

Deep Recessions, Fast Recoveries, and Financial Crises: Evidence from the American Record

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Abstract

Do steep recoveries follow deep recessions? Does it matter if a credit crunch or banking panic accompanies the recession? Moreover does it matter if the recession is associated with a housing bust? We look at the American historical experience in an attempt to answer these questions. The answers depend on the definition of financial crisis and on how much of the recovery is considered. But in general recessions associated with financial crises are generally followed by rapid recoveries. We find three exceptions to this pattern: the recovery from the Great Contraction in the 1930s; the recovery after the recession of the early 1990s and the present recovery. The present recovery is strikingly more tepid than the 1990s. One factor we consider that may explain much of the slowness of this recovery is the moribund nature of residential investment, a variable that is usually a key predictor of recessions and recoveries.

The views expressed here are solely those of the authors and not necessarily those of the Federal Reserve Bank of Cleveland or the Board of Governors of the Federal Reserve System.

1. Introduction

The recovery from the recent recession has now been proceeding for eight quarters. Many argue that this recovery is unusually sluggish and that this reflects the severity of the financial crisis of 2007-2008 (Roubini, 2009). Yet if this is the case it seems to fly in the face of the record of U.S. business cycles in the past century and a half. Indeed, Milton Friedman noted in 1964 that in the American historical record “A large contraction in output tends to be followed on the average by a large business expansion; a mild contraction, by a mild expansion.” (Friedman 1969, p. 273). Much work since then has confirmed this stylized fact, but has also begun to make distinctions between business cycles, particularly between cycles that include a financial crisis. Zarnowitz (1992) documented that recessions pre World War II accompanied by banking panics tended to be more severe than average recessions and that they tended to be followed by rapid recoveries.

In this paper we revisit the issue whether business cycles with financial crises are different. We then use this evidence to shed some light on the recent recovery. A full exploration of this question benefits from an historical perspective, not only to provide a statistically valid number of crises, but to also gain perspective from the differing regulatory and monetary regimes in place. We look at 26 cycles starting in 1882 and use several measures of financial crises. We compare the change in real output (real GNP) over the contraction with the growth in real output in the recovery, and test for differences between cycles with and without a financial crisis. After comparing the amplitudes, we then look at various measures of the shape of cycles, ranging from simple steepness measures to more recent tools such as Harding and Pagan’s (2002) excess cumulative movement. Finally we introduce residential investment as a possible explanation of slow recovery after a recession involving a housing bust as the U.S. is currently experiencing. Our results here suggest that a significant fraction of the shortfall of the present recovery from the experience of recoveries after deep recessions is due to the collapse of the housing market.

We then turn to more quantitative measures of financial crises and assess that impact on the shape of the resulting recovery. With both price (credit spread) and quantity (bank loan) data, finer distinctions between financial crises can be drawn. In other words, is the strength of the recovery related to either the change in lending or the credit spread?

Our analysis of the data shows that steep expansions tend to follow deep contractions, though this depends heavily on when the recovery is measured. In contrast to much conventional wisdom, the stylized fact that deep contractions breed strong recoveries is particularly true when there is a financial crisis. In fact, on average, it is cycles without a financial crisis that show the weakest relation between contraction depth and recovery strength. That is, for many configurations, the evidence for a robust bounce-back is stronger for cycles with financial crises than those without. The results depend somewhat on the time period, with cycles before the Federal Reserve looking different from cycles after the second world war.

Though the literature on this topic is extensive, there is little work that incorporates both such a long data series and examines financial crises. Friedman, (1969, 1988) has a similarly long series, but does not consider the effect of financial crises, in addition to using somewhat different data and empirical techniques. In contrast to most subsequent work, Friedman looks at growth over the entire expansion. Wynne and Balke (1992, 1993) include only cycles since 1919, and do not consider the effect of financial crises. They measure growth 4 quarters into the expansion. Lopez-Salido and Nelson (2010) explicitly look at the connection between financial crises and recovery strength, but look only at post-World War Two cycles in the US. Reinhart and Rogoff (2008, 2009) concentrate on major international financial crises since the second world war, and document long and severe recessions, but make few direct comparisons of the recovery speed with non-crisis cycles. Bordo and Haubrich (2010), find that contractions associated with a financial crisis tend to be more severe, but do not gauge the speed of the resulting recovery.

The remainder of the paper is as follows. Section 2 presents an historical narrative on U.S. recoveries. Section 3 examines the amplitude, duration and shape of business cycles since 1882, testing whether strong recoveries follow deep contractions, and whether financial crises alter that pattern. Section 4 looks at how credit spreads and bank lending affect the relationship between contraction depth and recovery strength. Section 5 examines the connection between weak recoveries and slow residential investment. It incorporates the long standing importance of housing in the transmission mechanism. Section 6 concludes and offers some policy advice for the current recovery in light of the historical record.

2. Narrative

We present some descriptive evidence and historical narratives on U.S. business cycle recoveries from 1880 to the present. Figure 1 shows the quarterly path of GNP from the preceding peak to the trough of each business cycle and then the quarterly path of GNP from the trough for the same number of quarters that occurred in the downturn. The figure makes it easy to determine if output has returned to the level at the peak, though this may not be the best comparison, as it does not account for trend growth. Table 1 shows some metrics on the salient characteristics of the recessions and recoveries. Column 1 reports the data of the cyclical trough, as dated by the NBER, column 2 measures the steepness of the drop, column 3 shows the steepness of the recovery, both measured as the percentage change in real GNP divided by the duration of the contraction. Column 3 shows the total drop in GNP during the contraction, and column 4 shows the total rise during the recovery, Columns 5 and 6 show the percentage changes.

Table 2 summarizes the historical experience of all U.S. business cycles since 1880. It is divided into 3 eras: pre Federal Reserve; the interwar; post World War II. Column 1 dates the NBER trough, column 2 shows the dates of the recovery; column 3 indicates if it was a major recession; column 4 indicates whether a banking crisis occurred during the recession; column 5 indicates whether there was a credit crunch as defined in Bordo and Haubrich (2010); column 6 indicates

whether there was a housing bust as indicated by Shiller(2009); and column 7 indicates whether or not there was a stock market crash.

The table divides the historical record into three periods: before the Federal Reserve (Panel A), the interwar years (Panel B) and the post-War era (Panel C). Each panel is divided into two parts, the first showing recessions cycles where the pace of the recovery was at least as rapid as the downturn. The second shows cycles where recoveries were slower than the downturn.

1880-1920: Pre Federal Reserve.

During this era the U.S. was on the gold standard and it did not have a central bank. The NBER demarcates 11 business cycles, of which two, 1893 I to 1894 II and 1907 II to 1908 II, had major recessions. There were also 4 banking panics and 6 stock market crashes. Most of the recoveries were followed by recoveries at least as rapid as the downturns with the exception of two business cycles that bracketed World War I.

The key driving forces in the pre WWI business cycles were foreign shocks, e.g. Bank of England tightening, banking instability, the state of harvests in the U.S. relative to , and investment in railroads. Fels (1959) and Friedman and Schwartz (1963) have useful narratives of business cycles in this era.

The recovery of 1879 to 1882, according to Friedman and Schwartz chapter two, shows a perfect example of the operation of the price specie flow mechanism of the classical gold standard. Favorable harvests in the U.S. at the same time as unfavorable ones in Europe generated a large balance of trade surplus and gold inflows, raising the money supply and stimulating the economy. The key driver of expansion was railroad construction, continuing the boom that had been interrupted by the panic of 1873 and the resulting year recession. The succeeding recession of 1882-85 was highlighted by a banking panic in May 1884 and a stock market crash. The banking panic ended with the issuance of clearing house loan certificates and US Treasury quasi-central banking operations. The recovery of 1885 II to 1887 II was driven by capital and gold inflows. The recovery was interrupted by a brief one year mild contraction .

The next recovery from 1888 I to 1890 III was driven by good harvests in the U.S. and bad ones in Europe (Fels 1959). Two big shocks ended the recovery: the passage of the Sherman Silver Purchase Act, which led to serious capital flight based on fears that the U.S. would be forced off gold; and the Baring Crisis in London which led to a sudden stop of capital flows to all emerging markets, including the U.S. These events culminated in a banking panic in New York which was ended by the issue of clearing house loan certificates. The recession ended in May 1891 and recovery from 1891II to 1893 I was fostered by a series of good U.S. harvests which generated gold inflows.

The decade of the 1890s was shadowed by silver uncertainty and falling global gold prices which produced persistent deflationary pressure. The recovery ended in May 1893 with a stock market

crash and a major banking panic which spread from New York city to the interior and then back. The panic led to many bank failures across the country and a monetary contraction, contributing to a serious recession. It ended with the suspension of convertibility of deposits into currency in the fall of 1893. The subsequent recovery 1894 II to 1895 III was aided by the Belmont Morgan syndicate created in early 1895 to rescue the US Treasury's gold reserves from a silver induced run. Silver uncertainty contributed to capital flight leading to another recession from late 1895 to 1897. The election of 1896 was fought over the issue of free Silver and once the silver advocate William Jennings Bryan was defeated the pressure eased.

The recovery from 1897 II to 1899 II began a long boom interrupted by a few minor recessions. The key drivers of the boom were important gold discoveries in Alaska and South Africa which increased the global monetary gold stock and ended the Great Deflation of the late nineteenth century. Increased gold output stimulated the real economy. A very mild recession in 1899-1900 associated with the outbreak of the Boer War interrupted the expansion. Gold inflows and good harvests drove the recovery from 1900 I to 1902 IV, which ended with the "rich man's panic" of 1902 and a mild recession from 1902 to 1904. The following recovery from 1904 II to 1907 IV was driven by heavy capital inflows from London, in part reflecting insurance claims resulting from the San Francisco earthquake (Odell and Weidenmeier 2004). The Bank of England reacted to declining gold reserves by raising its discount rate and rationed lending based on U.S. securities. This created a serious shock to U.S. financial markets, triggering a stock market crash and a major banking panic in October 1907. The banking panic led to many bank failures, a drop in money supply and a serious recession which ended in May 1908. The panic and recession of 1907-08 led to the monetary reform which created the Federal Reserve in 1913.

The recession of 1907-1908 was followed by a vigorous recovery 1908 II to 1910 I. Friedman and Schwartz attribute this to gold inflows reflecting a decline in US prices relative to those in Britain stemming from crisis. A mild recession from 1910 to 1912 triggered by capital outflows was followed by a brief recovery 1912-1913 which was too weak to offset the decline in activity in the preceding recession. The onset of World War I in 1914 led to a recession and banking crisis. The recession was then followed by a major boom driven by the demands for U.S. goods by the European belligerents and then the U.S. as it prepared for war.

The wartime recovery ended with a recession from 1918 III to 1919 I following the cessation of hostilities and the conversion from war to peace. The vigorous recovery involved a major restocking boom and rapid commodity inflation in the US. The Federal Reserve, which had opened its doors in 1914 and had become an engine of inflation subservient to the Treasury, was reluctant to raise its discount rate to fight inflation in 1919 because of concern over the Treasury's portfolio. Reluctantly in the face of a declining gold reserve the Fed tightened sharply at the end of 1919 precipitating a serious recession in 1920.

The Interwar Period: 1920-1945

The Federal Reserve was established in 1914 in part to solve the problem of the absence of a lender of last resort in the crises of the pre-1914 national banking era. In the Fed's first 25 years there were three very severe business cycle downturns and several minor cycles. In addition to exogenous shocks such as wars, Fed policy actions were key in both precipitating and mitigating cycles. Most of the recoveries in this period were at least as rapid as the downturns that preceded them with two important exceptions: the recovery from the Great Contraction 1929 to 1933 and the recovery from the recession of 1937 to 1938.

Recovery 1921III to 1923 II. The recession that followed Fed tightening in December 1920 was severe but short: industrial production fell 23%, wholesale prices fell 37% and unemployment increased from 4% to 12%. No banking panic occurred but the stock market crashed in the fall of 1920. In the face of mounting political pressure the Fed reversed course in November 1921 and the real economy began recovering in August 1921, and by March 1922 IP had increased 20% above the previous year's level.

