

**A NEW HISTORY OF BANKING PANICS IN THE UNITED STATES, 1825-1929:  
CONSTRUCTION AND IMPLICATIONS<sup>1</sup>**

By

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**Abstract**

There are two major problems in identifying the output effects of banking panics of the pre-Great Depression era. First, it is not clear when panics occurred because prior panic series—lists of when panics occurred—combine panics with other developments in financial markets, fail to distinguish among different types of financial panics, and employ unreliable strategies to identify panics. Second, establishing the direction of causality is tricky: are panics causing downturns or are downturns causing panics? This paper addresses these two problems (1) by deriving a new panic series for the 1825-1929 period—one that rectifies many of the problems of earlier series—and (2) by studying the output effects of major banking panics via vector autoregression (VAR) methods. My paper derives four main empirical findings: (1) major banking panics have large and strongly negative effects on both output and prices, (2) panics were a substantial source of economic instability prior to the founding of the Federal Reserve, (3) on average, downturns with major banking panics were more severe than downturns without them and output recoveries were longer for downturns with major banking panics than output recoveries for downturns without them and (4) panics are associated with persistent level and trend effects. Moreover, the new series has important implications for the history of financial panics in the United States.

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The general absence of banking panics in the United States since the Great Depression means that there are few modern-day equivalents to the banking crisis of 2008. Indeed, as the crisis was unfolding, there was a growing sense that the developing recession might more closely resemble the downturns of the 19<sup>th</sup> and early 20<sup>th</sup> centuries that accompanied banking crises than the recessions of the postwar period. As a consequence, commentators were speculating at the time, “this may be your great-great-grandfather’s recession.”<sup>1</sup>

However, the effects of financial panics of this era are not very well understood. Indeed, there are two main problems in identifying the macroeconomic effects of the financial panics of the pre-Great Depression era. First, it is not clear when panics occurred because prior panic series—lists of when panics occurred—differ in their identification of panic episodes. Some series document panics occurring at a rate of more than one per year, whereas other series identify recurring periods of ten to twenty years without a panic. For example, two studies on the output effects of the financial panics of the pre-Federal Reserve era—DeLong and Summers (1986) and Miron (1986)—arrive at contradictory conclusions because they rely on different panic series to identify when panics occurred.

Second, even if the timing of when panics occurred is consistent with panics having real output effects, establishing the direction of causality is inherently difficult. Are panics causing downturns or are downturns causing panics? There are two schools of thought. According to one view, panics are shocks to the real economy that cause downturns, but according to the alternate view, panics are consequences of major recessions. Under this latter specification, even if a correlation between downturns and panics exists, it would be misleading to attribute output declines to panics since panics would be products of downturns rather than causes.

This paper seeks to identify the macroeconomic effects of a main class of financial panics of the pre-Great Depression era: banking panics. It accomplishes this by addressing these two major problems. To address the first problem, this paper derives a new series on banking panics for the pre-Great Depression era. To address the second problem, this paper studies the output effects of major banking panics via

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<sup>1</sup> Krugman, Paul, “Who’ll Stop the Pain?”, *New York Times*, Feb 19, 2009.

VAR-based methods. In the process, this paper recreates a detailed record of when and where banking panics occurred—a chronology that has important implications for our understanding of the causes, effects and frequency of financial panics throughout U.S. history.

Section 1 begins by asking: when did the financial panics of the pre-Great Depression era occur? I show that—perhaps, somewhat surprisingly—answering this question is not a straightforward task. I document nine leading panic series and demonstrate that each of these series would arrive at a different answer to this question. Some series document panics occurring at a rate of roughly one per year, whereas other series identify recurring periods of ten to twenty years without a panic. Why do these series differ so dramatically? By studying each of the panic series on a case-by-case basis, I find that methodological problems behind the development of earlier series are the likely source of these extreme variations. Specifically, I find two common problems. First, many series do not explicitly define a panic, making it unclear exactly what kind of financial disturbance is being recorded. Second, most series do not adopt a systematic rule to identify panics over a specified period, raising the possibility that some panic episodes might be omitted or that non-panic episodes might be mistakenly classified as panics.

Due to the numerous contradictions across these series and in light of these methodological concerns, Section 2 derives a new panic series for the 1825-1929 period—one that rectifies many of the problems of earlier series. I begin by providing a definition of financial panic—one that distinguishes among different types of financial panics. In developing the new series, however, I restrict attention to one key type of financial panic of this era: banking panics. To identify banking panics, I adopt a systematic rule to search through more than one hundred years of contemporary financial and economic newspapers. Section 2 outlines the algorithm I use to identify banking panics from the historical news record and develops a consistent set of criteria for classifying banking panics as major or minor.

Section 3 presents the results of the new series and its implications. The new series on banking panics identifies seven major banking panics, as well as twenty minor banking panics. The new series has two main initial findings. First, using my new series and the accounts of contemporary observers contained in the historical news record, I discover that earlier series presented flawed lists of when panics

occurred. Some series combined panics with other developments in financial markets, others failed to distinguish among different types of financial panics, and a few series even went so far as to mistakenly identify foreign banking panics as domestic ones. Second, contrary to the accepted wisdom in the literature, I find that there is no evidence of a decline in the frequency of financial panics during the first fifteen years of the existence of the Federal Reserve. Previous studies used the Kemmerer series—a series that the analysis in this paper shows to be severely flawed—to document the pre-1914 frequency of panics, leading to spurious conclusions regarding the historical frequency of panics.

Equipped with the new panic series, Section 4.1 presents the empirical tests I conduct to identify the real output effects of major banking panics. Part A presents the basic vector autoregression. The basic VAR that I estimate has two variables: a panic dummy series and annual output growth. The impulse response function implied by the VAR of the panic dummy series to an output shock is insignificant, suggesting that the panics are unrelated to past output movements. By contrast, the impulse response function of output to a unit shock in the panic dummy is large and significant, indicating that panics have substantial real output effects. Part B then restricts the VAR using additional evidence from the narrative record to isolate those panics that the reports of contemporary observers suggest were the result of idiosyncratic disturbances, as opposed to declining output conditions. The impulse response functions with these additional restrictions are similar to those from the basic VAR. They indicate that major banking panics have large effects on output. Methodologically, this approach is similar to the work of Ramey (2011), Ramey and Shapiro (1998), and Romer and Romer (1989, 2004, 2010) who use narrative evidence to identify the effects of fiscal and monetary policy. Lastly, Part C estimates a three-variable VAR with monthly data on output and prices. The results indicate that banking panics have rapid, large, and strongly negative effects on both output and prices.

Armed with a reliable listing of when panics occurred, Section 4.2 then investigates three related macroeconomic issues. First, I investigate whether banking panics were a significant source of output volatility prior to the founding of the Federal Reserve. I find that nearly half of all business cycle downturns between 1825 and 1914 contained major banking panics. According to the estimates I derive in

Section 4.1, banking panics have large output effects. Thus, even if banking panics did not initiate all of these downturns, they amplified them. These findings suggest that banking panics were a substantial source of economic instability throughout much of U.S. history and that major banking panics either caused or amplified nearly half of all business cycle downturns between 1825 and 1914.

Second, I examine how downturns with major banking panics differed from downturns without major banking panics. I find that in the post-Civil War era, downturns with major banking panics were slightly longer and substantially more severe than downturns without major banking panics on average, and output recoveries for downturns with major banking panics were two-to-three times the length of output recoveries for downturns without them.

Third, I analyze the behavior of output in the aftermath of major banking panics. Following three of the four major banking panics of the post-Jacksonian period, output did not rapidly revert back to its pre-panic trend. Moreover, following two of these panics, trend output growth declined substantially. These results support the growing consensus in the literature that banking crises can have highly persistent and lingering effects on output. They also reveal that the sluggish output growth the U.S. economy has experienced in the aftermath of the Great Recession is consistent with the historical record.

## **Part I. Prior Panic Series**

### **1.1. When did Financial Panics Occur?**

When did financial panics occur before the Great Depression? Surprisingly, answering this question is not a simple task. Table 1 presents nine different panic series: the (1) Bordo-Wheelock, (2) Thorp, (3) Reinhart-Rogoff (two versions), (4) Friedman-Schwartz, (5) Gorton, (6) Sprague, (7) Wicker, (8) Kemmerer, and (9) DeLong-Summers series. Each panic series comes from a different study and covers a

different period.<sup>2</sup> A perusal of Table 1 quickly reveals that there is substantial disagreement across these series regarding the timing, incidence, and frequency of panics throughout U.S. history.

Consider first the period between 1825 and the end of the Civil War. The three series that span the 1825-1864 period—the Thorp, Bordo-Wheelock, and Reinhart-Rogoff series—identify 1825 and 1857 as panics.<sup>3</sup> However, there is substantial disagreement regarding other episodes. The Bordo-Wheelock and Thorp series identify 1833 as a panic, while both versions of the Reinhart-Rogoff series omit 1833. The Bordo-Wheelock and Thorp series identify 1837 and 1839 as two distinct panics, while one version of the Reinhart-Rogoff series classifies 1836 as a banking crisis, whereas the other version identifies a crisis from 1836 to 1838. The Thorp series identifies 1847 as a panic, whereas the other series do not contain this episode. One version of the Reinhart-Rogoff series identifies December 1861 and April 1864 as banking crises, whereas the other series do not contain these episodes.

Similar discrepancies extend into the post-Civil War period. From 1864 to 1929, the nine series concur in classifying 1873 and 1907 as panics; however, they disagree on other episodes. Some series list 1884, 1890, and 1893 as panics, whereas other series either omit these episodes or classify them as incipient panics, financial distress, or financial stringency, as opposed to full-scale panics. Some series also identify panics in 1896 and 1914, whereas other series omit these episodes. The Kemmerer series identifies three additional major panics (Dec 1899, May 1901, and Mar-Aug 1903) and twenty-one minor panics—the vast majority of which are not noted in any of the other series. The DeLong-Summers series also contains additional panic episodes that are not noted in any of the earlier series.

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<sup>2</sup> The series come from the following studies: (1) Bordo and Wheelock (1988), (2) Thorp (1926), (3) Reinhart and Rogoff (2009), (4) Friedman and Schwartz (1963), (5) Gorton (1988), (6) Sprague (1910), (7) Wicker (2000), (8) Kemmerer (1910), and (9) DeLong and Summers (1986). Reinhart and Rogoff (2009) provide two versions of their series. They list one version in Table A.3.1 and another version in Table A.4.1. The two versions occasionally contradict one another. As a consequence, I provide both versions in Table I.

<sup>3</sup> The Reinhart-Rogoff series uses the term crisis rather than panic.

## 1.2 Studies on the Output Effects and Causes of Panics Depend on the Panic Series

An understanding of when panics occurred is critical to studies on the real output effects and causes of panics. Studies on the real output effects of panics depend on the panic series to identify the timing of panics in relation to changes in output. Studies on the causes of panics depend on the panic series to identify the timing of panics in relation to forces that may have increased the susceptibility of the financial system to a panic.

First, consider studies that examine the real output effects of panics of the pre-Federal Reserve era. In assessing the determinants of historical changes in business cycles, DeLong and Summers (1986) conclude that financial panics were not a principal source of economic instability in the prewar period. They compare the behavior of output surrounding their twelve panic periods with the behavior of output in non-panic periods from 1890-1910. They conclude that no more than a small portion of the variance in output from 1890-1910 can be attributed to these panics, and that as a consequence, panics did not have significant real output effects.<sup>4</sup> However, their results critically depend on their panic series. If the DeLong-Summers series accurately reflects the incidence of panics from 1890 to 1910, then their conclusion that there is not a strong link between financial panics and real downturns might be well supported. However, if their series mischaracterizes non-panic episodes as panics, then they would be attributing the behavior of output in non-panic episodes to the behavior of output in panic episodes, rendering their conclusions regarding the output effects of panics spurious. That the DeLong-Summers series includes panics not noted in other series raises this concern.

By contrast, Miron (1986) comes to a different conclusion using the Kemmerer series of major panics for the 1890-1908 period—roughly the same period studied by DeLong and Summers. Miron notes that the average level of GNP growth almost doubles when panic years are excluded—a finding much more consistent with panics having real output effects. Romer (1999), also using the Kemmerer series,

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<sup>4</sup> DeLong and Summers write, “This suggests that financial and monetary shocks are less important sources of depression than we had suspected...Is there any way to rationalize the apparent lack of strong links between financial uproar and real recession? We believe that the conclusions of the exercise above are reasonable, because the effects of financial panic upon the rest of the real economy are smaller than is usually realized” (page 689).

reaches a similar conclusion, noting a strong correlation between recessions and panics. However, the Kemmerer series also includes many episodes not noted in other series, rendering its reliability questionable.

