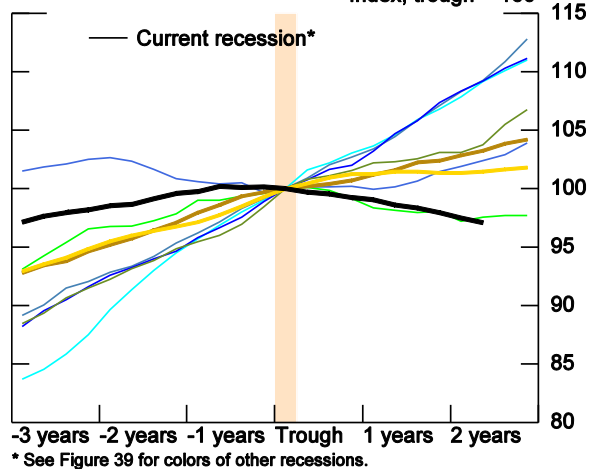
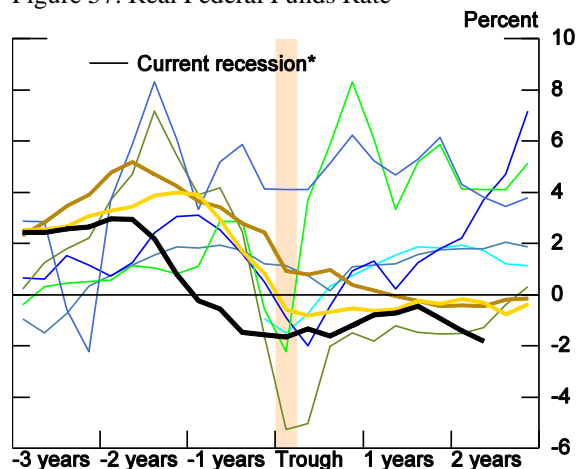
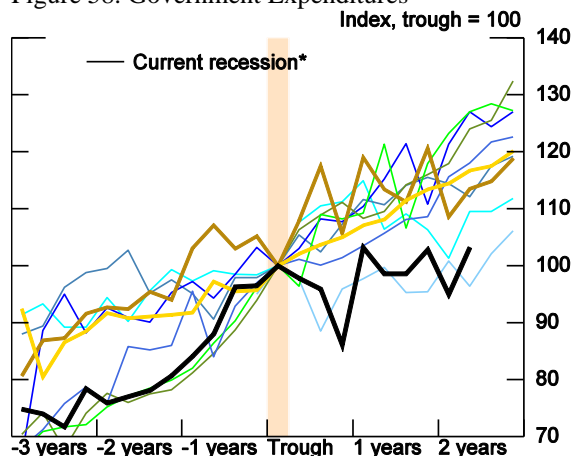


Figure 57. Real Federal Funds Rate



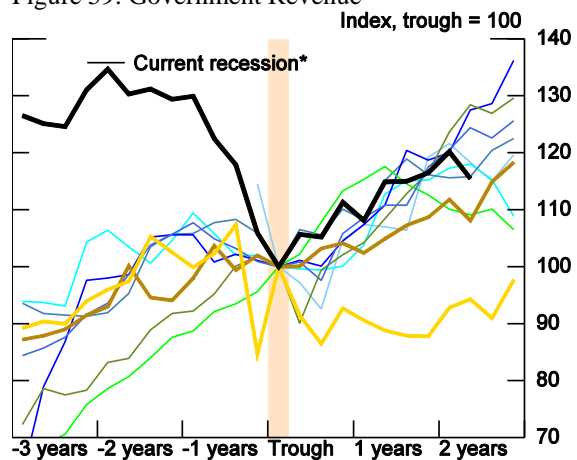
\* See Figure 39 for colors of other recessions.  
Federal funds rate minus 4-quarter core inflation.

Figure 58. Government Expenditures



\* See Figure 39 for colors of other recessions.  
Calculated as percent of GDP, then indexed to 100 at the trough of the recession.

Figure 59. Government Revenue



\* See Figure 39 for colors of other recessions.  
Calculated as percent of GDP, then indexed to 100 at the trough of the recession.