Recoveries 1924II -1926 III and 1927IV – 1929III. Two mild recessions in the mid 1920s reflected Fed preemptory tightening in the face of incipient inflation. In each case the recessions were followed by healthy recoveries. There were no banking crises or stock market crashes in these episodes but there was a housing bust in 1926 (White 2010).

Recovery 1933I – 1937II. The Fed tightened beginning in late 1926 to stem the stock market boom which had began that year. This tightening led to a recession in August 1929 and a major stock market crash in October. A series of banking panics beginning in October 1930 ensued. The Fed did little to offset them hence turning a recession into the Great Contraction. The recovery began after Roosevelt's inauguration in March 1933 with the Banking Holiday. Other key events in spurring recoveries included the U.S. leaving the gold standard in April, Treasury gold and silver purchases, and the devaluation of the dollar by close to 60% in January 1934. These policies produced a big reflationary impulse from gold inflows which were unsterilized passing directly into the money supply. They also helped convert deflationary expectations into inflationary ones (Eggertsson 2008). Expansionary monetary policy largely explains the rapid growth from 1933 to 1937 (Romer 1992). As Table 2 and Figure 1 shows the recovery, although rapid (output grew by 33%) was not sufficient to completely reverse the preceding downturn. Recovery may have been impeded somewhat by New Deal cartelization policies like the NIRA which in an attempt to raise wages and prices artificially reduced labor supply and aggregate supply (Cole and Ohanian 2004).

Recovery 1937 III – 1945 I. The 1937-38 recession, which cut short the rapid recovery from the Great Contraction of 1929-1933 was the third worst recession of the twentieth century, as real GNP fell by 10% and unemployment, which had declined considerably after 1933, increased to 20%. The recession was produced by a major Fed policy error. It doubled reserve requirements

in 1936 to sop up excess reserves and prevent future inflation. The Fed's contractionary policy action was complemented by the Treasury's decision in late June 1936 to sterilize gold inflows in order to reduce excess reserves. These policies led to a collapse in money supply and a return to a severe recession (Friedman and Schwartz 1963, Meltzer 2003). Fiscal policy hardly helped, with the Social Security payroll tax debuting in 1937 on top of the tax increased mandated by the Revenue Act of 1935 (Hall and Ferguson, 1998).

The recession ended after FDR in April 1938 pressured the Fed to roll back reserve requirements, the Treasury stopped sterilizing gold inflows and desterilized all remaining gold sterilized since December 1936 and the Administration began pursuing expansionary fiscal policy. The recovery from 1938 to 1942 was spectacular: output grew by 49% fueled by gold inflows from Europe and a major defense buildup. However as can be seen in Table 2 and Figure 1 the recovery was not as rapid as the downturn.

Post World War II: 1945 -2011

In the post World War II era, with only two exceptions, recoveries were at least as rapid as the downturn. In general recessions were shorter and recoveries loner than before World War II (Zarnowitz 1992). There also were fewer stock market crashes. The key exceptions to this pattern were the recovery 1991I -2001 I and the recent recovery since 2009 II. The recent recession was the only one with a banking crisis, stock market crash and housing bust.

1945IV -1948 IV. The conversion from a wartime to peacetime economy led to a very sharp, quick recession followed by a very rapid recovery which ended in 1948 with Fed tightening to fight inflation , leading to a mild recession from 1948 to 1949.

1949IV -1953II. According to Meltzer (2003, chapter 7) the rapid recovery from the 1948-49 recession was aided by deflation which encouraged gold inflows and increased the real value of the monetary base.

1954III- 1953II. After the Federal Reserve Treasury Accord of March 1951, the Fed was free again to use its policy rates to pursue its policy aims. At the end of the Korean War it tightened policy to stem inflation, leading to a recession beginning in July. The Fed then began easing policy well before the business cycle trough in May 1954 leading to a rapid recovery. Again in the face of incipient inflation the Fed began a tightening cycle at the end of 1954 ultimately leading to a recession which began in august 1957II (Friedman and Schwartz 1963 chapter 11, Meltzer 2010, chapter 2).

1958II – 1960 II. The recession of 1957-58 was one of the most severe recessions of the post war but it was very short lived. It ended after April 1958 following expansionary policy which began in November 1957. The subsequent recovery was vigorous. Again the Fed, worrying about

rising inflation and gold outflows began tightening in August 1958. The tightening cycle ended with a recession beginning in April 1960. (Friedman and Schwartz 1963 , chapter 11, Meltzer 2010, chapter two).

1961I – 1969IV. By early 1960 the FOMC recognized that the economy had slowed and began to ease two months before the April business cycle peak. The recession of 1960-61 was mild and brief, lasting 10 months. Fed policy continued to be loose throughout the downturn. The recession ended in February 1961 and the subsequent recovery exhibited very rapid growth with low inflation.

1970 IV-1973 IV. In face of rising inflation after 1965 the Fed began tightening but not enough to stem the buildup of inflation, although it led to the Credit Crunch of 1966, a growth slowdown (Bordo and Haubrich 2010). Fed tightening in the summer of 1969 led to a mild recession beginning in July 1969. Policy began to ease after January 1970. In April 1970 Chairman Arthur Burns abandoned the anti inflationary policy that had been pursued by his predecessor William McChesney Martin because of the slowing economy. The easy policies continued until after the business cycle trough. Recovery in real GNP was relatively sluggish and unemployment didn't peak until the summer of 1971.

1975II- 1980I. In the face of rising inflation in 1972, the Fed tightened but not enough (Meltzer 2010 chapter 6). Further tightening occurred in the summer of 1973. The recession which began in November was one of the worst in the postwar, real GNP fell by 3.4% and unemployment increased to 8.6%. The recession was greatly aggravated by the first oil price shock which doubled the price of oil and by wage price controls which prevented the necessary adjustment. During this episode the U.S. experienced a banking crisis with the failure of Franklin National and other significant banks (Lopez Salido and Nelson 2010) Beginning in July 1974 the Fed shifted to easier policy in the face of rising unemployment. The recovery began in April 1975. As in most of the postwar recessions the pace of the recovery exceeded the pace of the downturn.

1980III-1981III. By 1979 inflation had reached double digit levels. In August, Paul Volcker was appointed as Chairman of the Federal Reserve. In October, he announced a major shift in policy aimed at lowering inflation. The announcement was followed by a series of sizable hikes in the federal funds rate. The roughly 7 percentage point rise in the nominal funds rate between October 1979 and April 1980 was the largest increase over a six month period in the history of the Federal Reserve. The tight monetary stance was temporarily abandoned in mid 1980 as interest rates spiked and economic activity decelerated sharply. The FOMC then imposed credit controls (March to July 1980) and let the funds rate decline. The controls led to a marked decline in consumer credit, personal consumption and a very sharp decline in economic activity. The recession ended in July 1980 followed by a very rapid recovery.

1981IV – 1990III. Fed policy began to tighten again in May 1981 in the face of a jump in inflation. It raised the federal funds rate from 14.7% in March to 19.1 % June. This second and

more durable round of tightening succeeded in reducing the inflation rate from 10% in early 1981 to 4% in 1983 but at the cost of a sharp and very prolonged recession. Real GNP fell by close to 3% and unemployment increased from 7.2% to 10.8%. During this period there were two banking crises, the first between 1982-1984 as a consequence of the Latin American debt crisis which seriously impacted the money center banks and the second, the Savings and Loan Crisis from 1988 -1991 (Lopez Salido and Nelson 2010). There also was a stock market crash in the fall of 1987.

The Fed shifted to a looser policy in June 1982. After the trough, real output rose rapidly and the pace of the recovery greatly exceeded that of the downturn. The recession of 1991 was preceded by Fed policy tightening beginning in December 1988 (Romer and Romer 1994). The FOMC wanted to reduce inflation from the 4 to 4.5 5 range. The federal funds rate was raised from 6½% to 9 7/8% between March and May. The recession began in July 1990 and was aggravated by an oil price shock after Iraq invaded Kuwait in August 1990. The recession was mild. Real GNP only fell by 1.1%.

1990I to 2001 I. The FOMC only began cutting the funds rate in November 1990 because its primary concern was to reduce inflation which had reached 6.1% in the first half of 1990 (Hetzel 2008 chapter 15). The recovery from the trough in March 1991 was considered tepid and it was referred to as a jobless recovery. Unemployment peaked at 7.75% in June 1992. The recession was also viewed as a credit crunch (Bordo and Haubrich 2010) and real housing prices declined by 13% suggesting a minor housing bust. This is the first recovery in the post war era where the pace of expansion was less than that in the downturn.

2001IV -2007IV. In 2000 the Fed loosened monetary policy because of the fear of Y2K. The tech boom which had elevated the NASDAQ to unsustainable levels led to a bust and a decline in wealth and consumption. The FOMC didn't forecast a recession and was slow to respond because of tightness in the labor market (Hetzel 2008 page 241). Although real growth began decelerating in mid 2000, the FOMC began reducing the funds rate in January 2001, from 6.5% to 1% by June. After the trough in November, although real growth had picked up, employment had not and like the previous recession there was talk about a jobless recovery. By March 2004 the unemployment rate was at 5.7% still near its cyclical peak. Moreover the Fed worried about deflation and the zero lower bound problem in 2003. Consequently the funds rate was maintained at its recession low until June 2004 when alarmed by an increase in inflationary expectations the Fed began raising the funds rate at 0.25 5 increments until late summer 2007.

2009III - ?. The recent recession which began in December 2007 was precipitated by a banking crisis and a stock market crash consequent on the end of a major housing boom. The severity of the resulting recession from December 2007 to the summer of 2009 reflected both a credit crunch and tight Fed policies (seen in high real federal funds rates, Hetzel 2009). The recession was the most severe in the postwar period (real GDP fell by more than 5% and unemployment

increased to 10.8%) and the financial crisis in the fall of 2008 was without doubt the most serious event since the Great Contraction.

Both the crisis and the recession were dealt with by vigorous policy responses (expansionary monetary policy cutting the funds rate from 5.25% in early fall 2007 to close to zero by January 2009 and a massive fiscal stimulus package), and by quantitative easing (the purchase of mortgage backed securities and long-term Treasuries from January 2009 to June 2011; and an extensive network of facilities created to support the credit markets directly and reduce spread involving a tripling of the Fed's balance sheet. The recovery since 2009 has been tepid with real growth expanding at slightly above 2%. The pace of recovery is well below the drop of output during the recession.

3. The relation between recessions and recoveries

In this section we take a more statistical view of the relation between contraction depth and the following expansion. At this point, we make no claims about causality: whether financial crises contribute to recessions or recessions create financial crises does not concern us here, fascinating as the topic is.

Data: Our data is based on Bordo and Haubrich (2010), where the interested reader will find a more detailed description. Business cycle turning points (in quarters) come from the NBER. Real Gross National Product, again at a quarterly frequency, is based on Balke and Gordon (1986) extended via the NIPA accounts. This gives us quarterly RGNP for 26 business cycles, starting with the Peak in 1882, ending with the recovery from the 2001 recession. For comparison purposes, the 2007 recession is at times not included in the regressions.

We measure the amplitude of the contraction by the percentage drop (from the peak) of quarterly RGNP. We measure the recovery strength as the percentage change from the trough at two horizons: four quarters after the cyclical trough and after a time equal to the duration of the contraction. Going out the length of the contraction, while it appeals to symmetry, appears to be new, as most papers restrict their attention to 4 quarters (or 12 months if they use monthly data). Friedman is the exception, looking at growth to the next cyclical peak.

