A New Chronology of U.S. Asset Price Bubbles, 1825-1929[*]

December 31, 2018

**This version is preliminary and being distributed for discussion purposes only.
Please do not cite without authors' permission.**

Matthew J. Botsch
Bowdoin College

Andrew J. Jalil
Occidental College

Abstract.

Asset price bubbles have played an important role in the two most severe downturns in U.S. economic history of the past century: the Great Contraction of 1929-33 and the Great Recession of 2007-09. However, little is known about whether these episodes are typical. We develop a new chronology of U.S. asset price bubbles between 1825-1929, using a narrative approach. We read all relevant articles from more than a century's worth of leading financial and business newspapers and identify bubbles based on contemporaneous descriptions. We use our new chronology to investigate the relationship between bubbles and the macroeconomy. Are bubbles more likely to form in certain macroeconomic environments? Does the typical bubble "pop" or merely fizzle out? Are popping bubbles associated with banking panics? What types of bubbles pose greater danger of spilling over onto the broader economy? Finally, we investigate what lessons modern policymakers can take from connections between credit conditions and 19th-Century asset price bubbles.

I. Development of a New Chronology

A. Motivation

Asset price bubbles have played an important role in the two most severe downturns in U.S. economic history of the past century: The Great Contraction of 1929-33 and the Great Recession of 2007-09. Scholars have connected the bursting of asset price bubbles to these downturns. For example, Romer (1990) argues that the crash of the stock market bubble of the 1920s generated uncertainty, helping to trigger the onset of the Depression, and Gorton (2010) provides a detailed account of how the bursting of the housing bubble sparked a panic within the shadow banking sector, helping to generate the Great Recession. Furthermore, the two most recent recessions in the United States—the 2001 and 2007-2009 recessions— both arose, in part, due to the bursting of asset price bubbles, causing policymakers to become increasingly concerned about the destabilizing influences of financial market imbalances for macroeconomic stability. At the most recent Jackson Hole conference, Fed Chair Jerome H. Powell highlighted these concerns, noting "In the run-up to the past two recessions, destabilizing excesses appeared mainly in financial markets rather than in inflation. Thus, risk management suggests looking beyond inflation for signs of excesses."[1]

Yet, while scholars have greatly expanded our knowledge on asset price bubbles in recent decades—and while the role of asset price bubbles as a destabilizing influence is increasingly recognized—most of this literature focuses on theoretical models or isolated case studies of particular episodes, rather than empirical time-series studies based on a large sample of observations over a prolonged stretch of history.[2] Indeed, whereas macroeconomists have, in recent years, constructed extensive historical time-series of a variety of macroeconomic shocks (i.e. monetary, tax, spending, banking)—and have used those newly constructed series to tease out the effects of monetary policy, fiscal policy, and banking crises, so far, similar analyses for asset price bubbles have been missing.[3]

The absence of such analyses makes it challenging to address many of the key questions economists pose about the nature of asset price bubbles. Equipped with a listing of when asset price bubbles occurred over a prolonged period, it would be possible to systematically examine (1) whether bubbles are more likely to emerge in some economic environments than in others and (2) the macroeconomic consequences of the bursting of bubbles. Indeed, a chronology of asset price bubbles would help us to address a host of questions. For example, are asset price bubbles more likely to form in a period of strong economic growth than in a period of stagnation or recession? Are bubbles more likely to occur in periods when money and credit are plentiful, than in periods when money and credit are more stringent? Do major bubbles only form after a substantial lag following a prior crash—that is, once financial market participants have had sufficient time to forget? Are bubbles more likely to occur in certain regulatory or policy regimes than in others? Has the historical frequency of bubbles changed over time? Do asset price bubbles tend to lead the outbreak

---

[1] Powell, Jerome H. "Monetary Policy in a Changing Economy", August 24, 2018, Speech at "Changing Market Structure and Implications for Monetary Policy," a symposium sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, Wyoming.

[2] A few exceptions to this rule include Bordo and Wheelock (2004) and Jordà, Schularick, and Taylor (2015), who identify bubbles based on quantitative criteria (e.g., upward movements in a detrended stock price index exceeding a specified threshold over a certain period of time); and Brunnermeier and Schnabel (2015), who construct their time-series from Kindleberger's (1978) account of famous bubbles. Thus, we lack a systematic and representative chronology of asset price bubbles that includes market segments where historical data are sparse as well as less-famous bubbles that were not associated with financial panics.

[3] Scholars who have employed newly constructed historical time-series to tease out the effects of macroeconomic shocks include Romer and Romer (1989, 2004) for monetary policy, Romer and Romer (2010) for tax policy, Ramey (2011) for government spending, and Jalil (2015), Reinhart and Rogoff (2009), and Romer and Romer (2017) for financial crises.

of major banking panics? Are certain types of asset price bubbles (i.e. those concentrated in real estate) more likely to be followed by banking panics? Does output behave similarly, in the aftermath of bubbles, or does the behavior of output vary across episodes—and if so, what factors can account for such variation?

In addition, a systematic analysis of a large sample of asset price bubbles could shed new insights into a host of other related questions. For instance, the bubbles that end in violent crashes (e.g. the stock market bubble of the late 1920s and the housing bubble of the mid 2000s) tend to capture much of the professional and public attention. But do most bubbles end in a sudden and rapid crash? Or is it more common for bubbles to slowly dissipate over time? And if so, what factors account for this variation?

In this study, we strive to rectify this shortcoming in the literature by carefully reconstructing a detailed chronology of when and where asset price bubbles occurred in U.S. history, in the century before the Great Depression, using information contained in the historical narrative record. Then, armed with this new chronology, we assess (1) whether bubbles are more likely to form in certain macroeconomic environments, and (2) the macroeconomic consequences of the bursting of bubbles. The development of a new chronology of asset price bubbles will not only help us to understand where and when asset price bubbles occurred throughout U.S. history; it will also serve as a valuable tool to better understand the causes and consequences of bubbles, and to guide modern policymakers' attempts to incorporate bubbles into their loss functions.

Methodologically, our work is similar to other recent studies that have employed the historical narrative approach to identify macroeconomic shocks. Romer and Romer (1989, 2004, 2010, and 2017) examine the minutes of the Federal Open Market Committee to isolate relatively exogenous monetary policy shocks, government documents (e.g. presidential speeches and Congressional reports) to identify every major legislated U.S. tax policy shock since 1945, and reports compiled by analysts at the Organisation for Economic Co-Operation and Development (OECD) to construct a new series on financial crises in advanced countries. Ramey (2011) and Ramey and Shapiro (1998) use historical news reports, found in *Business Week* and other news sources, to identify the timing of U.S. government spending shocks since the 1930s and Jalil (2015) employs historical news reports to construct a new series on pre-Depression era U.S. banking panics. This literature has been strongly inspired by Friedman and Schwartz (1963), who pioneered the use of the narrative approach in their seminal work *A Monetary History of the United States, 1867-1960*. Our study is the first, however, to employ such an approach to study asset price bubbles over a prolonged period of U.S. economic history—that is, from 1825-1929.[4]

B. Definition of an Asset Price Bubble

The modern literature on asset price bubbles took off in the late 1970s, and experienced resurgences of interest in the aftermaths of the "dot-com" bubble in the late 1990s and U.S. real estate bubble in the mid 2000s. This literature is sufficiently vast that we do not try to summarize it here. Rather, we selectively highlight certain issues that are germane to grounding the popular notion of a bubble in a rigorous, theoretical framework. See Camerer (1989) for a survey of the early literature on bubbles, and LeRoy (2004) and Barlevy (2007) for more recent surveys.

