Stock Market Volatility and Uncertainty Shocks during the Great Depression

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Abstract

Stock market volatility was extremely high during the Great Depression relative to any other period in American history. At the same time, large negative and positive discontinuous jumps in stock returns can be detected using the Barndorff-Nielsen and Shephard (2004) test for jumps in financial time-series. These jumps coincided with periods when stock volatility was high as the arrival of new information about the uncertain future drove both the record stock volatility and the record jumps in stock returns. A timeline of the Depression is outlined, with important events that drove uncertainty highlighted such as the collapse of the banking system, policy changes, the breakdown of the gold standard, monetary policy uncertainty, and war jitters. I do not find that the New Deal was a major driver of uncertainty as stock jumps and volatility were low, but that banking failures, the breakdown of the gold standard, and monetary uncertainty were significant factors in generating both uncertainty, stock return jumps and return volatility.

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I. Introduction

The Great Depression was a superlative period in American history, with record output declines, record unemployment, and economic weakness which persisted for over a decade. With the benefit of hindsight it may seem clear that the Great Depression was a temporary aberration for an American economy which has seen persistent growth throughout its recorded economic history. Those that lived through the Depression however,[1] experienced unprecedented uncertainty shocks, including a major banking and financial crisis, uncertainty monetary policies, an uncertain international monetary system based on the gold standard, and major government policy changes. I outline major events by examining the historical record that could plausibly have driven uncertainty. As stock prices are based on expectations of future profitability, increased uncertainty about future profitably should generate higher stock volatility. I tie these events to stock volatility, which was high at the same time as many uncertainty shocks were buffeting the American economy.

The 1930s in the United States saw volatility in equity prices which was unprecedented in both magnitude and persistence, as shown by Officer (1973) and Schwert (1990). This volatility was not just a series of steady declines in equities as the 1930s saw both some of the largest positive and negative returns in U.S. history, which can be clearly seen in Table I. Figure 1 shows the behavior of stock volatility over this period with the record stock volatility of the Great Depression appearing as shaded rectangles. Real GDP, the GDP deflator, and total employment are plotted in Figure 2, and all variables fall during the 1929-1933 and 1937-1938 recession and are flat or rising otherwise. Figure 3 show the volatility over the entire 1929-1941 period, where we can see that the period of most rapid decline in output and prices are also times when stock volatility is high, while times when output is rising are times that stock volatility is low or falling.

[1] Cogley and Sargent (2008) show that the Great Depression is a watershed for equity markets, with the Sharpe ratio, a market price of risk, being permanently higher after the Depression.

An uncertainty shock is an increase in the dispersion of expected future outcomes. In a financial context, this can be either uncertainty over future profitability or in determinants of future discount rates, both of which will appear as increase stock volatility. Dixit and Pindyck and their coauthors have produced an extensive literature on investment under uncertainty.[2] In general in these models, firms face uncertainty over revenue and costs when making an irreversible investment. As some future states of the world can be characterized by low profits, firms delay investment (McDonald and Siegel, 1986). I follow Schwert's characterization of stock market volatility as directly reflecting economic uncertainty: "[T]he volatility of stock returns reflects uncertainty about future cash flows and discount rates, or uncertainty about the process generating future cash flows and discount rates" (Schwert, 1990, p. 85). But it is not simply the case that this volatility is driven by a smooth process of regular increases or decreases in returns. New information, or "news"[3] about uncertainty arrives periodically, and this drives discontinuous jumps in stock returns that can be observed during uncertainty period, such as the 1930s.

Veronesi (1999) develops a financial model with a regime shift between high and low economic uncertainty which produces significant variation in stock volatility over time. This model provides a theoretical justification for the stylized fact of a high correlation between uncertainty and stock volatility.[4] Following the intuition in Veronesi (1999), I argue that uncertainty shocks will correspond to period of high volatility, as uncertainty over the expected profitability of firms generates high stock volatility. Volatility in discount rates would also generate higher stock volatility, as asset prices are determined jointly by discount rates and expected returns. This theory is both able to explain why stock returns made large

[2]See Pindyck (1991, 1993); Abel et al. (1996); Caballero and Pindyck (1996); Pindyck (1988); Majd and Pindyck (1987); Dixit and Goldman (1970); Dixit (1992, 1993); Dixit and Pindyck (1994).

[3]See the voluminous literature in finance about news and stock returns, of which Maheu and McCurdy (2004) is closely related to this paper.

[4]This also helps explain the excess volatility puzzle of Shiller (1981) where dividend volatility is not sufficient to explain equity price volatility, as Shiller did not consider such regime shifts.

upwards and downward movements as well as explaining the persistently high volatility through uncertainty, as this is a prediction of uncertainty theory. This argument can also hep explaining when the American economy was in recession during these periods, as these uncertainty shocks would have reduced investment and consumption, which fell sharply during the Depression. To confirm the correct identification of uncertainty shocks from the historical record, I use the bipower variation test of Barndorff-Nielsen and Shephard (2006) to show that not only was stock volatility high, but also the level of stock returns were constantly gyrating in large upward and downturn jumps at the same time. One can see some periods with low uncertainty and high volatility, such as the late 1990s, which see both high stock volatility and low jumps, as compared to the 1930s which sees high volatility and many discontinuous jumps, as can be seen in Figures 1 and 5 I then analyze the historical record to show the types of events that could have given rise to high measured uncertainty during the periods when output was falling in the 1930s.

An implication of the theory of investment under uncertainty as in Dixit and Pindyck (1994) is that periods of high uncertainty should cause firms to postpone investment and consumers to postpone consumer durable purchases. As Bernanke (1983) argues, if enough consumers and firms postpone these expenditures, then aggregate expenditures would fall and a recession would result. Both measures of volatility are high during the 1929-1933 and 1937-1938 recessions, which makes it plausible that uncertainty shocks played a role in these declines. This paper examines the historical record of this period to outline a series of events that are candidates for uncertainty shocks, and then matches these events to change in stock returns and stock volatility, as predicted by the theory of investment under uncertainty. Section 1 introduces the paper. Section 2 outlines the test for stock return jumps using bipower variation. Section 3 outlines events in the 1930s though could have driven these large increases in volatility and large increases in extreme jumps in stock returns. Section 4 concludes.

II. Bipower variation

While a Gaussian distribution roughly matches the distribution of stock returns in the data, the distribution of stock returns for the Dow Jones Industrial Average for 1896-2013 deviates significantly from a normal distribution. There remain "fat tails," where the frequency of very large negative downward changes (and to some extent upward changes) in stock returns is larger than would be predicted with a normal distribution. This can clearly be seen in Figure 4, which shows the actual path of stock volatility, and a series of simulated stock volatility for the entire equity sample. The simulation is an artificial series generated with random draws from a normal distribution with the same mean and standard deviation as the actual stock return series. To better model the distribution of stock returns, I will include a series of discontinuous "jumps" which will arrive at a Poisson rate. This jump-diffusion model of stock returns is common in finance, beginning with Merton (1976) and continuing with models like that of Kou (2002). The 1930s, especially during the 1929-1933 Great Collapse period, saw many of the largest declines in the Dow Jones Industrial Average, but this period also saw some of the largest *gains* in Dow history as well. These results are plotted in Table I which shows clearly that this period saw both large downward and upward changes in the stock market. While assuming a Gaussian distribution is convenient, we can both understand the behavior of stock returns as well as how new information about uncertainty affects financial markets by examining discontinuous jumps, which are an important driver of return volatility.

A. Model

To separately identify jumps in the data from large observations of the diffusion part of the data generating process, I use the bipower variation test of Barndorff-Nielsen and Shephard (2006), which identifies jumps in a jump-diffusion time-series. These jump-diffusion processes

combine the standard diffusion process with a jump process as follows:

$$\frac{dY_t}{Y_t} = \mu dt + \sigma_t dW + x dZ \tag{1}$$

This in this continuous-time framework Y is the stock index level, μ as the trend in percent, σ as the standard deviation of changes, and x as the average size of discrete jumps. dW is a standard Brownian motion process, following a Gaussian distribution, and dZ follows a Poisson distribution and has a value of either 0 or 1.

While this model is intuitively appealing and accurate in describing the behavior of stock prices, distinguishing between the diffusion process and the jump process for a given time-series is a non-trivial problem. Aït-Sahalia (2004) and Tauchen and Zhou (2005) outline jump tests, but I will use Barndorff-Nielsen and Shephard's seminal contributions to test bipower variation to test for jumps in time-series data (Barndorff-Nielsen and Shephard, 2006; Barndorff-Nielsen et al., 2006). Define Y_t as the log-price of a stock index, such as the Standard and Poor's 500 Index. Denote Y^c as the continuous portion and define Y^d as the jump term from II.A. Quadratic Variation (QV) is defined as

$$[Y]_t = \text{plim} \sum_{j=0}^{n-1} (Y_{t,j+1} - Y_{t,j})^2 \tag{2}$$

and it is easy to show that $[Y]_t = [Y^c]_t + [Y^d]_t$, with $[Y^d]_t = \sum_{0 \leq g \leq t} \Delta Y_u^2$, and with ΔY_t representing the jumps in Y. The null hypothesis of no jumps is formed by setting [Y]=[Y^c]. While there is a limiting case of continuous time, my dataset uses daily data so I will perform the test with daily returns, defined as $y_t = Y_t - Y_{t-1}$. For daily returns, the bipower variation [1,1] of a time-series over time t is defined as follows:

$$Y_t^{[1,1]} = \sum_{j=2}^{t} |y_{j-1}||y_j| \tag{3}$$

Barndorff-Nielsen and Shephard (2004) show that the above expression can be consistently estimated with

$$[Y]_t - (\mu^{-2})Y_t^{[1,1]},$$

where $\mu = \sqrt{\frac{2}{\pi}}$. The above expression is simply the difference between the bipower variation and the quadratic variation, and will provide the basis for the BNS difference test.

To test for the presence of jumps in a time series, an estimator of integrated quarticity $\int_0^t \sigma_u^4 du$ is required. BNS propose quadpower variation, which is defined as follows:

$$Y_t^{[1,1,1,1]} = \sum_{j=4}^{t} |y_{j-3}||y_{j-2}||y_{j-1}||y_j| \tag{4}$$

The BNS difference test statistic has the following asymptotic distribution for daily returns.[5]

$$\hat{D} = \frac{(\mu^{-2}\{Y\}_t^{[1,1]} - [Y]_t)}{\sqrt{\theta\mu^{-4}\{Y\}_t^{[1,1,1,1]}}} \rightarrow^L N(0,1) \tag{5}$$

There is also a ratio test that measures the ratio of quadratic variation to bipower variation.

$$\frac{\{Y\}_t^{[1,1]}}{\sqrt{\theta\{Y\}_t^{[1,1]}}} \left(\frac{\mu^{-2}\{Y\}_t^{[1,1]}}{[Y]_t} - 1 \right) \rightarrow^L N(0,1) \tag{6}$$

I display the bipower and quadratic variation measure for 1896-2013 in Figure 5 and for just the Depression period in Figure 6. One can see that the quadratic variation measure is generally larger than the bipower variation measure, especially when the former is larger. I use the BNS difference test to determine jumps, so the difference between quadratic and bipower variation is plotted for the entire period in Figure 7, where the Depression period clearly appears as a period of significant and persistent jumps. Notice that this test statistic

[5]Note that $\theta = (\pi^2/4) + \pi - 5$.

will appear as a large value for both upward and downward jumps, so both negative and positive jumps are evidence of jumps in the series.