Exactly what constitutes a financial crisis depends, and has been answered several ways. In this section, for the pre-World War Two years we use the chronology from Bordo and Eichengreen, 2002, and also add 1914, a year in which the bond markets closed. For the post war period, we use the chronology of Lopez-Salido and Nelson. This gives us crisis periods of 1884-5, 1892-93, 1895, 1904, 1907, 1914, 1930-33, 1973-75, 1982-84, 1988-91. Consequently, the recessions we associate with a financial crisis are those that start in 1882, 1892, 1907, 1912, 1929, 1973, 1981, and 1990. (We drop the 1945 recession from our sample. This is reasonable, but it matters, as it

was the deepest recession of the century outside the Great Depression, with an extremely weak recovery.)

Are deep recessions followed by steep recoveries?

The visual evidence (Figure 2) strongly suggests that deep recessions are followed by strong recoveries, though it suggests that a few outliers, particularly the Great Depression, may have a disproportionate impact. Regressing growth 4 quarters after the trough against contraction amplitude shows a positive and statistically significant relationship, although the coefficient is not large. The relationship is tighter, and stronger, if we examine more of the recovery, measuring growth out to the duration of the contraction after the trough. Looking out only 4 quarters can give a misleading picture, particularly for longer recessions. Much of the difference is in fact driven by the Great Depression, and it should not be surprising that the drop in output from 1929 to 1933 was not fully reversed by 1934, though the economy came much closer by 1936.

Do financial crises affect the bounce-back?

The first approach to answering this question should be to visually inspect the data for any relationships. The scatterplots in Figure 3 strongly suggest a difference between the recoveries in crisis and non-crisis cycles, but for reasons contrary to the conventional wisdom. In crisis times, strong recoveries follow deep recessions, but outside of a crisis, they do not. The relation is in fact negative, though not statistically significant. This holds looking out only four quarters or out the duration of the contraction.

Though instructive, it may not be proper to lump all crises and all cycles together, given the very different monetary standards and regulatory regimes in place over time. We split the data several ways, first before and after the founding of the Federal Reserve. This results in seven regressions of recovery strength against the contraction depth: all cycles, all crisis cycles, all non-crisis cycles, all cycles pre- and post-1914, and crisis and non-crisis cycles pre- and post-1914. (All regressions exclude 1945, as noted above.) These are done for both recovery lengths; four quarters and the duration of the contraction. The results are reported in Table 3.

Overall, strong expansions follow deep contractions, but this is primarily true for crisis cycles. When split by time period, the pre-1914 cycles do not show a significant relationship, the result of a rather surprising conjunction: the non-crisis cycles have a strong and statistically negative relationship between contraction amplitude and recovery strength. In the post-1914 era, cycles without a crisis have a large but insignificant relation. In both periods, crisis cycles show a strong significant relationship between contraction amplitude and recovery strength. A coefficient of 1.0 provides a natural bench mark, indicating that the percentage increase in output during the start of the expansion equals the percentage drop in output during the contraction.

While 1914 provides a natural dividing point, it is not the only obvious one. World War Two is another common and sensible division point. Likewise there are other possible crisis definitions. Bordo and Landon Lane (2010) find the world has had five global financial crises since 1880 (1890-91, 1907-08, 1913-14, 1930-33 and 2007-2008). Figure 4 plots contraction and plots recovery (4 quarters) against contraction amplitude for BLL crises and all post-world war 2 contractions, including 2007-2008. Like the previous figures, it shows a positive relationship between contraction amplitude and recovery strength, though the coefficient is relatively small. In part, this arises from the three most recent cycles, which seem different, with both a lower intercept and lower slope. Some speculation suggests that this results from changes in labor market behavior since the 1980s. (Beauchemin, 2010).

Does “shape” matter?

Another possible relation between contractions and expansions concerns their shape. One obvious measure of shape is steepness, or change in output divided by duration. Table 4 reports the results of regressing the steepness of the recovery against the steepness of the contraction, again divided as before, pre and post Fed, with and without crises. The steepness regressions generally confirm the results using changes. Using all cycles, the coefficient is the right sign, but insignificant, most likely driven by the pre-Fed cycles without crises, in which steeper recessions have shallower recoveries, although the coefficient is not significant. Crises, both pre and post Fed, show the expected sign and are significant, but although post-Fed recoveries have the expected sign, the coefficient is not significant. These results hold for both horizons.

Steepness is not the only measure of shape. For example, the contraction might be “L” shaped, that is, drops quickly at first, but then only slowly reaches a trough. (Macroeconomic Advisors, 2009) This might be thought of as a worse contraction than one that is more linear. Overall, the cycle might have a “V” shape, or a “U” shape, or other imaginative denotations—the 2007 cycle has at times been described as having a “square root sign” shape by pundits anxious to show they remember grade-school math.

Quantifying shape beyond mere steepness may seem a daunting task, but Harding and Pagan (2002) have a useful approach. They measure the extent to which the drop in output during the contraction deviates from a straight line, and develop an index of *excess cumulated movements*. Several specifications, however, have not uncovered any meaningful relationship between the shape of the contraction and the shape of the recovery.¹

¹ Harding and Pagan define the duration of the phase (for example, time from peak to trough for a contraction) as D , and the Amplitude as A , then $C_T = 1/2 (D \times A)$ is the triangle approximation to the cumulative movement. The actual cumulative movement is denoted C , and the excess cumulated movement is $E = (C_T - C + 0.5A)/D$. The more negative this number is, the more closely the contraction approximates the “L” shape.

4. Bank Lending and Credit Crunches

Designating a time period as having a crisis or not is in some ways an unsubtle approach to the problem --it also does little to uncover the mechanisms involved in the amplitude of cycles. An alternative pursued in this section looks for measures of financial stringency, and then examines their effect on the strength of the recovery. In the historical context, measures of financial stringency are associated with more severe recessions (Bordo and Haubrich, 2010), and it thus makes sense to look at their effect on the strength of recoveries.

In an attempt to capture both the market-based and intermediary-based aspects of finance, we look at both stock prices and bank loans. The stock price index for 1875-1917 is the Cowles commission index, re-leveled to match the Standard and Poor index which begins in 1917. For bank lending, we construct a new quarterly series from 1882 to 2010 for all commercial banks, detailed in the appendix. Table 5 reports the results of regressing the expansion strength against contraction depth, the change in real loans over the expansion and the change in the stock index over the expansion. It is meant to uncover whether financing problems held back the recovery.

It is perhaps more common to measure financial conditions via some sort of credit spread, and in our earlier work we followed that tradition and looked the spread between Baa and safe bonds, or between different grades of rail road bonds for the 19th century. Credit spreads will play an important role in the results of the next section, but here we look more on the quantity side. While certainly the price of credit should matter, some authors (Owens and Schreft, 1995) *define* a “credit crunch” as non-price rationing of credit, and thus observable mostly from the quantity side.

Financing matters for the recovery, but the results depend on the horizon examined, particularly for bank lending. The duration regressions show no significant effect of bank lending. The four-quarter regressions indicate that higher lending is associated with a stronger recovery, but those results seem driven by the pre-Fed data. Indeed, there is an anomalous result that post-1914, stronger recoveries see slower loan growth. This may reflect timing, and bank lending is well known as a lagging indicator. Furthermore, loans do not always drop in a contraction. However, the past three recessions (1990, 2001, and 2007) are among the relatively few that do show a drop, and are also those that show a slower than average recovery given the depth of the recession, at least relative to the post-world-war two period.

The effect on the stock index is more consistent across horizons. There is a positive relationship between change in the stock index and strength of recovery for all cycles and all non-crisis cycles. There is a negative relationship in crisis cycles, but the coefficient is not significant. Of course, particularly with the stock market, causality is hard to determine, and the results may be telling us that strong recoveries have bull markets.

5. The effect of Housing

Housing deserves separate attention, if only because it played such a prominent role in the crisis. In fact, housing has been important in many cycles (Leamer, 2007) and indeed a stylized fact noticed even by Burns and Mitchell is that household investment (which is predominantly housing) leads the business cycle (Fisher, 2007). A standard story for the transmission of monetary policy was that the Federal Reserve would raise rates, which in the days of Regulation Q, would lead to disintermediation, cutting off funds needed for construction (cite?). Home builders famously sent Paul Volcker hundreds of two-by-fours to protest his raising of rates (Greider, 1987, p. 462). Other work has suggested that a shock to the housing market can account for much of the output decline in the recent recession (Henly and Wolman, 2011).

More recently, chairman Bernanke (2011) has remarked that

Notably, the housing sector has been a significant driver of recovery from most recessions in the United States since World War II, but this time--with an overhang of distressed and foreclosed properties, tight credit conditions for builders and potential homebuyers, and ongoing concerns by both potential borrowers and lenders about continued house price declines--the rate of new home construction has remained at less than one-third of its pre-crisis level.

The obvious question then becomes to what extent the problems in the housing market can account for the slow recovery so far. Clearly, questions of precedence, causality and influence are difficult to sort out. Our approach is to ask a counterfactual: what would the current recovery look like if it followed the historical pattern based on the depth of the contraction? Since the recovery in fact is much slower than predicted by just the recession depth, that is, the bounce-back is weaker than expected, we see if the effects of the financial crises or problems in the housing market can account for the difference.

In essence, the first step then is to look for outliers in the relationship between recession depth and recovery. If we can identify which recoveries look different, can we then start to understand why? We do this in a three step process. First, as mentioned already, we compare actual with fitted values in a regression of RGNP growth in the recovery against contraction depth, again also measured by the drop in RGNP. We then add a measure of financial distress, the risk spread used Bordo and Haubrich (2010), Moody's Seasoned Baa less Long-term Treasury Composite, and again compare fitted with actual values. Finally, we add a third term, Residential Investment, **as our measure of the housing market**, comparing actual to fitted values. Using the measures of financial distress and the housing market, unfortunately restricts the data to the post-world war two era.

Figures 5 and 6 graphically report the results. The first panel compares actual change in real GNP for the recovery with the fitted value from the regression against contraction depth. The most recent three cycles stand out as having particularly weak recoveries given the size of the recessions. Their bounce back is abnormally slow.

The second panel shows how much of the shortfall we attribute to problems in the financial sector. This might be expected to be large, as the 1990 cycle is famous for its financial “headwinds” and the problems of the current crisis need no further recapitulation. Given the historic relationship between changes in the risk spread over the recovery, does the risk spread account for the slow recovery? The answer is essentially no—the fit is hardly better for these cycles. A closer look at the regression confirms what the figures show—the R-squared improves only in the fourth decimal place and the coefficient on the spread is insignificantly different from zero, along with being very small.

The third panel shows the effect of adding Residential Investment, an obvious measure of the housing market, and a key component of Leamer’s (2007) contention that “Housing is the business cycle.” The final panel shows the actual and fitted values using contraction depth, risk spread, and residential investment. **Residential investment is not a large component of national expenditure but it is closely linked to the purchases of consumer durables and other housing sensitive sectors which together give it a bigger impact.** The improvement is particularly noticeable at the four quarter horizon for the current recovery. This was also the case in the last five recessions which show noticeable improvement in fit—a Wald test rejects excluding the extra variables at well above the one percent level. Nevertheless the orders of magnitude are strikingly greater in the current recovery.

In the absence of a model, of course, this finding points to the need for further analysis, to determine if weakness in housing was directly to blame for the weak recovery, or merely reflecting or transmitting other problems, such as weakness in the intermediary sector. None-the-less, the role of housing does stand out as a marker for weakness in the current recovery.

6. Prospects for the current recovery.

Recessions that accompany a financial crisis tend to be long and severe (Bordo and Haubrich, 2010, Reinhart and Rogoff, 2009). What that portends for economic growth once a recovery has started is less certain, however. On the one hand, there is the feeling that “growth is sometimes quite modest in the aftermath as the financial system resets.” (Reinhart and Rogoff, p. 235). On the other hand is the stylized fact behind Friedman’s plucking model, that “A large contraction in output tends to be followed on the average by a large business expansion,” (Friedman, 1969, p. 273). One popular measure, the time required to return output to the pre-crisis level, confounds the depth of the recession with the strength of recovery. For many purposes, it is important to separate the notions of contraction depth and recovery strength.