In the popular imagination, an asset price bubble might be described as *a period of rapidly rising prices, driven by the purchasing activity of irrationally exuberant investors, followed by a sudden and rapid price decline*. Contrast this with the following representative quotes from the theoretical literature on bubbles:

---

[4] Other scholars who have employed the narrative historical approach include Carlson, Mitchener, and Richardson (2011), Hausman (2016), Jalil and Rua (2016), Kenny, Lennard, and Turner (2017), Richardson and Troost (2009), Mathy and Stekler (2017), and Velde (2009).

"We say that investors exhibit speculative behavior if the right to resell a stock makes them willing to pay more for it than they would pay if obliged to hold it forever." Harrison and Kreps (1978, p. 323)

"[A] bubble is defined as the difference between the market price and the market fundamental." Tirole (1985, p. 1071)

"In legal terms, the fundamental is the value of the usufruct, while the bubble measures the value of the stock minus its usufruct." Weil (1990, p. 1467)

"Everybody realizes the stock is overpriced but each person thinks he may be able to sell it at a higher price to somebody else before the true value becomes publicly known." Allen, Morris, and Postlewaite (1993, p. 207)

"[A] situation in which temporarily high prices are sustained largely by investors' enthusiasm rather than by consistent estimation of real value." Shiller (2000, preface)

"When evaluating an asset, agents consider their own view of fundamentals and the fact that the owner of the asset has an option to sell the asset in the future [...]. This difference between the current owner's demand price and his fundamental valuation, which is exactly the resale option value, can be reasonably called a bubble." Scheinkman and Xiong (2003, p. 1185-86)

There are some key differences between the popular definition and the economist's definition. First, the popular definition involves irrational behavior by investors. Irrationality is not a requirement for bubbles to exist. In a classic paper, Tirole (1982) shows that four conditions are sufficient to rule out the existence of bubbles: common priors, common knowledge of rationality, an initially-efficient resource allocation, and a finite number of traders.[5] Bubbles may therefore arise in economies with rational traders but some other market imperfection. Even models with "irrational" investors may only require small deviations away from fully-rational, forward-looking optimization to generate bubbles: e.g., overconfidence in their own abilities, limited attention, etc. Perhaps the most famous critic of efficient financial markets states in his Nobel Prize lecture that "Bubbles are not, in my mind, about the craziness of investors."[6]

Second, the economist's definition does not mention rapidly rising prices. In the simplest possible model, asset prices are the solution to a difference equation:
$$P_t = \frac{D + P_{t+1}}{1 + r},$$
where P_t is the price of the asset at time t, r is the real interest rate and D is the constant, non-stochastic dividend paid every period. Without an initial condition, any price path that involves the fundamental value plus a bubble term, $P_t = D/r + B_t$, where the bubble term B_t grows at the rate $1 + r$, is an admissible solution. Such bubbles do not grow explosively, so do not bear a strong resemblance to the popular notion, but they clearly represent deviations from the "usufruct." Moreover, bubbles do not necessarily cause assets to be overvalued; Weil (1990) studies a model in which a bubble depresses prices below their no-bubble fundamental value.[7]

Third, price deviations from fundamental value do not necessarily reverse themselves all at once, if ever. Since Samuelson (1958), economists have recognized that money resembles a long-lived, non-collapsing bubble (however, Townsend (1980) presents a competing, non-bubbly view of money in terms of discounted quasi-dividends). Summers (1986) famously calibrates market efficiency tests to show that we would require over 5,000 years of data to have at least 50% power to detect a large, persistent deviation of

---

[5] See Barlevy (2007) for a discussion of how various models of bubble economies involve a failure of one of these conditions.
[6] Shiller, Robert J., Dec 8, 2013, "Speculative Asset Prices", Nobel Prize Lecture.
[7] Although the bubble term is positive, the fundamental value is depressed in the bubble state.

aggregate stock market prices from fundamental value. On the other hand, bubbles that occur in experimental settings tend to build slowly and crash suddenly (*e.g.*, Smith, Suchanek, and Williams 1988). This observation also seems consistent with some of the most famous historical experiences – e.g., the Dutch Tulipmania of 1634-37, the British South Sea Bubble of 1720, and the U.S. Stock Bubble of the late 1920s.

Although the popular definition so far appears to have little in common with these technical definitions, closer inspection reveals areas of agreement. The economist's definition tends to invoke two key ideas. First, assets possess something called "fundamental value" – e.g., in the case of a tree, its future fruit yields; in the case of a stock, its future dividends. Fundamental value derives from the asset's continued existence permitting society as a whole to enjoy an increased level of consumption. If we assume that fundamental value is slow moving, then unusual movements in one direction suggests that the asset's price has deviated from its fundamental value. In this sense, the economist's notion of deviations from fundamental value is not so different from the popular notion of rapidly rising prices. Second, several of these definitions connect the bubble to investors' right to resell. This is also a key idea in the popular definition. Bubbles are exacerbated, if not initially caused, by the entry of short-term investors hoping to "ride" the wave and realize a short-term capital gain.

We view these two areas of agreement as being the key elements we use in our search for historical bubble episodes. We thus adopt the following definition. *A bubble is a deviation of prices above fundamental value due to speculative trading activity; i.e., investors hoping to realize a capital gain by reversing their positions in the near future*. We require that bubbles be linked to speculative activity to rule out more general violations of the Law of One Price, such as the well-known Royal Dutch / Shell anomaly (Froot and Dabora 1999). Our definition encompasses Ponzi schemes, in which participants hope to profit by selling their positions to new entrants, but rules out failed investment opportunities in which investors bought based on fundamentals that did not pan out. We do not explicitly look for evidence of irrational behavior, although contemporaries may well describe speculative activity as being irrational in nature; nor do we identify bubbles by whether or not they collapse.

Our narrative approach to construct a historical chronology of asset price bubbles has several key advantages that build on the existing literature. First, our classification scheme is motivated by theoretical descriptions of asset price bubbles. So far, no one has merged the voluminous theoretical literature with a narrative approach, instead relying on arbitrary quantitative thresholds that are not theoretically-grounded. Second, early American stock price indices have to be reconstructed based on surviving financial market records that are limited and possibly non-representative. Beyond the data limitations, aggregate asset price indices may mask underlying more sector-specific bubbles that were transparent to contemporaries. Third, the narrative approach lets us identify bubbles in asset classes where no price data survives, such as real estate prior to 1890. Fourth, our narrative approach places the speculative motive front and center. Understanding why traders were buying an asset requires going beyond price data and systematically accounting for investors' motives, something that can be accomplished via a narrative approach that examines real-time sources documenting the motivations for asset purchases.