Table II shows the 20 largest jumps in Dow history, with those occurring in the recession period of 1929-1933 in bold. One can see that jumps predominate in the Great Contraction with uncertain events largely driving these jumps, both upward and downward. Other events that see very large jumps are the 1987 Crash and the very uncertain period of October 2008 as the financial crisis reached its worst phase, as well as during the 1937 recession and bad news related to the First World War.

B. Results

I perform both the BNS difference test as well as the BNS ratio test using daily return data from the Dow Jones Industrial Average from 1896-2013.[6] The tests yield very small p-values, so I can reject the null hypothesis of no jumps in the series for both the entire sample of 1896-2013 as well as the 1929-1941 Great Depression period. For the BNS difference test, I obtain a Z-value of -6.43 for the entire period, and -3.22 for the Great Depression, with both p-values significant at the 0.1% level. For the BNS ratio test, I obtain a Z-value of -3.224664 for the entire sample and a Z-value of -2.817148 for the Great Depression, with both tests recommending rejection at a 1% level. Thus the BNS tests clearly point to the existence of jumps. Bloom (2009) also performs the BNS difference and ratio tests, and finds support for jumps in return for the postwar as I do for the interwar period. I also display in Figure 8 the percent of the month that features "high jumps," which I define to be in the 95th percentile of jumps over the entire period. It is easy to see that the period with many jumps is also the period when stock volatility is high, which is consistent with the uncertainty hypothesis where stock prices should exhibit large returns jumps and high

[6] I have removed the observations from the closure of the NYSE during World War 1 and for the 1987 October Crash as these are outliers.

stock volatility during uncertainty periods. Recession periods are also indicated, which are contemporaneous with the periods of high jumps which is consistent with uncertainty shocks generating both the discontinuous jumps and these sharp recessions.

III. Uncertainty Shocks: 1929-1941

Bloom (2009) points to major uncertainty shock events in the post-war era where coincided with major stock volatility and significant uncertainty such as the Cuban missile crisis, the assassination of JFK, the Gulf War, the Asian Financial Crisis, 9/11, and the 2008 financial crisis. In a related paper, Charles and Darné (2014) identify large shocks in the volatility of the Dow Jones Industrial Average from 1928 to 2013 and, similarly, find that both the 1929-1934 and 1937-1938 periods see elevated return volatility. Moreover, these use a similar narrative approach to match large jumps to particular events, though they do not make the explicit connection to uncertainty and do not analyze some lower frequency increases in uncertainty such as banking failures and the possibility of an end to the capitalist system. I construct a timeline of Depression uncertainty shock events in the same vein as these authors as can be seen in Figure 10. I describe how uncertainty can be viewed as a channel through which events like banking failures and the breakdown in the gold standard can affect the broader economy. Concurrently, major theories of the Depression are mentioned for each phase of the Great Depression, which is split into relevant phases. All the events are listed in Table III with a corresponding classification of the uncertainty shock type, and many of these events are shown in Figures 9-12, which match these events to large jumps and stock volatility during the 1929-1941 Great Depression.

A. Prelude and Early Stages

The roots of the crisis of 1929 can be found in the economic and asset boom that preceded the crash. In order to combat stock market speculation and a stock market bubble, the Federal Reserve raised discount rates to combat excessive purchases of stock on margin and to prevent the economy from overheating (Eichengreen, 1996). While this event slowed output growth, its effect were debated for a long period at the Fed and the discount rates were relatively well communicated relative to other monetary policy at the interwar Fed. This tightening was felt first not in the United States where it originated, but instead in countries most sensitive to transmission of the credit channel. These countries included agricultural exporters in Latin America and Eastern Europe, as well as Germany which suffered from both tighter credit conditions and higher interest rates on its reparations debt (Kindleberger, 1986). The United States eventually did experience a mild downturn, as the peak of industrial production and the official start of the recession can be dated to the summer of 1929.[7] Up to this point, I see no role for uncertainty as an explanatory factor in the nascent disaster. Monetary tightening, as outlined in Hamilton (1987), is sufficient to explain the mild decline in economic activity.

Likely due to the unsustainable rise of securities prices between 1928-1929, stocks crashed significantly in October 1929 in one the largest financial routs in American history, and the character of the downturn changed significantly. However, while the recession seemed to be mild to observers at the time, the Great Crash of 1929 would fundamentally change the nature of the downturn, as Friedman and Schwartz argue: "During the two months from August 1929 to the crash, production, wholesale prices, and personal income fell at annual rates of 20 per cent, 7.5 per cent, and 5 per cent, by October respectively. In the next twelve months, all three series fell at appreciably higher rates: 27 per cent, 13.5 per cent, and 17

[7] While the stock market crash looms large in popular accounts of the Depression, it is clear that the Great Crash occurred with a recession already underway.

per cent, respectively. All told, by October 1930, production had fallen 26 per cent, prices, 14 per cent, and personal income, 16 per cent. ... Even if the contraction had come to an end in late 1930 or early 1931, as it might have done in the absence of the monetary collapse that was to ensue, it would have ranked as one of the most severe contractions on record." (Friedman and Schwartz, 1971, p. 306)

Friedman and Schwartz are well known for their monetarist explanation for the Great Depression. But one, perhaps underappreciated, aspect of their argument is that central told that uncertainty plays a central role in their monetary theory of the Depression. Friedman and Schwartz argue, as Romer does, that uncertainty was a direct result of the Great Crash of 1929. "Partly, no doubt, the stock market crash was a symptom of the underlying forces making for a severe contraction in economic activity. But partly also, its occurrence must have helped to deepen the contraction. It changed the atmosphere within which businessmen and others were making their plans, and spread uncertainty where dazzling hopes of a new era had prevailed. It is commonly believed that it reduced the willingness of both consumers and business enterprises to spend, ..." (Friedman and Schwartz, 1971, p.306). Romer (1990) examined contemporary business forecaster which became markedly more uncertain after the Crash. While monetary factors were likely another trigger of the price collapse, the Great Crash generated a sense of uncertainty among businesses and consumers. The Stock Crash itself was a major uncertainty event, but a pervasive sense of uncertainty would not set in until the banking crises of later years. After October 1929 stock volatility and return jumps fall significantly, so that these uncertainty measures are low by early 1930. However, the largest declines in the DJIA in U.S. history (outside of the 1987 crash[8] occur on October 28th[9], 29th, and November 6th with declines of 12.82 %, 11.73 %, and 9.92% respectively. While we we often think about the Great Crash as a single day's decline, it actually saw

[8]See Table I.

[9]This date appears as the second highest jump according to the BNS test statistic, behind the 1987 crash.

several days of extreme jumps. Also, the third largest increase in Dow Jones history occurred on October 31st when some investors purchased stocks in a wave of optimism.[10].

B. Great Contraction: 1930-1933

B.1. Euphoria and Dissapointment

Several events that generated euphoria and disappointment are evident in both Table I of the largest daily returns, as well as in Table II of the largest jumps in Dow history.[11] On November 14th, 1929, a discount rate cut by the New York Federal Reserve from 5% to 4.5% sparks optimism that the Crash of the month before would not last (Friedman and Schwartz, 1971, p. 367) and led to a 10 percent increase in the Dow. On October 6th, 1931 the Dow Jones surged higher by over 12 percent which appears as the 5th highest jump in U.S. history, despite coming in the wake of the UK departure from the gold standard and another wave of banking failures that resulted from the monetary tightening necessary for the United States to remain on the gold standard. On that date, Hoover outlined a plan for a banking coalition to improve confidence in the banking system (Hoover, 1931). On February 11th, 1932, the resignation of Hoover's liquidationist [12] Treasury Secretary, Andrew Mellon, generated a wave of optimism that the economy would improve as a result of his resignation, which caused a large jump in stocks and the 9th largest jump in U.S. history. On August 3rd, 1932, the Dow rose almost ten percent on the news that GM would pay a dividend again after a long suspension, which pointed to some expectations of recovery. On August 12th, 1932, the DJIA fell by over 8 percent after Herbert Hoover accepted to be the Republican

[10] An optimism that these investors would likely regret as the stock market fell.

[11] These events are identified using newspaper accounts of the time, from Charles and Darné (2014), or from

[12] Mellon famously stated that his preferred policy response to the Great Depression was to "liquidate labor, liquidate stocks, liquidate farmers, liquidate real estate... it will purge the rottenness out of the system. High costs of living and high living will come down. People will work harder, live a more moral life. Values will be adjusted, and enterprising people will pick up from less competent people. " (Hoover, 1952)

nominee in 1932, with the prospect that his ineffective policies would continue. On June 10th, 1932 Congressman Louis McFadden gave a speech that blamed the Federal Reserve and Wall Street for the Depression which meant the prospect of increased regulation and scrutiny of the financial system. On September 21st, 1932, the Dow Jones rose by over 11 percent which appears as the 8th largest jump, on the news that the Reconstruction Trust Finance Corporation, a government agency meant to support the banking system, would support agriculture as well. The largest daily return (an increase of 15.34%) occurred on March 15th, 1933 when the Emergency Banking Act and the Bank Holiday ended which meant that only solvent banks remained. This decisively ended the banking panics of the early 1930s and meant a major upward revision of the outlook for the future (Friedman and Schwartz, 1971).[13]

B.2. Banking Failures

Wicker (2001) identifies 4 major periods of banking crises which largely line up with the banking crises of Friedman and Schwartz (1971). These banking crises took place from November-December 1930, April-August 1931, September-October 1931, and June-July 1932.[14] It is intuitive that large scale bank failures would reduce confidence about the future. Bank runs and uncertainty about whether one's life savings will be safe could only add to existing uncertainty. Friedman and Schwartz argued that the increase in uncertainty in the 1930s could explain the decline in monetary velocity. In this theory, economic agents would hold money due to a "precautionary savings" effect, which is quite similar to a real-option effect due to uncertainty at the firm level. "Other things being the same, it is highly plausible that the fraction of their assets individuals and business enterprises wish to hold in the form of money, and also in the form of close substitutes for money, will be smaller when they look forward

[13] This appears as the third highest jump in the BNS difference series, behind the Great Crash.