Where does that leave the current recovery? It remains an outlier, as one of the few cases where output did not return to the level of the previous peak after the duration of the recession. In this it resembled two very different recessions, the Great Depression and 1990. Significantly, both of those combined financial problems and (real) housing price declines, albeit of strikingly different magnitudes. The unanswered question, of course, relates to causality—tracing out the exact shocks, and their transmission, remains key. Must housing recover for the recovery to take off, or will the economy pull the industry along? These are questions for another day.

Also of great importance is the question whether additional monetary stimulus could speed up the current recovery. Since the end of 2009, short-term interest rates have been close to zero. The Federal Reserve has gone through two rounds of quantitative easing designed to lower long-term interest rates and stimulate investment expenditure. Yet the housing sector has not recovered and residential investment has remained flat. This raises the question whether further quantitative easing could make the pace of recovery more consistent with the depth of the recession. It is possible that forces other than looser monetary policy may be needed to instill recovery in the housing sector. One possibility is that house prices still need to fall further to clear the market. Then builders would be eager to borrow knowing that prices will no longer fall and lenders will be more eager to lend knowing that the value of their collateral has stabilized.

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Data appendix

Construction of the quarterly bank loan numbers.

We started with the Annual numbers for all commercial banks, Millennial statistics, table Cj253 “Commercial Banks-number and assets.” Total Loans.

After 1914Q4 these are made quarterly by interpolation using RATS disaggregate (linear, ar1) procedure using Total Loans for all member banks, from the Fed’s Banking and Monetary Statistics, 1914-1941 No. 18, All Member banks—Principal assets, “Loans” p. 72-74. The data were pushed forward to 1955 Q4 using the data from Banking and Monetary Statistics 1941-1970 table 2.1 All Member Banks A. total assets and Number of banks Loans.

There were several missing quarters, which we interpolated using No. 48, Weekly Reporting Banks in 101 Leading Cities—Principal Assets and Liabilities, weekly and Monthly,

To go back further, we again began with the Millennial statistics, and interpolated again, this time using national and state bank data.

The national bank data came from the NBER series, adding up NBER 14016, Loans and Discounts, national Banks, country districts, NBER 14018, Loans and discounts, national Banks, Reserve cities other than central, and NBER 14019, Loans and Discounts, National Banks, Central Reserve cities. Some judgment was used to apportion the data into quarters.

Annual State bank data was taken from Millennial Statistics, Cj151, State banks, Loans and discounts. It was made quarterly by linear interpolation.

The state and national bank numbers were added together and used to interpolate the Millennial statistics annual number. This let us interpolate from 1896 to 1913. Then we attached the series for state and national banks, discounting by the ratio for that series to the Millennial series in 1914. This gave us a series from 1882 to 1955.

Table 1: Output change in contractions, 1880-2011

TROUGH	Steepness		Total	total rise	tot drop, %	tot rise,
	of drop	T+D	total	(T+D)		%(T+D)
	exp	drop	drop			
March 1882(I)	0.25%	0.48%	-2.27	4.51	3.2%	6.3%
March 1887(II)	-1.25%	0.90%	2.95	2.04	-3.8%	2.7%
July 1890(III)	-0.35%	4.57%	0.9	11.65	-1.0%	13.7%
January 1893(I)	-2.22%	3.47%	10.87	15.11	-11.1%	17.3%
December 1895(IV)	0.23%	0.67%	-1.47	4.27	1.4%	4.0%
June 1899(III)	0.42%	2.18%	-2.56	13.51	2.1%	10.9%
September 1902(IV)	0.30%	2.75%	-2.93	27.54	2.1%	19.2%
May 1907(II)	-2.95%	3.27%	21.18	20.67	-11.8%	13.1%
January 1910(I)	0.86%	-0.51%	-17.65	-11.51	9.4%	-5.6%
January 1913(I)	-1.19%	1.63%	17.01	21.32	-8.3%	11.4%
August 1918(III)	-3.12%	-2.35%	15.86	-11.23	-6.2%	-4.7%
January 1920(I)	-1.84%	4.04%	25.09	49.09	-11.0%	24.3%
May 1923(II)	-0.61%	2.79%	7.91	34.86	-3.1%	14.0%
October 1926(III)	-0.53%	1.51%	7.81	21.74	-2.6%	7.6%
August 1929(III)	-2.59%	3.30%	117.31	95.21	-36.2%	46.1%
May 1937(II)	-2.51%	1.86%	31.93	21.31	-10.0%	7.4%
February 1945(I)	-4.83%	-1.93%	86.31	-29.56	-14.5%	-5.8%
November 1948(IV)	-0.44%	3.38%	8.96	67.58	-1.8%	13.5%
July 1953(II)	-0.64%	1.96%	16.48	49.24	-2.6%	7.8%
August 1957(III)	-1.09%	2.19%	23.36	45.32	-3.3%	6.6%
April 1960(II)	-0.14%	1.87%	3.33	42.84	-0.4%	5.6%
December 1969(IV)	-0.05%	1.14%	2.33	52.57	-0.2%	4.6%
November 1973(IV)	-0.67%	1.42%	45.17	92.39	-3.4%	7.1%
January 1980(I)	-1.17%	1.85%	37.62	58.38	-2.3%	3.7%
July 1981(III)	-0.53%	1.95%	43.12	156.01	-2.6%	9.8%
July 1990(III)	-0.54%	0.44%	23.47	19.02	-1.1%	0.9%
March 2001(I)	0.23%	0.46%	-21.24	41.64	0.7%	1.4%

Steepness is change divided by duration

Source

Table 2 Descriptive Evidence on U.S. Recoveries 1880—2011

A. Pre-Federal Reserve 1880—1920

Recessions with recoveries that are at least as rapid as the downturn

Trough	Recovery	Major Recession	Banking Crisis	Credit crunch	Housing bust	Stock crash
1885(II)	1885 II-1887 II	No	Sept. 1884	Yes	No	Feb. 1884
1888(I)	1888 I-1890 III	No	No	No	No	No
1891(II)	1891 II-1893 I	No	Nov. 1890	No	No	Nov. 1890
1891(II)	1894 II-1895 IV	Yes	May 1843	Yes	?	May 1893
1894(II)	1894 II-1895 IV	No	No	No	No	No
1897(II)	1897 II-1899 III	No	No	No	No	No
1900(IV)	1900 IV-1902 IV	No	No	No	No	Oct. 1903
1908(II)	1908 II-1910 I	Yes	Oct. 1907	Yes	?	Oct. 1907
1914(IV)	1914 IV-1918 III	No	Yes	No	?	Fall 1917

Recession with recoveries that were slower than the downturn

Trough	Recovery	Major Recession	Banking Crisis	Credit crunch	Housing bust	Stock crash
1912(I)	1912 I-1914 IV	No	No	No	No	No
1919(I)	1919 I-1920 I	No	No	No	No	No

Source: Bordo and Haubrich (2010), Freidman and Schwartz, (1963) Shiller, (2009)

?—Shiller (2009) shows a drop in real house prices.

B. Interwar 1920-1945

Recession with recoveries that are at least as rapid as the downturn

Trough	Recovery	Major Recession	Banking Crisis	Credit crunch	Housing bust	Stock crash
1921(III)	1921III-1923II	Yes	No	No	?	Fall 1920
1924(III)	1924III-1926III	No	No	No	No	No
1927(IV)	1927IV-1929III	No	No	No	Yes	No

Recession with Recoveries that were slower than the downturn

Trough	Recovery	Major Recession	Banking Crisis	Credit crunch	Housing bust	Stock crash
1933(I)	1933I-1937II	Yes	1930,1931, 1933	Yes	Yes	Oct. 1929
1938(II)	1938II-1945I	Yes	No	Yes	No	Feb 1937, May 1940

C. Postwar 1948-2011

Recession with recoveries that are at least as rapid as the downturn

Trough	Recovery	Major Recession	Banking Crisis	Credit crunch	Housing bust	Stock crash
1945(IV)	1945(IV)-1948(IV)	No	No	No	No	Setp. 1946
1949(IV)	1949(IV)-1953(II)	No	No	No	No	No
1954(II)	1954(II)-1957(III)	No	No	Yes	No	No
1958(II)	1958(II)-1960(II)	No	No	Yes	No	No
1961(II)	1961(II)-1969(IV)	No	No	Yes	No	Spring 1966
1970(I)	1970(I)-1973(IV)	No	No	Yes	No	May 1970
1975(I)	1975(I)-1980(I)	Yes	Yes	Yes	?	Nov. 1973
1980(III)	1980(III)-1981(III)	No	No	Yes	No	No
1982(IV)	1982(IV)-1990(III)	Yes	Yes*	Yes	No	Aug 1990
2001(IV)	2001(IV)-2007(IV)	No	No	No	No	Spring 2001

Recession with Recoveries that were slower than the downturn

Trough	Recovery	Major Recession	Banking Crisis	Credit crunch	Housing bust	Stock crash
1991(I)	1991(I)-2001(I)	No	Yes*	Yes	?	No
2009(IV)	2009(II)-?	Yes	Sept. 2008	Yes	Yes	Oct. 2008

Source: Bordo and Haubrich (2010), Freidman and Schwartz, (1963) Shiller, (2009)

?—Shiller (2009) shows a drop in real house prices.

*- Lopez-Salido and Nelson (2010) identify a banking crisis.

TABLE 3: Regressions of expansion growth on contraction amplitude.

4 Qs after trough	Constant	Contraction Amplitude	R-squared	No. of Obs
All	0.0635*** (0.0103)	0.209*** (0.0607)	0.0499	26
All crisis	0.0605*** (0.0127)	0.268** (0.0861)	0.525	8
All non-crisis	0.075*** (0.0161)	-0.150 (0.499)	0.0083	18
Pre-1914 all	0.078*** (0.023)	0.062 (0.359)	0.0023	10
Pre-1914 crisis	0.007 (0.007)	1.060*** (0.059)	0.960	4
Pre-1914 non-crisis	0.120*** (0.015)	-1.504*** (0.247)	0.578	6
Post-1914 all	0.059*** (0.013)	0.230*** (0.054)	0.158	10
Post-1914 crisis	0.049 (0.014)	0.242** (0.042)	0.804	4
Post-1914 non-crisis	0.058*** (0.018)	0.322 (0.359)	0.045	12

HAC robust standard errors in parentheses.

Duration+ after trough	Constant	Contraction Amplitude	R-squared	No. of Obs
All	0.041** (0.0150)	1.002*** (0.1629)	0.521	26
All crisis	0.024* (0.0107)	1.192*** (0.0415)	0.969	8
All non-crisis	0.074*** (0.0251)	0.042 (0.847)	0.0004	18
Pre-1914 all	0.094** (0.032)	-0.016 (0.522)	0.0001	10
Pre-1914 crisis	0.029 (0.011)	1.053* (0.228)	0.797	4
Pre-1914 non-crisis	0.148** (0.037)	-2.200*** (0.420)	0.602	6
Post-1914 all	0.0345** (0.0142)	1.144*** (0.067)	0.745	16
Post-1914 crisis	0.031 (0.018)	1.193*** (0.053)	0.980	4
Post-1914 non-crisis	0.046 (0.022)	0.823 (0.620)	0.167	12

HAC robust standard errors in parentheses.

TABLE 4: Regressions of expansion steepness on contraction steepness.

4 Qs after trough	Constant	Contraction Steepness	R-squared	No. of Obs
All	0.017*** (0.002)	-0.221 (0.258)	0.701	26
All crisis	0.011*** (0.002)	-0.844*** (0.098)	0.971	8
All non-crisis	0.084*** (0.003)	0.147 (0.279)	0.635	18
Pre-1914 all	0.018*** (0.005)	0.026 (0.428)	0.677	16
Pre-1914 crisis	0.008*** (0.003)	-0.997*** (0.104)	0.951	4
Pre-1914 non-crisis	0.020*** (0.005)	0.302 (0.400)	0.662	12
Post-1914 all	0.017*** (0.004)	-0.533 (0.206)	0.785	10
Post-1914 crisis	0.013*** (0.000)	-0.734*** (10.53)	0.993	4
Post-1914 non-crisis	0.017*** (0.004)	-0.286 (0.767)	0.612	6

HAC robust standard errors in parentheses.