C. Identifying Asset Price Bubbles

A primary goal of this study is to identify asset price bubbles throughout U.S. history—that is, to construct a historical chronology of bubbles. To accomplish this goal, we adopt a narrative approach. We search through more than a century's worth of historical newspapers. We read all articles containing key words likely to signal the occurrence of an asset price bubble. We then classify episodes as bubbles, based on contemporaneous descriptions of events. Lastly, we examine any available data series, alongside other historical evidence, to check that these episodes satisfy the key characteristics of bubbles.

To begin, we use a narrative historical approach to create our chronology of asset price bubbles. We rely on this approach for several reasons. First, narrative sources, *i.e.* historical economic and financial periodicals, contain a detailed record of when and where asset price bubbles were reported to occur throughout U.S. history. Contemporaries devoted great attention to reporting developments of interest to the financial and business community, including the emergence of asset price bubbles.

Second, the narrative approach is particularly well-suited to document the motivations for asset purchases. A key feature of a bubble involves the speculative purchasing of an asset, *i.e.* the purchasing of an asset in the hope of achieving speculative gains by selling at a price that exceeds its perceived fundamental value. These descriptions of bubbles emphasize the speculative nature of a bubble:

> "Everybody realizes the stock is overpriced but each person thinks he may be able to sell it at a higher price to somebody else before the true value becomes publicly known." (Allen, Morris, and Postlewaite, 1993)

> "[A] situation in which temporarily high prices are sustained largely by investors' enthusiasm rather than by consistent estimation of real value." (Shiller, 2000)

> "When evaluating an asset, agents consider their own view of fundamentals and the fact that the owner of the asset has an option to sell the asset in the future [...]. This difference between the current owner's demand price and his fundamental valuation, which is exactly the resale option value, can be reasonably called a bubble." (Scheinkman and Xiong, 2003)

Each of these descriptions focuses on a speculative motive for asset purchases during the bubble. The reports of contemporary observers contained in the historical news record provide a rich source of information as to *why* contemporaries purchased particular assets. Were contemporaries buying assets to achieve speculative gains? Did contemporaries perceive the price of the asset to have exceeded its fundamental value? The historical news record provides real-time descriptions on the motivations behind asset purchases—information that is helpful in classifying events as bubbles.

Third, the narrative approach permits the use of a consistent rule to identify bubbles over a prolonged period. Because periodicals span the entire period, we are able to employ a well-specified rule to identify bubbles from the financial press, using the same set of criteria over the entire 1825-1929 period.

Fourth, the huge range of industries in which bubbles could materialize, along with historical data limitations, make a purely statistical approach to identify bubbles challenging. A bubble could theoretically emerge in any market or among any asset class. A purely statistical approach to identify bubbles would require an examination of price data series for every market and asset class in existence, over the entire 1825-1929 period—a massive undertaking, made more complicated by the fact that (1) historical price series do not exist for every market and asset class across the entire 1825-1929 period, (2) the consistency and quality of the available price data series vary widely, both over time and across industry, (3) the price data series that do exist are not readily available for every market and asset class, nor are they centrally located in one repository, and (4) given the dramatic changes to the industrial structure of the U.S. economy between 1825 and 1929, it would be easy for a scholar to mistakenly overlook—and hence, omit—a market that may have been an important sector of the economy at some point in U.S. history. By contrast, because financial periodicals devoted substantial resources to covering contemporary financial developments of interest to the business community across a broad range of sectors, a careful scanning of news articles by keywords should be able to identify a large sample of reported bubbles in a wide array of assets, without having to identify those markets or asset classes *ex ante*.

As a result of the reasons outlined above, we adopt a narrative approach. Nonetheless, once we construct our new narrative chronology of asset price bubbles, we analyze all episodes on our list with any available

price data series we are able to amass, episode-by-episode. In essence, we "check" whether the identified episodes reflect the key characteristics of a bubble using any of the available statistical and quantitative evidence. Thus, our methodology is similar to the approaches of other studies—Romer and Romer (2010) and Ramey (2011)—that merge their newly constructed narrative shocks with statistical information, both to assess the macroeconomic effects of their identified shocks and to bolster the case that their new narrative measures reflect legitimate macroeconomic shocks.

The narrative sources that we employ were leading economic and financial periodicals of their day: *Niles Weekly Register*, *Hunt's Merchants' Magazine*, and the *Commercial and Financial Chronicle*. These newspapers are available electronically.[8]

To identify bubbles, we employ the following rule: We read every news article in the above newspapers that contain any of the following keywords or phrases: bubble, overspeculation, excessive speculation, mania, speculative boom, speculative craze, speculative fever, speculative frenzy, speculative excess, speculative market, speculative orgy, speculative spirit, wild speculation, and boom or speculation in various industries (stock market, railroad, real estate, land, mining, grain, corn, wheat, hay, cotton, oat, coal, gold, silver, petroleum, oil, iron, iron ore, copper, and commodity).[9] Each term signals a potential characteristic of a bubble. The term "bubble" directly references bubbles. The terms overspeculation, excessive speculation, mania, wild speculation, and speculative boom, craze, fever, frenzy, excess, market, orgy, and spirit were frequently used in the 19th and early 20th centuries to refer to episodes of high investor enthusiasm to acquire assets in the hope of profiting from short-term capital gains. The term "boom" refers to a period of substantial growth, which in some industries and on some occasions may coincide with a bubble. We search for articles referencing booms or speculation in stock, railroad, real estate and land markets (markets that have historically been associated with rapid booms and busts), grain, corn wheat, hay, cotton, oats, coal, mining, gold, silver, petroleum, oil, iron, iron ore, and copper (the top agricultural and mineral outputs according to the 1880 and 1920 *Historical Statistics of the United States*) and booms or speculation using a more general "commodity" term (to identify articles that reference booms or speculation in commodities not identified *ex ante*). We employ these terms to identify news articles that may contain a report of an asset price bubble.[10]

We read all news articles containing those key terms. We classify an event as a bubble if two key criteria are met: (1) the news articles ascribe the rising price of an asset to speculative activity; and (2) the news articles describe the price of the asset as exceeding its fundamental value.

The first criterion captures a key characteristic of a bubble: speculative activity—that is, the purchasing of an asset, for the intention of reselling at a higher price—alongside an increase in the price of the asset. To satisfy this criterion, the news reports must describe price increases, in conjunction with speculative buying,

---

[8] The Commercial and Financial Chronicle may be found on-line at FRASER, via the Federal Reserve Bank of St. Louis (https://fraser.stlouisfed.org/title/1339).

[9] In searching for key terms and phrases, we take into account variant spellings, *e.g.* "over-speculation" along with "overspeculation"; a potential reordering of words, *e.g.* "boom in railroads" along with "railroad boom," and "speculation in railroads" along with "railroad speculation"; and plural, in addition to singular, *e.g.* "speculative markets" along with "speculative market," and "speculative excesses" along with "speculative excess."

[10] In addition, whenever an article—found using any of the above key terms—references an asset price bubble from another year in U.S. history between 1825 and 1929 (for example, perhaps, because a contemporaneous episode is compared to another historical bubble from years ago), we conduct a follow-up search in which we download and examine the news articles that contain references to that specific asset within a three-year window surrounding the date or year mentioned. For example, the July 22 1899 issue of the *Commercial and Financial Chronicle* refers to "the collapse of the Leiter wheat bubble" (p. 153), so we additionally search for references to "Leiter" and "Leiter wheat" between 1896 and 1902. This helps to ensure that we are casting a wide net in drawing on articles that may contain a report of a bubble.

especially for the purpose of flipping, via specific words (*e.g.*, speculative frenzy, speculative fever, over-speculation, excessive speculation, speculative mania, gambling, wild speculation).