Figure 60. Gross Domestic Product

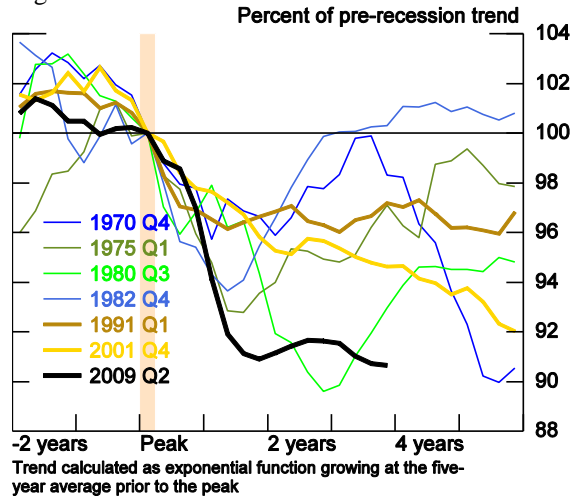


Figure 61. Total Hours

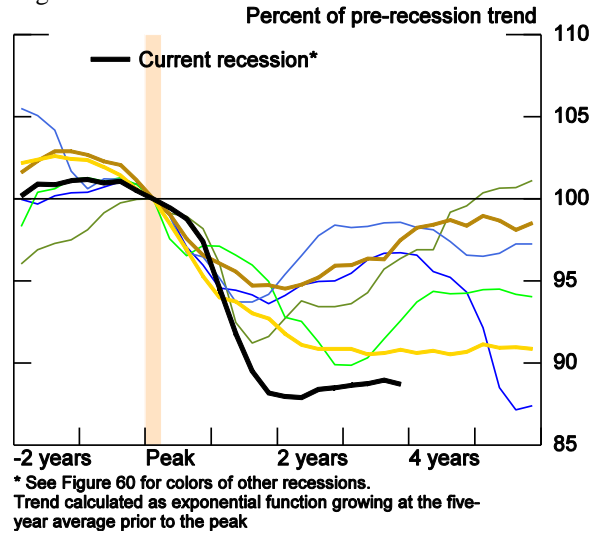


Figure 62. Output per Hour

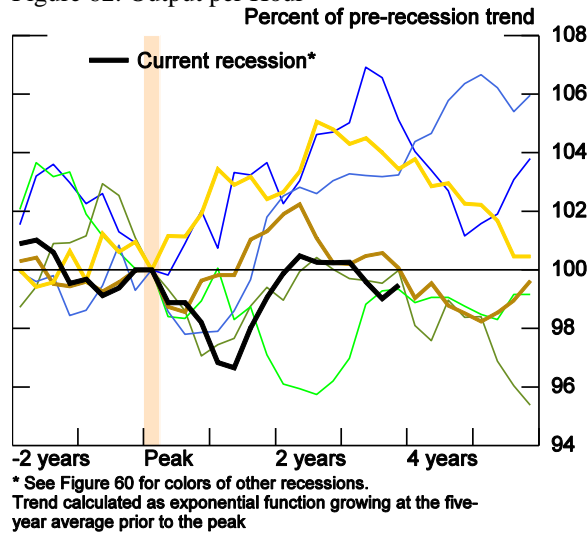


Figure 63. Labor Force Participation

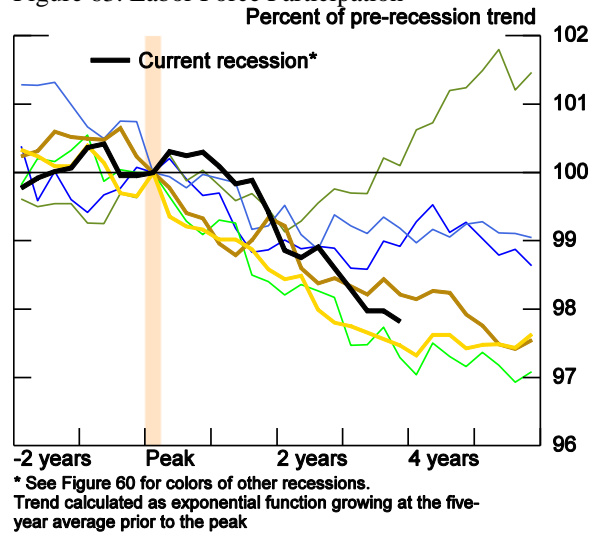