[14] A fifth crisis from February-March 1933 was considered somewhat differently by Wicker as there were no banking failures due to the bank holiday.

to a period of stable economic conditions than when they anticipate disturbed and uncertain conditions. ... The more uncertain the future, the greater the value of such flexibility and hence the greater the demand for money is likely to be." (Friedman and Schwartz, 1971, p. 673)

Thus we have another channel whereby uncertainty can reduce aggregate demand, through a monetary channel in this case. "The contraction instilled instead an exaggerated fear of continued economic instability, of the danger of stagnation, of the possibility of recurrent unemployment. The result, from this point of view, was a sharp increase in the demand for money, accounting for the magnitude of the decline in velocity from 1929 to 1932." (Friedman and Schwartz, 1971, p.673) Cole and Ohanian (2001) finds that the banking collapse was not a major factor in the decline of output from 1929-1933, as only 0.4% of banking deposits were lost from 1930-1932, which was similar ratio as for the 1920-1921 recession. Also, Cole and Ohanian (2001) are not able to generate a significant decline in output as a result of banking failures from their general equilibrium model. However, while the direct effect of these banking failures may not be that large, the uncertainty effect of banking failures of household behavior could still be sizeable, as uncertainty over potential banking failures caused households to pull their money out of banks and reduced monetary velocity. Thus the Friedman-Schwartz monetary hypothesis can be seen through an uncertainty lens where the sharp decline in velocity is due, in large part, to these uncertainty shocks. Both jumps and stock volatility are large and persistent during these periods, compounding the uncertainty effect of the rampant banking failures.

B.3. Smoot-Hawley tariff

While tariffs did rise astronomically in the wake of the Smoot-Hawley Tariff, the direct impact was clearly too small to have been a significant determinant of the enormity of the Great Depression (Eichengreen, 1988). However, this tariff could have a significant

uncertainty effect. Archibald and Feldman (1998) argue that uncertainty surrounding the Smoot-Hawley tariff adversely affected the American economy. Indeed, there is a spike in stock volatility during June 1930 when the Smoot Hawley tariff was signed into law. Also, the extent of retaliation with American trading partners was uncertain: Would other countries raise tariffs on American products? Canadian tariffs did rise significantly over this period in retaliation. Elsewhere nominal tariffs rose quickly, and volatile and unpredictable deflation made real tariff rates uncertain (Hamilton, 1992). While the Smoot-Hawley tariff was not a large uncertainty event on its own, it is plausible that this major policy change increased uncertainty. Indeed, the Dow Jones Industrial Average fell by 6% on June 16th when passage of the Smoot-Hawley Tariff was assured.

B.4. Gold Standard

While in hindsight it is now clear that the end of the gold standard was needed for recovery (Eichengreen, 1996), at the time the "gold standard mentality" was prevalent (Mouré, 2002). Countries experiencing currency attacks might be forced off the gold standard, as the United Kingdom was in September 1931. We can see in Figure 9 that volatility spikes during this month. It was unclear whether the British departure would drive the United States to leave the gold standard as well. As to gold outflows to England the money supply in the United States fell significantly and a financial and banking crisis resulted predictably. In response the Fed raised interest rates to preserve the gold standard, though of course this further worsened the negative effects of the financial crisis. Ferderer and Zalewski (1999) find that uncertainty propagated the Great Depression as doubts about a country's commitment of the gold standard lead to interest rate volatility, which then caused output declines as a result. This channel could clearly be operative in this case as well, so there are several ways that uncertainty could generate output declines in this period.

B.5. Political Threats

The Great Depression brought widespread hunger and unemployment, so it is perhaps unsurprising that support for radical policies grew. A Roman Catholic priest, James Cox, led 25,000 unemployed Pennsylvanians on a march on Washington in January 1932 to push for increased relief for the unemployed and stronger labor unions. This was a prelude for the much larger Bonus army marches of the spring and summer. Veterans of World War I were promised, through 1924 legislation, a Veteran's Bonus to be paid in 1945. Widespread unemployment and poverty among veterans during the 1930s drove a push by veterans' groups for the Bonus to be paid early, and some 17,000 veterans and their families went to Washington to lobby the government. Media reports reported that the veterans groups were largely composed of communists and criminals. General MacArthur saw the marchers as revolutionaries intent on overthrowing the Republic, a sentiment to which Patrick J. Hurley, the Secretary of War, enthusiastically agreed (Lisio, 1967).

While these sentiments may have been overblown, the perceived probability of violence and radicalism among well-trained veterans in the heart of the nation's capital could not but generate a sense of uncertainty. Figure 9 show the major events of the Bonus army, culminating in the July 28th eviction of the Bonus Army. This eviction began with two marchers being killed by police. As the crisis intensified, MacArthur commanded a tank column, ordering a cavalry charge and infantry armed with bayonet and vomiting gas disbursing the veterans (Dickson and Allen, 2006).[15] Later in 1932, on October 5th, 1932, the Minnehaha County Farmers' Holiday Association, a farmer's organization, blocked roads in Sioux Falls in protest of low farms prices. Their blockade was part of a supply-side boycott of farmers refusing to sell their farm products until prices rose, to protest supposed over-supply. These Farm Holiday Associations threatened significant rural unrest, in keeping with the general

[15]The veterans would eventually receive their bonus in 1936 when Congress passed a Bonus bill over President Roosevelt's veto.

instability of the time, and this event coincided with a major jump in the Dow Index.

C. 1933

Uncertainty resulting from the gold standard's future was discussed in the context of the British departure from gold in 1931. Friedman and Schwartz also saw significant uncertainty in 1933 regarding the status of the gold standard in the United States under a Roosevelt administration: "The rumors about gold were only one part of the general uncertainty during the interregnum about future financial and economic policy. Under ordinary circumstances, it would have been doubtful that such rumors and such uncertainty would be a major force accounting for so dramatic and widespread a financial panic. But these were not ordinary circumstances. The uncertainty came after more than two years of banking difficulties in which one wave of bank failures had followed another and had left the banking system in a particularly vulnerable position. The Federal Reserve itself participated in the general atmosphere of panic. Once the panic started, it fed on itself."(Friedman and Schwartz, 1971, p. 332)

Roosevelt did not initially have a clear position on the status of the gold standard, so there was some uncertainty over his potential gold standard policies. This uncertainty can be seen during FDR's inauguration (March 1933), Executive Order 6102 which forced the sale of private gold holdings to the government (April 1933), and the Gold Reserve Act (January 1934) which set gold's price at $35 an ounce.[16] The gold price floated between March 1933 and January 1934, which is the same period as when stock volatility remains high, so this could be due to lingering uncertainty over the gold standard prior to the repegging of the dollar at therate of $35 per troy ounce. The Gold Reserve Act also set up an Exchange Stabilization Fund which purchased gold in exchange for freshly created money, which put in place a more clearly expansionary monetary policy (Wicker, 1971).

[16] $35 an ounce would remain the price of gold until the end of the Bretton Woods system in the 1970s.

For Friedman and Schwartz, monetary policy can work better if it is not impeded by the negative impacts of uncertainty. "After three years of economic contraction, there must have been as many forces in the economy making for revival, and it is reasonable that they could more readily come to fruition in a favorable monetary setting than in the midst of continued financial uncertainty." (Friedman and Schwartz, 1971, p. 324) While this study does not address the interaction between uncertainty and monetary policy effectiveness, Vavra (2013) and Bloom et al. (2007) found monetary policy was less effective during volatile or uncertain times, confirming Friedman and Schwartz's intuition. This lingering uncertainty at the beginning of the recovery can help explain why recovery was not more rapid given the sharp change in monetary policy from contractionary to expansionary. Other policies, like the NIRA, represented major departures from existing policy and significant interventions in the American economy of the time (Cole and Ohanian, 1999).

D. After 1933

The 1930s were a time of low support for existing political and economic frameworks. With widespread hunger and unemployment, it is perhaps unsurprising that support for radical policies and actions rose which made business uncertainty about its future prospects. Merton (1985)[p. 1185] also argued that there was significant uncertainty about the survival of capitalism: "With the benefit of hindsight, we know that the U.S. and world economies came out of the Depression quite well. At the time, however, investors could not have had such confident expectations."[17] Voth (2002) found that stock volatility and uncertainty rose during waves of strikes and other political uncertainty in Europe where the threats of upheaval and violence were tragically realized. The Roosevelt administration was well aware of the threats of upheaval they faced. FDR remarked to John Nance Garner, his vice-president, on the way to his inauguration: "I had better be a good president or I will

[17] cited in Voth (2002)[p. 2]

be the last one"(Cowley, 1981, p. 152) Other observers thought along similar lines: "Before March 4th, America was in a state of extreme shock. No one would ever know, General Hugh S Johnson later said, "how close were we to collapse and revolution. We could have got a dictator a lot easier than Germany got Hitler." "I do not think it is to much to say," wrote Tugwell, "that on March 4 [FDR's inauguration] we were confronted with a choice between an orderly revolution- a peaceful and rapid departure from past concepts- and a violent and disorderly overthrow of the whole capitalist structure." (Schlesinger, 2003b, p. 22) This was not idle speculation. General Smedley Butler, who had been active with the Bonus Army, would later be approached by a group of executives and conservatives opposed to Roosevelt. The "Business Plot" was to have Butler lead a veterans' group in overthrowing Roosevelt and imposing a authoritarian government more favorable to opponents of the New Deal. While this plan was largely ridiculed at the time and even today, when Butler testified in 1934 an official government investigation found these allegations to be true (Schlesinger, 2003b).

Farmers were also hard-hit by the Depression and this discontent could have easily become violent without a resolution of the crisis. "The seething violence in the farm belt over the winter - the grim mobs fathered to stop foreclosures, the pickets along the highways to prevent produce from being moved to town - made it clear that patience was running out. In January 1933, Edward A. O'Neal, the head of the Farm Bureau Federation, warned a Senate committee: 'Unless something is done for the American farmer we will have revolution in the countryside within less than twelve months.' " (Schlesinger, 2003b, p. 28) While it is difficult to point to specific events where the possibility of regime change was more salient, stock volatility and return jumps are high during the period 1929-1934 when this uncertainty was more salient, and after 1934 when recovery was taking hold and support for existing political and economic structures rose, uncertainty fell as well.