The second criterion captures another key characteristic of a bubble: prices that exceed the perceived fundamental value of the asset. We examine the reports of contemporary observers to determine whether contemporaries (or at least, a subset of contemporaries) viewed the price movements as unjustifiable, on the basis of the asset's fundamentals. To satisfy this criterion, the news reports may describe elevated prices that do not accurately reflect the fundamental value of the asset, via specific words (*e.g.*, fictitious, inflated, overvalued, or unjustified,) or by explicitly stating that the price of the asset has exceeded its fundamental value.[11]

In documenting episodes, we also note whether contemporaries specifically used the term bubble to describe the event. While the use of the term "bubble" is not necessary to classify the event as a bubble, so long as the descriptions that the historical news accounts provide fit our two criteria, we do record such information.

To date the beginnings and endings of bubbles, we adopt the following approach. For start dates, if the newspaper reports identify a specific month when the bubble developed or first emerged, we record that month as the start date. Otherwise we set the start date using the first account of speculative activity that we uncover in the narrative record.[12] When the narrative evidence only refers to a season, we use the first full month of the season ("summer" = "July", etc.) unless the accounts provide an "early" or "late" modifier ("early summer" = "June" and "late summer" = "August", etc.). For episodes where the narrative accounts do not provide enough information to record the specific months, we date the episode only with the calendar years in which the episode is reported to occur.[13] In cases where the narrative evidence is conflicting, we use the earlier start date.

Dating the ends of bubbles is somewhat more complicated. In cases where bubbles are reported to end in a sudden price decline or crash, we record this month as the end date. However, some bubbles end in a less newsworthy fashion, fizzling out rather than popping. Is the bubble over once prices have passed their peak and begun to decline? The answer is debatable. If prices are still elevated above fundamentals – and perhaps more importantly, if contemporaries believed that prices were still elevated above fundamentals – then one could argue that the bubble still exists. It is, perhaps, in the process of collapsing, but it has not yet collapsed. We thus record both the peak date and the end date, in instances where the narrative evidence suggests they differ, so as to track bubbles both from trough to peak and from trough to trough whenever possible. We date the peak based on the last report of speculative activity or the first report of continuous price declines. If a news article states outright that prices have returned to normal levels, we record this as the end date. Otherwise we look for key words indicating that prices have reached a new equilibrium (e.g., calmed, stabilized). If the narrative record does not provide such evidence, we date both the peak and the trough as of the last report of speculative buying activity. In cases where the narrative evidence is conflicting, we use the later peak date and/or end date.

---

[11] Also, to ensure that we are weeding out blips, for an episode to be classified as a bubble, we require a minimum of two articles, within one year of one another.

[12] *I.e.,* one week or month before the publication date of the first article describing each episode that we uncover.

[13] This is more common for the earlier episodes; news traveled more slowly prior to the widespread adoption of the electro telegraph in the mid 19th century, making it less likely that the historical newspapers of that era would identify a specific month in which a bubble emerged. Instead, for most episodes in the early part of the 19th century, we only have enough information to record the years in which the bubble was reported to occur. By contrast, for the later episodes (*i.e.* starting with those in the 1860s), we are able to record a specific month or season as start and end dates in most instances.

To illustrate our dating methodology: our narrative search uncovers evidence of a bubble in grain prices (particularly wheat, but also corn, oats, and rye) beginning in 1924. One report refers to the bubble beginning in the fall (which we would date as October, the first full month of the season); but another refers to "the last six months of 1924," so we use the earlier start date of July 1924.[14] An article published on January 31, 1925, refers to wheat futures prices reaching "the highest price [...] in 50 years."[15] The next article we find was published on March 28, 1925, and states that "[g]rain has fallen very sharply within the last few months, but wheat is still 30 to 64 cents higher than a year ago."[16] Two weeks later an article states that "the gigantic speculation in both grain and in stocks, which was in progress for so many months, has signally and utterly collapsed, causing havoc on every side [...]."[17] All subsequent news articles refer to the episode in the past tense. We accordingly date the peak of the bubble in January 1925 and the end of the bubble in April 1925.

Lastly, it is important to note that while we are compiling a list of bubbles based on descriptions in the historical news accounts from 1825-1929, there is no way to prove that an event is a bubble. This limitation is, however, not specific to our paper. Rather, this problem is pervasive to the full literature on bubbles: How can one prove that the price of an asset exceeds its fundamental value? Indeed, how can one measure the fundamental value of an asset? There is no clear-cut rule or widely agreed upon approach to tackle such questions. Nonetheless, for those who subscribe to the view that (1) bubbles do occur and that (2) bubbles should be studied systematically, what we are accomplishing in this study – constructing a list of reported bubbles, for more than a century's worth of U.S. economic history, via a narrative approach and then checking to see whether those events appear to be consistent with the key features of a bubble – is incredibly valuable, both for scholars seeking to better understand when and where asset price bubbles occurred through U.S. history and for scholars seeking to better understand the causes and consequences of bubbles.[18] Furthermore, even if it may not be possible to prove whether the price of an asset exceeds its fundamental value, what may be more relevant in identifying bubbles is whether contemporaries, *in real time*, perceived the price of the asset to have exceeded its fundamental value, and were, nevertheless, buying the asset in anticipation of reselling it at an even higher price. A key strength of our narrative approach— which involves the methodical reading of a century's worth of historical news reports—is that it gathers new evidence from the reports of contemporary observers as to why investors were purchasing assets. Were contemporaries purchasing the asset due to a widespread belief that its fundamental value had increased? Or were contemporaries, in general, of the belief that the price of the asset had outstripped its fundamental value, but were, nevertheless, purchasing the asset in the hope of reselling at a higher price to obtain a speculative gain? Using the historical news accounts, our chronology identifies events in which contemporaries describe asset purchases arising, not out of a widely perceived shift in the fundamental value of the asset, but rather out of a hope of flipping the asset at a higher price—a key characteristic of a bubble.

---

[14] "The Federal Reserve System and the Proposed McFadden Amendments," *Chronicle*, Vol. 120, May 9, 1925, p. 2331. And "Edward Jerome Dies on 'Speculation and the Grain Futures Market'—Service Organized Speculation Renders", *Chronicle*, Vol. 120, May 30, 1925, p. 2770.

[15] "The State of Trade—Commercial Epitome", *Chronicle*, Vol. 120, Jan 31, 1925, p. 511.

[16] "The State of Trade—Commercial Epitome, *Chronicle*, March 28, 1925, p. 1535.

[17] "The Federal Reserve System and the Speculative Excesses in Grain and in Stocks", *Chronicle*, Vol. 120, April 11, 1925, p. 1797

[18] Moreover, even for scholars who do not subscribe to the view that bubbles occur, price booms are important to study in their own right. The home price boom of the 2000's and stock price boom of the late 1920s were both followed by rapid price collapses that unleashed severe financial crises. Regardless of whether such events are classified as bubbles or price booms, they should still be studied systematically—a major goal of this paper.