Duration+ after trough	Constant	Contraction Steepness	R-squared	No. of Obs
All	0.017*** (0.003)	-0.193 (0.320)	0.616	26
All crisis	0.007*** (0.001)	-0.986*** (0.099)	0.960	8
All non-crisis	0.019*** (0.004)	0.231 (0.363)	0.560	18
Pre-1914 all	0.019*** (0.005)	0.183 (0.536)	0.604	16
Pre-1914 crisis	0.007** (0.003)	-10.00*** (0.115)	0.931	4
Pre-1914 non-crisis	0.022*** (0.006)	0.501 (0.519)	0.6044	12
Post-1914 all	0.016*** (0.004)	-0.624*** (0.166)	0.717	10
Post-1914 crisis	0.007*** (0.001)	-0.976*** (0.105)	0.980	4
Post-1914 non-crisis	0.018 (0.004)	-0.598 (0.798)	0.563	6

HAC robust standard errors in parentheses.

TABLE 5: Regressions of expansion size credit variables

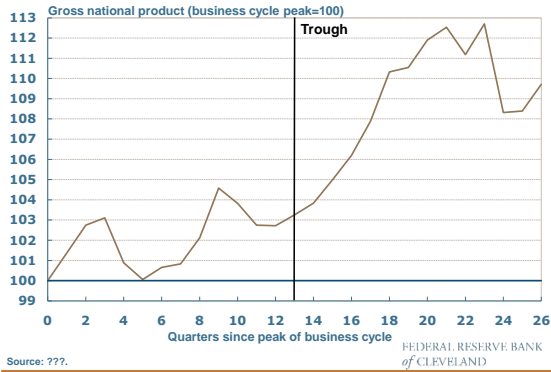
4 Qs after trough	Constant	Contraction Depth	Change in Loans	Change, stock index	R-squared	No. of Obs
All	0.032*** (0.006)	-0.256** (0.129)	0.247* (0.138)	0.173*** (0.054)	0.824	25
All crisis	0.052** (0.020)	-0.435*** (0.063)	0.255** (0.108)	-0.032 (0.092)	0.973	6
All non-crisis	0.050*** (0.016)	0.078 (0.266)	-0.140 (0.363)	0.258*** (0.095)	0.790	19
Pre-1914 all	0.020 (0.018)	-0.314*** (0.091)	0.471** (0.217)	0.157*** (0.056)	0.895	9
Pre-1914 crisis	-0.058 (NA)	-1.55 (NA)	0.142 (NA)	0.0 (NA)	1.0	3
Pre-1914 non-crisis	0.014 (0.042)	-0.163 (0.207)	0.474 (0.515)	0.208 (0.133)	0.856	6
Post-1914 all	0.040*** (0.010)	-0.011 (0.262)	-0.066 (0.268)	0.203** (0.095)	0.802	16
Post-1914 crisis	-0.011	0.559	-1.59	0.0	1	3
Post-1914 non-crisis	0.092*** (0.027)	0.600 (0.396)	-1.049** (0.516)	0.324*** (0.110)	0.858	13

HAC robust standard errors in parentheses.

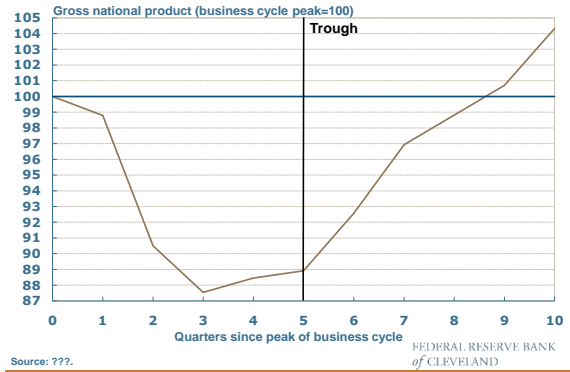
Duration+ after trough	Constant	Contraction Depth	Loans	Stock index	R-squared	No. of Obs
All	0.015 (0.014)	-0.789*** (0.160)	0.141 (0.109)	0.249*** (0.089)	0.853	25
All crisis	0.012 (0.016)	-1.285*** (0.140)	0.010 (0.058)	-0.026 (0.098)	0.993	6
All non-crisis	0.012 (0.024)	-0.524* (0.270)	0.333 (0.279)	0.219*** (0.081)	0.735	19
Pre-1914 all	0.004 (0.031)	-0.479*** (0.184)	0.389* (0.211)	0.261*** (0.097)	0.857	9
Pre-1914 crisis	-0.090	-1.583	0.558	0.0	1.0	3
Pre-1914 non-crisis	0.027 (0.044)	-0.364* (0.199)	0.085 (0.439)	0.399*** (0.107)	0.802	6
Post-1914 all	0.008 (0.017)	-1.00*** (0.256)	0.124 (0.162)	0.186 (0.118)	0.883	16
Post-1914 crisis	-0.052	1.78	-3.93	0	1	3
Post-1914 non-crisis	0.014 (0.032)	-0.665 (0.436)	0.282 (0.411)	0.164* (0.094)	0.726	13

HAC robust standard errors in parentheses.

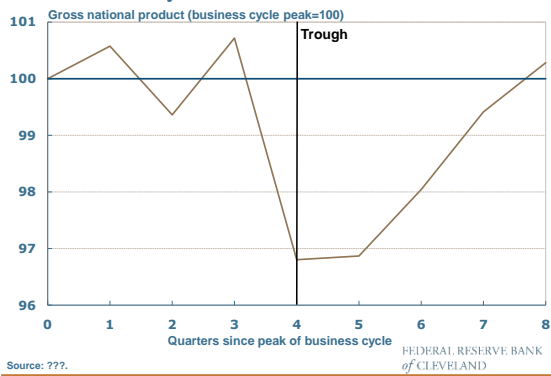
Business Cycle Peak: March 1882



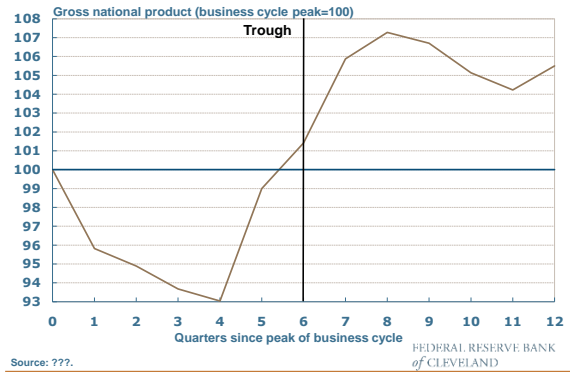
Business Cycle Peak: January 1893



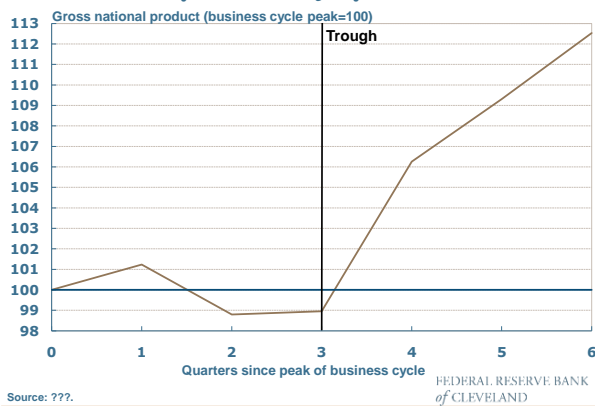
Business Cycle Peak: March 1887



Business Cycle Peak: December 1895



Business Cycle Peak: July 1890



Business Cycle Peak: June 1899

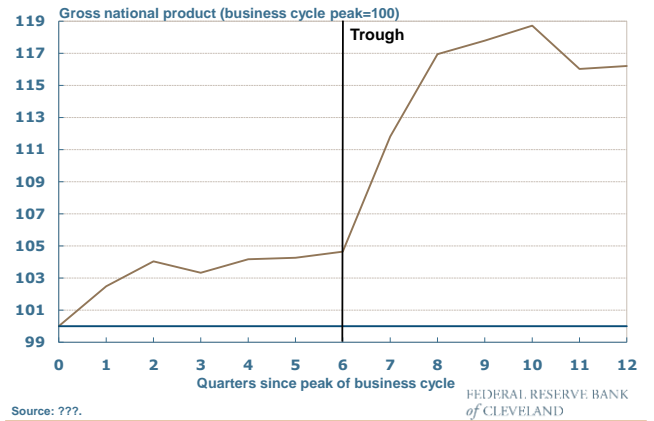
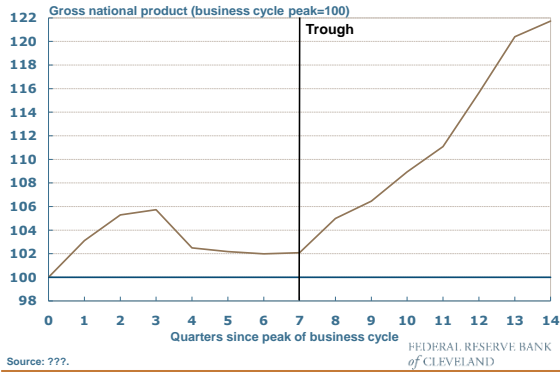
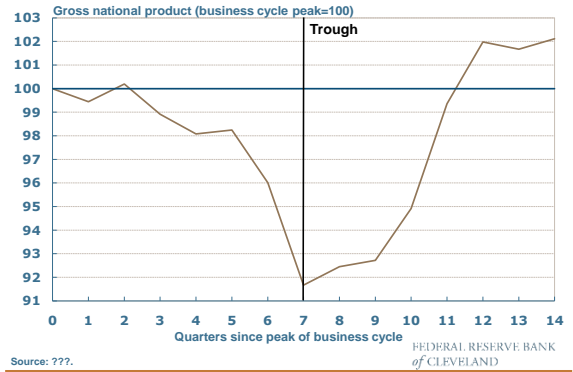