Studies on the causes of panics also depend on the panic series. Miron (1986) argues that seasonal monetary forces caused recurring panics prior to the founding of the Federal Reserve. Increased demand from the agricultural sector for currency and credit in the spring planting season and fall crop-moving season generated seasonal “stringencies” in the money market, forcing interest rates up and bank reserve-to-deposit ratios down. These forces weakened the nation’s banking system and caused a contraction in the money supply in the fall and spring, precisely when the demand for money increased—a phenomenon known as ‘the perverse elasticity’ of the money supply. Relying on the Kemmerer series to document the incidence of panics from 1890 to 1908, Miron argues that panics of the pre-Fed era had a tendency to recur during those seasons characterized by stringent monetary conditions: two-thirds of Kemmerer’s 21 panics of this period occurred during the fall or spring. Miron then claims that by contrast, no panics occurred between 1914 and 1929, the first fifteen years of the existence of the Federal Reserve. On this basis, Miron concludes both that the panics of the pre-Fed period were products of seasonal monetary forces and that the establishment by the Federal Reserve of an elastic currency—one that could expand and contract when needed—dramatically reduced the frequency of panics between 1914 and 1929. However, Miron’s conclusions—both in terms of the seasonality of panics prior to 1914 and the reduction in the frequency of panics between 1914 and 1929—hinge on the Kemmerer series.

### **1.3 Methodologies Behind the Panic Series**

Why do these panic series differ so dramatically? By analyzing the methodologies behind each of the nine panic series, I find that methodological problems behind the development of earlier series are the likely source of these extreme variations. Section A1 of the appendix to this paper describes the methodologies behind each of the nine panic series on a case-by-case basis. However, I find two common methodological problems that I summarize below. First, several series do not explicitly define a panic,

making it unclear exactly what kind of financial disturbance is being recorded. Second, most series do not adopt a systematic rule to identify panics, raising the possibility that some important panic episodes might be omitted or that non-panic episodes might be mistakenly classified as panics.

As an example, consider the Kemmerer series. Kemmerer (1910) identified financial panics by reading the *Commercial and Financial Chronicle*, the leading economic newspaper of the late 19<sup>th</sup> and early 20<sup>th</sup> century, from 1873 to 1908. He found eight major and twenty-one minor panics. However, he provided almost no explanation for his methodology. He did not provide a clearly defined criterion for selecting major and minor panic episodes, nor did he provide a definition of panic. For the major panics, he chose periods that were “financial disturbances”<sup>5</sup> without explaining what that term encompassed, and for minor panics, he did not provide any rationale for his selection process. Moreover, when describing his panics, Kemmerer wrote, “the word panic has been used here to cover several financial disturbances for which many would not use so strong a word, i.e., the disturbances of 1884, 1890, 1899, and 1901.”<sup>6</sup> Furthermore, in a footnote, Kemmerer provided a cautionary message regarding the methodology he used to identify his minor panics, noting that such a list was created after “a rather hasty perusal of the [*Commercial and Financial*] *Chronicle*” and that “this list is probably not complete, and there may be room for doubt as to the inclusion of some of the dates mentioned.”<sup>7</sup>

Similar concerns pertain to other panic series. Thorp (1926) did not provide a definition for financial panic nor did he describe how he identified his panic observations. Sprague (1910) described five episodes of financial unrest during the National Banking era—three crises, one panic and one episode of monetary stringency; yet he did not describe why he labeled each episode accordingly nor did he provide an explanation for how he assembled this listing. Reinhart and Rogoff (2009) and Bordo and Wheelock (1988) compile their series on the basis of previous studies, raising the concern that any errors embedded in earlier studies would simply be transplanted over to their series. DeLong and Summers (1986) derive their panic series, in part, by defining a panic as a period when the average commercial

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<sup>5</sup> Page 223.

<sup>6</sup> Page 223.

<sup>7</sup> Page 223.

paper rate increases by one percentage point or more from quarter-to-quarter. However, extending their methodology beyond the 1890-1910 period reveals that a quarter-to-quarter increase of one percentage point or more in the average commercial paper rate fails to identify several of the major financial panics of the Great Depression, but does identify several dubious cases from the postwar period that are not conventionally regarded as panics.<sup>8</sup> This raises the concern that the episodes identified by DeLong and Summers were not, in fact, panics.

#### **1.4 Necessity of a New Panic Series**

The numerous contradictions across these series and the potential concerns that underpin the methodology behind many of these series necessitate the development of a new panic series and a reexamination of many of the leading arguments on the effects and causes of financial panics that have been formulated using these series. What are the macroeconomic effects of the financial panics of the pre-Great Depression era? Can financial panics account for a significant fraction of the volatility in output in the 1800s and early 1900s? Were panics of the pre-Federal Reserve era caused by seasonal agricultural shocks? Or did other forces cause them? Is the claim that the frequency of financial panics decreased during the first fifteen years of the existence of the Federal Reserve accurate? Or is it a spurious conclusion drawn from a biased panic series? The development of a new, consistent series on panics is more than an important exercise in taxonomy; it serves as a crucial tool for analyzing the causes, effects, and frequency of panics throughout U.S. history.

## **Part II. Development of a New Series on Banking Panics**

This section derives a new series on banking panics. I begin by providing a definition of financial panic—one that distinguishes among different types of financial panics. I then describe the methodology I

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<sup>8</sup> The additional episodes identified using this criterion are 1958:4, 1973:2, 1974:2, 1974:3, 1978:4, 1979:4, 1980:1, and 1980:4—periods not generally regarded as panics. See the appendix for more details.

use to compile the new series on banking panics. In particular, I develop a clearly defined rule to identify banking panics from 1825 to 1929.

## **2.1 Definition of Financial Panic**

A financial panic occurs when there is a widespread rush by private agents to liquidate assets, e.g., deposits in the banking sector (a banking panic), stocks in equity markets (a stock market panic), or currency in foreign exchange markets (a currency panic). The principal characteristic of any financial panic—the rush to liquidate assets—is driven out of fear that a particular type of asset will suddenly decline in value or be rendered illiquid.

My definition of financial panic distinguishes among different types of financial panics: banking panics, stock market panics, and currency panics. A banking panic occurs when there is an increase in the demand for currency relative to deposits that sparks bank runs and bank suspensions. A stock market panic occurs when there is a rush to liquidate stocks in equity markets, resulting in sharp declines in stock prices. A currency panic occurs when agents sell currency in foreign exchange markets out of fears of devaluation. In each of these types of financial panics, there is a rush by private agents to dispose of a particular kind of asset—bank deposits in the case of banking panics, stocks in the case of stock market panics, and currency in the case of currency panics.

In developing a new panic series, however, I restrict my attention to one type of financial panic: banking panics. I leave the development of a series on stock market or currency panics for later work.<sup>9</sup>

## **2.2 Identifying Banking Panics**

Quantitative sources are not sufficient to identify banking panics. Consistent data series on bank suspensions and failures are not readily available throughout much of the 19<sup>th</sup> century. Beginning in 1865,

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<sup>9</sup> In a classic essay, Schwartz (1986) describes financial crises as either real or pseudo. According to Schwartz, real financial crises develop when the banking system experiences a crisis. By contrast, Schwartz describes all other financial disturbances—e.g., declines in asset prices of equity stocks, depreciation of a national currency—as pseudo crises. My decision to focus on banking panics and to distinguish among different types of financial panics builds, in part, on her work.

a consistent series on national bank failures—provided by the Comptroller of the Currency—exists. However, the Comptroller’s series is available at a yearly frequency, making it difficult to determine whether bank failures were clustered together—as would be the case in a banking panic—or whether they were spread out over the course of a year. Furthermore, even if one were to overlook this shortcoming, the Comptroller’s series on national bank failures omits state banks, private banks, and trust companies, making the series unrepresentative of the overall banking system.<sup>10</sup> Lastly, data on bank failures or suspensions, by itself, does not reveal whether there was a panic by depositors since a cluster of bank suspensions or failures can occur without runs by depositors.

To overcome these limitations, I employ other sources to identify banking panics: financial and economic newspapers from the 19<sup>th</sup> and early 20<sup>th</sup> centuries. The press of that era devoted substantial resources to covering banking panics. Incidents of bank runs, suspensions and failures were regularly reported in contemporary newspapers, regardless of place of origin. Indeed, disturbances occurring in the less populated regions of the interior as well as those occurring in more populated urban centers received significant attention by the press. Consequently, contemporary newspapers contain a detailed, comprehensive record of when and where banking panics occurred.

Therefore, to identify banking panics, I utilize contemporary newspapers. In particular, I use three newspapers: the *Niles Weekly Register*, *The Merchants’ Magazine and Commercial Review*, and *The Commercial and Financial Chronicle*. These three newspapers were among the leading economic and financial newspapers of their day. Most importantly, they provided comprehensive coverage of developments in the banking sector, with special attention placed to reporting incidents of bank runs, suspensions and failures. I use the *Niles Weekly Register* for the period 1825 to 1849, *The Merchants’*

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<sup>10</sup> Grossman (1993) reports that the Comptroller of the Currency provides a series on both national and state bank failures. Due to regular inspections and uniform reporting rules, the Comptroller provides consistent and detailed information on national banks. However, the same level of consistency in reporting did not apply to state banks.

*Magazine and Commercial Review* for the period 1842 to 1869, and *The Commercial and Financial Chronicle* for the period 1865 to 1929.<sup>11</sup>

These newspapers were printed on a regular basis and were bound in volumes for preservation. The *Niles Weekly Register* and *The Commercial and Financial Chronicle* were published on a weekly basis, and *The Merchants' Magazine and Commercial Review* on a monthly basis. Editions of the *Niles Weekly Register* and *The Merchants' Magazine and Commercial Review* were bound in six-month volumes. Editions of *The Commercial and Financial Chronicle* were bound in six-month volumes from 1865 to 1916 and three-month volumes from 1917 to 1929.

The bound volumes of all three newspapers contain index pages. The index pages provide detailed lists of specific information found in each volume, arranged alphabetically. Each item listed in the index is matched to its respective page number, permitting readers to quickly identify its precise location in the volume. Of particular importance, the index pages provide information regarding banking panics. Reports of bank runs, suspensions, and failures, along with general entries for banking panics and financial crises are listed in the index pages.<sup>12</sup>

Since the index pages of these newspapers provide comprehensive lists of economic, financial, and banking news, a careful scanning of these pages locates banking panics reported in the *Niles Weekly Register*, the *Merchants' Magazine and Commercial Review*, and the *Commercial and Financial Chronicle*. Therefore, to identify banking panics, I read the index pages of these newspapers—from 1825 to 1929—for key terms that are likely to signal a banking panic. In particular, I search for any of the following terms: bank failure, bank suspension, bank run, bank closure, bank crisis, bank panic, bank disturbance, crash, crisis, financial crisis, financial disturbance, financial revulsion, panic, revulsion, run,

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<sup>11</sup> *The Merchants' Magazine and Commercial Review* was first published in July 1839, but it did not contain the "Monthly Commercial Chronicle" section—the key section that covered contemporaneous economic news—until April 1842. During its early years, from July 1839 until March 1842, *The Merchants' Magazine and Commercial Review* devoted little coverage to current news.

<sup>12</sup> The index pages are consistent over the 1825 to 1929 period in that they comprehensively report incidents of bank runs, suspensions and failures. However, the structure of these index pages changed somewhat over time and across different newspapers. For example, *The Merchants' Magazine and Commercial Review* split its listing of articles into an index page and a contents page. Even though it is not officially labeled an index page, the contents page serves in that capacity and consequently, I treat it as such. Also, the *Commercial and Financial Chronicle* split its index into several different categories that varied across years.

suspension, suspension of payments and suspension of specie payments.<sup>13</sup> When I find one of these terms in an index page, I read the referenced article to see if any bank runs, suspensions or failures occurred.<sup>14</sup>

Since a banking panic occurs when there is a loss of depositor confidence that sparks runs on financial institutions and bank suspensions, I identify banking panics in these newspaper articles by the occurrence of a cluster of bank suspensions and runs. The presence of both runs and suspensions is a necessary criterion. A wave of bank suspensions without runs would not be classified as a banking panic because a key feature of a banking panic is a rush by depositors to convert deposits into currency. Similarly, runs on institutions that did not produce bank suspensions would not be classified as a banking panic.<sup>15</sup>

Moreover, to separate isolated bank runs and suspensions from banking panics, which are more generalized disturbances that extend beyond the confines of individual bank-specific problems, I identify banking panics by a cluster of bank suspensions and runs. To avoid any ambiguity, I define a cluster as three or more banks. In addition, for a bank run or suspension to be treated as part of a cluster, the report containing the bank run or suspension must contain a reference to other bank runs or suspensions or there must be reports of a general panic. This avoids classifying scattered, unconnected bank runs and suspensions as a cluster. Lastly, to partition banking panics, I implement the following rule: a panic ends if there are no reports of any bank runs or suspensions for one full calendar month.

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<sup>13</sup> In compiling this list, I chose words that describe key features of banking panics—failure, suspension, run, crisis, panic, disturbance, crash. One of the terms—revulsion—was widely used in the 19<sup>th</sup> century to denote financial panics even though it has fallen out of use today. Moreover, in scanning the index pages for key terms, I take into consideration the possibility of a rearrangement of words. For example, suspension of payments could be listed as “payments, suspension of” and suspension of specie payments could be listed as “specie payments, suspension of.”