II. The New Chronology

A. Results

Table 1 presents the new chronology on asset price bubbles. The new chronology contains 19 reported asset price bubbles. The chronology includes the most famous asset price bubbles (e.g. the stock bubble of the late 1920s), asset price bubbles that have been noted in other prior research (e.g. the Florida real estate bubble of 1925-26), as well as many asset price bubbles that are not widely known.

Descriptions of each of these asset price bubbles are in the Appendix. For each asset price bubble, the appendix describes any information that the narrative accounts contain regarding (1) the industry or asset class in which the reported bubble occurs, (2) the start and end date of the bubble, (3) the geographical reach of the bubble, and (4) the magnitude of the price increases. In addition, the appendix presents a summary for each asset bubble, along with screenshots and direct quotes of the narrative evidence we used to classify these events as bubbles.

Consider a representative example: the 1919-21 Midwestern Land Bubble. Box 1 summarizes this episode, with select narrative evidence (see the Appendix for the full narrative evidence). Between 1919-21, prices for land in the Midwest, particularly for farm land, increased rapidly; "Farm land prices in the Corn Belt have increased in recent months with unprecedented rapidity."[19] Contemporaneous accounts describe prices exceeding fundamental value; "land prices were higher than earning on the investment justified, because the prices reflected the anticipated further increase of land prices."[20] The news accounts describe widespread speculative activity; "Speculation and reckless inflation of land values has been much in evidence during the last year or two, and unless this movement is checked, it will result in conditions which are highly detrimental…If farm lands are permitted to attain speculative market prices in excess of their actual value, based upon use and productivity, it becomes relatively impossible for the landless farmer to acquire a farm of his own".[21] In addition to the categories described above, the Appendix provides other interesting tidbits for each bubble. For example, for this episode, the Appendix documents the debate amongst contemporaries about the role played by an overexpansion of credit, via both the public sector (via the Farm Loan Act, an act designed to facilitate the purchase of farm land) and the private sector, in the formation of the bubble.

---

[19] "Farmers Warned of Danger in Rapidly Rising Land Prices," *Chronicle,* September 20, 1919, p. 1133.

[20] "Farmers Warned of Danger in Rapidly Rising Land Prices," *Chronicle,* September 20, 1919, p. 1133

[21] "Needed and Not Rendered," *Chronicle,* November 20, 1920, p. 101.

Box 1. 1919-1921 Midwestern Land Boom

1. Industry: Farm land in the Midwest.
2. Date: Late 1919 – Early 1921. First reference found to the land boom on September 20, 1919: "Profits made by speculators in farming lands, especially in the Corn Belt, have produced what in some sections, according to the U.S. Department of Agriculture, is almost a frenzy of trafficking in farms that portends serious results".[22] Last reference (in the past tense) to the land boom in June 1921:   "In certain States we need not name, fabulously rich in themselves, there have been vital land booms".[23]
3. Geography: The Midwest, particularly in the Corn Belt states of Iowa, Illinois, Missouri, Kansas, Nebraska, North Dakota, South Dakota, Minnesota, and Indiana: "Farm land prices in the Corn Belt have increased in recent months with unprecedented rapidity. In most of Iowa and the principal corn-producing counties of central Illinois…. The tendency has spread into northern Missouri, eastern Kansas, eastern Nebraska, eastern North and South Dakota, southern Minnesota, and western Indiana".[24]
4. Magnitude of Price Increases: Increase in price from $75 per acre to $100 per acre in 1919, with possibly greater increases in 1920: "In most of Iowa and the principal corn-producing counties of central Illinois, representative farms probably have been sold, and are being sold at increases averaging at least $75 to $100 an acre since last spring, and many far greater increases have been noted".[25]
5. Select Narrative Evidence Suggesting A Bubble:
Contemporaneous Reports of Prices Exceeding the Fundamental Value of the Asset, P>V: (1) "Indeed there are indications that in many parts of the northern States even before the present 'boom,' land prices were higher than earning on the investment justified, because the prices reflected the anticipated further increase of land prices".[26] (2). "It should be pointed out that the present marking up of land prices on the basis of abnormal earnings is analogous to the watering of stock by a corporation which has been earning a large return on its initial investment".[27]   (3). "Speculation and reckless inflation of land values has been much in evidence during the last year or two, and unless this movement is checked, it will result in conditions which are highly detrimental, not only to the farming interests of the country, but to our entire economic structure. If farm lands are permitted to attain speculative market prices in excess of their actual value, based upon use and productivity, it becomes relatively impossible for the landless farmer to acquire a farm of his own".[28]

B.   Do These Episodes Coincide With Rising Asset Prices?

Now that we have compiled our chronology from narrative sources, a useful check is to see whether our episodes coincide with rising prices for the specific asset. For historical U.S. stock return data, we use the series compiled by Schwert (1990). Schwert discusses how best to combine the major historical stock price or return datasets available, considering issues such as equal- rather than value-weighting; the use of monthly high-low averages, rather than closing prices; and the exclusion of dividends yields. He corrects for many of these issues and provides a continuous series of monthly total returns from 1802-1925.[29] Since the benchmark series used by academic economists, the Center for Research on Securities Prices (CRSP) value-weighted return series inclusive of dividends, starts in 1926, this data source provides continuous

[22] "Farmers Warned of Danger in Rapidly Rising Land Prices," *Chronicle,* September 20, 1919, p. 1133.
[23] "Resumption on Farm and in Factory," *Chronicle,* June 25, 1921, p. 2681.
[24] "Farmers Warned of Danger in Rapidly Rising Land Prices," *Chronicle,* September 20, 1919, p. 1133.
[25] "Farmers Warned of Danger in Rapidly Rising Land Prices," *Chronicle,* September 20, 1919, p. 1133.
[26] "Farmers Warned of Danger in Rapidly Rising Land Prices," *Chronicle,* September 20, 1919, p. 1133
[27] "Farmers Warned of Danger in Rapidly Rising Land Prices," *Chronicle,* September 20, 1919, p. 1133
[28] "Needed and Not Rendered," *Chronicle,* November 20, 1920, p. 101.
[29] Data from 1802-1862 rely on Smith and Cole (1935); from 1863-1871 on Macaulay (1938); from 1872-1885 on Cowles (1939); and from 1885-1925 on Dow Jones (1972). Prior to 1872 the series largely consist of bank and railroad stocks. See Schwert (1990) Table 5 for more details.

coverage through the present day. For historical real estate prices, we use the series compiled by Shiller (2005), who constructs an annual house price index starting in 1890 based on a "repeat-sales" methodology.

The top panel of Figure 1 shows the incidence of stock bubbles versus annual stock returns. Our stock bubble dates coincide with periods of high stock returns – *e.g.*, the Civil War bubble of 1863-64, the railroad bubble of 1885, the industrial trust bubble in 1898-99, the war stock bubble of 1915, and the stock market bubble of 1924-29 However, not all periods of rapid price increase are bubbles – *e.g.*, we do not find narrative evidence of bubbles in 1843-45, 1879-80, 1904-05, or 1908, periods that also stand out on the graph for their unusually high returns. Finally, we identify sectoral stock bubbles during periods when overall stock returns were low – *e.g.*, the railroad stock bubble of 1872-73 and the curb market bubble of 1902. It appears that unusually rapid increases in overall stock prices are neither a necessary nor a sufficient condition for a stock bubble.