D.1. New Deal Uncertainty

Criticism of Roosevelt was prevalent in the 1930s, as the election of 1932 brought to power an executive and legislative branch that was highly supported of an expanded role of government in the economy. This unprecedented government intervention in the economy was opposed by critics, labeled afterwards as the "Old Right," as moves towards socialism or fascism (Hoover, 1952). Schumpeter argued that the major legislation changes caused uncertainty about the path and effects of government policy. "The subnormal recovery to 1935, the subnormal prosperity to 1937 and the slump after that are easily accounted for by the difficulties incident to the adaptation to a new fiscal policy, new labor legislation and a general change in the attitude of government to private enterprise all of which can be distinguished from the working of the productive apparatus as such. So extensive and rapid a change of the social scene naturally affects productive performance for a time, and so much the most ardent New Dealer must and also can admit. I for one do not see how it would otherwise be possible to account for the fact that this country which had the best chance of recovering quickly was precisely the one to experience the most unsatisfactory recovery." (Schumpeter, [1942] 1994, pp. 6465, emphasis is Schumpeter's) This "regime uncertainty" argument has continued to influence modern scholars. Higgs (1997) argues that the uncertainty regarding private property rights during the Roosevelt administration explains the weak investment seen during the 1930s. As policies were unclear, business did not want to invest given the uncertain future. This is similar to the "wait-and-see" effect discussed earlier. Higgs lists some events that could have generated "regime uncertainty", but this is simply a list of New Deal policies and does not identify more or less important policies. I will focus on major New Deal legislation that had significant implication for the economy, to see if these events acted as uncertainty shocks.[18] Endogeneity may be a concern here as the economic downturn,

[18]Cole and Ohanian (2004) also argue that the New Deal impeded recovery due to its suspension of antitrust laws and support for labor unions, which cartelized output and labor markets. They do not argue for an uncertainty argument specifically, though uncertainty stemming from the New Deal could also be

partially driven by the uncertainty of 1929-1933, played a big role in the New Deal landslide of 1932, and thus the downturn could have generated some uncertainty. However, Baker and Bloom (2013) show that natural disasters, clearly exogeneous events, generate declines in output through the channel of uncertainty, addressing this endogeneity issue, though Bloom (2013) finds that uncertainty is, to some extent, endogeneous.

The first set of polices was the National Industrial Recovery Act (NIRA), which put in place the National Recovery Administration (NRA) in June 1933. This allowed business to collude and set minimum standards for wages and prices. Thousands of pages of codes were printed to regulate almost all aspects of business. Adding to the uncertainty was doubt over the constitutionality of the bill. This uncertainty was resolved in 1935 when the Supreme Court struck down the NIRA in *Schechter Poultry Corp. v. United States*. The ruling of the NIRA unconstitutional on May 27, 1935 would seem to return the American economy to a more familiar regulatory framework. If the regime uncertainty hypothesis were correct, uncertainty, as measured by stock volatility, should decrease as the regulatory regime became more certain. However, no change in stock volatility is observable, though that may be because the NIRA had already stopped being effective months before.[19]

The Wagner Act, which was signed into law on July 5th, 1935, was the high tide for union legislation in American history. This Act constrained employer interference in union activities and encouraged collective bargaining and the right to strike. The number of strikes increased dramatically after the passage of this Act, and it seems plausible that this Act could have increased uncertainty in effected industries. The Revenue Act of 1935 also raised taxes significantly, and was called a "Soak the Rich" tax. By February 1937 the United

detrimental to economic recovery in a similar fashion.

[19]Chicu et al. (2013) find that collusion was significant in the cement industry during the 1933-1935 period, though Taylor and Klein (2008) finds that there was a decline in compliance in 1934, and Krepps (1997) find that industries subject to industry codes did not have higher mark-ups than those not covered by codes. Indeed, Hugh Johnson, NIRA's chief and major supporter, resigned in failure on October 1st, 1934, so serious problems were evident less long before the *de jure* end of the program. (Schlesinger, 2003a, p. 159). In any case, the NIRA was clearly finished for good by 1935.

Auto Worker's Flint strike had succeeded and the union was recognized by General Motors, a major coup for the labor movement. The Social Security Act followed soon after the Wagner Act's passage on August 14, 1935, which was a major expansion of social spending by the federal government and set the stage for vastly higher tax rates. In June 1936 an Undistributed Profits Tax was imposed, which encouraged businesses to distributed profits as dividends instead of retained earnings. By reducing undistributed profits, this tax made bankruptcy much more likely for firms in trouble as they had fewer cash reserves (Hendricks, 1936). In his fireside chat of March 9, 1937 Roosevelt attempted to "pack" the Supreme Court by adding more judges to the court. This was intended to reverse the anti-New Deal rulings the Court had been steadily issuing. This was ultimately unsuccessful, though the attempt was viewed as an overreach by the executive.

These New Deal events are shown in Figures 10 and 12. Other than the NIRA's passage none of these events line up with high volatility and jumps, which was vastly reduced from the volatile period of 1929-1934. While policy uncertainty could absolutely create uncertainty shocks, the evidence doesn't show that policy uncertainty played a large role in the weak recovery. Uncertainty was falling while real GDP growth was growing at record rates while the New Deal was in place, as pointed out by Eggertsson (2010, p.203). Romer (1992) argues that the recovery is not slow, as GDP growth rates were at a record for peacetime. Also, the focus on the potential for an even stronger recovery seems misplaced, as the economy effectively reached its trough in March 1933 when FDR was inaugurated, and record declines in GDP were replaced with record GDP growth rates for peacetime. This paper is the first to both directly address economic uncertainty in the New Deal and to find that the New Deal only generated uncertainty in its early phases through 1934 and not for the rest of the FDR presidency.

D.2. Monetary Uncertainty and Certainty

It is clear that the devaluation of the dollar in 1933 was enormously beneficial to the American economy. The devaluation increased the value of the monetary gold stock, encouraged an inflow of gold from abroad, and caused the price level to shoot up. Romer (1992) finds that the loose monetary policy alone essentially explains the recovery from the Great Depression and Temin and Wigmore (1990) frame this as a major regime change with significant positive consequences. Eggertsson (2008) argues that the devaluation fundamentally changed agents' expectations from deflationary to inflationary, due to both the devaluation and FDR's commitment to reflate the price level back to its 1926 level. According to Eggertson, the administration made this commitment credible by increasing real and nominal spending. Indeed, price-level targeting is a "fool-proof" way to exit a liquidity trap according to Svensson (2001), and the American economy did rapidly exit the liquidity trap after this regime change. While I do not disagree with Eggertson's analysis, this policy change had an effect beyond the direct monetary effect. The more important effect was that the increased credibility and commitment of these expansionary monetary policies vastly reduced uncertainty about future demand and profitability. Both measures of uncertainty shocks (stock volatility and jumps in returns) fell rapidly to more moderate levels from 1933-1937, after being high during the period when monetary policy was uncertain.

However, it is clear that the initial stages, from when the gold standard was suspended during the First Hundred Days, through the new parity of $35 per troy ounce of gold through the Gold Reserve Act of 1934, there was some uncertainty over the future of dollar and of the American gold standard. Lewis W. Douglas, Roosevelt's Director of the Bureau of the Budget, said about the suspension of the gold standard, apparently without hyperbole, "This is the end of Western civilization" (Schlesinger, 2003a, p. 201). Conservatives were concerned that these monetary changes generated much uncertainty which can find some confirmation in the extreme jumps of this period (Schlesinger, 2003a, p. 200).

E. 1937-1941

E.1. Monetary Uncertainty

The recovery of the 30s was not unbroken, as the American economy suffered a second recession between the summer of 1937 and the summer of 1938. The monetarist argument of Friedman and Schwartz (1971) posit that monetary policy switched from being expansionary to being sharply contractionary in 1936-1937 due to a misplaced fear of inflation and that this policy change can explain the 1937-1938 recession. Keynesian critics like Telser (2001) argue that, as the United States was at the zero lower bound, the banking system had significant excess reserves. This meant that increased reserve requirements could be met easily by reclassifying excess reserves as required reserves without restricting lending. Calomiris et al. (2011) and Park and Van Horn (2014) find increases in required reserves increase, while Cargill and Mayer (2006) find otherwise. Eggertsson and Pugsley (2006) argue that there is scope for monetary policy through a non-reserve channel, though they do cite the change in reserve policy and other policies like the Treasury's sterilization of gold as contributing to the downturn. For Eggertsson and Pugsley, FDR had a clear policy of reflation and price-level targeting at the the 1926 price level from 1933-1937. In 1937, FDR was convinced by his advisors that the economy was near recovery. Due to this belief and an inflation rate that was creeping higher, FDR's administration abandoned its commitment to reflation and left policy vague and unclear. By 1938, the administration reversed its stance, and committed itself to its previous policy of reflation and price-level targeting at the 1926 price-level. These policy changes, based on dates outline in Eggertsson and Pugsley (2006), show that policy changes that left policy unclear are associated with return jumps and volatility, while changes in policy that were clearly expansionary and more certain in 1938, are associated with lower volatility. I have noted in Figure 12 the period that Eggertson and Pugsley highlighted as characterizing the "Mistake of 1937," which is also a period when equity returns are very

volatile.

E.2. War Jitters

While the 1937 recession was likely sparked by monetary policy changes and associated monetary uncertainty, events in 1937 through 1939 related to the propect of war in Europe and in the Pacific also generated heightened uncertainty. In retrospect, it may seem that the prospect of war would have been welcome given the record GDP growth of the war years to come. Indeed, the American economy had experienced an economic boom in the late 1910s during the Great War, especially in agriculture bolstered by agricultural exports. However, this boom led to a postwar surge in inflation and ultimately the painful recession of 1920-1921. Sentiment was strongly opposed to foreign entanglements in the 1920s and 1930s, showing that the war was not seen fondly (Lowenthal, 1981).[20] Attacks on American shipping had been one of the triggers for the American declaration of war in 1917, and the Neutrality Acts of the 1930s made the prospects for international trade during the war quite dire. Even if the United States remained neutral during the conflict, it could find itself cut off from export markets. The Neutrality Act of 1937 extended the existing embargo on arms to any warring nations and extending the prohibitions to exclude belligerent ships from U.S. ports. Any trade in non-military material could only occur on a "cash-and-carry" basis, which meant payment had to take place immediately in cash. Any loans to or security exchange with belligerents was also banned (Fellmeth, 1996).

Roosevelt had followed popular sentiment and publicly expressed an aversion to interventionism and supporting neutrality. His famous "I hate war speech" of August 1936 was one of the more forceful examples of this. However, it is clear that he was supportive of the British side and wishes to intervene in Britain and China's favor in the case of armed conflict. In September 1937 Japan bombed major Chinese cities like Shanghai and the War

[20] This can be seen as a revealed preference argument.

in the East began in earnest. In response to this, Roosevelt gave his famous "Quarantine Speech" in October 1937. FDR argued that "a reign of terror and international lawlessness" by the fascists threatened peaceful nations everywhere. If this violence and war did not stop, other peaceful nations would be forced to act and "Quarantine" this threat. As this was not only a change in policy but an unclear one, observers at the time were not sure what to make of this. While FDR had not officially repudiated neutrality, it was clear that he favored the Allies (Maney, 1998, p. 114). On 12 December 1937, the Japanese airforce bombed and sank the U.S.S. Panay in the Nanking harbor. While Japan claimed this was accidental, American flags were clearly visible to Japanese pilots. Later research has found that the attack was order by hardline elements of the Japanese to bring the U.S. officially into the war so that American interests could be expelled from China (Perry, 1969).