Figure 64. Employment Rate

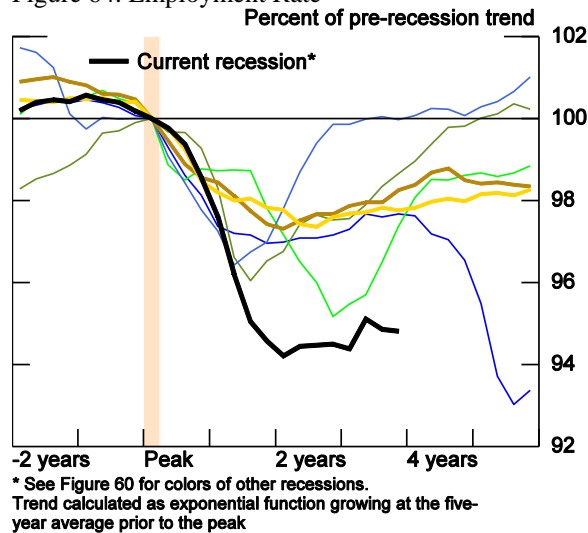
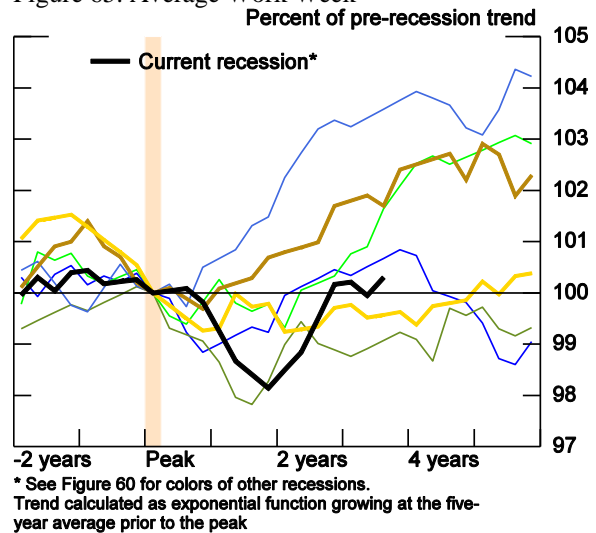


Figure 65. Average Work Week



## Appendix A. Data by Episode

Duration measured in quarters, Depth as a percentage of GDP. Recessions after 2007 are not categorized.