The middle and bottom panels of Figure 1 indicate the timing of real estate / land bubbles and commodity bubbles versus the stock market return series. We note that these bubbles tend to form in bear markets, when stock returns are negative – the pattern is particularly pronounced for commodity bubbles.

As further evidence, Figure 2 zooms in on the time period of 1861-1865 and shows the monthly *level* of the stock price index (*i.e.*, cumulative returns including dividends). This time period coincides with a rapid price appreciation: stocks rose 62% in 1862 and 40% in 1863, but only 10% in 1864, as the market petered out in the second half of the year. Our narrative methodology indicates that the Civil War stock bubble began in January 1864, about one year into the period of rapid price increases, and ended in April 1864, just as the price index plateaued. While one might quibble with the exact start and end dates, the narrative methodology and a quantitative approach would likely produce very similar results.[30]

Figure 3 repeats this exercise using Shiller's nominal house price index, which only begins in 1890. Shiller's source for 1890-1933 is Grebler et al. (1956), who construct a 22-city index of house prices based on owner estimates of acquisition prices versus valuations in 1934. The index is thus based on changes in prices for the same units of housing over time, similar to the benchmark repeat-sales methodology pioneered by Case and Shiller (1987). However, the series exhibits excess volatility in the early years and may understate the height of the 1920s peak – see White (2009) and Knoll et al. (2017). Despite these shortcomings, the timing of peaks in 1920 and 1925 coincide with both of the land bubbles we identify during the time period. The first bubble, beginning in late 1919 and ending in early 1921, is referred to by contemporaries as a "land boom" in the Midwest that centered on farm land in Corn Belt states. The second bubble, which we date from March 1925 to June 1926, was centered in Florida, although there were some reports of land speculation along the New Jersey coast and of a construction boom in other parts of the country. As both of these bubbles appear to have been regional in nature, it is perhaps not surprising that the price run-ups in Figure 3 are not more pronounced.

C. Do "Pure" Bubbles Exist? Froth and Fundamentals

As mentioned earlier, it is impossible to prove that the price of an asset exceeds its fundamental value since there is no widely agreed upon approach for determining the fundamental value of an asset. However, in documenting episodes in which the reports of contemporary observers describe the event as a bubble because there are widespread descriptions of speculative activity bidding up the price of an asset, alongside contemporaneous reports that the asset's price had exceeded its fundamental value, we also record every account we found in the historical news record that could be interpreted to imply a fundamentals-based explanation for the advances in the asset's price.

---

[30] This time period also featured two sector-specific stock bubbles, which we do not indicate on the figure: the "mining fever" of 1863 - October 1865, and the "petroleum mania" of 1864 - July 1865.

Interestingly, nearly every episode on our new chronology contains at least one report in the historical news accounts that offers a fundamentals-based explanation for the price increases, including for the most famous and well-documented bubbles, e.g. the 1920s stock bubble. It appears that pure "froth" bubbles—bubbles without any potential rationalizable fundamentals-based explanation—rarely exist in practice. Our reading of a century's worth of historical news reports suggests that a fundamentals-based explanation may justify, to some investors, the purchase of the asset, even if most investors rush to purchase the asset, not because they agree that the asset's fundamentals have improved, but rather to reap speculative gains from the price increases that have materialized. According to the narrative evidence most episodes seem to involve a mixture of froth and fundamentals, reinforcing each other to cause rapid price appreciations. As Eugene White (2008, p. 16) noted in a careful study of two of the bubbles noted on our chronology (the Florida housing bubble and the stock bubble of the 1920s), "As in all such episodes, there were fundamentals and froth."

Consider, for example, the Florida real estate bubble of the mid-1920s. The narrative accounts contain numerous descriptions of speculative activity bidding the price of Florida real estate above its fundamental value. For example, the *Chronicle* reported:

> "If these speculators are permitted to tie up the national banks on a basis of fictitious values, in buildings doubly inflated by watered labor, we shall run into a situation which will not merely require the deflation of the land boom but the liquidation of banks themselves."[31]

> "An almost feverish boom in land values in Florida and several other localities is in full blast."[32]

> "This condition, along with the considerable volume of credit absorbed by land speculation in some parts of the country and speculative building operation constitute the danger spots in our present situation. There is evidence that a section of the public is losing its bearings and being drawn into the arena of thoughtless speculation."[33]

At the same time, the *Chronicle* published a speech by Peter Knight, a banker affiliated with the Bank of West Tampa, who characterized the Florida real estate boom as being grounded in fundamentals:

> "And this prosperity of Florida, the prosperity that Florida is now having is not due to any hectic real estate speculation that this State has been afflicted with, but to fundamental underlying conditions, and to consistent, continuous development and growth the past thirty years. Florida is a marvelous state."[34]

Hence, the narrative accounts describe both froth and fundamentals-based explanations for the Florida real estate boom.

As another example, consider the infamous 1920s stock bubble. Most contemporaneous accounts described stock prices in excess of their fundamental value. For example, the *Chronicle* reported:

---

[31] "Real Estate Loans by National Banks – A Plain Warning," Chronicle, Vol. 121, October 10, 1925, p. 1734.
[32] "Lewis E. Pierson on 'Bankers at A. B. A. Convention Look for Greater Business Activity," Chronicle, Vol. 121, October 3, 1925, p. 1620.
[33] "A. C. Miller on the Operation of the Federal Reserve System," *Chronicle,* Vol. 121, November 28, 1925, p. 2593.
[34] "Address of Welcome of Peter O. Knight – Growth in Deposits of Florida Banks – Florida a State Without Taxation," *Chronicle,* Vol. 121, December 19, 1925, p. 2931

"The movement inspires caution, not alone because prices have been carried to such extreme heights, but also because it has a fictitious element in it."[35]

"There is nothing to interrupt the speculation, no matter how inordinate or how flagrant its character. We must expect the present speculation, therefore, to continue absorbing more and more credit and more and more funds, until some untoward event occurs, bringing it to an abrupt close, and shows the hollowness and unsubstantial nature of the whole movement."[36]

"Stocks are now selling on expectation rather than on realization. All the experience of the past points clearly to the conclusion that prices are too high, and must come down. The public appears to be mistaking the past for the future."[37]

"The enormous waves of stock speculation with their grossly inflated prices for favorite stocks"[38]

Nonetheless, the *Chronicle* contained a few reports arguing that stock price increases reflected strengthening fundamentals. For instance—and perhaps most prominently—the *Chronicle* noted that distinguished economist Irving Fisher declared the price increases to be grounded in fundamentals:

> Stock prices are not too high…is the opinion of Professor Irving Fisher, of Yale University, one of the nation's leading economists and students of the market...He gave as one reason why security values were high 'that we are living in the age of mergers under the Coolidge and Hoover Administrations...These mergers have effected great economies and have therefore increased the profits of corporations to a great extent. Every merger boosts the stock of the merged companies because of this expectation. A considerable part of the rise in stock prices in the last two years has been due to the increased rate of formation of these mergers and the anticipation of future economies arising from them.[39] Addressing the New York Credit Men's Association, Professor Fisher asserted that the market has not been inflated...he contended that even in the present high market the price of stocks have not yet caught up with their real values.[40]

Hence, even for the notorious stock bubble of the 1920s, the reports by contemporary observers offer both froth- and fundamentals-based explanations. Section _ of the Appendix provides a full listing of froth-and fundamentals-based explanations for each episode on our chronology, based on the narrative evidence in the historical news reports. Indeed, we direct interested readers to this section for more detailed information.