Figure 1: contractions and recoveries

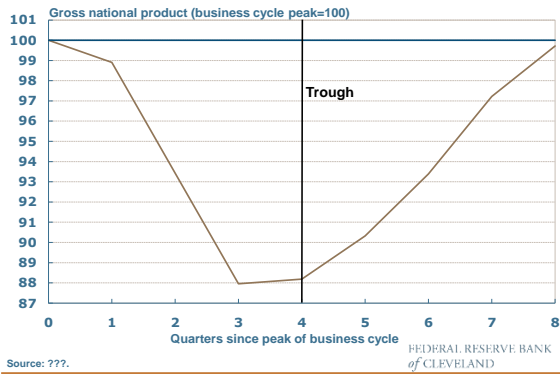
Business Cycle Peak: September 1902



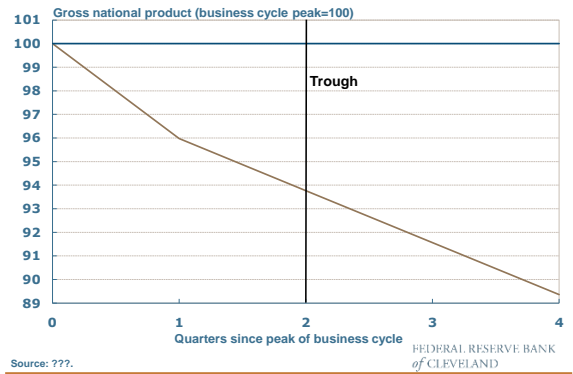
Business Cycle Peak: January 1913



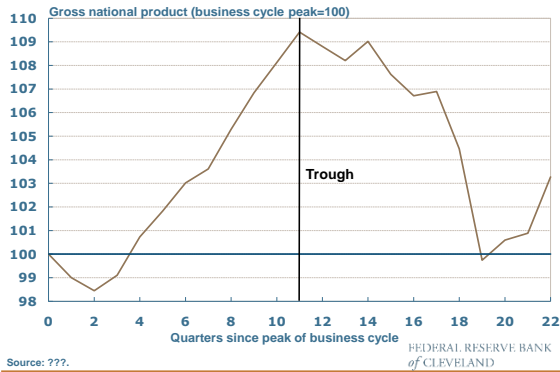
Business Cycle Peak: May 1907



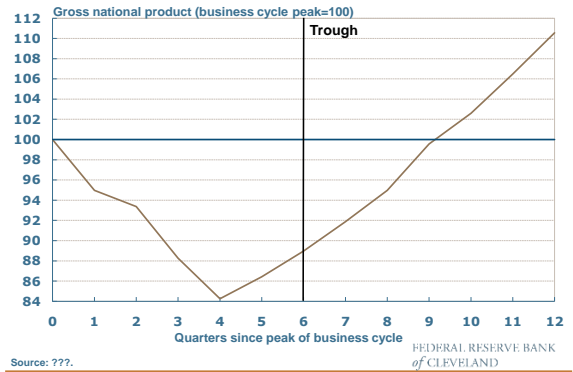
Business Cycle Peak: August 1918



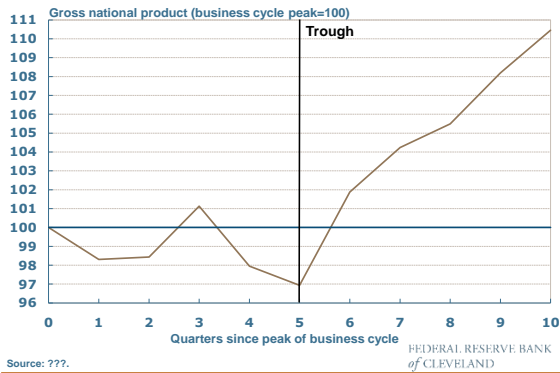
Business Cycle Peak: January 1910



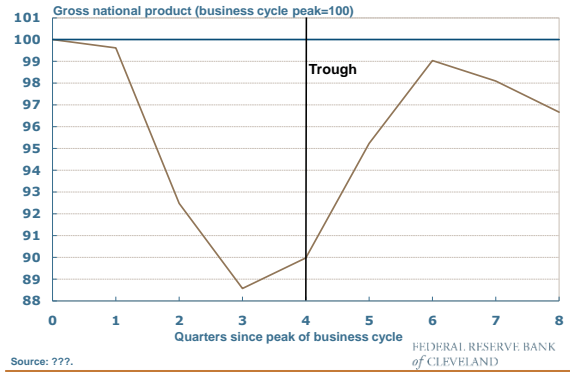
Business Cycle Peak: January 1920



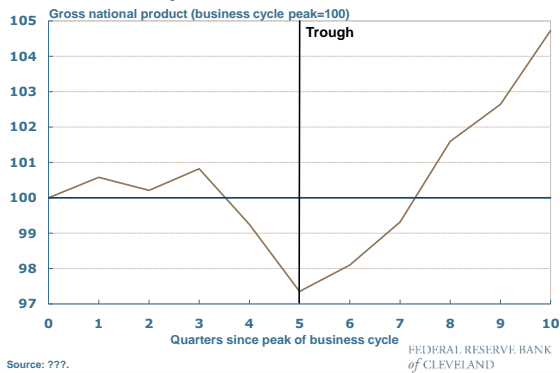
Business Cycle Peak: May 1923



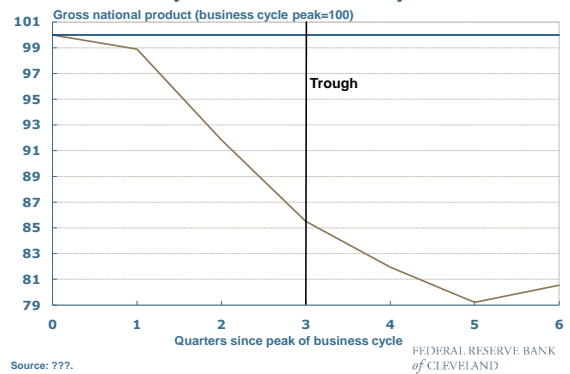
Business Cycle Peak: May 1937



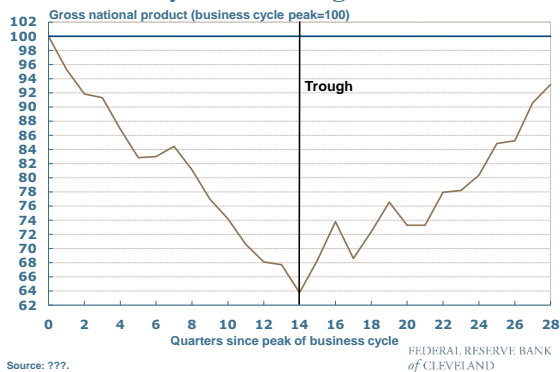
Business Cycle Peak: October 1926



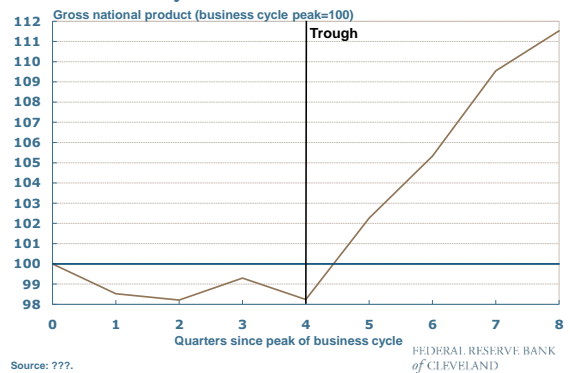
Business Cycle Peak: February 1945



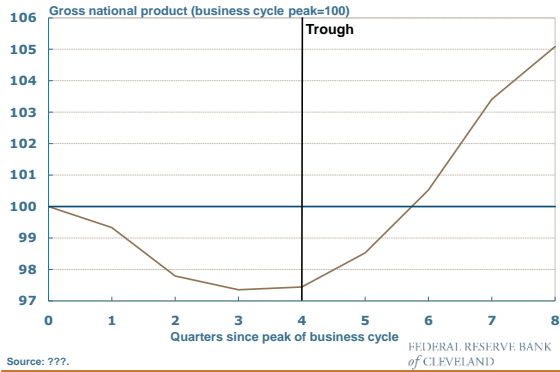
Business Cycle Peak: August 1929



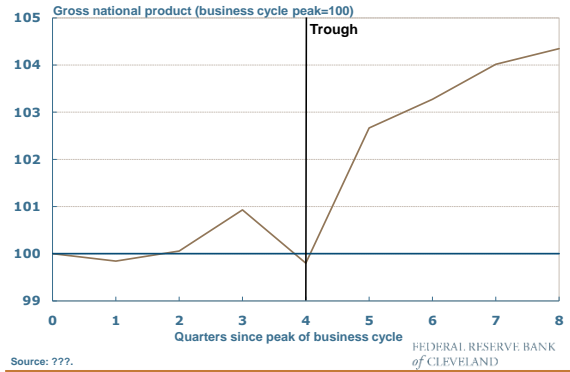