Country	Peak	Trough	IMF	Housing	AE/EME	Duration	Depth
Argentina	1974 Q4	1976 Q1	Currency		EME	5	3.6
Argentina	1977 Q2	1978 Q3			EME	5	4.9
Argentina	1980 Q3	1981 Q4	Banking, Currency		EME	5	9.8
Argentina	1984 Q4	1985 Q3			EME	3	10.7
Argentina	1986 Q3	1987 Q1	Currency		EME	2	2.7
Argentina	1988 Q1	1989 Q3	Banking		EME	6	15.6
Argentina	1992 Q3	1993 Q1			EME	2	3.9
Argentina	1994 Q4	1995 Q3	Banking, Currency, Debt		EME	3	5.7
Argentina	1998 Q2	2002 Q1	Banking		EME	15	20
Argentina	2008 Q3	2009 Q1			EME	2	1.5
Australia	1971 Q3	1972 Q1			AE	2	1.3
Australia	1975 Q2	1975 Q4			AE	2	2.4
Australia	1977 Q2	1977 Q4			AE	2	0.7
Australia	1981 Q3	1983 Q2			AE	7	3.7
Australia	1990 Q4	1991 Q2			AE	2	1.4
Australia	2000 Q2	2000 Q4			AE	2	0.6
Austria	1974 Q3	1975 Q2			AE	3	2
Austria	1981 Q2	1981 Q4			AE	2	0.8
Austria	1982 Q2	1982 Q4			AE	2	0.4
Austria	1983 Q4	1984 Q2			AE	2	2
Austria	1992 Q3	1993 Q1			AE	2	0.8
Austria	2000 Q4	2001 Q3			AE	3	0.8
Austria	2008 Q2	2009 Q2			AE	4	4.8
Belgium	1974 Q2	1975 Q2			AE	4	2.8
Belgium	1976 Q3	1977 Q2			AE	3	0.8
Belgium	1979 Q4	1980 Q4		Housing	AE	4	2
Belgium	1982 Q3	1983 Q1		Housing	AE	2	0.7
Belgium	1992 Q3	1993 Q1			AE	2	1.9
Belgium	2001 Q2	2001 Q4			AE	2	0.5
Belgium	2008 Q2	2009 Q2			AE	4	4.1
Brazil	1980 Q4	1981 Q4			EME	4	7.8
Brazil	1982 Q3	1983 Q1	Currency, Debt		EME	2	5.5
Brazil	1987 Q1	1987 Q3	Currency		EME	2	3.1
Brazil	1988 Q1	1988 Q4			EME	3	3.5
Brazil	1989 Q4	1991 Q1	Banking		EME	5	8.9
Brazil	1991 Q3	1992 Q3	Currency		EME	4	4.7
Brazil	1995 Q1	1995 Q3	Banking		EME	2	2.9
Brazil	1998 Q2	1999 Q1	Currency		EME	3	1.6
Brazil	2001 Q1	2001 Q4			EME	3	1.2
Brazil	2008 Q3	2009 Q1			EME	2	5.6
Canada	1981 Q2	1982 Q4		Housing	AE	6	4.4
Canada	1990 Q1	1991 Q1		Housing	AE	4	3.3
Canada	2008 Q3	2009 Q2			AE	3	3.6
Chile	1971 Q4	1973 Q2	Currency		EME	6	8.6
Chile	1974 Q2	1975 Q4			EME	6	16.8
Chile	1981 Q2	1982 Q4	Banking, Currency		EME	6	19.2
Chile	1990 Q1	1990 Q3			EME	2	1.2
Chile	1998 Q2	1999 Q1			EME	3	4.1
Chile	2008 Q2	2009 Q2			EME	4	4.3
China	1971 Q2	1971 Q4			EME	2	0.2
China	1973 Q3	1974 Q2			EME	3	1.4
China	1975 Q3	1976 Q3			EME	4	4.7
Colombia	1982 Q2	1982 Q4	Banking		EME	2	1.2
Colombia	1998 Q1	1999 Q2	Banking		EME	5	6.7
Costa Rica	1995 Q3	1996 Q1			EME	2	2.7
Costa Rica	2008 Q1	2009 Q1			EME	4	3.6
Czech Republic	1996 Q4	1997 Q3	Banking		EME	3	2.4
Czech Republic	2008 Q2	2009 Q2			EME	4	4.8
Denmark	1973 Q3	1975 Q2			AE	7	4.2
Denmark	1976 Q4	1977 Q2			AE	2	0.3
Denmark	1979 Q4	1981 Q2		Housing	AE	6	3.3
Denmark	1986 Q3	1987 Q2		Housing	AE	3	0.6
Denmark	1992 Q3	1993 Q2		Housing	AE	3	1.9
Denmark	1997 Q2	1997 Q4			AE	2	1
Denmark	2000 Q4	2002 Q4			AE	8	-0.1

## Appendix A. Data by Episode

Duration measured in quarters, Depth as a percentage of GDP. Recessions after 2007 are not categorized.