Conditions in Europe were worsening by 1937 and 1938 as well. In March 11th and 12th, 1938, German soldiers invaded and annexed Austria into the Reich in the *Anschluss*. Emboldened by Allied weakness, Hitler immediately demanded the Sudetenland from Czechoslovakia. As both the USSR and France (and by extension, potentially the United Kingdom) had treaty commitments to defend Czechoslovakia, tensions were high throughout September 1938. This crisis had the possibility to set off a general war in Europe. Tensions remained high through September 1939 when war in Europe began with the invasion of Poland.[21] Stock volatility fell from 1939 through December 1941, as which point the United States entered the war. This is perhaps because US involvement was fairly certain once the United Kingdom entered the war, though this also points to the importance of monetary certainty after 1938 in driving the final recovery from the Great Depression. In any case, rearmament accelerated recovery and provided certain jobs and profits. Gordon and Krenn (2010) finds that fiscal policy contributed to the recovery after 1939 through rearmament, though it is clear that the economy would have recovered eventually through monetary policy alone as

[21] A string of crucial Nationalist victories in early 1939 appears as a period of large jumps in Table 12.

shown by Romer (1992).

IV. Conclusion

The Great Depression period has been extensively studied by both economists and historians due to its importance both as a macroeconomic event and as a watershed in American history. Previous explanations have focused mainly on monetary, fiscal, or policy related explanations for this unprecedented economic crisis. This paper adds to this previous literature by outlining a history of the 1929-1941 period by outlining major plausible uncertainty shocks in this period. Integrating the well-established connection between stock volatility and uncertainty, and utilizing the Barndorff and Nielsen-Shephard test for bipower variation to identify jumps in returns, this history was connected with economic theory regarding the effect of uncertainty on financial markets. This paper has also made the case that uncertainty shocks can be identified by information from securities markets, and that these uncertainty shocks are concentrated in the recession periods of the 1930s. Not only were prices and output falling during this period, but also we can see uncertainty shock events that correspond with these periods of equity volatility and extreme changes in accordance with theory. I find that, contrary to the existing literature, that New Deal policy changes did not generate large increases in uncertainty, as seen by low levels of both overall stock volatility and low levels of discontinuous jumps. Major drivers of both jumps and return volatility during the 1929-1933 Great Contraction are primarily banking failures, the breakdown of the gold standard, and the the threat of an end to capitalism. While uncertainty plays a smaller role in 1938, monetary uncertainty and war jitters help explain this uncertain recessionary period as well. The Great Depression was an uncertain period, which can be seen in large and persistent disturbances to equity markets as well as in the economic collapse of that period.

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Appendix

Table I: Daily Percent Increases or Decreases in Dow Index: 1896-2013

	Increases			**Decreases**	
Rank	Date	% Change	Rank	Date	% Change
(1)	**3/15/1933**	**+15.34**	(1)	10/19/1987	−22.61
(2)	**10/6/1931**	**+14.87**	(2)	**10/28/1929**	**−12.82**
(3)	**10/31/1929**	**+12.34**	(3)	**10/29/1929**	**−11.73**
(4)	**9/21/1932**	**+11.36**	(4)	**11/6/1929**	**−9.92**
(5)	10/13/2008	+11.08	(5)	12/18/1899	−8.72
(6)	10/28/2008	+10.88	(6)	**8/12/1932**	**−8.40**
(7)	10/21/1987	+10.15	(7)	3/14/1907	−8.29
(8)	**8/3/1932**	**+9.52**	(8)	10/26/1987	−8.04
(9)	**2/11/1932**	**+9.47**	(9)	10/15/2008	−7.87
(10)	**11/14/1929**	**+9.36**	(10)	7/21/1933	−7.84

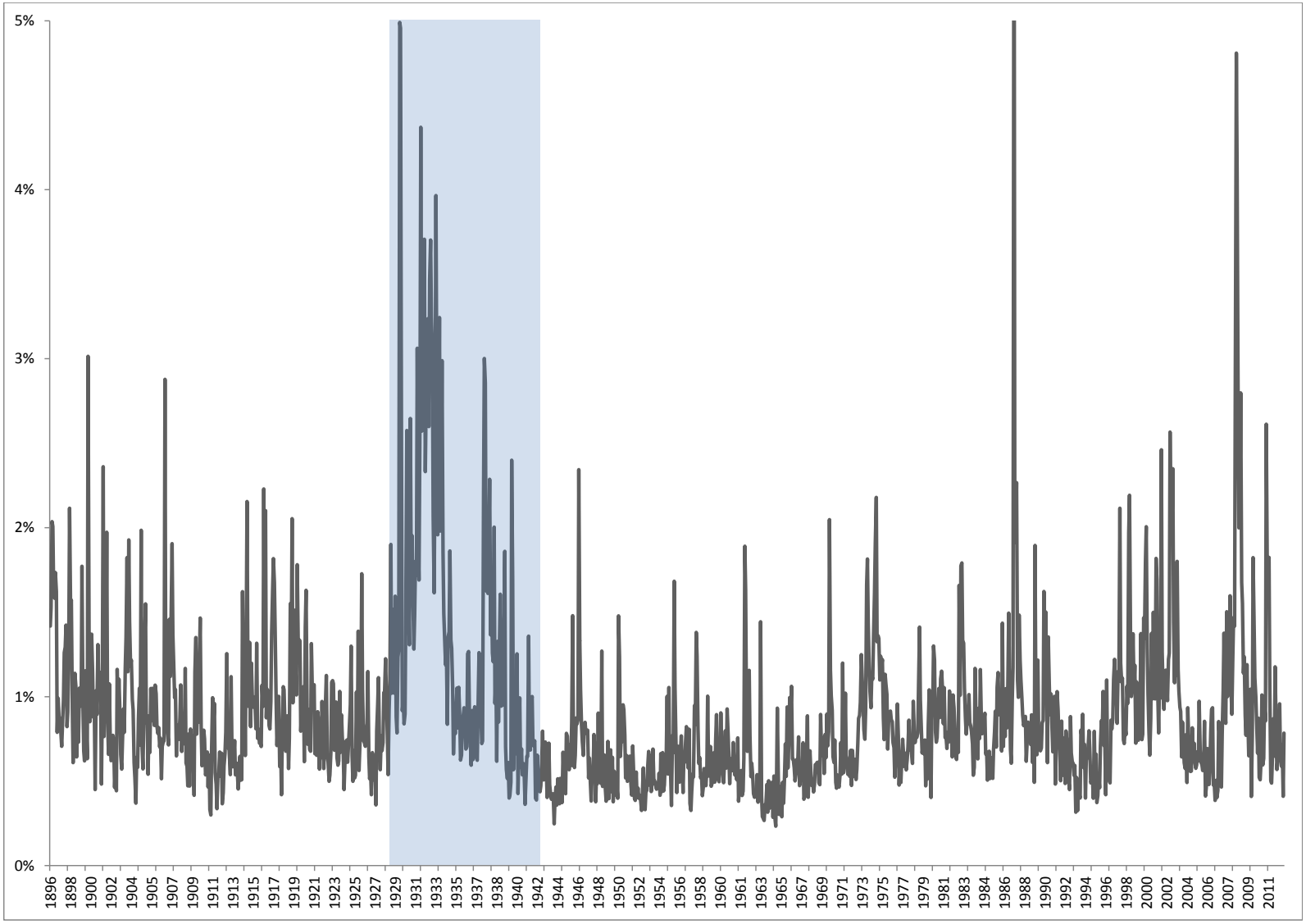
Notes: Dates in bold indicate occurrence during 1929-1933 Recession when Real GDP fell by about 30%

Table II: 20 Largest Jumps as measured by BNS jump test statistic: 1896-2013

Rank	Date	BNS Jump	Reason
(1)	10/19/1987	0.054	1987 Crash
(2)	**10/28/1929**	**0.018**	**1929 Crash**
(3)	**3/15/1933**	**0.017**	**Emergency Banking Act**
(4)	**10/6/1931**	**0.009**	**Hoover Bank Plan**
(5)	10/13/2008	0.009	Bank Bailout
(6)	10/28/2008	0.008	Monetary Stimulus Announced
(7)	**9/21/1932**	**0.008**	**RFC to aid farmers**
(8)	**2/11/1932**	**0.007**	**Treasury Secretary Mellon resigns**
(9)	**8/12/1932**	**0.007**	**Hoover accepts Republican presidential nomination**
(10)	10/26/1987	0.007	1987 post-crash
(11)	**5/6/1932**	**0.006**	**Major Insurance Merger**
(12)	10/15/2008	0.006	Gov't buys bank shares/surprise negative economic reports
(13)	10/18/1937	0.006	Surprise negative economic reports
(14)	**04/19/1933**	**0.006**	**USA leaves Gold Standard**
(15)	**06/10/1932**	**0.006**	**Congressman McFadden speech blasts Fed for Depression**
(16)	12/01/2008	0.005	NBER declares recession
(17)	09/17/2008	0.005	Post-9/11 jitters
(18)	09/17/2008	0.005	AIG baillout
(19)	**10/05/1932**	**0.005**	**Farmer road blockade/Protest of low food prices**
(20)	02/01/1917	0.005	Germany resumes unrestricted submarine warfare

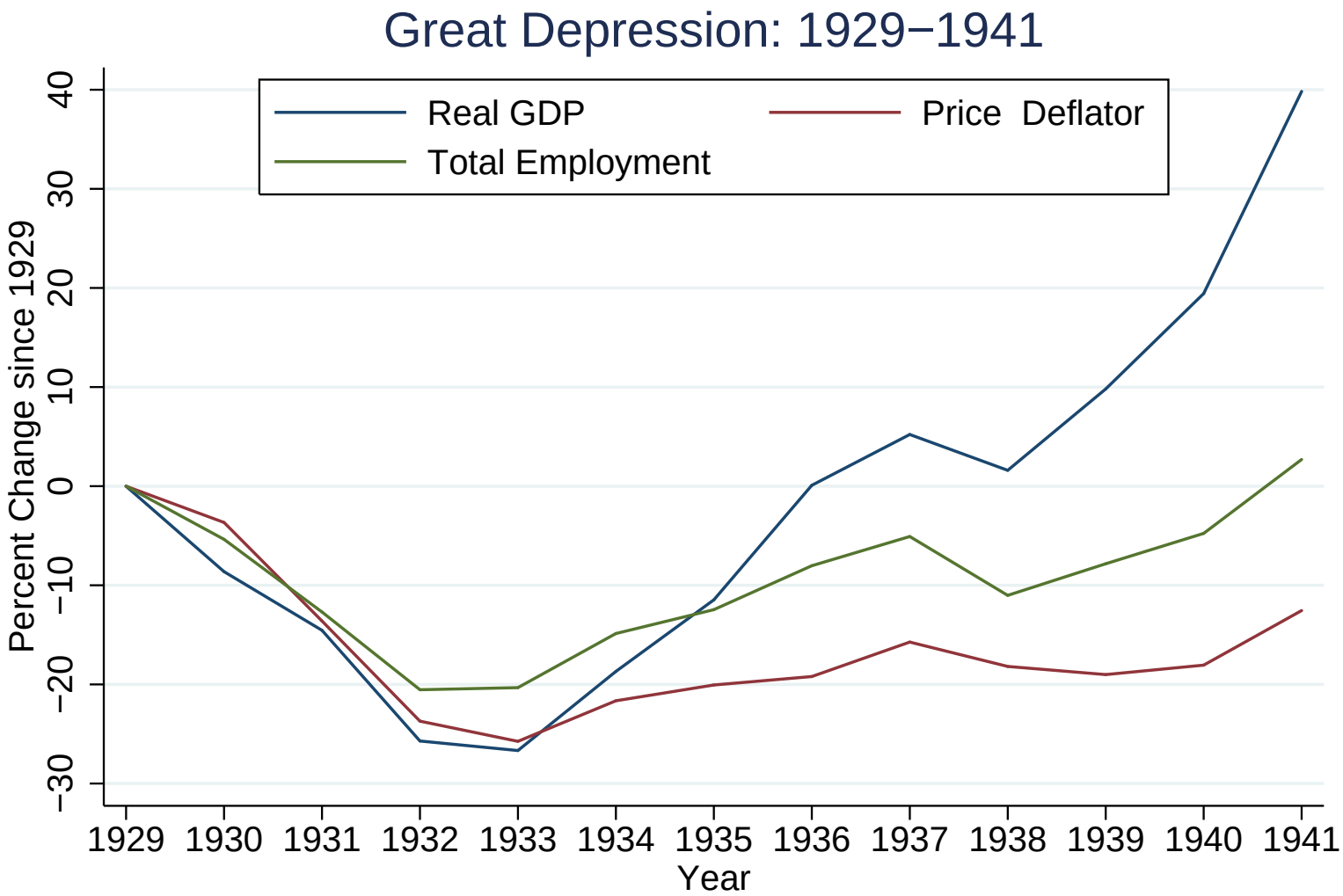
Notes: Dates in bold indicate occurrence during 1929-1933 Recession when Real GDP fell by about 30%