Business Cycle Peak: November 1948



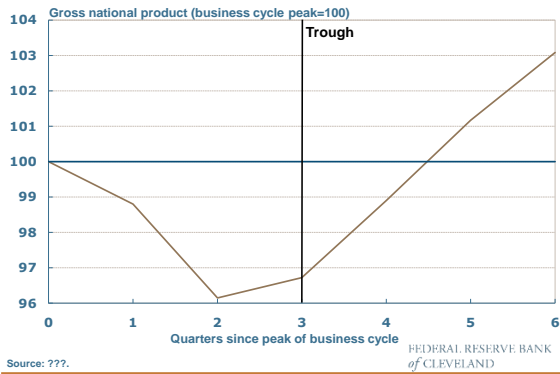
Business Cycle Peak: July 1953



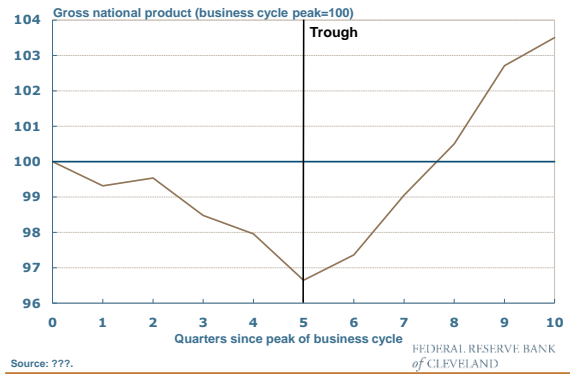
Business Cycle Peak: December 1969



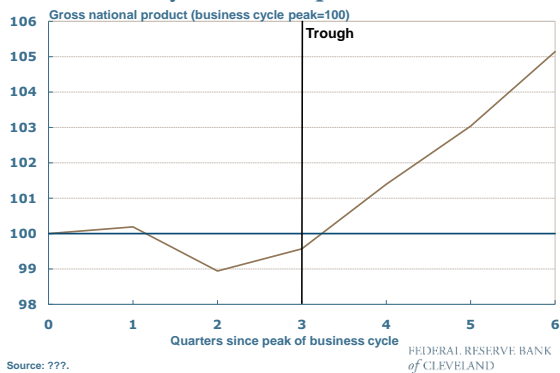
Business Cycle Peak: August 1957



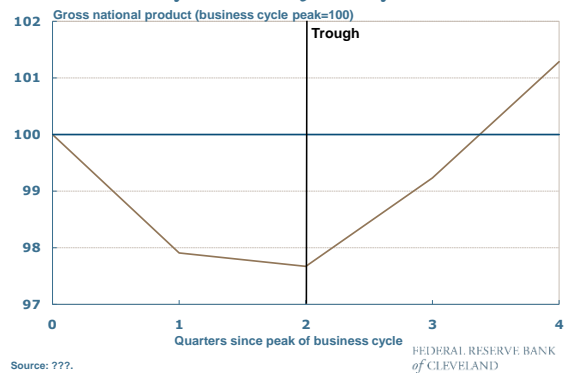
Business Cycle Peak: November 1973



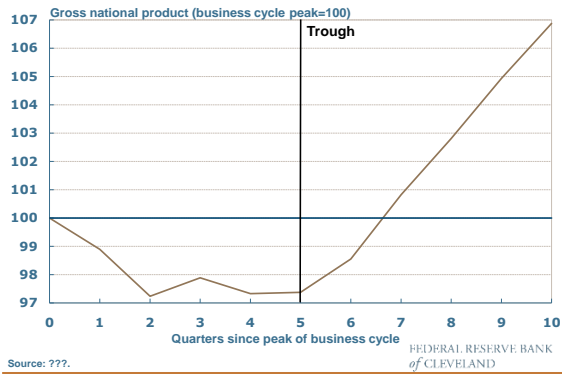
Business Cycle Peak: April 1960



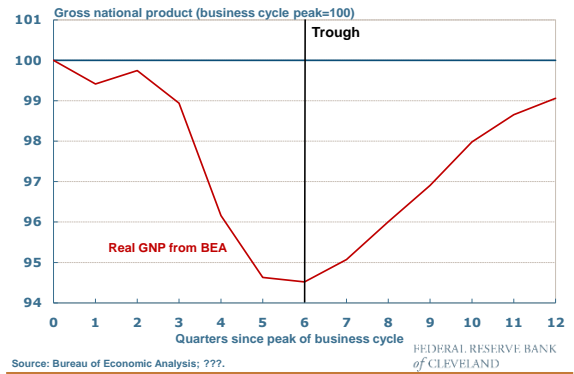
Business Cycle Peak: January 1980



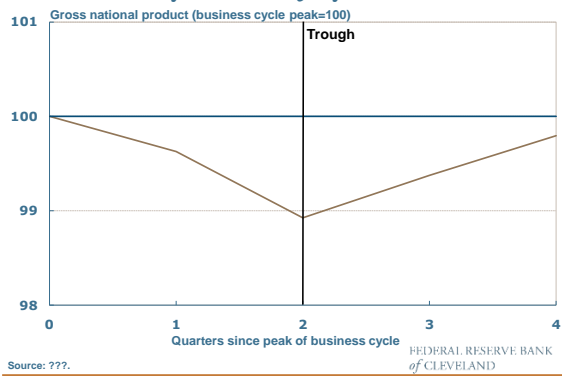
Business Cycle Peak: July 1981



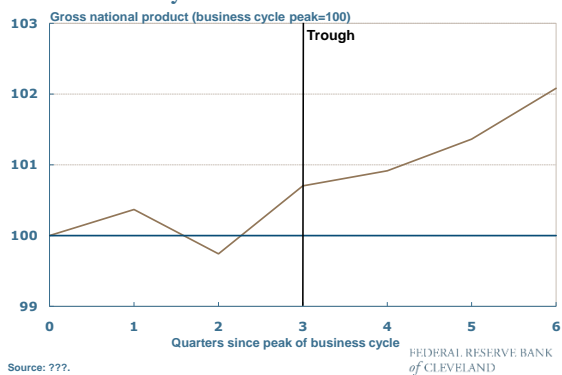
Business Cycle Peak: December 2007



Business Cycle Peak: July 1990



Business Cycle Peak: March 2001



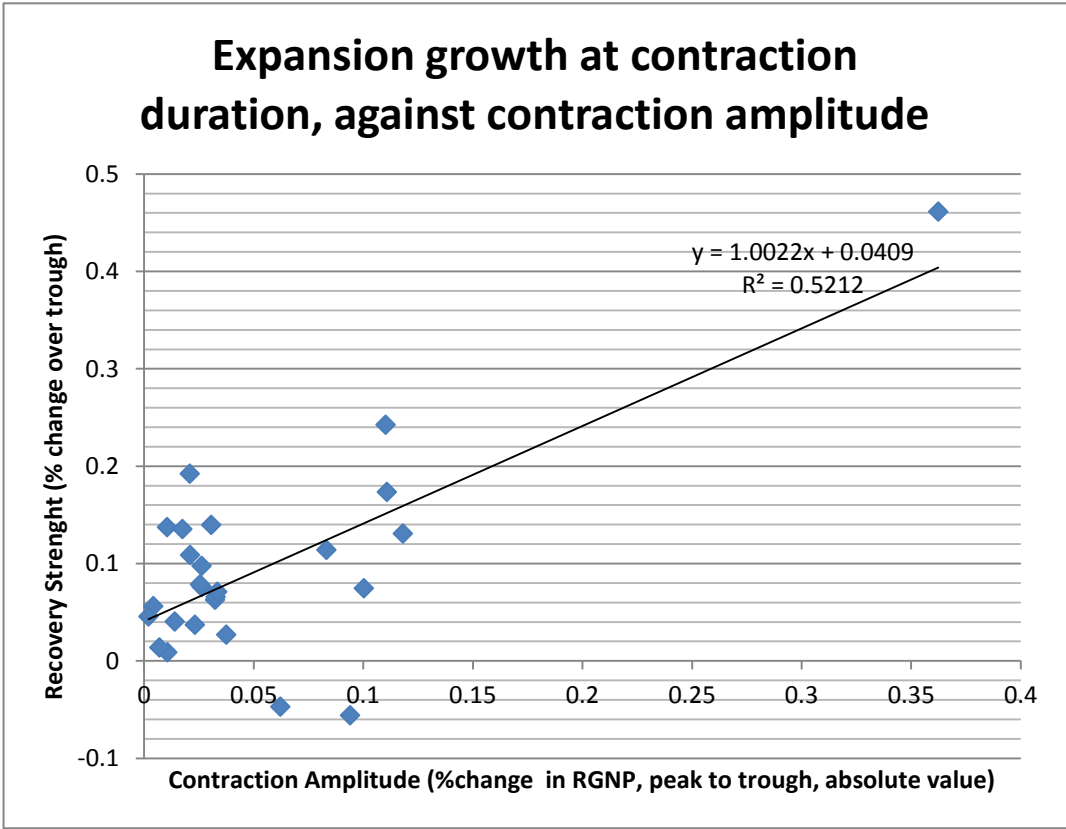
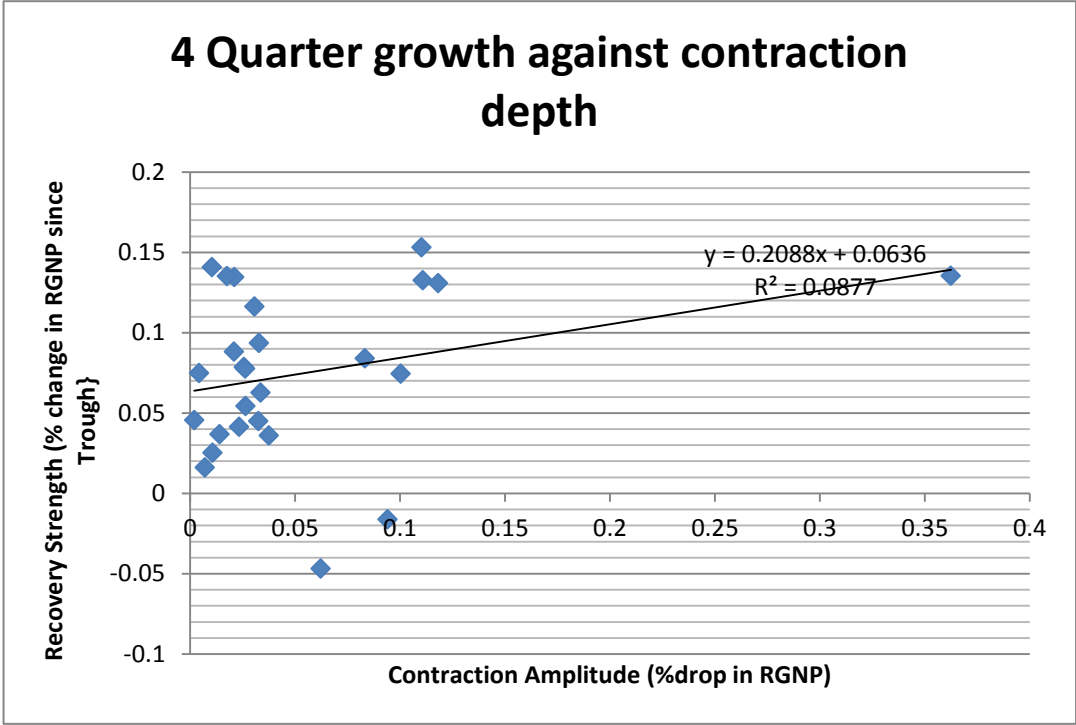
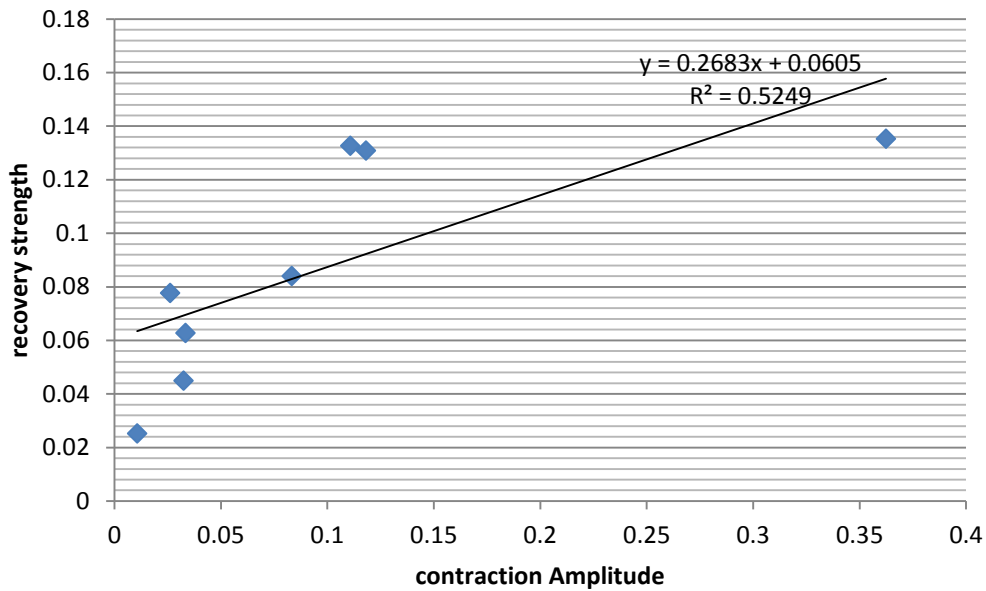


Figure 2: Expansion growth against contraction depth: all cycles.