Country	Peak	Trough	IMF	Housing	AE/EME	Duration	Depth
Denmark	2008 Q2	2009 Q3			AE	5	7.3
Estonia	1998 Q3	1999 Q2			EME	3	2.4
Estonia	2007 Q4	2009 Q3			EME	7	20.2
Finland	1971 Q2	1971 Q4			AE	2	0.3
Finland	1975 Q1	1975 Q4		Housing	AE	3	2.2
Finland	1980 Q3	1981 Q1			AE	2	2.7
Finland	1990 Q1	1992 Q3	Banking	Housing	AE	10	12.8
Finland	2008 Q1	2009 Q2			AE	5	10.3
France	1974 Q3	1975 Q2			AE	3	2.8
France	1980 Q1	1980 Q3			AE	2	0.3
France	1992 Q1	1993 Q1			AE	4	1.1
France	2008 Q1	2009 Q2			AE	5	3.9
Germany	1974 Q3	1975 Q1			AE	2	3.4
Germany	1981 Q3	1982 Q4			AE	5	2.2
Germany	1985 Q3	1986 Q1			AE	2	1.2
Germany	1992 Q3	1993 Q1			AE	2	2
Germany	1995 Q3	1996 Q1		Housing	AE	2	0.7
Germany	2002 Q3	2003 Q2		Housing	AE	3	0.9
Germany	2004 Q1	2004 Q3		Housing	AE	2	0.2
Germany	2008 Q1	2009 Q1			AE	4	6.6
Greece	1973 Q3	1974 Q3			AE	4	12.4
Greece	1976 Q4	1977 Q2			AE	2	3
Greece	1979 Q2	1979 Q4			AE	2	3.1
Greece	1980 Q2	1981 Q1			AE	3	5.6
Greece	1981 Q3	1982 Q4			AE	5	4.6
Greece	1984 Q3	1985 Q1			AE	2	2.3
Greece	1990 Q1	1990 Q3			AE	2	7.1
Greece	1992 Q3	1993 Q1			AE	2	3.6
Greece	2000 Q1	2000 Q3			AE	2	1.1
Hong Kong	1973 Q4	1975 Q1			EME	5	4.9
Hong Kong	1981 Q4	1982 Q2			EME	2	2.9
Hong Kong	1984 Q2	1985 Q3			EME	5	4.1
Hong Kong	1988 Q4	1989 Q2			EME	2	1.3
Hong Kong	1995 Q1	1995 Q3			EME	2	0.4
Hong Kong	1997 Q3	1998 Q4			EME	5	8.8
Hong Kong	2000 Q4	2001 Q4			EME	4	2
Hong Kong	2002 Q4	2003 Q2			EME	2	2.5
Hong Kong	2008 Q1	2009 Q1			EME	4	7.6
Hungary	1995 Q1	1995 Q4			EME	3	1.2
Hungary	2008 Q1	2009 Q3			EME	6	8.3
Iceland	1982 Q2	1983 Q2	Currency		AE	4	3
Iceland	1987 Q4	1988 Q3			AE	3	1.3
Iceland	1991 Q1	1992 Q3			AE	6	4.4
Iceland	1997 Q3	1998 Q1			AE	2	1.4
Iceland	2003 Q1	2003 Q3			AE	2	4.3
Iceland	2008 Q1	2010 Q2			AE	9	12
India	1975 Q2	1976 Q1			EME	3	1.6
India	1978 Q1	1979 Q2			EME	5	8.6
India	1981 Q2	1981 Q4			EME	2	0.2
India	1983 Q4	1984 Q2			EME	2	1.3
Indonesia	1997 Q3	1998 Q4			EME	5	18.2
Ireland	1982 Q3	1983 Q2		Housing	AE	3	1
Ireland	1985 Q3	1986 Q2		Housing	AE	3	1.3
Ireland	2007 Q1	2009 Q4			AE	11	11.4
Israel	2000 Q4	2001 Q4			EME	4	3.9
Israel	2008 Q3	2009 Q1			EME	2	1.3
Italy	1974 Q2	1975 Q2			AE	4	3.7
Italy	1977 Q1	1977 Q3			AE	2	1.4
Italy	1982 Q1	1982 Q4	Currency	Housing	AE	3	0.9
Italy	1992 Q1	1993 Q1		Housing	AE	4	1.5
Italy	2001 Q1	2001 Q4			AE	3	0.6
Italy	2002 Q4	2003 Q2			AE	2	0.5
Italy	2004 Q3	2005 Q1			AE	2	0.1
Italy	2008 Q1	2009 Q2			AE	5	7
Japan	1974 Q3	1975 Q1		Housing	AE	2	0.3

## Appendix A. Data by Episode

Duration measured in quarters, Depth as a percentage of GDP. Recessions after 2007 are not categorized.