<sup>14</sup> To facilitate the process, the index pages of all three newspapers are alphabetical. The contents page of the *Merchants’ Magazine and Commercial Review* is chronological, and as a consequence, I read every entry. One of the index pages contained in the *Commercial and Financial Chronicle*—the Current Events and Discussion Page—is alphabetical, but occasionally, it listed banking panics under region; therefore, I read every entry.

<sup>15</sup> The newspapers do not need to use the word “run” if the action is described in other terms. For example, “heavy withdrawals” or “a depletion of reserves by depositors”—alternative ways of describing a sharp increased demand for currency by depositors—would be considered runs.

### 2.3 Scaling Banking Panics

To reflect varying degrees, I classify each banking panic as major or minor. A banking panic is classified as major if it meets two conditions: (1) it spans more than one geographic unit and (2) it appears on the front page of the newspaper. All other banking panics are minor. I define a geographic unit as a state and its bordering states. For example, bank runs and suspensions that occur in Ohio, Indiana and Illinois would be contained in one geographic unit, whereas bank runs and suspensions that occur in Ohio, Indiana, Illinois and Pennsylvania would not be contained in one geographic unit.

Scaling banking panics according to geographic extent serves two useful purposes. First, it separates more localized disturbances from more widespread disturbances. A banking panic that occurs in one part of the country, but does not spread to other regions would seem to be a more minor disturbance than a banking panic that involves a generalized loss of depositor confidence throughout many parts of the nation. Separating more localized disturbances from more widespread disturbances clarifies the degree of the panic. Second, geographic extent is measurable and hence, not susceptible to personal discretion. Given the lack of bank-specific data throughout the 1800s, geographic extent provides a measurable criterion for classifying panics according to degree.

However, scaling banking panics according to geographic extent is not a flawless measure of degree. It is entirely plausible that a banking panic could have spanned more than one geographic unit, but have remained a minor disturbance. Consider for example, a banking panic that spanned more than one geographic unit, but that remained confined to a few states with small banking sectors. While such a disturbance might have seriously affected the local economies of those states, a panic of that nature might have been a minor disturbance from the perspective of the overall banking system. To overcome this potential problem, I require that all major banking panics be reported on the front page of the newspaper—the *Niles Weekly Register* for 1825-1849, the *Merchants' Magazine and Commercial Review* for 1842-

1879, and the *Commercial and Financial Chronicle* for 1865-1929—to ensure that only the most serious episodes of banking distress are classified as major banking panics.<sup>16</sup>

### **Part III. The New Panic Series and Its Implications**

This section describes the new series on banking panics and presents its implications. I begin by documenting the incidence of banking panics between 1825 and 1929. I then assess the reliability of earlier series by comparing them to my new series and by reading contemporary news reports surrounding every panic episode on all nine series. Next, equipped with my new series, I document the historical frequency of banking panics. Lastly, I investigate whether banking panics displayed a seasonal tendency prior to 1914 and I examine whether banking panics were correlated with downturns.

#### **3.1 Results**

Table 2 presents the new banking panic series. The new series identifies seven major banking panics and twenty minor banking panics between 1825 and 1929. Descriptions of each of these banking panics—with citations to the contemporary news articles reporting them—are contained in the companion appendix to this paper.<sup>17</sup>

The new series contains many banking panics not noted in earlier series. While all of the major banking panic episodes from the new series are noted in at least one earlier series, thirteen of the twenty minor banking panics are not listed in any of the earlier series. Moreover, the new series differs from many of the earlier series in another notable respect: it classifies two of the most commonly cited banking

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<sup>16</sup> By front page, I refer to the first page of the newspaper, with the exception of index or contents pages. If the first page of the newspaper is an index or contents page, then I treat the first page following the index or contents page as the front page.

<sup>17</sup> Because I am using three different newspapers over the 1825 to 1929 period, a useful check to make sure that the reporting is consistent across newspapers is to see if different newspapers in overlapping periods—periods in which more than one newspaper were in operation—identify the same banking panics. There are two overlapping periods: (1) April 1842 to 1849 (*Niles Weekly Register* and *Merchants' Magazine*) and (2) 1865 to 1869 (*Merchants' Magazine* and *Commercial and Financial Chronicle*). In the two overlapping periods, I arrive at the same results, regardless of which newspaper I use. Between April 1842 and 1849, both the *Niles Weekly Register* and the *Merchants' Magazine* identify just one minor banking panic: the minor banking panic in New Orleans in 1842. Between 1865 and 1869, both the *Merchants' Magazine* and the *Chronicle* do not identify any banking panics.

panics—1884 and 1890—as minor. Both the 1884 and 1890 banking panics were localized disturbances confined primarily to New York City.

### **3.2 Inconsistencies in Earlier Series**

A comparison of my new series with earlier series reveals major inconsistencies in some of the earlier series. Some series combined panics with other developments in financial markets. Others failed to distinguish among different types of financial panics. A few series even went so far as to incorrectly identify foreign banking panics as domestic ones.

To demonstrate this, consider Table 3, which presents the new series on banking panics alongside the nine earlier series for the period 1825-1929. This is a particularly useful comparison since five of the panic series—Bordo-Wheelock, Reinhart-Rogoff, Friedman-Schwartz, Gorton, and Wicker—explicitly refer to themselves as series on banking panics or banking crises. Entries with strikes through them are panic episodes noted in one of the earlier panic series that are not included in the new series on banking panics. These episodes do not contain banking panics. To verify this, I read the contemporary news reports surrounding each of these episodes. I consider them one at a time.

**1825 and 1847.** In both 1825 and 1847, a banking panic occurred in England—not in the United States. The Bordo-Wheelock, Thorp, and Reinhart-Rogoff series list 1825 as either a U.S. panic or crisis date and the Thorp series lists 1847 as a U.S. panic date. While serious banking panics did occur, they were confined to England in both cases. The reporting of the *Niles Weekly Register* in 1825 contains only a few reports of isolated bank failures in the U.S and the reporting of the *Merchants' Magazine and Commercial Review* in 1847 does not contain any accounts of bank runs, suspensions or failures in the U.S. There was no generalized panic in the U.S. in either year.

**April 1864.** One version of the Reinhart-Rogoff series lists April 1864 as a banking crisis; however, no banking panic occurred. Instead, a serious disturbance on stock markets erupted following the passage

of a law in the U.S. senate designed to force a reduction in the price of gold.<sup>18</sup> According to the press, the measure “excited the liveliest fears...the stock market, under the immense pressure...underwent a severe revulsion.”<sup>19</sup> In reporting the events of April 1864, the editors of the *Merchants’ Magazine* described “one of the most severe revulsions of late years in the stock market.”<sup>20</sup> However, the crisis appears to have been confined to the stock market: there were no reports of any bank runs, suspensions, or failures in April of 1864.

**Oct 1896.** The Gorton series lists October 1896 as a banking panic; however, no banking panic occurred then. The *Commercial and Financial Chronicle* did not report any banking panics in October 1896. Instead, a minor banking panic—confined entirely to Chicago, St. Paul and West Superior—occurred in December of that year. The panic was small in scope; only 4 banks suspended.<sup>21</sup>

**1914.** Even though serious financial instability occurred, the events of the summer of 1914 do not constitute a banking panic—according to my definition—since bank runs, suspensions, and failures were avoided. The outbreak of war in Europe dramatically increased the demand for specie and caused a worldwide rush to liquidate stocks, resulting in the closing of the New York Stock Exchange on July 31, 1914. A few days later in early August, fears of a run on the U.S. banking system led to the issuance of emergency currency under the Aldrich-Vreeland Act. The Act flooded the country’s banking system with additional currency. No banking panic materialized in 1914.<sup>22</sup>

**Five DeLong-Summers Panics.** Five of the twelve DeLong-Summers panic quarters do not contain banking panics: 1896:01, 1896:03, 1898:02, 1903:02, and 1909:04. To verify this, I read the *Commercial*

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<sup>18</sup> Due to increased borrowing to finance wartime expenditures, the price of gold had increased substantially.

<sup>19</sup> “Commercial Chronicle and Review,” *Merchants’ Magazine and Commercial Review*, May 1864, p. 365.

<sup>20</sup> “Commercial Chronicle and Review,” *Merchants’ Magazine and Commercial Review*, May 1864, p. 363.

<sup>21</sup> Gorton included Oct 1896 as a panic, noting that the issuance of Clearing House loan certificates was authorized, even though none were actually issued. However, a reading of the *Chronicle* reveals that the issuance of loan certificates was authorized ten months earlier in Dec 1895: “The action taken by the Clearing-House Association on Monday, providing for the issuance of Clearing-House loan certificates was a strong factor in producing the change in sentiment which took place early in the week. The measure was entirely a precautionary one, looking to the possibilities of the future rather than to the needs of the present, and no certificates have been applied for” (“The Money Market and Financial Situation,” *Commercial and Financial Chronicle*, Dec 28, 1895, p. 1144).

<sup>22</sup> This episode is contained on the Gorton and Reinhart-Rogoff series. However, Reinhart and Rogoff acknowledge in a brief summary of the episode that a banking crisis was avoided in 1914: “a banking crisis was avoided by flooding the country with emergency currency to prevent hasty withdrawals” (Reinhart and Rogoff, p. 390).

and *Financial Chronicle* during all of the DeLong-Summers panic quarters. Since no banking panics occurred, why were these five episodes classified as panics? Several of them satisfy the DeLong-Summers panic criterion of a quarter-to-quarter increase of one percentage point or more in the average commercial paper rate—a potentially important development in financial markets, but not necessarily an indicator of a financial panic.

**Twenty-One Kemmerer Panics.** Table 3 makes it clear that the Kemmerer series should never be used or interpreted as a series on banking panics: more than two-thirds of Kemmerer’s panic episodes do not contain banking panics. Eight of the twenty-nine Kemmerer panic episodes contain banking panics—Sept 1873, May 1884, Nov 1890, May-Aug 1893, Dec 1896, July 1901, and Oct 1907—whereas the remaining twenty-one do not contain banking panics. To verify this, I read the *Commercial and Financial Chronicle*—Kemmerer’s source in identifying panics—during all of Kemmerer’s panic episodes. Since no banking panics occurred, why did Kemmerer classify these twenty-one episodes as panics? A reading of the *Chronicle* provides a hint: many of Kemmerer’s episodes coincided with reports of instability in the stock market. This raises the possibility that Kemmerer combined banking panics with stock market disturbances in one series or that Kemmerer’s panic series was intended to serve as a series on stock market panics, with these eight banking panic episodes simply coinciding with stock market panics. However, because Kemmerer never clearly explained what kind of financial disturbance he included as a panic, it is unclear which of these two interpretations most accurately applies to his series. Moreover, even if Kemmerer had intended his series as a series on stock market panics, it is unlikely that he constructed it in a consistent way. Kemmerer relied on the reporting of the *Chronicle*—rather than on stock market indices or other quantitative evidence—to identify his episodes. Deciphering the magnitude of declines in stock prices or the magnitude of instability in stock markets from the qualitative reporting of the *Chronicle* is likely to be highly unreliable. This might, in part, explain the cautionary messages—outlined in Section 1.3—that Kemmerer provided regarding the accuracy of his series.

### 3.3 Frequency of Banking Panics

Table 4 presents the frequency of banking panics implied by the new series. Frequencies are calculated by dividing number of years by number of panics. To differentiate the pre-Federal Reserve era from the post-Federal Reserve era, I calculate pre-1914 and 1914 to 1929 frequencies.

Before 1914, major banking panics occurred at a rate of one every 12.9 years and minor banking panics occurred at a rate of one every 6 years. It should be noted, however, that the occurrence of three major banking panics during the 1830's increases the rate of major banking panics—by contrast, the median number of years separating major banking panics is sixteen. Between 1914 and 1929, minor banking panics occurred at a rate of one every 3.5 years. No major banking panics occurred between 1914 and 1929.

These findings differ in substantive ways from the orthodox view in the literature. The conventional wisdom on the historical frequency of panics is that the frequency of panics was high before 1914 and that the frequency dramatically decreased between 1914 and 1929—that is, during the first fifteen years of the existence of the Federal Reserve. However, these claims originate with Miron (1986), who used the Kemmerer series to document the incidence of panics prior to 1914. Between 1890 and 1908, Kemmerer identified six major panics, leading Miron to conclude that before the founding of the Fed, the probability of having a major panic in a given year was 0.316 and that major panics occurred at a rate of roughly one every three years. If minor panics are included, then the rate—according to Miron—increases to more than one panic per year.<sup>23</sup> By contrast, Miron then claims that between 1915 and 1929, the banking system did not experience any financial panics.<sup>24</sup> Using the pre-1914 frequency of major panics derived from the Kemmerer series, Miron calculates that the probability of going fourteen years—from 1915 to 1929—without a major panic was 0.005. On the basis of this evidence, Miron concludes that the Federal Reserve's policies of furnishing an elastic currency—one that could expand during seasons of high money

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<sup>23</sup> Miron writes, "If only major panics are included, the frequency was slightly more than one every three years. Including minor panics raises the frequency to more than one per year" (page 131).