Figure 1: Stock Volatility 1896-2012



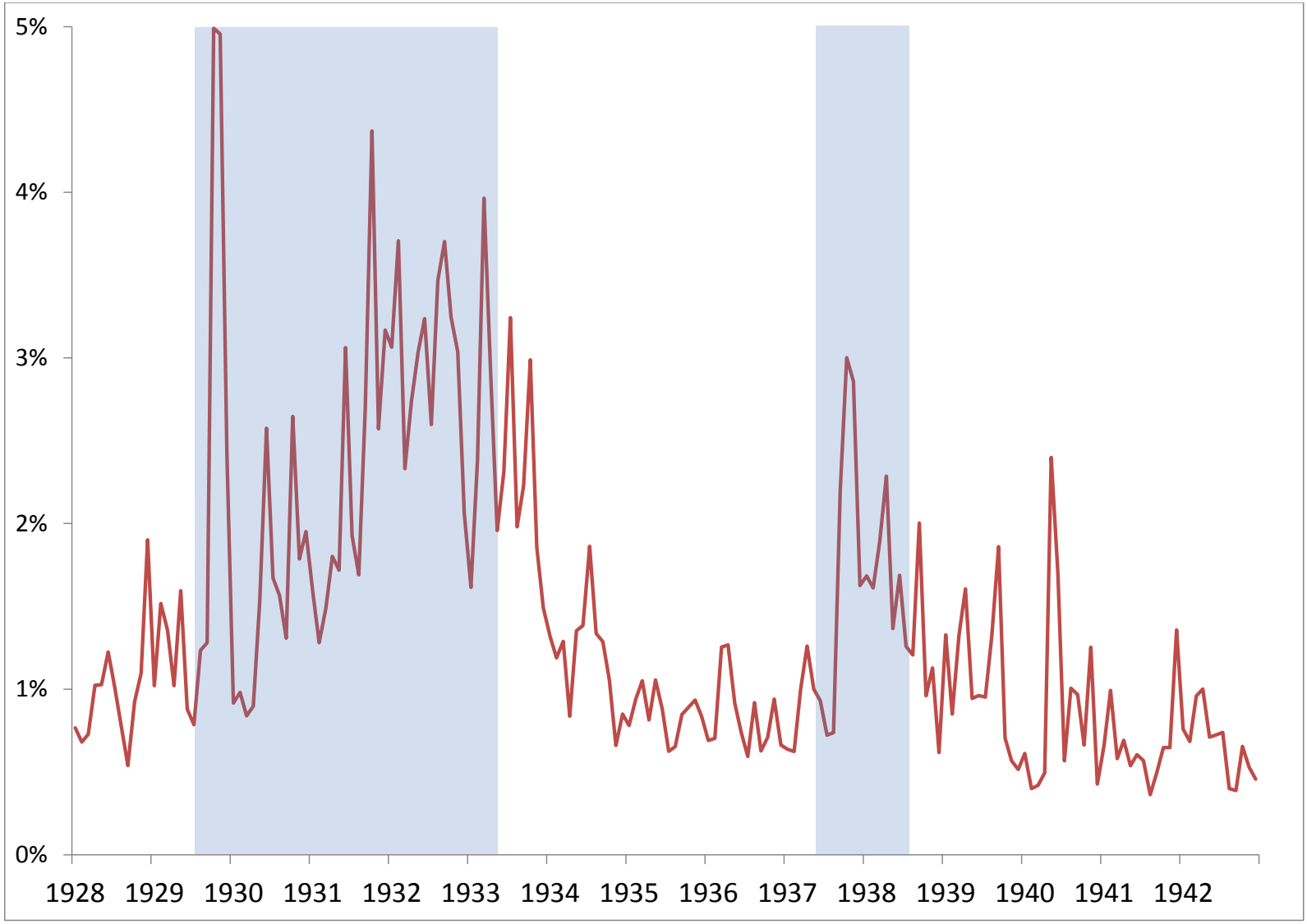
Notes: Stock volatility is calculated as the monthly standard deviation of Dow Jones Industrial Average stock returns. Stock returns are calculated as the daily difference of the natural logarithm of Dow stock index. The blue shaded area is 1929-1941 Great Depression.

Figure 2: Overview of the Depression



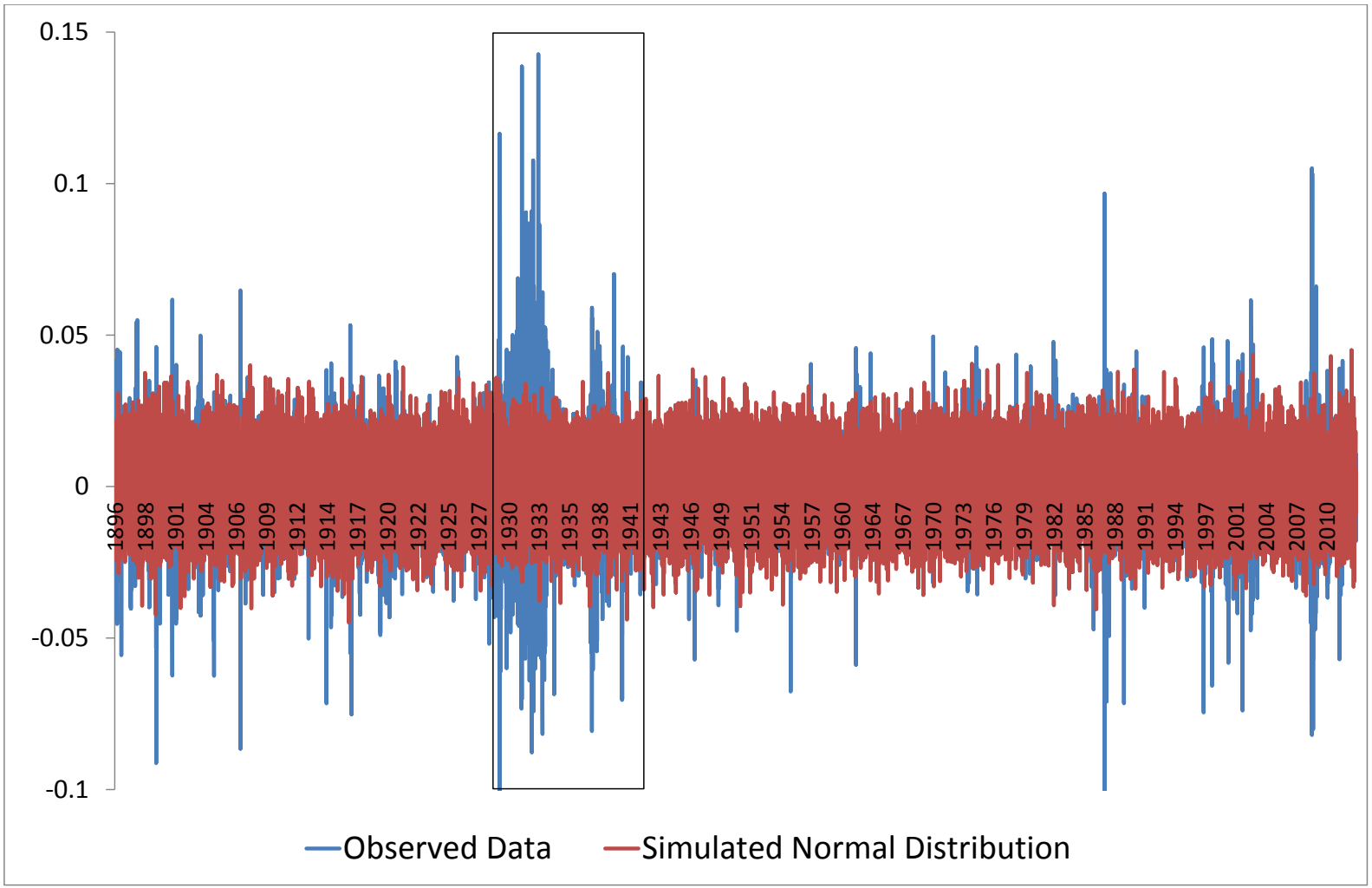
Source: Real GDP from NIPA. Price Deflator from BEA. Total Employment from BLS.

Figure 3: Stock Volatility 1928-1942



Notes: Stock volatility is calculated as the monthly standard deviation of Dow Jones Industrial Average stock returns. Stock returns are calculated as the daily difference of the natural logarithm of Dow stock index. NBER recession periods appear as blue shaded rectangles.

Figure 4: Comparison of Actual Stock Returns and Simulation under Pure Brownian Motion



Notes: Stock data is from the Standard & Poor's Dow Jones Indices and Federal Reserve Bank of Saint Louis from 1896-2013. Observed data is the log difference between daily Dow Jones Industrial Average index values. Simulated normal distribution is a simulated series for a normal distribution with the same mean and standard deviation as the observed series. The mean is .0002 and the standard deviation is 0.011 for the simulated series. The Great Depression period of 1929-1941 is highlighted by the black rectangle.