Country	Peak	Trough	IMF	Housing	AE/EME	Duration	Depth
Japan	1997 Q1	1998 Q2	Banking	Housing	AE	5	3.2
Japan	2001 Q1	2001 Q4		Housing	AE	3	2.1
Japan	2008 Q1	2009 Q1			AE	4	9.9
Jordan	1998 Q1	1998 Q3			EME	2	1.2
Latvia	1992 Q1	1993 Q4	Currency		EME	7	29.9
Latvia	1994 Q3	1995 Q1			EME	2	3.1
Latvia	2007 Q4	2009 Q4			EME	8	25.4
Lithuania	2008 Q2	2009 Q4			EME	6	17.3
Luxembourg	1974 Q2	1975 Q3			AE	5	8.3
Luxembourg	1980 Q2	1981 Q2			AE	4	0.7
Luxembourg	2008 Q1	2008 Q4			AE	3	5.7
Malaysia	1974 Q3	1975 Q2			EME	3	1.3
Malaysia	1984 Q3	1985 Q3			EME	4	2
Malaysia	1997 Q4	1998 Q4	Banking, Currency		EME	4	11.1
Malaysia	2000 Q4	2001 Q2			EME	2	1.1
Malaysia	2008 Q2	2009 Q1			EME	3	6.5
Mexico	1982 Q2	1983 Q2	Banking, Currency, Debt		EME	4	5.5
Mexico	1985 Q3	1986 Q4			EME	5	4.6
Mexico	1987 Q4	1988 Q2			EME	2	1.3
Mexico	1994 Q4	1995 Q2	Banking, Currency		EME	2	9.4
Mexico	2000 Q3	2002 Q1			EME	6	2.6
Mexico	2008 Q1	2009 Q2			EME	5	8.5
Netherlands	1974 Q3	1975 Q2			AE	3	0.8
Netherlands	1980 Q1	1980 Q3		Housing	AE	2	2.5
Netherlands	2008 Q1	2009 Q2			AE	5	4.6
New Zealand	1970 Q1	1970 Q3			AE	2	4
New Zealand	1971 Q3	1972 Q1			AE	2	6.5
New Zealand	1973 Q1	1973 Q3			AE	2	7.8
New Zealand	1974 Q3	1975 Q2		Housing	AE	3	9.9
New Zealand	1977 Q2	1978 Q1			AE	3	13.1
New Zealand	1982 Q3	1983 Q1			AE	2	4.6
New Zealand	1984 Q1	1984 Q3			AE	2	3.2
New Zealand	1985 Q1	1985 Q3			AE	2	3.1
New Zealand	1986 Q3	1987 Q1			AE	2	7
New Zealand	1990 Q4	1991 Q2			AE	2	3.8
New Zealand	1997 Q3	1998 Q1			AE	2	1.4
New Zealand	2007 Q4	2009 Q1			AE	5	2.4
Norway	1977 Q3	1978 Q1			AE	2	5.9
Norway	1978 Q3	1979 Q2			AE	3	1.2
Norway	1980 Q1	1980 Q3			AE	2	2.5
Norway	1991 Q2	1991 Q4	Banking	Housing	AE	2	0.6
Norway	1992 Q3	1993 Q1		Housing	AE	2	1.4
Norway	2005 Q3	2006 Q1			AE	2	0.9
Norway	2008 Q2	2009 Q2			AE	4	2.5
Peru	1982 Q1	1983 Q4	Banking, Currency		EME	7	18.3
Peru	1985 Q1	1985 Q3			EME	2	7
Peru	1987 Q3	1989 Q2			EME	7	26.2
Peru	1990 Q1	1990 Q3			EME	2	21.5
Peru	1992 Q1	1992 Q3			EME	2	5.2
Peru	1997 Q4	1999 Q1			EME	5	3.1
Peru	2000 Q1	2000 Q4			EME	3	5
Peru	2003 Q2	2003 Q4			EME	2	0.2
Peru	2008 Q3	2009 Q1			EME	2	2.6
Philippines	1983 Q2	1985 Q3	Banking, Currency, Debt		EME	9	16.9
Philippines	1990 Q3	1991 Q1			EME	2	1.4
Philippines	1997 Q4	1998 Q2	Banking, Currency		EME	2	2.8
Poland	2000 Q4	2001 Q2			EME	2	0.6
Portugal	1974 Q1	1975 Q2			AE	5	6
Portugal	1982 Q4	1984 Q2	Banking, Currency		AE	6	2.7
Portugal	1992 Q2	1993 Q3			AE	5	2.6
Portugal	2001 Q4	2003 Q2			AE	6	2.1
Portugal	2004 Q2	2004 Q4			AE	2	0.2
Portugal	2007 Q4	2009 Q1			AE	5	4
Russia	1989 Q2	1995 Q1			EME	23	39.1
Russia	1995 Q3	1996 Q3			EME	4	5.4