<sup>24</sup> "Between 1915 and 1933, the banking system experienced financial panics only during the subperiod 1929-33" (Miron, page 131).

demand and contract during seasons of low money demand—strengthened the nation’s banking system to ward off panics, resulting in this purported dramatic reduction in the frequency of panics between 1914 and 1929. This claim has subsequently been picked up by others and is now widely circulated in the literature.<sup>25</sup>

However, Miron’s claims hinge on an unreliable panic series, the Kemmerer series. According to my new series on banking panics, it was not uncommon for fifteen consecutive years to elapse without a major panic. Eighteen years separated the major banking panics of 1839 and 1857, sixteen years separated the major banking panics of 1857 and 1873, twenty years separated the major banking panics of 1873 and 1893, and fourteen years separated the major banking panics of 1893 and 1907. Moreover, the median number of years separating major banking panics between 1825 and 1914 was 16. Therefore, the absence of a major panic for fifteen consecutive years—from 1914 to 1929—provides no support for the claim that the frequency of panics decreased during the first fifteen years of the existence of the Federal Reserve.<sup>26</sup> Prior to 1914, recurring periods of 14 to 20 years without a major banking panic were the norm.<sup>27</sup>

### 3.4 Seasonality of Major Banking Panics

An additional result of the new series is the seasonality of major banking panics. Consider Table 5, which documents the seasonality of banking panics before the founding of the Federal Reserve. There is a strong tendency for major banking panics of this era to break out during the fall or spring. Six of the seven major banking panics—or 86%—began in a fall or spring month. Four broke out during the fall—the

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<sup>25</sup> For example, Meltzer (2003), in his *History of the Federal Reserve*, writes “In the 1920s, the Federal Reserve received credit for improving economic performance...Although the economy continued to experience relatively large cyclical fluctuations and many banks failed, old style financial panics did not return in the three recessions from 1920 through 1927” (page 9). Bordo (1989) also notes that, “financial panics in the United States before 1914 generally occurred at seasonal peaks in nominal interest rates...After 1914, however, the Fed extended reserve bank credit to accommodate seasonal credit demands, thereby considerably reducing the amplitude of the seasonal interest rate cycle and preventing any panics from occurring between 1914 and 1929” (page 40).

<sup>26</sup> The next major banking panic—the first one of the Great Depression—occurred in 1930, sixteen years after the founding of the Fed.

<sup>27</sup> Broadening the analysis to incorporate minor banking panics does not provide support to the claim of a reduction in the frequency of panics between 1914 and 1929. Between 1825 and 1914, minor banking panics occurred at a rate of one every 6 years. By contrast, between 1914 and 1929, minor banking panics occurred at a rate of one every 3.5 years.

Panic of 1833 (November), the Panic of 1839 (October), the Panic of 1873 (September), and the Panic of 1907 (October)—and two broke out during the spring—the Panic of 1837 (March) and the Panic of 1893 (May). The sole exception—the Panic of 1857—began during the last week of August, but became more intense during the fall months of September and October. Thus, there is strong evidence that major banking panics were more likely to occur during particular seasons: six of the seven major banking panics began during the spring or fall.<sup>28</sup> These findings lend credence to the view that before the founding of the Fed, seasonal stringencies in the money market made financial panics more likely to occur during particular seasons. By extension, they also suggest that policies designed to eliminate seasonal stringencies in the money market—such as the establishment of an elastic currency after the founding of the Fed—might have had a stabilizing influence on the nation’s banking system. In this sense, these findings support the broad conclusions of Miron (1986).<sup>29</sup>

### **3.5 Correlation with Downturns**

A final trend that merits attention is the strong correlation between major banking panics and downturns. Table 6 presents the behavior of the Davis Index of Industrial Production surrounding every major banking panic between 1825 and 1914. The Davis Index is the only consistent output series that spans the entire pre-WWI U.S. economy. Davis (2004) used 43 quantity-based annual series in the mining and manufacturing sectors to compile his index. According to Davis, these series “indirectly represent close to 90 percent of the value added produced by the U.S. industrial sector during the nineteenth

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<sup>28</sup> Minor banking panics were not more likely to occur during the fall or spring: 53% broke out during the fall or spring, whereas 47% broke out during the summer or winter.

<sup>29</sup> Even though it was noted in the previous subsection that there is no evidence of a decline in the frequency of panics during the first fifteen years of the existence of the Federal Reserve, the policies of the Federal Reserve—such as the establishment of an elastic currency—still might have helped strengthen the nation’s banking system to ward off panics. The true counterfactual—the incidence of panics from 1914 to 1929 without the Federal Reserve’s policies—is unobservable. However, the general tendency of major banking panics to occur during those seasons characterized by stringent monetary conditions before 1914 suggests that the establishment of an elastic currency following the founding of the Federal Reserve might have helped stabilize the country’s banking system.

century.”<sup>30</sup> Consequently, it serves as a reliable measure of real economic activity. Its chief limitation is that it is available at only a yearly frequency.

Table 6 shows that the Davis index declines surrounding each panic episode. The correlation between major banking panics and downturns is clear. These results stand in stark contrast to those of DeLong and Summers (1986) who do not find a strong link between panics and downturns using their series.

However, the existence of a correlation between panics and downturns does not prove that panics have real output effects since panics might be consequences—rather than causes—of downturns. Indeed, Mitchell (1941) and Fels (1959) provide the main articulation of this hypothesis. They argue that major recessions cause banking panics. During downturns, business failures and declining fundamentals cause depositors to become alarmed that banks will suspend or fail. This precipitates a run to convert deposits into currency, thereby generating a panic. Under this specification, it would be misleading to attribute output declines to panics since panics would be products of downturns rather than causes. Therefore, to identify the output effects of panics, stronger evidence is required.

#### **Part IV. The Macroeconomic Effects of Banking Panics**

Equipped with the new panic series, this section empirically examines the macroeconomic effects of major banking panics of the pre-Great Depression era. The main problem in identifying the output effects of panics is the possibility that panics might be consequences—rather than causes—of downturns. To overcome this problem, Section 4.1 studies the output effects of major banking panics via VAR-based methods. Part A presents the baseline VAR estimated using annual data. Part B then restricts the VAR using additional evidence from the narrative record to isolate those panics that the reports of contemporary observers suggest were the result of idiosyncratic disturbances, as opposed to declining output conditions. Lastly, Part C presents a VAR estimated using monthly data on output and prices. Section 4.2 then

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<sup>30</sup> Page 1179.

investigates three related macroeconomic issues: (1) the role of panics as a source of economic instability before the founding of the Fed, (2) how downturns with major banking panics differed from downturns without them, and (3) the behavior of trend output in the aftermath of panics.

#### **4.1 A VAR-Based Approach**

##### **A. The Basic VAR**

To identify the output effects of major banking panics, I estimate a basic VAR. VARs are frequently used in the literature to estimate the effects of policy and other macroeconomic events. VARs possess the benefit of controlling for the prior behavior of all variables in the system.

The basic VAR that I estimate has two variables: a panic dummy series that equals one in the year in which a major banking panic breaks out and the change in log output. The panic dummy includes all seven major banking panics identified in my series from 1825-1929. Output is measured using the Davis Index of Industrial Production. The sample period is 1825 to 1914, the final year of the Davis Index of Industrial Production.<sup>31</sup>

Figure 1 presents the results from the VAR. It shows the impulse response functions of the panic dummy and output to shocks of one unit in the panic dummy and one-percentage point in output growth, along with one-standard error bands. Panels A and D show that both the panic dummy and output growth exhibit few dynamics in response to shocks in their own series: in both cases, shocks lead to small and irregular movements in the two respective series.

Panel B shows that the movements in the panic dummy in response to an output shock are insignificant. After a one-percentage point innovation to output growth, the panic dummy increases by an

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<sup>31</sup> I limit my test of the real output effects of banking panics to major banking panics. I exclude minor banking panics due to data limitations. The existing historical series on real economic activity are available at a national level, making an assessment of the effect of major banking panics on aggregate output feasible. By contrast, an assessment of the real effects of minor banking panics, which tend to be more localized disturbances, would require regional data on output. Unfortunately, such data are unavailable throughout most of U.S. history. This does not mean that localized banking panics did not have significant real effects for the U.S. economy. However, any evidence of the output effects of localized panics would likely be muddled in national statistics on output, making a statistical analysis of the real effects of localized panics very noisy. As a consequence, I confine my study to major banking panics.

insignificant 0.42 units one year after the shock (t-stat = 0.83), returning in years 2 and 3 to roughly zero. The p-value for the test of the null hypothesis that output does not Granger-cause the panic dummy series is 0.79, suggesting that the panics are unrelated to past movements in output.

The main result of the VAR is in panel C. It presents the behavior of output following a unit shock in the panic dummy variable. The results indicate that banking panics have large and strongly significant effects on output. The estimated maximum effect is a decline of 10.5 percent in the year following the panic (t-stat = -4.18).

## **B. Further Restrictions on the VAR: Narrative Evidence**

The results from the basic VAR indicate that banking panics cause output declines. Thus, while the purely statistical results from the basic VAR are strong, evidence from the narrative record can be used to further address identification issues. Of particular relevance, financial and economic newspapers from the 1825 to 1929 period contain detailed commentaries by economic observers. In many instances, the economic press identify the events that precipitated a panic among depositors, making it easier to determine whether the panic was caused by a downturn or by some other disturbance. Moreover, the economic press provide descriptions of economic conditions on the eve of the outbreak of the panic. According to the Mitchell and Fels framework, major recessions cause panics because depositors become alarmed by declining fundamentals. Thus, newspaper reports should reflect these deteriorating economic conditions and serve as a signal to depositors that fundamentals are declining or expected to decline.

Therefore, to obtain additional information on the causes of panics, I read the newspaper records surrounding every major banking panic between 1825 and 1929 to identify those panics that the reports of contemporary observers suggest were the result of idiosyncratic disturbances, as opposed to declining output conditions. I then use these episodes to empirically identify the output effects of panics by imposing restrictions on the VAR.

Methodologically, this test is similar in approach to the work of Romer and Romer (1989, 2004) to identify the effects of monetary policy, Romer and Romer (2010) to identify the effects of changes in

taxes, and Ramey and Shapiro (1998) and Ramey (2011) to identify the effects of changes in government spending. Moreover, similar to Ramey and Shapiro (1998) and Ramey (2011), the narrative sources that I use are contemporary financial and economic news reports. In particular, I employ the following newspapers: *The Niles Weekly Register* (1825-1849), *The New York Commercial Advertiser* (1825-1857), *The Merchants' Magazine and Commercial Review* (1839-1869) and *The Commercial and Financial Chronicle* (1865-1914). These periodicals were among the leading economic and financial newspapers of their day.

Thus, I read the newspaper records surrounding major banking panics to accomplish two goals: (1) to identify the perceived causes of panics and (2) to identify the perceived state of the economy when the panic broke out. I classify panics along a two-dimensional scale. On the first dimension, I classify panics according to reported causes. On the second dimension, I classify panics according to the state of the economy when the panic broke out. The scale ranges from 1 to 3 along both dimensions. Figure 2 presents a visual representation of this scale.

On the first dimension of the scale, if the newspaper records identify an event unrelated to output fluctuations as the primary cause of the panic, then I assign the panic a 3; if the newspaper records identify output fluctuations as the primary cause of the panic, then I assign the panic a 1. Examples of events that might precipitate a panic, but that are likely to be unrelated to domestic output fluctuations include a political decision that causes a change in market expectations regarding the stability of the banking sector, the failure of a mismanaged bank and a subsequent contagion of fear generated in the aftermath of such a failure, or a panic abroad that triggers financial instability at home. If the newspaper records identify any of these events as the primary cause of the panic, then I assign the panic a 3. By contrast, a panic caused by depositor anxiety that a major recession will cause banks to fail or suspend would be a prime example of a panic that would receive a 1. On the second dimension, if the newspaper records characterize economic conditions as “prosperous” on the eve of the outbreak of panic, then I assign the panic a 3; if the newspaper records characterize the state of the economy as in “depression” or “in recession” on the eve of the outbreak of panic, then I assign the panic a 1. Moreover, on both dimensions, there is an intermediate

category 2, which is reserved for ambiguous situations in which the newspaper records are not definitive in assigning causes or in characterizing the state of the economy. If the newspaper records identify both a downturn as well as other events that are unrelated to output fluctuations as primary causes of the panic, then the panic is assigned a 2 on the first dimension. If the newspaper records do not clearly characterize economic conditions either as “prosperous” or as in “depression/recession,” then the panic is assigned a 2 on the second dimension. Lastly, in situations where the newspaper records are uninformative in identifying causes or in characterizing the state of the economy, I simply exclude the panic from the ranking. This occurs when the newspaper records do not seem to know what caused the panic and are in widespread disagreement or when the newspaper records simply do not contain descriptions of the state of the economy on the eve of the outbreak of panic.