Moreover, even for the most famous episodes of bubbles that are commonly cited—Tulip Mania, the South Sea Bubble, the Dot Com Bubble—recent scholarship has offered fundamentals-based explanations. Neal (1993, ch. 4) classifies the South Sea Bubble as a rational bubble, in the sense that prices satisfy the dividend-discount difference equation above. Garber (1989, 1990) argues that Tulip Mania and the South Sea episodes were not bubbles at all, even in the rational sense, but rather were due to changes in fundamentals – an increased probability of large future cash flows that did not pan out *ex post*. Popular author Michael Lewis (2002) defends the Dot Com bubble on similar grounds. Even during the recent

---

[35] "The Financial Situation", *Chronicle*, October 8, 1927, p. 1877.
[36] "The Financial Situation", *Chronicle*, April 14, 1928, p. 2205.
[37] "A New Investment Policy for a New Economic Era", *Chronicle*, October 6, 1928, p. 1873
[38] "Is Not Group Speculating a Conspiracy Making For Sham Prosperity?", *Chronicle*, June 1, 1929, p. 3586
[39] "Stock Prices on Firm Basis, Irving Fisher Asserts – Values Not Inflated and Serious Drop Remote, Yale Professor Holds – Makes Reply to Roger W. Babson", *Chronicle*, September 7, 1929, p. 1530.
[40] "Stock Slump Only Temporary, According to Professor Irving Fisher – Says Market Rise Since War Has Been Justified – 'Public Speculative Mania' He Declares Least Important Cause of Price Inflation", *Chronicle*, October 26, 1929, p. 1531.

housing bubble of the mid 2000s, contemporaries offered fundamentals-based explanation to justify the sharp advances in the prices of homes, at the same time that many other contemporary observers declared that the event was clearly a bubble (*e.g* Himmelberg, Mayer, and Sinai (2005) argue that U.S. houses as of the end of 2004 were reasonably priced based on local market fundamentals). Our careful reading of a century's worth of historical news accounts suggests that froth and fundamental-based explanations occur alongside one another, and likely reinforce the advances in the asset's price. Pure bubbles—episodes in which speculative factors alone sustain the price increases—may not exist in the historical record.

D. Forgotten Bubbles

Our chronology contains many historical asset price bubbles that are largely forgotten today, but that were mentioned in the historical news record as classic examples of bubbles that were widely known to contemporaries of the 19th century. For example, in 1860, *Hunt's Merchants' Magazine* listed several of the most well-known bubbles to contemporaries of that day. The list included the silk *Morus multicaulis* bubble of 1836-39, involving speculation in a species of mulberry tree used for the cultivation of silkworms, alongside the "tulip mania" [41] and "South Sea scheme"[42]. However, half a century later, the silkworm mania was apparently fading from memory, prompting economic historian Arthur H. Cole to describe this as a "neglected" episode in a 1926 article in the *American Economic Review*:

> The fever of which the virus was the innocent morus multicaulis is interesting not only because of its exceptional violence but also of its close similarity to the famous tulip mania that rocked Holland in the early years of the seventeenth century. Neither the morus multicaulis or Chinese mulberry tree, nor the tulip bulb could be considered in any way an essential agricultural commodity; and in neither case did there exist a market for the commodity sufficiently broad to warrant the extensive speculation which in fact occurred. Only the excessive and buoyant hopes of the participants (or victims) gave impetus to the extraordinary inflation of value.[43]

Our chronology contains this episode, which is largely forgotten today.[44]

As another example, in 1865, *Hunt's* compares the petroleum bubble of 1864-65—found on our chronology, but also largely forgotten today—to both the silkworm bubble of 1836-39 and tulip mania: "The poetry of petroleum is fast following the 'morus multicaulus' [sic] […] and 'tulip' manias of other years."[45] The Florida real estate bubble of 1926, though it appears toward the end of our period of analysis, serves as another example. White (2008, p. 1) describes the Florida bubble as "a forgotten episode"— which is particularly unfortunate, given that like the housing bubble of the mid-2000s, the Florida real estate bubble triggered a banking crisis when it collapsed, according to the contemporaneous news accounts. Knowledge about this episode, or others, could hold valuable lessons for policymakers today.

E. Episodes That Were Not Bubbles

Our comprehensive search through nearly one hundred years of newspaper articles also unearthed a number of historical episodes that resemble but, upon close inspection, do not appear to have been bubbles. Table 2 lists these episodes and explains why we exclude each episode from our chronology. Each episode fails

---

[41] "Mercantile Miscellanies," *Hunt's Merchant Magazine*, June 1860, p.50.

[42] Ibid.

[43] Cole (1926), p. 627.

[44] Arthur Cole's article is the most recent entry in the economics literature discussing the *Morus multicaulis* bubble of which we are aware. However, at least one agricultural historian has recently written about the episode – Marsh (2012) – and the episode receives passing mention in Kilborne (2012), ch. 1.

[45] "Commercial Chronicle and Review," *Hunt's Merchant Magazine*, July, 1865, p. 49.

to satisfy one of our two criteria: either that the asset's price was above its fundamental value, or that price increases were driven by speculative activity.

We can definitively rule out several episodes. We identify attempted corners in gold in 1869, in coffee and wheat in 1887, and in wheat in 1897-98. We exclude corners from our chronology because price increases are due to deliberate manipulation by a small group of investors, rather than to widespread speculation. Nevertheless, in every one of these episodes prices appear to have risen above fundamentals for a time, and in at least one case contemporaries described the episode using the word "bubble" (the "Leiter Wheat Bubble" of 1897-98). Our search also unearths a stock market crash in 1901, but we found no reports of prices exceeding fundamentals prior to the crash.

In most cases, we exclude episodes due to a lack of evidence. However, we are cautious not to definitively rule out these episodes. Failure to confirm a hypothesis is of course different from refuting said hypothesis. Further archival work may unearth additional evidence, so we provide this list in the interests of transparency and for the benefit of future researchers.

F. The Historical Frequency of U.S. Asset Price Bubbles

Our results indicate that asset price bubbles were common throughout U.S. history before the Great Depression. Because there are nineteen reported bubbles between 1840 and 1929, the frequency is one asset price bubble every five years. In addition, using our new chronology, we are able to observe any changes in the historical frequency of asset price bubbles over various subperiods.

One particularly interesting question that we are able to examine is whether there is evidence of a "Greenspan put" during the first fifteen years of the Federal Reserve. The "Greenspan put" is the notion that a central bank, via its commitment to promote financial stability, could inadvertently foster excessive risk-taking, and thereby increase the likelihood that a speculative asset bubble emerges.[46] Miron (1986) shows that the Federal Reserve, by furnishing an elastic currency, reduced the seasonality of interest rates and relieved monetary stringencies between 1915 and 1929. Could the smoothing of the seasonal interest rate, combined with a perception that the Federal Reserve would reduce the likelihood of future financial panics, have inadvertently encouraged excessive risk-taking that increased the likelihood that asset price bubbles would emerge?