## Appendix A. Data by Episode

Duration measured in quarters, Depth as a percentage of GDP. Recessions after 2007 are not categorized.

Country	Peak	Trough	IMF	Housing	AE/EME	Duration	Depth
Russia	2008 Q2	2009 Q2			EME	4	10.9
Singapore	1984 Q4	1985 Q4			EME	4	2
Singapore	1997 Q4	1998 Q3			EME	3	1.3
Singapore	2000 Q4	2001 Q3			EME	3	1.7
Singapore	2008 Q1	2008 Q4			EME	3	2.6
Slovakia	1998 Q4	1999 Q4	Banking		EME	4	6.7
Slovakia	2008 Q3	2009 Q1			EME	2	6.4
Slovenia	2008 Q2	2009 Q3			EME	5	9.8
South Africa	1974 Q3	1975 Q1			EME	2	1.3
South Africa	1976 Q3	1977 Q2			EME	3	1.3
South Africa	1981 Q4	1983 Q1			EME	5	5.1
South Africa	1984 Q2	1985 Q3	Currency, Debt		EME	5	2.8
South Africa	1990 Q1	1992 Q4			EME	11	4.6
South Africa	1998 Q1	1998 Q3			EME	2	0.1
South Africa	2008 Q3	2009 Q2			EME	3	2.6
South Korea	1979 Q2	1980 Q2			EME	4	3.9
South Korea	1997 Q3	1998 Q2	Banking, Currency		EME	3	8.1
South Korea	2008 Q2	2008 Q4			EME	2	4.1
Spain	1974 Q4	1975 Q2			AE	2	0.6
Spain	1978 Q2	1979 Q1	Banking	Housing	AE	3	0.4
Spain	1980 Q3	1981 Q2		Housing	AE	3	0.3
Spain	1992 Q2	1993 Q2			AE	4	1.8
Spain	2008 Q1	2009 Q4			AE	7	4.9
Sweden	1973 Q1	1973 Q3			AE	2	2.1
Sweden	1976 Q4	1977 Q2			AE	2	3
Sweden	1982 Q2	1983 Q1		Housing	AE	3	0.9
Sweden	1990 Q4	1992 Q4	Banking	Housing	AE	8	5.6
Sweden	2007 Q4	2009 Q3			AE	7	7.8
Switzerland	1974 Q2	1975 Q3		Housing	AE	5	10.3
Switzerland	1977 Q3	1978 Q1			AE	2	0.6
Switzerland	1981 Q2	1982 Q2			AE	4	1.7
Switzerland	1986 Q2	1986 Q4			AE	2	0.2
Switzerland	1990 Q3	1991 Q2		Housing	AE	3	1.4
Switzerland	1992 Q1	1993 Q1		Housing	AE	4	1.5
Switzerland	2002 Q2	2003 Q1			AE	3	0.9
Switzerland	2008 Q2	2009 Q2			AE	4	3.2
Taiwan	1974 Q1	1974 Q3			EME	2	2.3
Taiwan	2000 Q3	2001 Q3			EME	4	4.4
Taiwan	2008 Q1	2009 Q1			EME	4	9.5
Thailand	1996 Q3	1998 Q3	Banking, Currency		EME	8	14.9
Thailand	2008 Q2	2009 Q1			EME	3	7.6
Turkey	1987 Q4	1989 Q2			EME	6	4.3
Turkey	1993 Q4	1994 Q2			EME	2	11.6
Turkey	2000 Q4	2001 Q2			EME	2	7.5
Turkey	2008 Q1	2009 Q1			EME	4	13.3
United Kingdom	1973 Q1	1974 Q1		Housing	AE	4	3.3
United Kingdom	1975 Q1	1975 Q3		Housing	AE	2	1.5
United Kingdom	1979 Q4	1981 Q1			AE	5	4.4
United Kingdom	1990 Q2	1991 Q3		Housing	AE	5	2.5
United Kingdom	2008 Q1	2009 Q3			AE	6	6.6
United States	1973 Q4	1975 Q1			AE	5	3.3
United States	1980 Q1	1980 Q3			AE	2	2.2
United States	1981 Q3	1982 Q1			AE	2	2.8
United States	1990 Q3	1991 Q1			AE	2	1.2
United States	2008 Q2	2009 Q2			AE	4	5.3
Uruguay	1988 Q1	1988 Q4			EME	3	0.1
Uruguay	1994 Q3	1995 Q1			EME	2	2.2
Uruguay	1998 Q3	1999 Q4			EME	5	5.7
Uruguay	2001 Q1	2002 Q4	Banking, Currency, Debt		EME	7	19.6
Venezuela	1979 Q2	1981 Q1			EME	7	3.1
Venezuela	1982 Q2	1983 Q4	Debt		EME	6	7.6
Venezuela	1984 Q2	1985 Q1	Currency		EME	3	1.2
Venezuela	1988 Q2	1989 Q3	Currency		EME	5	11.7
Venezuela	1992 Q4	1994 Q1	Banking, Currency		EME	5	2.8
Venezuela	1995 Q4	1996 Q2			EME	2	2.6