Table 7 presents the classification of panics along the scale. Detailed accounts of the reported causes of each of these panics—along with an extensive description of the classification of each of the major banking panics along this scale—is contained in Sections A4 and A5 of the appendix to this paper.

Equipped with this additional evidence on the causes of panics, I restrict the VAR to only include certain panic observations. Specifically, I estimate three different VAR specifications, with each specification corresponding to a distinct restriction on the panic dummy variable. In the first specification, I include panics that received a 3 on the first dimension of the scale in the panic dummy, in the second, I include panics that received a 2 or a 3 on the first dimension and in the third, I include only those panics that received a 3 on both dimensions of the scale. The first specification presents the baseline case in which all panics that received a 3 on the first dimension of the scale—those that the newspaper records attribute to events unrelated to output fluctuations—are included in the panic dummy variable. The second specification takes into account the possibility that panics that received a ranking of 2 on the first dimension of the scale were, in fact, not caused by output fluctuations. The third specification presents the most restrictive case in which only panics that received a 3 on both dimensions of the scale—those that did not break out in the midst of a downturn and that were not caused by output fluctuations, according to the

newspaper records—are included in the panic dummy. The sample period is 1825 to 1915, the final year of the Davis Index of Industrial Production.

Figure 3 displays the results. It presents the impulse response functions of output to a unit shock in the restricted panic dummy and the impulse response functions of the restricted panic dummy to a shock of one-percentage point in output growth. The impulse response functions are very similar to those from the unrestricted VAR. The impulse response functions of output to a unit shock in the restricted panic dummy indicate that panics have large and strongly negative effects on output. In the year following the panic, there is a large decline in output: 10.1 percent according to the first specification (t-stat = -2.80), 12.8 percent according to the second (t-stat = -4.06), and 9.1 percent according to the third (t-stat = -2.26). The impact remains fairly constant in years 2 and 3, decreasing slightly in year 2, but then increasing slightly again in year 3. By contrast, the impulse response functions of the panic dummy to a one-percentage point shock in output growth are insignificant. The results are robust across all three specifications.

### C. Monthly Measures of Output and Prices

It is also useful to analyze the impact of banking panics on monthly measures of output and prices. A monthly output series—the Long Index of Urban Construction—is available beginning in 1868. It measures building construction in thirty-five major cities. In his work *Building Cycles and the Theory of Investment*, Long (1940) argues that building was a leading investment goods industry in the 19<sup>th</sup> and early 20<sup>th</sup> centuries and as a consequence, that his series can be used as a proxy for investment.<sup>32</sup> At the very least, the index is a reliable measure of construction, an important indicator of real economic activity. Likewise, a monthly price series—the USA Annalist Wholesale Price Index—is available beginning in 1854.<sup>33</sup>

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<sup>32</sup> Grossman (1993) adopts this interpretation.

<sup>33</sup> The price data come from [globalfinancialdata.com](http://globalfinancialdata.com). The index incorporates the wholesale prices of twenty-five commodities. It begins in 1854 and ends in 1940.

The VAR that I estimate has three variables: a panic dummy series that equals one in the month in which a major banking panic breaks out, the log of the USA Annalist Wholesale Price Index, and the log of the Long Index of Urban Construction. The sample period is 1868-1914.

Figure 4 displays the results. Panels A and B show the impulse response functions of the panic dummy to a shock of ten percent in output and to a shock of one percent in prices. The movements of the panic dummy in response to either an output shock or a price shock are small, irregular, and insignificant. Neither output movements nor price movements Granger cause the panic dummy series. The p-value for the test that all of the output coefficients are zero is 0.64 and the p-value for the test that all of the price coefficients are zero is 0.34, indicating that the panics are unrelated to prior movements in both output and prices. That the monthly impulse response function of the panic dummy to an output shock is insignificant corroborates the results from the VARs estimated using annual data. Taken together, they provide strong evidence that major banking panics are not systematically related to prior movements in output.<sup>34</sup>

Panels C and D present the main results of the VAR. They show the response of output and the price level to a unit shock in the panic dummy, together with one-standard error bands. The impulse response functions reveal that panics have rapid effects on both output and prices. Panel C shows that output declines to its lowest level two months after the panic; the estimated impact at month 2 is -77.5% (t-stat = -4.66). Output then remains at a depressed level for the following two months, before increasing in month 5, where it fluctuates within a band for the remainder of the period. Panel D shows that prices decline quickly; the impact at month 3 is -6.7% (t-stat = -3.40). The decline slows down over time, but continues over the course of a year.<sup>35</sup>

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<sup>34</sup> The impulse response function of the panic dummy to a price shock is also interesting in its own right. There are reasons to suspect that panics might be preceded by either periods of deflation or inflation. On the deflationary side, the debt-deflation hypothesis, first articulated during the Great Depression by Irving Fisher (1933), suggests that deflation, by raising the real value of debts, increases bank distress and raises the likelihood of a banking panic. On the inflationary side, others—see, for example, *America's Great Depression* by Murray Rothbard (1963)—have contended that financial crises occur when economies overheat—that is, when economies operate above their normal capacity; in that scenario, financial crises would be preceded by a run-up in inflation. My results provide no evidence in favor of either view; they suggest that major banking panics are unrelated to prior movements in prices.

<sup>35</sup> Restricting the monthly VAR with narrative evidence—in a manner similar to the restrictions imposed on the annual VARs—does not change the results.

## 4.2 Related Macroeconomic Findings

Armed with the new panic series, this subsection investigates three related macroeconomic issues: (1) the role of panics as a source of economic instability before the founding of the Fed, (2) how downturns with major banking panics differed from downturns without them, and (3) the behavior of trend output in the aftermath of panics.

### A. Panics as a Source of Output Volatility, 1825-1914

In assessing the determinants of historical changes in output variability, DeLong and Summers (1986) conclude that financial panics were not a significant source of economic instability prior to World War II:

“The view that financial panics were a principal cause of economic instability before World War II does not seem to be strongly supported. This finding weakens the monetarist argument linking output variability to erratic monetary growth by showing that relatively little of the variability in output observed before World War II can be linked to exogenous changes in the money stock.”<sup>36</sup>

They base this conclusion on their finding that no more than a small portion of the variance in output between 1890 and 1910 can be attributed to financial panics. However, their findings depend on their panic series.

According to my new series, how important were panics as a source of economic instability? The Davis Chronology of Business Cycle Turning Points provides a useful indicator for the pre-WWI period. Davis (2006) isolates fifteen turning points—fifteen downturns—between 1825 and 1915 using the Davis Index of Industrial Production. Table 8 presents the Davis Chronology.

Seven of these fifteen cycles—or 47 percent—contained major banking panics: 1833-1834, 1836-1837, 1839-1840, 1856-1858, 1873-1875, 1892-1894, and 1907-1908. This suggests that banking panics either caused or—at the very least—seriously aggravated nearly half of all business cycle downturns between 1825 and 1914. If I exclude the three cycles contained within a major war—the two Civil War cycles from 1860 to 1861 and 1864 to 1865 and the World War I cycle from 1913 to 1914, then seven of the twelve non-war downturns—or 58 percent—contained major banking panics.

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<sup>36</sup> Pages 692-693.

An alternative measure of the role of panics as a source of output volatility is the  $R^2$  in a regression that includes a panic dummy equal to one in the year in which a major banking panic breaks out, three lagged panic dummies, and three lagged log changes in output (measured using the Davis Index) as right-hand side variables and that includes the log change in output as the left-hand side variable. The  $R^2$  in such a regression is 0.28, indicating that roughly 28% of the variation in the growth rate of output can be explained by the right-hand side variables. By contrast, the  $R^2$  in a regression that excludes the contemporaneous and lagged panic dummies—but otherwise remains the same—is 0.01.

These results suggest that banking panics were a substantial source of output volatility in the 85 years prior to the founding of the Federal Reserve. Indeed, the presence of major banking panics in nearly half of all business cycle downturns prior to WWI and their reoccurrence during the Great Depression—the sharpest downturn in U.S. history—suggest that panics were a significant source of economic instability throughout much of U.S. history.

## **B. Downturns with Major Banking Panics versus Downturns without Major Banking Panics**

Equipped with an accurate listing of when major banking panics occurred and with the Davis Chronology, I am also able to examine how downturns with major banking panics differed from downturns without them. Table 9 compares downturns with major banking panics and downturns without major banking panics on three dimensions: severity (the percentage decline in output from peak-to-trough), the length of the downturn (the length of time from peak-to-trough), and the length of recovery (the length of time output took to recover from its trough back to its pre-downturn peak level). The table reports averages for the pre-Civil war and post-Civil war sub-periods. Because wartime conditions represent special economic circumstances that may have their own unique features, the table omits the three downturns that occurred in the midst of major wars—that is, the two downturns during the Civil War (1860-1861 and 1864-1865) and the downturn at the beginning of World War I (1913-1914).

Table 9 reveals that in the post-Civil War period, downturns with major banking panics differed from downturns without them. Between 1865 and 1915, downturns with major banking panics were

slightly longer and substantially more severe than downturns without major banking panics on average, and output recoveries for downturns with major banking panics were two-to-three times the length of output recoveries for downturns without them. Specifically, for downturns with major banking panics, the average percentage decline in output was 12.3%, the average length of time from peak-to-trough was 1.7 years, and the average length of recovery was 2.7 years. For downturns without major banking panics, the average percentage decline in output was 4.5%, the average length of time from peak-to-trough was 1.3 years and the average length of recovery was 1 year.

However, similar patterns do not hold in the pre-Civil War period. Before the Civil War, downturns with major banking panics were not, on average, more severe than downturns without them and the average length of recovery was the same for both downturns with major banking panics and downturns without them. Why do strong differences exist in the post-Civil War era and not in the pre-Civil War era? One hypothesis is that structural changes to the U.S. economy over time—the transformation of an agricultural economy to a more industrial one or a greater reliance on bank credit—rendered the U.S. economy more vulnerable to disruptions in the banking sector. The hundred years prior to the Great Depression was a period of dramatic economic transformation; it is highly plausible that changes to the U.S. economy increased the susceptibility of the real economy to banking panics over time.

### **C. Trend and Level Effects**

How long do the effects of banking panics last? Are panics shocks to the economy that get rapidly undone? Does output quickly revert back to trend? Or do panics disrupt the normal dynamics of output in ways that persist over time? There appears to be a growing consensus in the literature that banking crises can have highly persistent and lingering effects on output. Several recent studies—primarily confined to international banking crises over the past half-century—have arrived at this conclusion. Using a panel data set for a large number of countries in the post-1960 period, Cerra and Saxena (2008) find that following financial crises, output does not, on average, revert back to its pre-crisis trend. In an analysis of 88 banking crises since 1970, the IMF's October 2009 *World Economic Outlook* concludes that output

typically does not recover to its pre-crisis trend over the medium term—that is, within the first seven years after the crisis. In a study of 40 banking crises since 1980, Cecchetti, Kohler, and Upper (2009) find that many banking crises have long-lasting effects on output and that trend reversion—when it occurs—tends to be a slow process.

Do similar patterns hold for the banking panics of the pre-Great Depression era? To investigate whether the banking panics of the pre-Great Depression era might have had lingering effects on the behavior of output, I estimate a trend regression for each major banking panic. The regression takes the following form:

$$\ln y_t = \alpha_0 + \alpha_1 D_t + \beta_0 t + \beta_1 D_t t + \varepsilon_t,$$

where  $y_t$  is the Davis Index of Industrial Production in year  $t$  and  $D_t$  is a dummy variable that equals 1 if year  $t$  is in the post-panic period and 0 if year  $t$  is in the pre-panic period. I include the dummy variable to identify changes in trend following the panic. Since the Davis Index is available at an annual frequency and since I want to come as close as possible to separating periods by banking panics, I implement a specific criterion for panic years. If the panic broke out in the first half of the year, then I include that year in the post-panic period. If the panic broke out in the second half of the year, then I include that year in the pre-panic period. For uniformity across panics, I restrict each pre-panic period to the fifteen years prior to the panic. To avoid contaminating the behavior of output following the panic with the behavior of output following a subsequent panic, each post-panic period ends before the next major banking panic. Because there were three major banking panics during the 1830's—1833, 1837, and 1839, I begin my analysis in 1840, rather than try to estimate shifts in trend between the panics of 1833 and 1837, which only spans four years, and between the panics of 1837 and 1839, which only spans two years. Thus, I run four separate regressions, corresponding to each of the four major banking panics of the post-Jacksonian period: 1857, 1873, 1893, and 1907.