Figure 5: Quadratic and Bipower Variation: 1896-2013

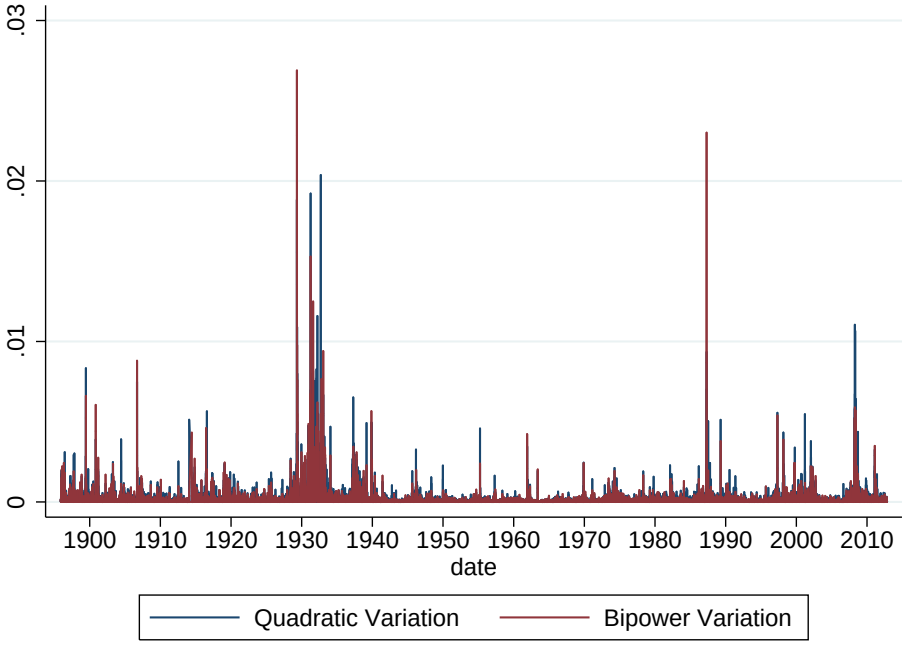


Figure 6: Quadratic and Bipower Variation: Great Depression

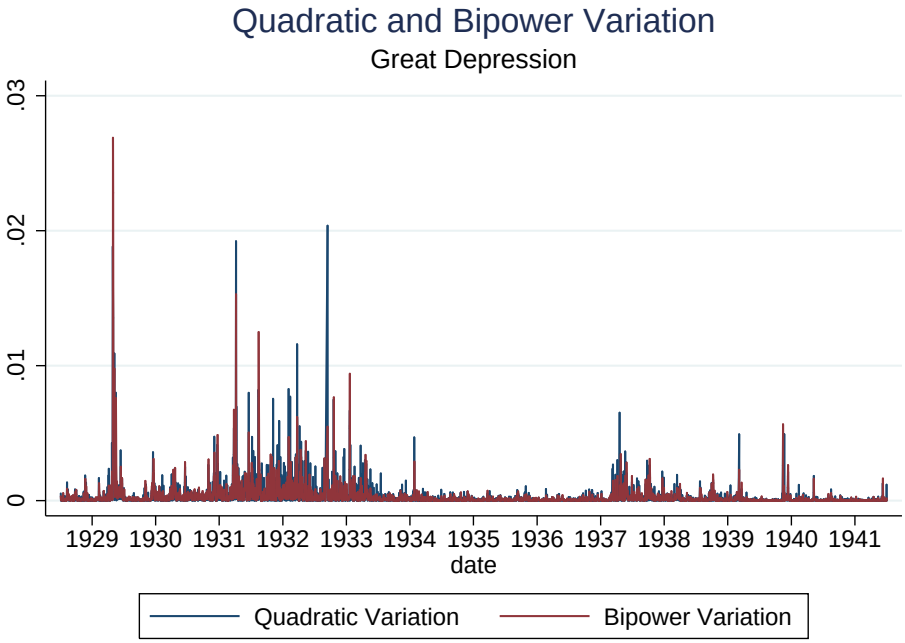
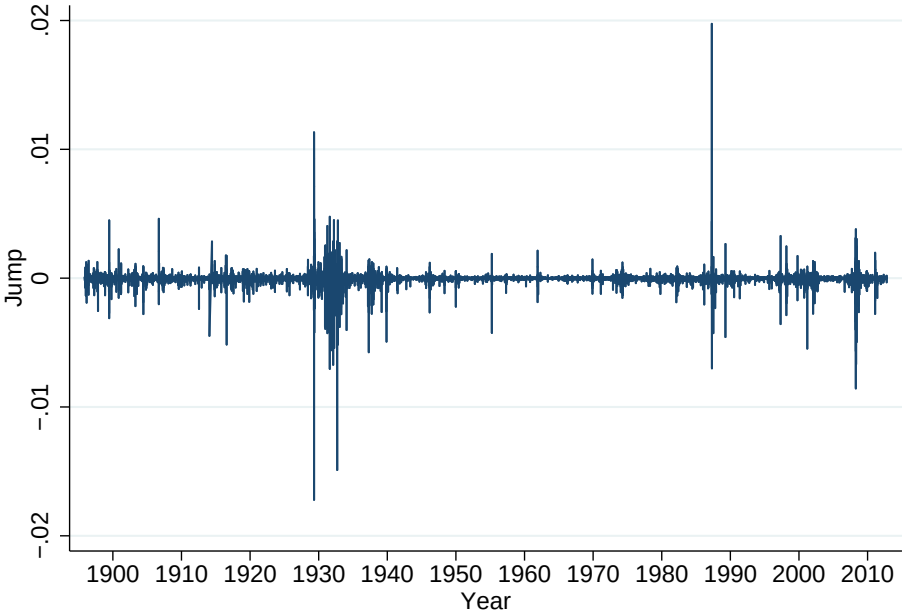
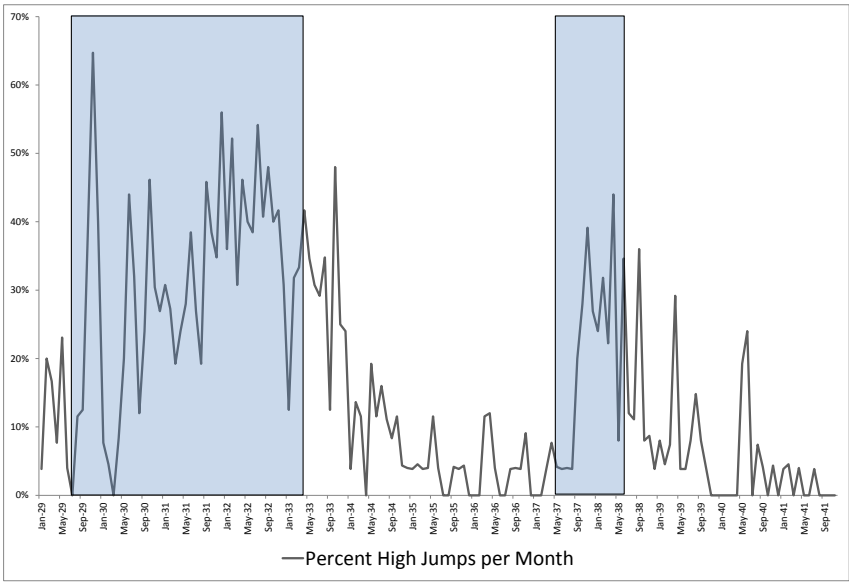


Figure 7: Jumps: 1896-2013



Jumps are calculated as the difference between quadratic variation and bipower variation

Figure 8: Jump Percent: 1929-1938



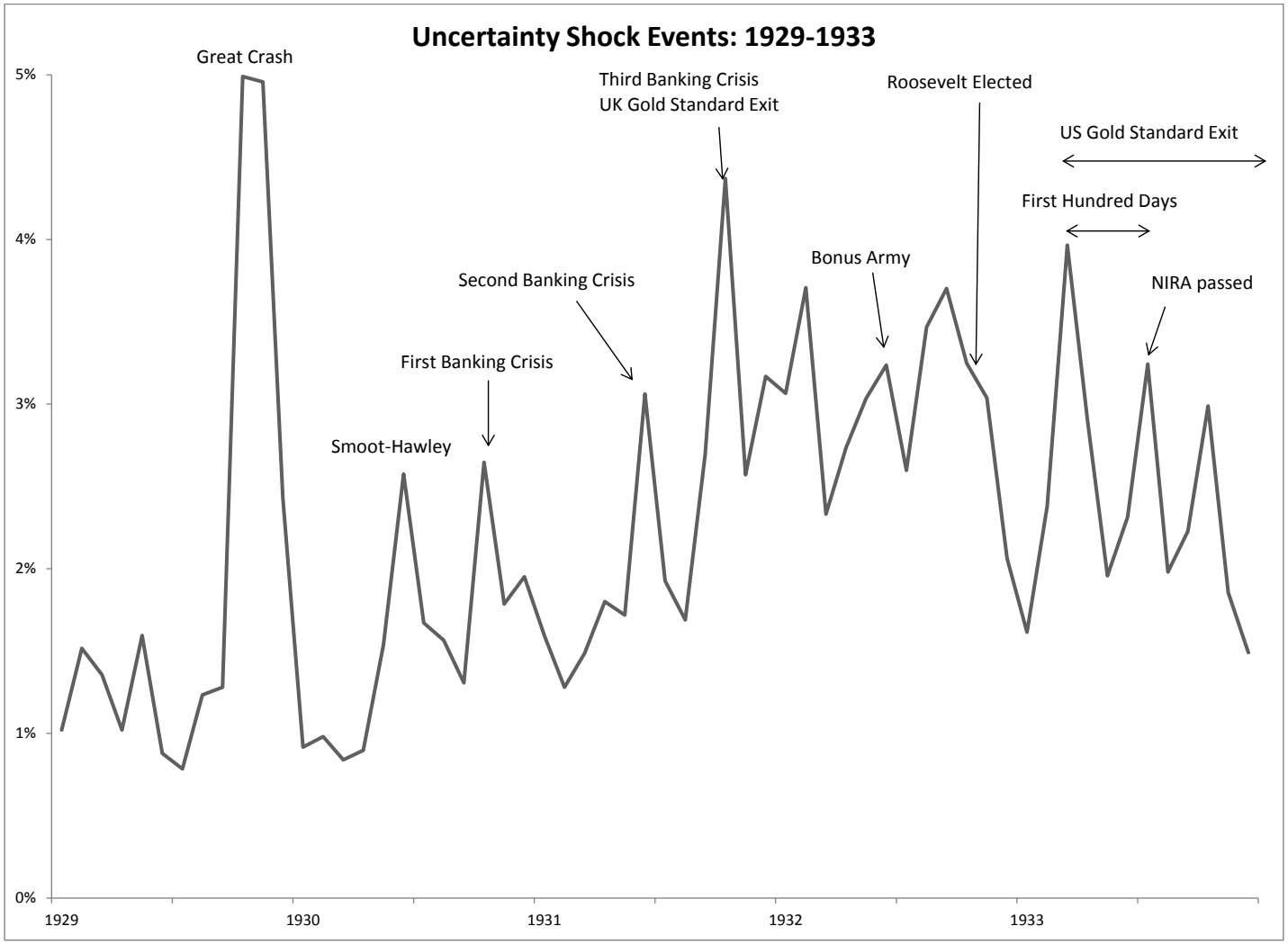
Notes: Percent High Jumps is the percent of days in the month with a jump in the 95th percentile of jumps over the entire sample 1896-2013. Jumps are the given by the difference between quadratic variation and bipower variation as outlined in Barndorff-Nielsen and Shephard (2004) for the Dow Jones Industrial Average. The two NBER Recession periods of the Great Depression are given by the blue shaded regions.