Recovery against contraction 4 quarters Crisis Cycles



Recovery Strength 4 quarters against contraction amplitude, Noncrisis Cycles

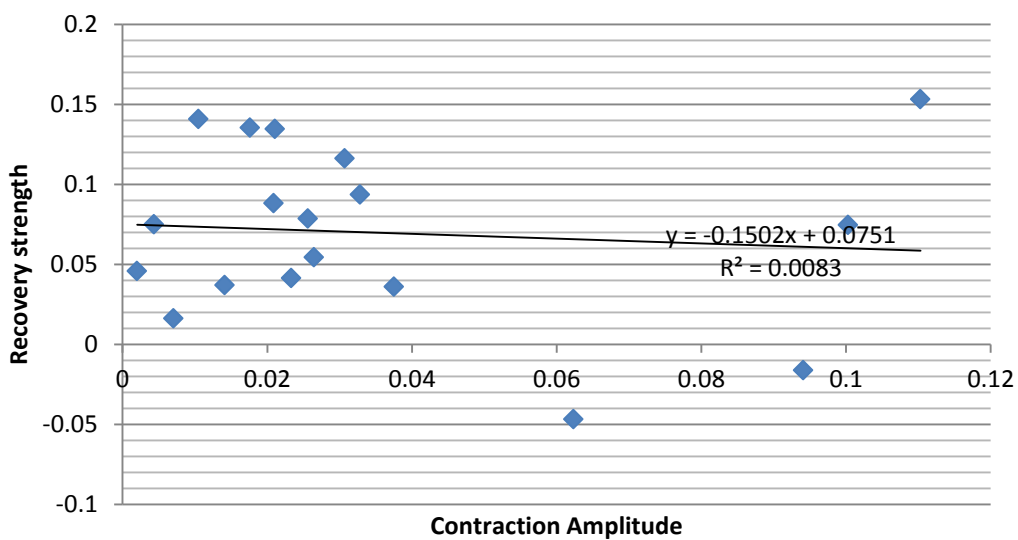


Figure 3. Crisis and Non-Crisis Cycles

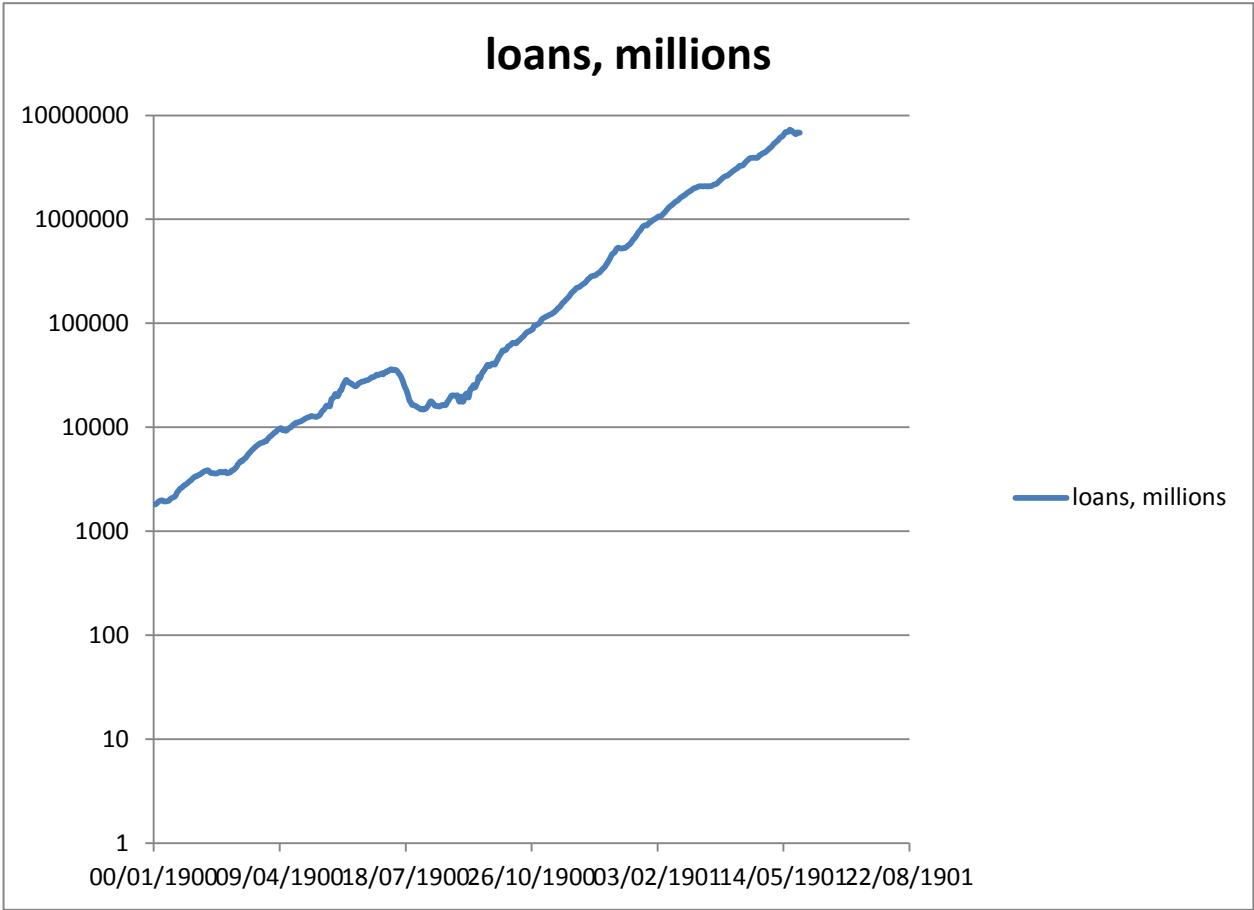


Figure 4: Bank Lending, on a log scale.

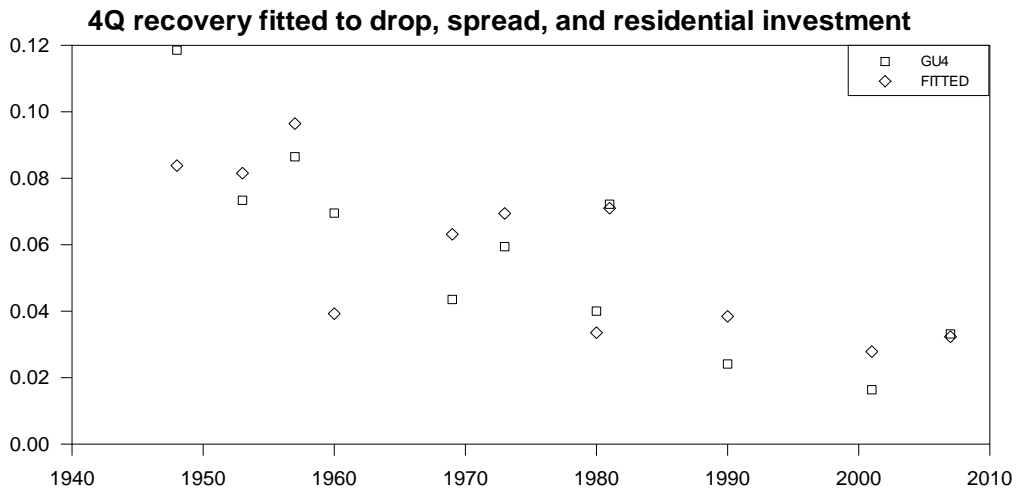
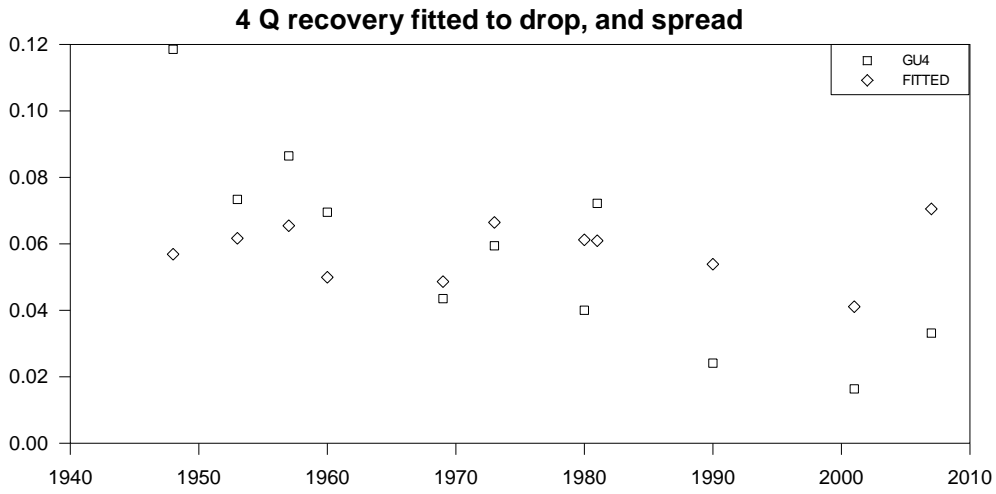
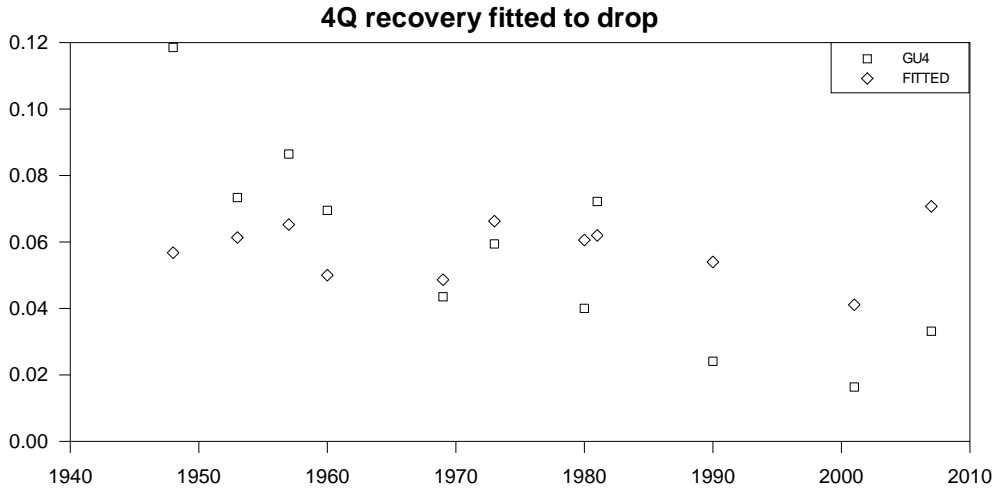


Figure 5: Actual and Fitted values, 4 Q recoveries

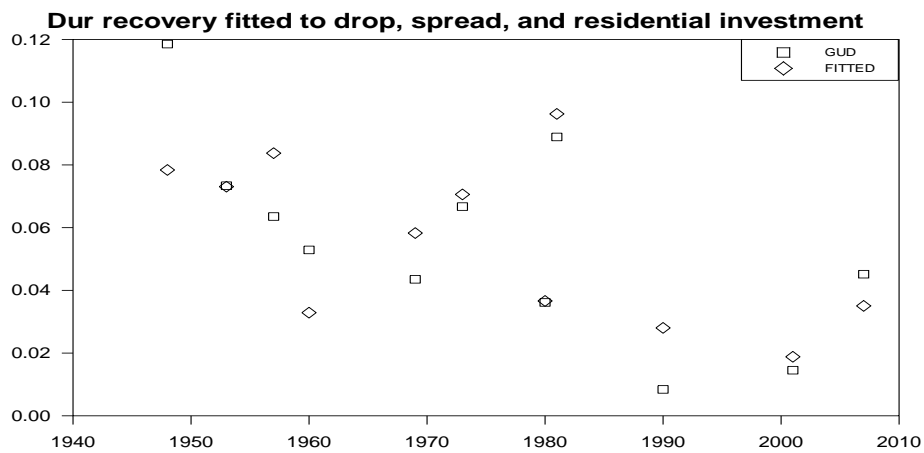
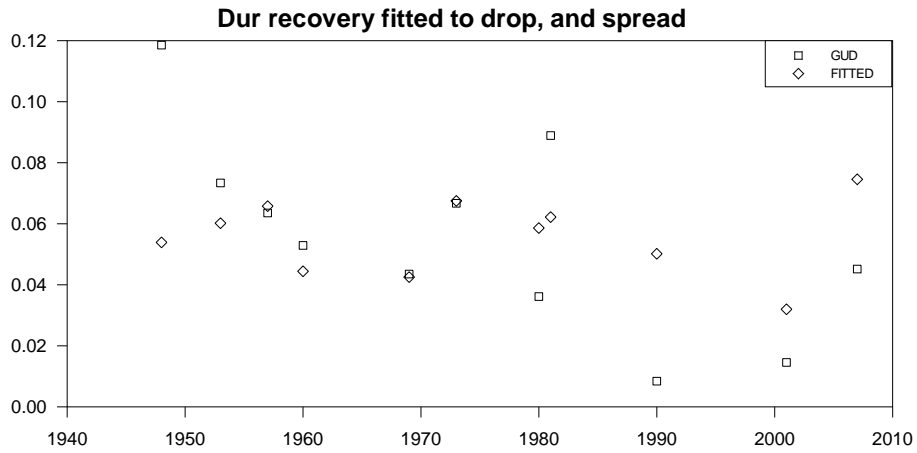
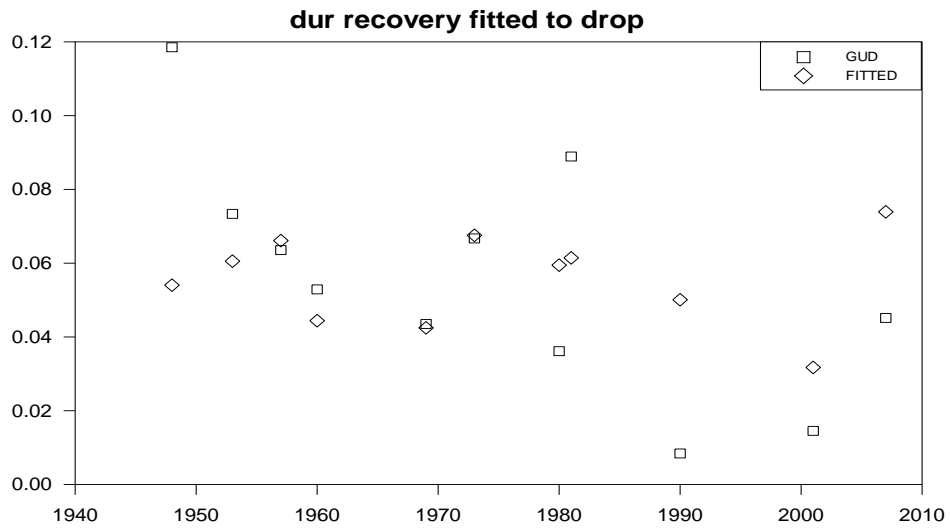


Figure 6: Actual and Fitted Values, Duration Recovery