Figure 5 presents a graphical representation of these breaks in trend. It contains four graphs, with each graph corresponding to a different banking panic. Each graph plots the log of the Davis Index of Industrial Production on the vertical axis and year on the horizontal axis. Pre-panic and post-panic

trends—based on the above regressions—are contained in each graph. To show where output would have been had it continued to follow its pre-panic trend, I project each pre-panic trend line out into the subsequent period. The solid lines represent actual trends whereas the dashed lines represent projected trends. Following the panics of 1857, 1893, and 1907, the actual trend line falls below the projected trend line. In these three instances, output does not rapidly revert back to its pre-panic trend. For the panic of 1893, the projected and actual trends are parallel, suggesting that a level effect is associated with this panic. For the panics of 1857 and 1907, the actual trend is flatter than the projected trend, indicating a decline in trend output growth following these panics. In the remaining projection—the one corresponding to the 1873 panic episode, the actual trend line crosses the projected trend line, indicating that output reverts back to its pre-panic trend. However, even in the case of the 1873 panic, output growth in the immediate aftermath of the panic was sluggish. Output did not return to its pre-panic peak level until 1878. Thus, while there is some variability across these episodes, these findings for the pre-Great Depression era corroborate the growing consensus in the literature that banking crises are often associated with lingering effects on output. They also suggest that the sluggish performance of output in the aftermath of the banking crisis of 2008 is not inconsistent with the historical record.

## **Part V. Conclusions**

There are two major problems in identifying the real output effects of financial panics of the pre-Great Depression era. First, it is not clear when panics occurred because prior panic series differ in their identification of panics. Second, establishing the direction of causality is tricky: are panics causing downturns or are downturns causing panics?

This study sequentially addresses these two problems. It accomplishes this (1) by deriving a new series on banking panics for the 1825-1929 period—one that rectifies many of the problems of earlier series—and (2) by studying the output effects of major banking panics via VAR-based methods.

The new series has important implications for our understanding of the history of banking panics in the United States. First, the series recreates a detailed record of when and where banking panics occurred. It identifies seven major and twenty minor banking panics in the century before the Great Depression. The appendix to this paper provides detailed descriptions—gathered from contemporaneous historical news accounts—of each of these panics.

Second, equipped with the new series and with the historical news record, I sort out the inconsistencies across earlier series. I document important mistakes in earlier series, e.g. the misidentification of foreign banking panics as domestic ones (1825 and 1847), the use of dubious rules to identify panic episodes, as in case of the DeLong-Summers series, and the indiscriminate lumping together of an array of different types of financial disturbances—banking panics, stock market disturbances, increases in interest rates—under the common heading of panic, as in the case of the Kemmerer series. In other instances, however, my results reaffirm key findings of some series, such as those of Wicker and Sprague, who also separated the disturbances of 1884 and 1890 from 1873, 1893, and 1907, the three full-scale banking panics of the National Banking Era.

Third, the new series sheds light on earlier studies on the causes and effects of panics. While my findings support the general conclusions of Miron (1986) that major financial panics—in particular, major banking panics—were more likely to occur during particular seasons prior to the founding of the Federal Reserve, Miron employed an unreliable panic series—the Kemmerer series—to document the incidence of panics before 1914, leading to spurious conclusions regarding the historical frequency of panics. My results also differ from those of DeLong and Summers (1986), who concluded—on the basis of a flawed series—that financial panics were not a substantial source of economic instability prior to WWII.

Moreover, the development of a pre-Great Depression chronology of U.S. banking panics—a main goal of this paper—is worthy in its own right. For example, recent studies by O’Grada and White (2003) and Carlson, Mitchener, and Richardson (2011) have masterfully analyzed the spread of banking panics through contagion effects. However, the panics that the respective studies examine—the panic of 1854 and the 1929 Florida panic—are not listed in any of the earlier series. Indeed, in the introduction to their

paper, O'Grada and White note the absence of the panic of 1854 from any prior panic series and in the title to their paper, Carlson, Mitchener, and Richardson refer to the 1929 panic as "the Forgotten Panic." It is reassuring confirmation then that the methodology independently employed in this paper to derive a new series on banking panics from historical news sources located both of these panics. It is also possible that among the other panics identified by the new series, some will prove valuable to researchers in the future.

As for the results of my empirical tests, I find that major banking panics have large and strongly significant effects on output. According to my estimates, output declines by roughly 10 percent in the year following a major banking panic. Moreover, using monthly data, I show that panics have rapid and strongly negative effects on both output and prices. Output declines to its lowest level two months after the outbreak of the panic and the price level declines by roughly 8% over the course of a year.

These findings shed important insights into the causes of the Great Depression. Banking panics cause large declines in output, suggesting that the banking panics of the Great Depression can account for a significant portion of the output losses occurring between 1930 and 1933. These results are consistent with the view of Friedman and Schwartz (1963) that a wave of banking panics converted a normal downturn into a severe depression. They also support the work of Bernanke and James (1991) who find that countries with banking panics had more severe downturns between 1929 and 1933 than countries without banking panics.

Moreover, the empirical findings have important implications both for our understanding of the causes of historical U.S. business cycle fluctuations and of the effects of banking crises on the macroeconomy. My results indicate that banking panics were a primary source of business-cycle fluctuations throughout U.S. history, that downturns with major banking panics differed substantially from downturns without them, and that output does not rapidly revert back to its pre-panic trend path following major banking panics. Thus, the empirical findings paint a broad picture of the role of banking panics in amplifying downturns in the century before the Great Depression, in much the same way the events of 2008 unfolded.

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TABLE 1  
EIGHT PANIC SERIES, 1825-2007

| Bordo-Wheelock<br>Banking Panic<br>1790-1933 | Thorp<br>Panic<br>1790-1925 | Reinhart-Rogoff: Table A.3.1<br>Banking Crisis<br>1800-2007 | Reinhart--Rogoff: Table A.4.1<br>Banking Crisis<br>1800-2007 | Friedman-Schwartz<br>Banking Panic<br>1867-1960 | Gorton<br>Banking Panic<br>1863-1914 | Sprague<br>Crisis<br>1864-1910 | Wicker<br>Banking Panic<br>1864-1914 | Kemmerer<br>Panic<br>1873-1908  | DeLong-Summers<br>Panic<br>1890-1913 |
|--|-----------------------------|---|--|---|--------------------------------------|--------------------------------|--------------------------------------|---|--------------------------------------|
| 1825   | 1825                        | 1825  | Jan 1825   |   |                                      |                                |                                      |   |                                      |
| 1833   | 1833                        |   |  |   |                                      |                                |                                      |   |                                      |
| 1837   | 1837                        | 1836  |  |   |                                      |                                |                                      |   |                                      |
| 1839   | 1839                        |   | 1836 - 1838  |   |                                      |                                |                                      |   |                                      |
|  |                             |   | March 1841   |   |                                      |                                |                                      |   |                                      |
| 1857   | 1847<br>1857                | 1857  | Aug 1857<br>Dec 1861<br>April 1864<br>Sept 1873              |   |                                      |                                |                                      |   |                                      |
| 1873   | 1873                        | 1873  |  | 1873  | Sept 1873                            | 1873 (Crisis)                  | Sept 1873 (Panic)                    | Sept 1873 (Major)<br>April 1876 (Minor)   |                                      |
| 1878 (financial distress)                    |                             |   |  |   |                                      |                                |                                      | Nov 1879 (Minor)<br>May-June 1880 (Minor)<br>March-April 1882 (Minor)               |                                      |
| 1884 (financial distress)                    |                             | 1884  | May 1884   | 1884  | June 1884                            | 1884 (Panic)                   | May 1884 (Incipient Panic)           | May 1884 (Major)<br>June 1887 (Minor)<br>March-April 1888 (Minor)                   |                                      |
| 1890 (financial distress)                    |                             | 1890  | 1890   | 1890  | Nov 1890                             | _1890 (Financial Stringency)   | Nov 1890 (Incipient Panic)           | Nov 1890 (Major)<br>Feb 1893 (Minor)  | 1890:4                               |
| 1893   | 1893                        |   |  | 1893  | May 1893                             | 1893 (Crisis)                  | Jun-Aug 1893 (Panic)                 | May - Aug 1893 (Major)<br>Sept-Dec 1895 (Minor)                                     | 1893:2 and 1893:3                    |
|  |                             |   |  |   | Oct 1896                             |                                |                                      | June-July 1896 (Minor)<br>Dec 1896 (Minor)<br>March 1898 (Minor)                    | 1896:1<br>1896:3                     |
|  |                             |   |  |   |                                      |                                |                                      | Sept 1899 (Minor)<br>Dec 1899 (Major)   | 1898:2<br>1899:4                     |
|  |                             |   |  |   |                                      |                                |                                      | May 1901 (Major)<br>July 1901 (Minor)<br>Sept 1901 (Minor)<br>Sept-Nov 1902 (Minor) | 1901:2                               |
|  |                             |   |  |   |                                      |                                |                                      | March - Aug 1903 (Major)<br>Dec 1904 (Minor)<br>April 1905 (Minor)                  | 1903:2                               |
|  |                             |   |  |   |                                      |                                |                                      | April-May 1906 (Minor)<br>Dec 1906 (Minor)<br>March 1907 (Minor)                    | 1905:4                               |
| 1907   | 1907                        | 1907  | March 1907   | 1907  | Oct-07                               | 1907 (Crisis)                  | Oct 1907 (Panic)                     | Oct 1907 (Major)<br>Sept 1908 (Minor)   | 1907:4                               |
| 1920s (financial distress)                   |                             | 1914  | Jul 1914   |   | Aug 1914                             |                                |                                      |   | 1909:4                               |
| 1929-1933                                    |                             | 1929  | 1929-1933  |   |                                      |                                |                                      |   |                                      |
| 1980s (financial distress)                   |                             | 1984  | 1984-1991  |   |                                      |                                |                                      |   |                                      |
|  |                             | 2007  |  |   |                                      |                                |                                      |   |                                      |

TABLE 2  
NEW SERIES ON BANKING PANICS, 1825-1929

| <u>Major Banking Panic</u> | <u>Minor Banking Panic</u>                                     |
|----------------------------|--|
| Nov 1833 - Apr 1834        |  |
| Mar - May 1837             |  |
| Oct 1839                   |  |
|                            | Jan - April 1841 (PA, DE, MD, NC, VA, IL)                      |
|                            | Mar 1842 (PA)  |
|                            | May - Jun 1842 (New Orleans)                                   |
|                            | Oct 1851 (NY, NJ, MD)  |
|                            | Sep 1854 - Feb 1855 (OH, IN, MI, WI, IA, MO, NY, CA)           |
| Aug - Oct 1857             |  |
|                            | Nov 1860 (suspension of specie payments by banks in the South) |
|                            | Dec 1861 (generalized suspension of specie payments)           |
| Sep 1873                   |  |
|                            | May 1884 (NYC, PA, NJ)   |
|                            | Nov 1890 (New York City)                                       |
| May - Aug 1893             |  |
|                            | Dec 1896 (IL, MN, WI)  |
|                            | Dec 1899 (Boston and New York City)                            |
|                            | Jun - Jul 1901 (New York: Buffalo and NYC)                     |
|                            | Oct 1903 (PA, MD)  |
|                            | Dec 1905 (Chicago)   |
| Oct - Nov 1907             |  |
|                            | Jan 1908 (New York City)                                       |
|                            | Aug - Sep 1920 (Boston)  |
|                            | Nov 1920 - Feb 1921 (North Dakota)                             |
|                            | Jul 1926 (FL, GA)  |
|                            | Mar 1927 (FL)  |
|                            | Jul - Aug 1929 (FL)  |