## Appendix A. Data by Episode

Duration measured in quarters, Depth as a percentage of GDP. Recessions after 2007 are not categorized.

Country	Peak	Trough	IMF	Housing	AE/EME	Duration	Depth
Venezuela	2000 Q1	2000 Q3			EME	2	1.6
Venezuela	2001 Q4	2003 Q1	Currency		EME	5	28.6
Venezuela	2008 Q4	2010 Q1			EME	5	6.4



## Appendix B. Sample Countries

Country	First Value
Argentina	1970 Q1
Australia	1970 Q1
Austria	1970 Q1
Belgium	1970 Q1
Brazil	1970 Q1
Canada	1970 Q1
Chile	1970 Q1
China	1970 Q1
Colombia	1970 Q1
Costa Rica	1991 Q1
Czech	1996 Q1
Denmark	1970 Q1
Estonia	1995 Q1
Finland	1970 Q1
France	1970 Q1
Germany	1970 Q1
Greece	1970 Q1
Hong Kong	1970 Q1
Hungary	1995 Q1
Iceland	1970 Q1
India	1970 Q1
Indonesia	1970 Q1
Ireland	1970 Q1
Israel	1970 Q1
Italy	1970 Q1
Japan	1970 Q1
Jordan	1992 Q1
Latvia	1992 Q1
Lithuania	1995 Q1
Luxembourg	1970 Q1
Malaysia	1970 Q1
Mexico	1970 Q1
Netherland	1970 Q1
New	1970 Q1
Norway	1970 Q1
Peru	1980 Q1
Philippine	1970 Q1
Poland	1995 Q1
Portugal	1970 Q1
Russia	1970 Q1
Singapore	1970 Q1
Slovakia	1993 Q1
Slovenia	1995 Q1
South Africa	1970 Q1
South Korea	1970 Q1
Spain	1970 Q1
Sweden	1970 Q1
Switzerland	1970 Q1
Taiwan	1970 Q1
Thailand	1970 Q1
Turkey	1987 Q1
United Kingdom	1970 Q1
United States	1970 Q1
Uruguay	1988 Q1
Venezuela	1970 Q1