Table III: Uncertainty Shock Events

Uncertainty Shock	**Date**	**Type of Uncertainty**
Great Crash	Oct 1929	Stock Market Crash
Smoot-Hawley	Jun 1930	Large Tariff Increase
First Banking Crisis	Nov-Dec 1930	Banking Crisis
Second Banking Crisis	Apr-Aug 1931	Banking Crisis
UK Gold Standard Exit	Sep 1931	Gold Standard Uncertainty
Third Banking Crisis	Sep-Oct 1931	Banking Crisis
Fourth Banking Crisis	Jun-Jul 1932	Banking Crisis
Bonus Army Crisis	Jul 1932	Political Uncertainty
FDR election	Nov 1932	Policy Uncertainty
First Hundred Days	Mar-Jun 1933	Policy Uncertainty
US Gold Standard Exit	Mar 1933-Jan 1934	Gold Standard Uncertainty
National Recovery Agency	Jun 1933	Policy Uncertainty
"Mistake of 1937"	May 1937-Feb 1938	Monetary Policy Uncertainty
Quarantine Speech	Oct 1937	War Uncertainty
Panay Incident	Dec 1937	War Uncertainty
Munich Agreement	Mar 1938	War Uncertainty
Anschluss	Sep 1938	War Uncertainty
Non-Uncertainty Shock	**Date**	**Type of Uncertainty**
Wagner Act	Jul 1935	Policy Uncertainty
Social Security Act	Aug 1935	Policy Uncertainty
Wealth Tax	Aug 1935	Policy Uncertainty
Undistributed Profits Tax	Mar 1936	Policy Uncertainty
Flint Sit-Down Strike	Dec 1936- Feb 1937	Policy Uncertainty
FDR Court Packing Plan	Feb-Jul 1937	Policy Uncertainty

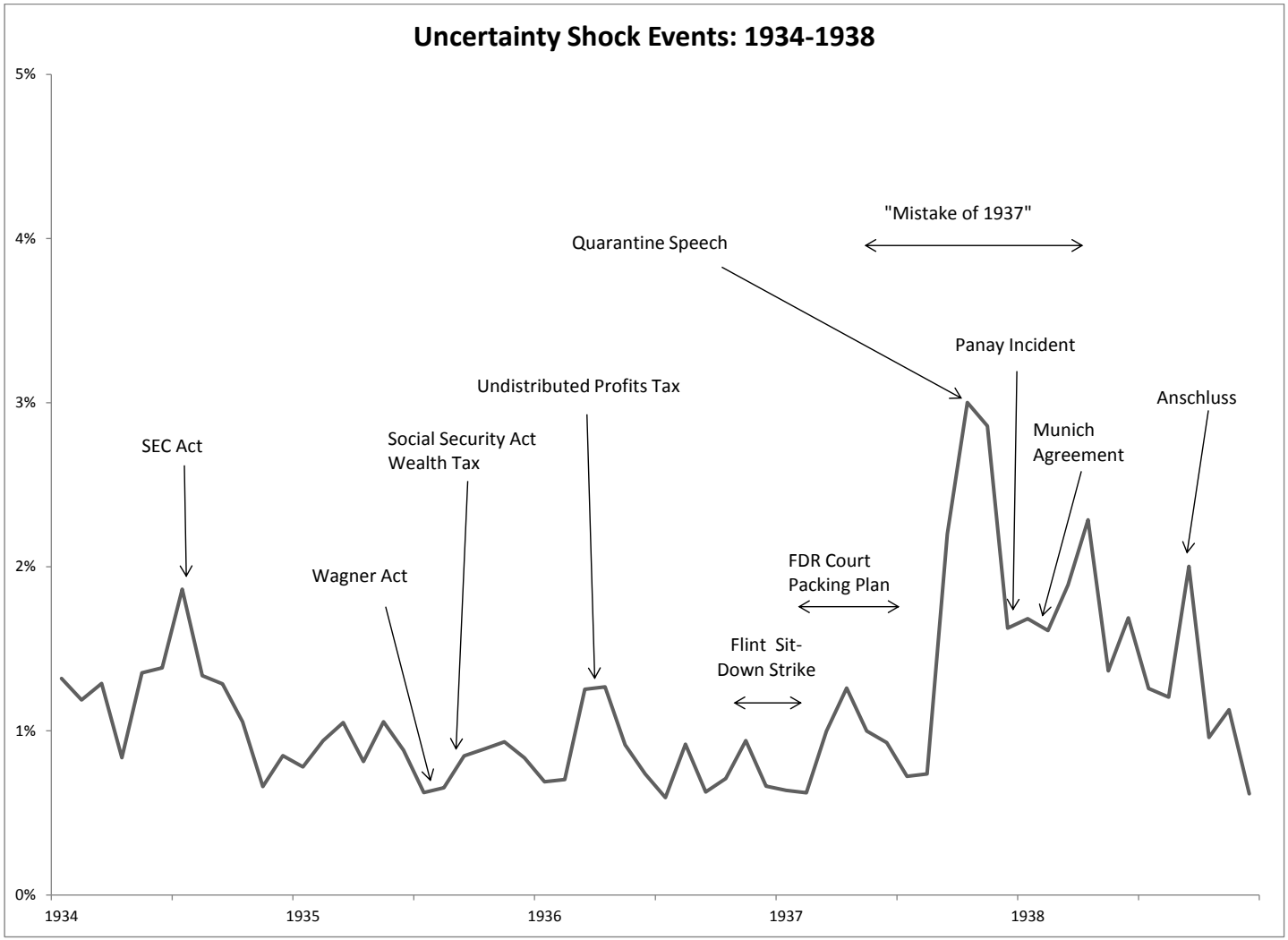
Notes: See text for explanation of uncertainty events and chart for associated stock volatility. Non-uncertainty shocks identified by low stock volatility and uncertainty shock events by high volatility.

Figure 9: Uncertainty Shock Events: 1929-1933



Note: Stock Volatility calculated as standard deviation of log returns of the Dow Jones Industrial Average index. **Source**: Federal Reserve Board of Governors, Dow Jones

Figure 10: Uncertainty Shock Events: 1934-1938



Note: Stock Volatility calculated as standard deviation of log returns of the Dow Jones Industrial Average index. **Source**: Federal Reserve Board of Governors, Dow Jones

Figure 11: Large Jump Events: 1929-1933

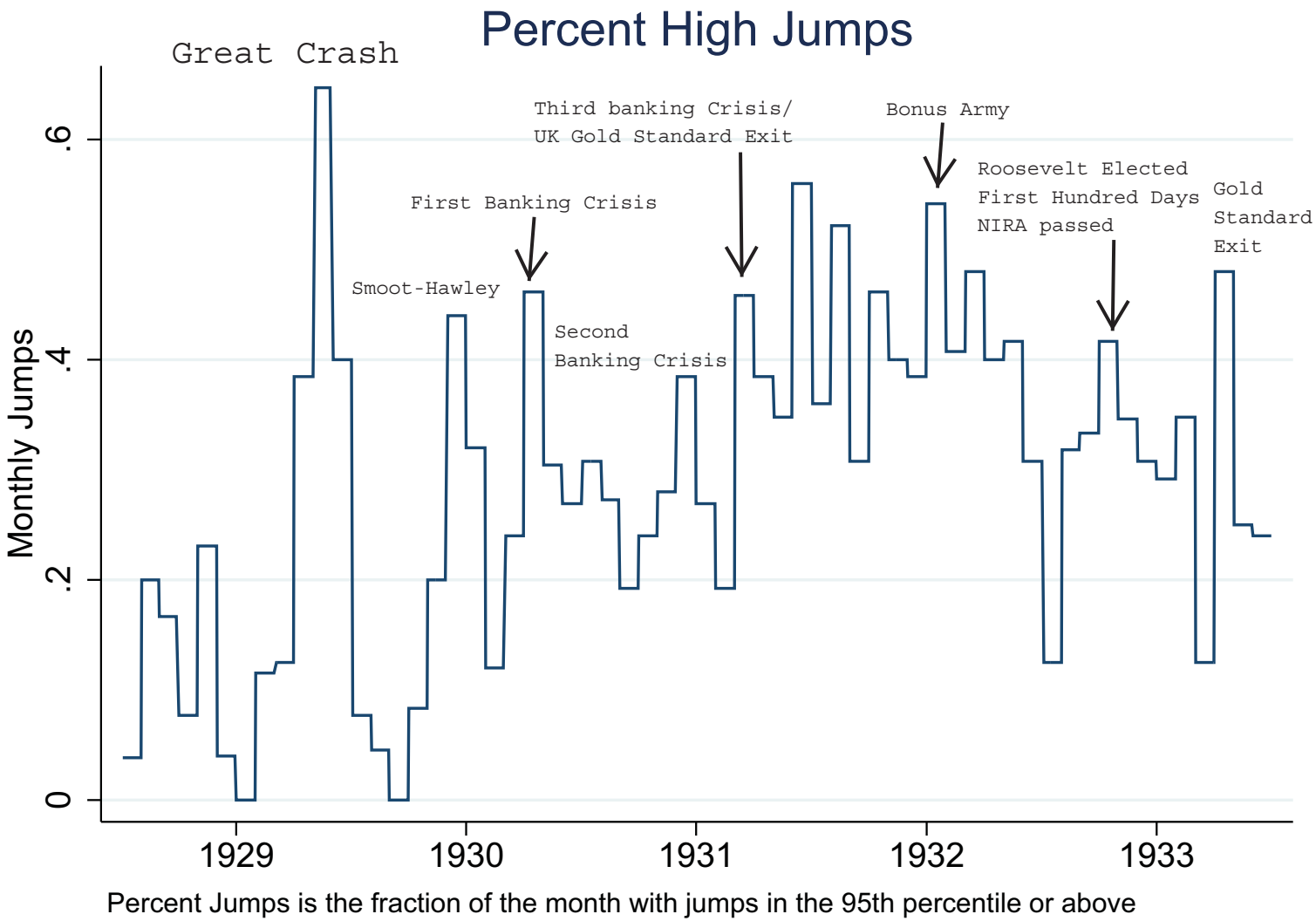


Figure 12: Large Jump Events: 1934-1938