TABLE 3  
COMPARISON OF EARLIER SERIES WITH NEW SERIES

| Bordo-Wheelock<br>1790-1933 | Thorp<br>1790-1925 | Reinhart-Rogoff: A.3.1<br>1800-2007 | Reinhart-Rogoff: A.4.1<br>1800-2007 | Friedman-Schwartz<br>1867-1960 | Gorton<br>1863-1914 | Sprague<br>1864-1910 | Wicker<br>1864-1914        | Kemmerer<br>1873-1908  | DeLong-Summers<br>1890-1913 | New Series (Major)<br>1825-1929 | New Series (Minor)<br>1825-1929   |
|-----------------------------|--------------------|-------------------------------------|-------------------------------------|--------------------------------|---------------------|----------------------|----------------------------|--|-----------------------------|---------------------------------|---|
| 1825                        | 1825               | 1825                                | Jan-1825                            |                                |                     |                      |                            |  |                             |                                 |   |
| 1833                        | 1833               |                                     |                                     |                                |                     |                      |                            |  |                             | Nov 1833 - Apr 1834             |   |
| 1837                        | 1837               |                                     | 1836 - 1838                         |                                |                     |                      |                            |  |                             | Mar - May 1837                  |   |
| 1839                        | 1839               |                                     | March 1841                          |                                |                     |                      |                            |  |                             | Oct 1839                        | Jan - April 1841<br>Mar 1842<br>May - Jun 1842                                |
|                             | 1847               |                                     |                                     |                                |                     |                      |                            |  |                             |                                 | October 1851<br>Sep 1854 - Apr 1855   |
| 1857                        | 1857               | 1857                                | Aug 1857                            |                                |                     |                      |                            |  |                             | Aug - Oct 1857                  | Nov 1860<br>Dec 1861  |
| 1873                        | 1873               | 1873                                | Dec 1861<br>April-1864<br>Sept 1873 | 1873                           | Sept 1873           | 1873 (Crisis)        | Sept 1873 (Panic)          | Sept 1873 (Major)<br>April-1876 (Minor)  |                             | Sept 1873                       |   |
| 1878 (financial distress)   |                    |                                     |                                     |                                |                     |                      |                            | Nov-1879 (Minor)<br>May-June-1880 (Minor)<br>March-April-1882 (Minor)  |                             |                                 |   |
| 1884 (financial distress)   |                    | 1884                                | May 1884                            | 1884                           | June 1884           | 1884 (Panic)         | May 1884 (Incipient Panic) | May 1884 (Major)<br>June-1887 (Minor)<br>March-April-1888 (Minor)  |                             |                                 | May 1884  |
| 1890 (financial distress)   |                    | 1890                                | 1890                                | 1890                           | Nov 1890            | 1890 (Stringency)    | Nov 1890 (Incipient Panic) | Nov 1890 (Major)<br>Feb-1893 (Minor)   | 1890:4                      |                                 | Nov 1890  |
| 1893                        | 1893               |                                     |                                     | 1893                           | May 1893            | 1893 (Crisis)        | June-August 1893 (Panic)   | May - Aug 1893 (Major)<br>Sept-Dec-1895 (Minor)  | 1893:2 and 1893:3           | May-Aug 1893                    |   |
|                             |                    |                                     |                                     |                                | Oct-1896            |                      |                            | June-July-1896 (Minor)<br>Dec 1896 (Minor)<br>March-1898 (Minor)   | 1896:1<br>1896:3            |                                 | Dec 1896  |
|                             |                    |                                     |                                     |                                |                     |                      |                            | Sept-1899 (Minor)<br>Dec 1899 (Major)<br>May-1901 (Major)<br>July 1901 (Minor)<br>Sept-1901 (Minor)<br>Sept-Nov-1902 (Minor)<br>March-Aug-1903 (Major) | 1898:2                      |                                 | Dec 1899  |
|                             |                    |                                     |                                     |                                |                     |                      |                            | Dec-1904 (Minor)<br>April-1905 (Minor)   | 1899:4<br>1901:2            | 1901:2 (same as above)          | Jun-Jul 1901  |
|                             |                    |                                     | March-1907                          |                                |                     |                      |                            | April-May-1906 (Minor)<br>Dec-1906 (Minor)<br>March-1907 (Minor)<br>Oct 1907 (Major)   | 1903:2                      |                                 | Oct 1903  |
| 1907                        | 1907               | 1907                                |                                     | 1907                           | Oct-07              | 1907 (Crisis)        | Oct 1907 (Panic)           | Oct 1907 (Major)<br>Sept-1908 (Minor)  | 1905:4                      | Oct - Nov 1907                  | Dec 1905  |
|                             |                    | 1914                                | Jul-14                              |                                |                     | Aug-14               |                            |  | 1907:4                      |                                 | Jan 1908  |
|                             |                    |                                     |                                     |                                |                     |                      |                            |  | 1909:4                      |                                 | Aug - Sep 1920<br>Nov 1920 - Feb 1921<br>Jul 1926<br>Mar 1927<br>Jul-Aug 1929 |

TABLE 4  
FREQUENCY OF BANKING PANICS

|              | <b>Pre-Fed (1825 - 1914)</b>                                    | <b>Post-Fed (1914 - 1929)</b>   |
|--------------|---|---|
| <b>Major</b> | one every 12.9 years<br>(median # years separating panics = 16) | no major banking panics between 1914 and 1929<br>(next one occurs in 1930, 16 years after 1914) |
| <b>Minor</b> | one every 6 years   | one every 3.5 years   |

TABLE 5  
SEASONALITY OF BANKING PANICS

| Distribution of Panics by Starting Months |       |       |
|---|-------|-------|
|   | Major | Minor |
| <u>Spring</u>                             |       |       |
| March                                     | 1     | 1     |
| April                                     | 1     | 0     |
| May                                       | 0     | 2     |
| <u>Summer</u>                             |       |       |
| June                                      | 0     | 1     |
| July                                      | 0     | 0     |
| August                                    | 1     | 0     |
| <u>Fall</u>                               |       |       |
| September                                 | 1     | 1     |
| October                                   | 2     | 2     |
| November                                  | 1     | 2     |
| <u>Winter</u>                             |       |       |
| December                                  | 0     | 4     |
| January                                   | 0     | 2     |
| February                                  | 0     | 0     |
| <hr/>                                     |       |       |
| Percentage Spring & Fall                  | 85.7  | 53.3  |
| <hr/>                                     |       |       |
| Percentage Summer & Winter                | 14.3  | 46.7  |
| <hr/>                                     |       |       |

TABLE 6  
CORRELATION OF MAJOR BANKING PANICS AND DOWNTURNS

| Panic | Percent Change in Davis Index |
|-------|-------------------------------|
| 1833  | -4.5% from 1833 to 1834       |
| 1837  | -1.4% from 1837 to 1838       |
| 1839  | -4.7% from 1839 to 1840       |
| 1857  | -8.0% from 1856 to 1858       |
| 1873  | -6.0% from 1873 to 1875       |
| 1893  | -15.3% from 1892 to 1894      |
| 1907  | -15.6% from 1907 to 1909      |

TABLE 7  
CLASSIFICATION OF PANICS

| Panic | Dimension 1 | Dimension 2 |
|-------|-------------|-------------|
| 1833  | 3           | 3           |
| 1837  | No Rank     | No Rank     |
| 1839  | No Rank     | No Rank     |
| 1857  | 3           | 3           |
| 1873  | 3           | 3           |
| 1893  | 3           | 1           |
| 1907  | 2           | 1           |

TABLE 8  
DOWNTURNS FROM 1825-1915

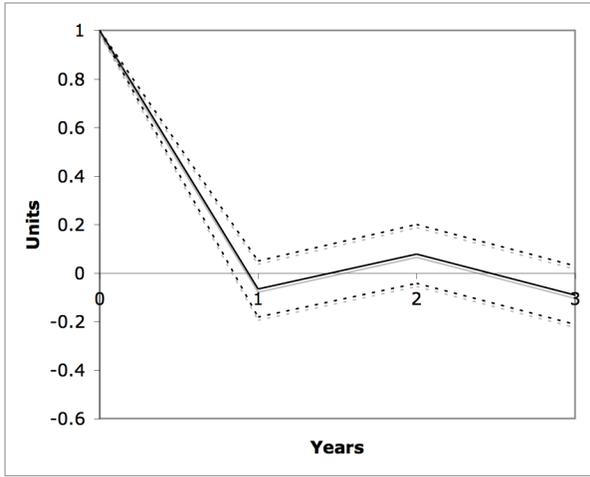
| Peak                         | Trough      | Major Panic          | % Output Decline |
|------------------------------|-------------|----------------------|------------------|
| Antebellum Industrial Cycles |             |                      |                  |
| 1828                         | 1829        | No Major Panic       | -6.0             |
| <b>1833</b>                  | <b>1834</b> | <b>Panic of 1833</b> | <b>-4.5</b>      |
| <b>1836</b>                  | <b>1837</b> | <b>Panic of 1837</b> | <b>-1.4</b>      |
| <b>1839</b>                  | <b>1840</b> | <b>Panic of 1839</b> | <b>-4.7</b>      |
| <b>1856</b>                  | <b>1858</b> | <b>Panic of 1857</b> | <b>-8.0</b>      |
| Civil War Industrial Cycles  |             |                      |                  |
| 1860                         | 1861        | No Major Panic       | -0.9             |
| 1864                         | 1865        | No Major Panic       | -5.2             |
| Postbellum Industrial Cycles |             |                      |                  |
| <b>1873</b>                  | <b>1875</b> | <b>Panic of 1873</b> | <b>-6.0</b>      |
| 1883                         | 1885        | No Major Panic       | -6.3             |
| <b>1892</b>                  | <b>1894</b> | <b>Panic of 1893</b> | <b>-15.3</b>     |
| 1895                         | 1896        | No Major Panic       | -3.1             |
| 1903                         | 1904        | No Major Panic       | -4.7             |
| <b>1907</b>                  | <b>1908</b> | <b>Panic of 1907</b> | <b>-15.6</b>     |
| 1910                         | 1911        | No Major Panic       | -3.7             |
| 1913                         | 1914        | No Major Panic       | -10.2            |

TABLE 9  
DOWNTURNS WITH AND WITHOUT MAJOR BANKING PANICS

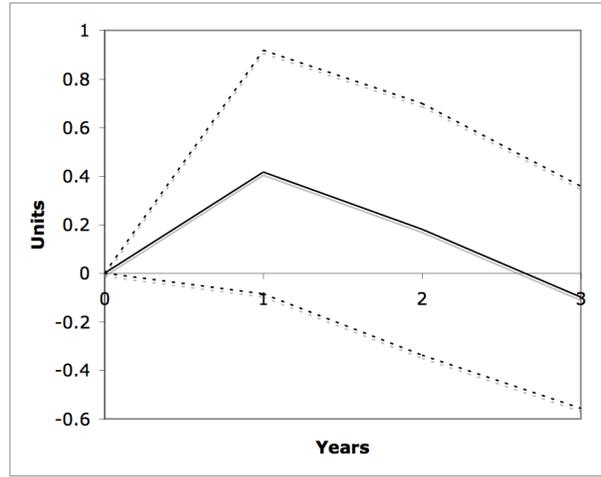
| <u>Downturns with Major Banking Panics</u> |                       |                    |                             | <u>Downturns without Major Banking Panics</u> |                       |                    |                             |
|--|-----------------------|--------------------|-----------------------------|---|-----------------------|--------------------|-----------------------------|
| Downturn                                   | % Change<br>in Output | Length<br>in Years | Output Recovery<br>in Years | Downturn                                      | % Change<br>in Output | Length<br>in Years | Output Recovery<br>in Years |
| <u>Pre-Civil War</u>                       |                       |                    |                             | <u>Pre-Civil War</u>                          |                       |                    |                             |
| 1833-1834                                  | -4.5                  | 1                  | 1                           | 1828-1829                                     | -6                    | 1                  | 1                           |
| 1836-1837                                  | -1.4                  | 1                  | 1                           |   |                       |                    |                             |
| 1839-1840                                  | -4.7                  | 1                  | 1                           |   |                       |                    |                             |
| 1856-1858                                  | -8.0                  | 2                  | 1                           |   |                       |                    |                             |
| <b>Average</b>                             | <b>-4.7</b>           | <b>1.3</b>         | <b>1.0</b>                  |   | <b>-6.0</b>           | <b>1.0</b>         | <b>1.0</b>                  |
| <u>Post-Civil War</u>                      |                       |                    |                             | <u>Post-Civil War</u>                         |                       |                    |                             |
| 1873-1875                                  | -6.0                  | 2                  | 3                           | 1883-1885                                     | -6.3                  | 2                  | 1                           |
| 1892-1894                                  | -15.3                 | 2                  | 3                           | 1895-1896                                     | -3.1                  | 1                  | 1                           |
| 1907-1908                                  | -15.6                 | 1                  | 2                           | 1903-1904                                     | -4.7                  | 1                  | 1                           |
| <b>Average</b>                             | <b>-12.3</b>          | <b>1.7</b>         | <b>2.7</b>                  |   | <b>-4.5</b>           | <b>1.3</b>         | <b>1.0</b>                  |

FIGURE 1  
Results of the Basic VAR

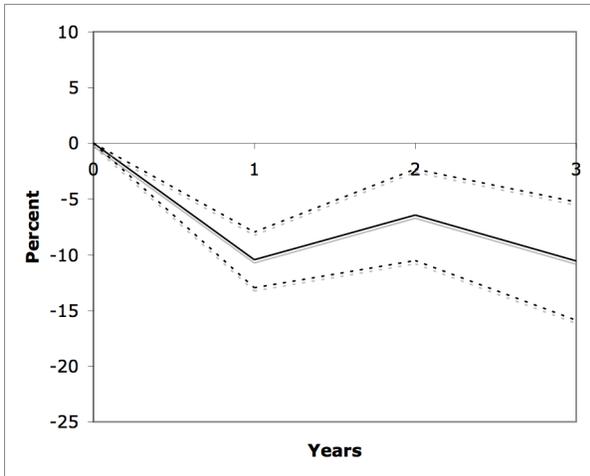
Panel A. Response of Panic to Panic



Panel B. Response of Panic to  $\Delta y$



Panel C. Response of Output to Panic



Panel D. Response of  $\Delta y$  to  $\Delta y$

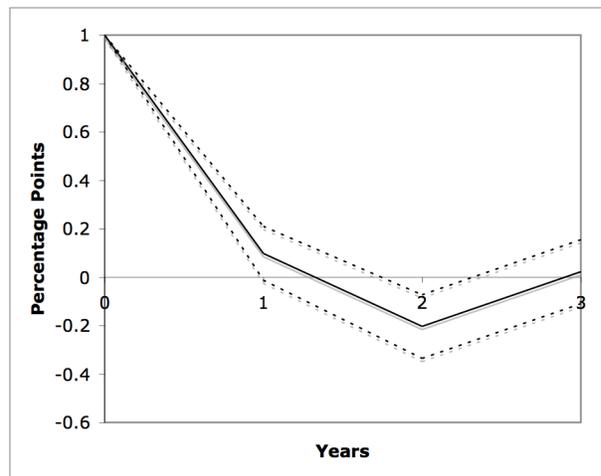


FIGURE 2  
Classification Algorithm

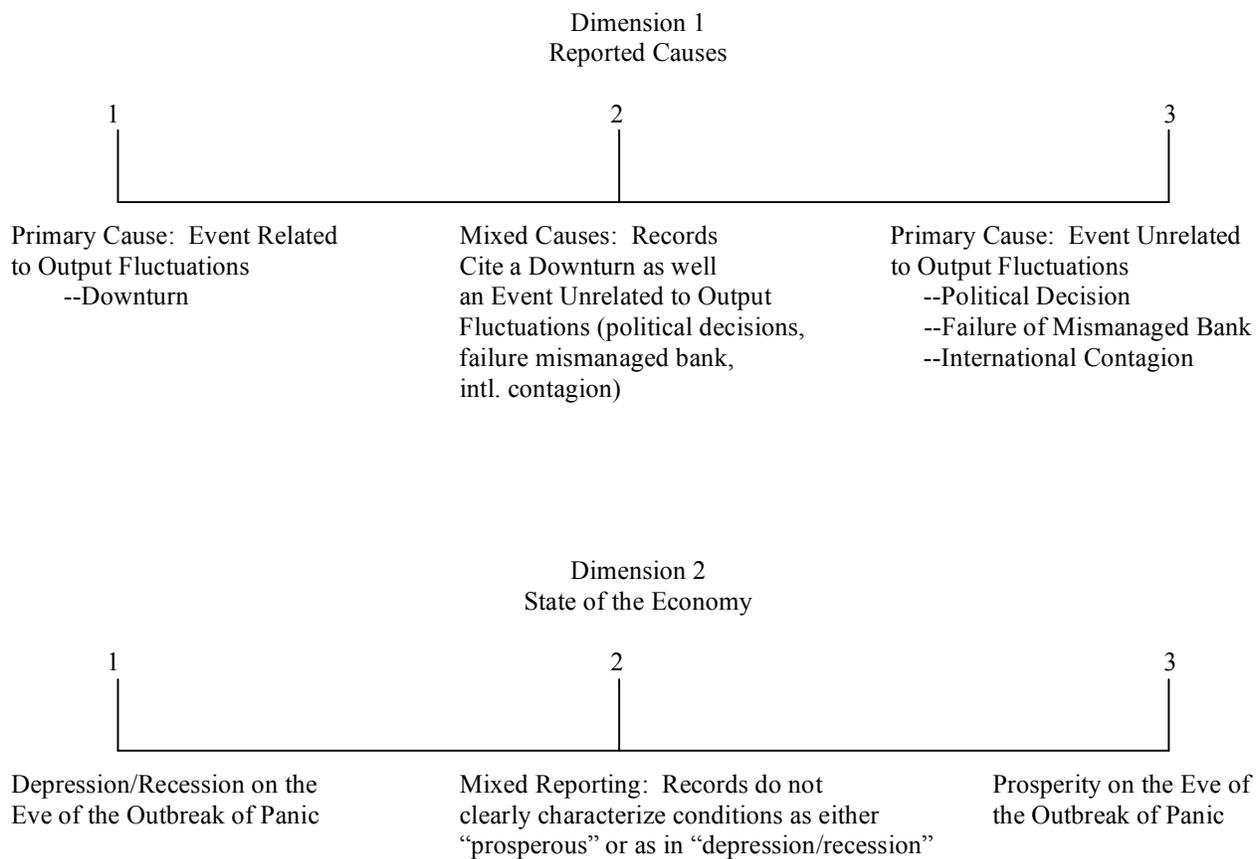
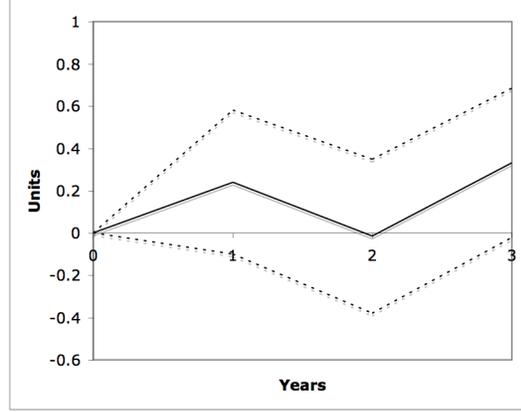
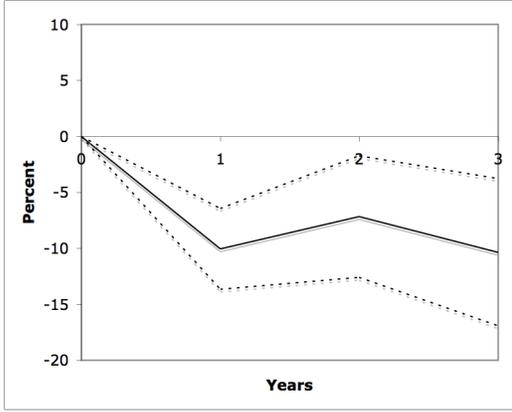


FIGURE 3  
Results of the Restricted VARs

Specification 1: Panic Dummy = {Panics with 3 on Dimension 1}

Panel A. Response of Output to Panic

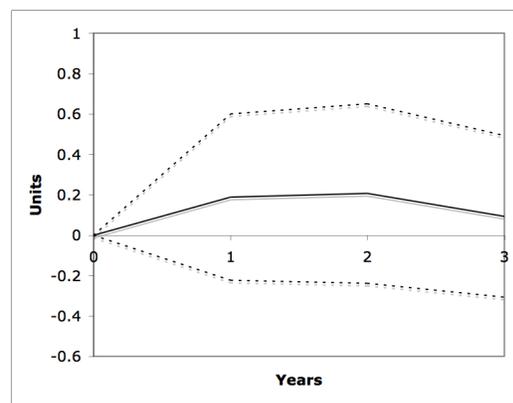
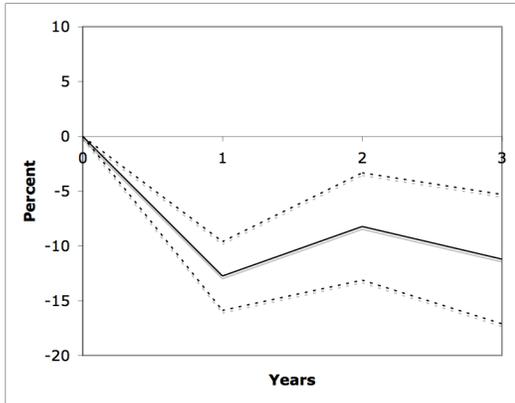
Panel B. Response of Panic to  $\Delta y$



Specification 2: Panic Dummy = {Panics with 2 or 3 on Dimension 1}

Panel A. Response of Output to Panic

Panel B. Response of Panic to  $\Delta y$



Specification 3: Panic Dummy = {Panics with 3 on Both Dimensions}

Panel A. Response of Output to Panic

Panel B. Response of Panic to  $\Delta y$

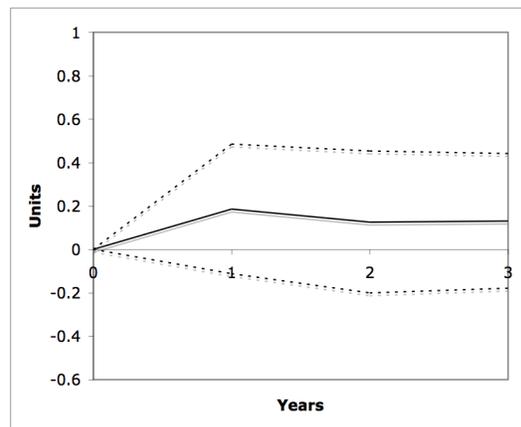
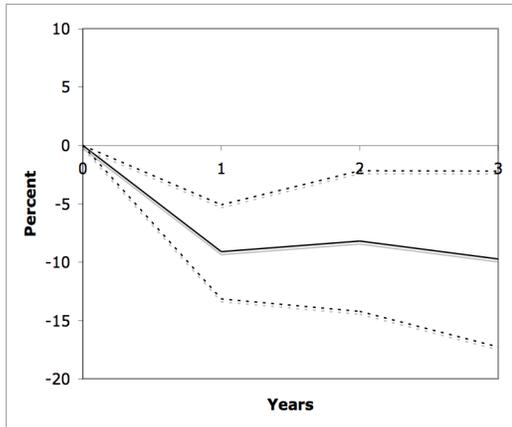
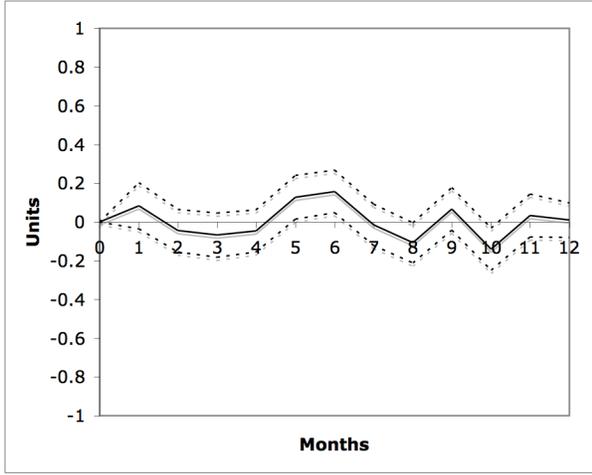
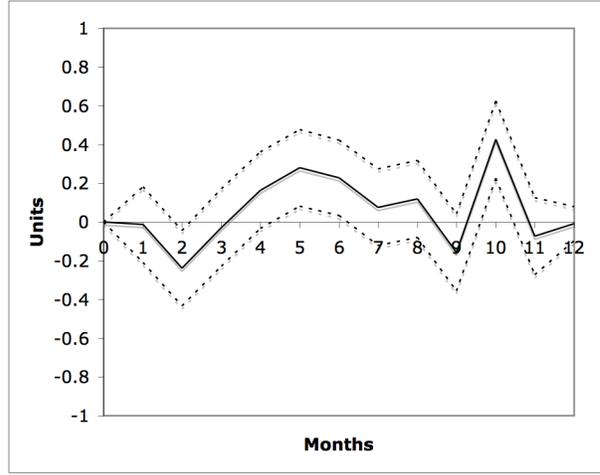


FIGURE 4  
Results of the VAR Estimated with Monthly Data

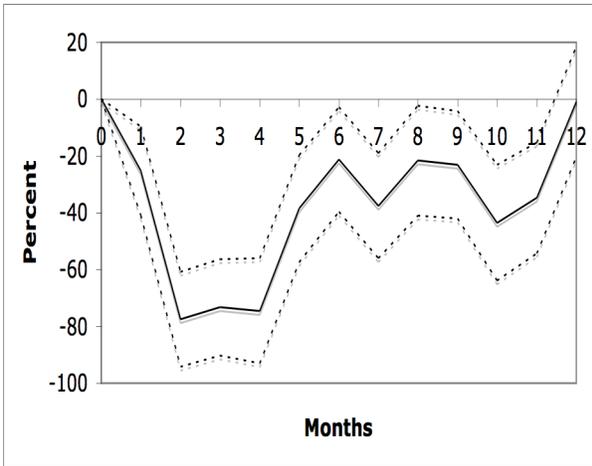
Panel A. Response of Panic to Output



Panel B. Response of Panic to Prices



Panel C. Response of Output to Panic



Panel D. Response of Prices to Panic

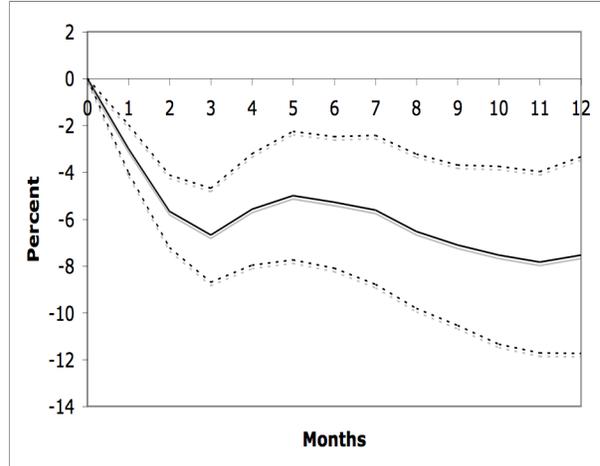


FIGURE 5  
Actual and Projected Trend Lines (Panic of 1857, 1873, 1893, and 1907)