To examine this question, we calculate the historical frequency of asset price bubbles, implied by our new chronology, for the first fifteen years of the existence of the Federal Reserve, compared with earlier periods. Between 1915 and 1929, six asset price bubbles are reported to emerge, at a rate of roughly one every 2.5 years, compared to twelve between 1840 and 1914, for a rate of roughly one every 6.25 years. However, if we restrict the pre-Fed period to the fifteen years immediately prior to the establishment of the Federal Reserve, 1900-1914—potentially, a more useful comparison given the dramatic structural changes to the U.S. economy over the course of the 19th century, three bubbles are reported to emerge, for a frequency of one every 5 years. Together, this suggests a doubling in the frequency of asset price bubbles during the first fifteen years of the existence of the Federal Reserve.

However, this exercise has both strengths and weaknesses, so we encourage caution in interpreting these results. A strength of this exercise is that it permits us to directly compare the first fifteen years of the

---

[46] This term was coined after the failure of Long-Term Capital Management. Critics argued that Fed Chair Alan Greenspan, by signaling that the Fed would maintain low-interest rates to promote stability when necessary, provided an implicit promise to financial markets that encouraged excessive risk-taking, creating an atmosphere conducive to the formation of bubbles. This claim is, however, high controversial.

Federal Reserve to the preceding fifteen years. Whereas the 1920s have a reputation for being a decade characterized by a roaring stock market boom and bust, arguably, less is known about how the early years of the Federal Reserve compared to the years immediately preceding its existence, in terms of the occurrence of bubbles. A benefit of our new chronology is that it identifies episodes from real-time sources, using a consistent set of criteria, permitting us to directly compare the reported occurrence of asset bubbles during the first fifteen years of the existence of the Federal Reserve to the preceding fifteen years. The higher frequency of reported asset price bubbles in the 1920s on our chronology corroborates the popular notion of a roaring decade—of a decade characterized by exuberant investors. By contrast, our chronology implies that the preceding fifteen years had fewer reported bubbles, suggesting that even if the Federal Reserve successfully reduced the seasonality of interest rate fluctuations, as shown by Miron (1986), to promote financial stability, other problems may have been lurking in the background.

Nonetheless, we interpret such evidence of an increase in the frequency of asset price bubbles as only suggestive for several reasons. For one, whereas our chronology finds six bubbles between 1915-1929, compared to three between 1900-1914, implying a doubling in the frequency of bubbles, the difference in the raw numbers—six bubbles compared to three—is not particularly large. For another reason, even if there were an increase in the frequency of bubbles during the first fifteen years of the existence of the Federal Reserve, other factors could account for this elevated frequency. For example, the first five years of the Fed's existence also saw the outbreak of a major world war and the imposition of price controls in the U.S. (see Rockoff 2004). The Fed's next ten years were the 1920s, a decade of rising income inequality. Reich (2010) argues that because the wealthy are more likely to make riskier investments, bubbles are more likely to form during periods of extreme income inequality, so the increase in the frequency of bubbles may be a byproduct of this development, rather than of the existence or policy actions of the Federal Reserve. Hence, it is important to interpret these findings with caution.

III. Are Bubbles More Likely To Form In Certain Macroeconomic Environments?

The Stock Market Bubble of the 1920s and the Housing Bubble of the mid-2000s, the two U.S. historical bubbles of the past century that have arguably, captured most of the professional and public attention, developed in periods with low interest rates and positive output growth. Some critics of Federal Reserve policy in those decades argue that easy monetary conditions helped to fuel the formation of those two asset price bubbles. Moreover, other scholars argue that bubbles may be more likely to form when the economy is booming since investors may be inclined to become overly exuberant and confident during business cycle upswings. Yet, so far, no one has tested to see whether a large sample of asset price bubbles, identified using a consistent set of criteria from narrative sources over a prolonged period, supports these views. Are asset price bubbles more likely to form in certain macroeconomic environments than in others? What patterns, if any, emerge from our new chronology?

To provide a sense of the behavior of output when bubbles emerge, Table 3 summarizes the state of key macroeconomic variables in months with vs. without a bubble. We define bubble months from the start date to the end date of each bubble. We measure output growth using the log change in the seasonally adjusted Miron and Romer (1990) Index of Industrial Production. The Miron-Romer Index of Industrial Production is a monthly index of industrial production that measures the physical output of thirteen manufactured and mineral products from 1884 to 1940. The seasonally adjusted series begins slightly later, so we begin our monthly analysis in January 1885 and stop with the end of the Great Contraction in August

1932, giving us 47 years and 7 months of data. Twelve of the nineteen bubbles in our new chronology occur during this time period.[47]

In addition to comparing output growth between bubble and no-bubble time periods, we also report average monthly stock market returns, using the Schwert index, and *ex ante* real interest rates. To construct the *ex ante* real interest rate, we subtract expected inflation, calculated as the equal-weighted moving average of inflation over the previous 36 months, from the Macaulay (1938) prime rate on 60-90 day (through 1923) and 4-6 month (post-1923) commercial paper in New York City.[48] Inflation is calculated as the log change in a monthly general price level index between 1860 and 1939, constructed by the Reports Division of the Federal Reserve Bank of New York.[49]

The table shows that monthly IP growth was 0.20 percentage points higher during bubble months ($t = 1.1$), mean stock market returns were 0.66 percentage points higher ($t = 1.4$), and *ex ante* real interest rates were 2 percentage points lower ($t = 6.3$). All of these differences are extremely large, representing a doubling or halving of each of the variables. However, only the difference in *ex ante* real interest rates is statistically significant. We are not surprised that the stock return difference is insignificant: the table does not distinguish among the various classes of asset price bubbles; and moreover, our narrative approach should hopefully capture bubbles that are not apparent in an aggregate stock return index. On the other hand, we are somewhat surprised by the lack of significance for a difference in output growth. We suspect that this is because the calculation pools together both early months in the lifespan of a bubble, when it is just forming (and we hypothesize that IP growth is unusually high), along with later months, when the bubble has reached or passed its peak (when we hypothesize that IP growth is slowing down).

To better investigate the dynamics among interest rates, output growth, and bubble formation, we estimate a monthly VAR with three variables, ordered as follows: a bubble counter variable that counts the number of bubbles reported to occur in each month in our new chronology (taking values from 0 for no bubbles to 3 if bubbles form simultaneously in all three asset classes), an estimate of the *ex ante* real interest rate, and the log of the seasonally adjusted Miron and Romer (1990) Index of Industrial Production. Since many of the bubbles that we observe start and end in the same calendar year, using monthly data lets us focus on within-year dynamics.

Figure 4 presents the impulse response functions implied by the VAR, along with one-standard-error bands.[50] First, consider the innovations of the three variables in response to shocks in their own series. In response to a positive output shock, output growth continues to be positive for the next several months, though the effect dissipates over time. In response to a positive *ex ante* real interest rate shock, the *ex ante* real interest rate continues to rise over the next two months and remains elevated for several months. In response to a positive bubble shock, the bubble series slowly returns to zero over the course of a year, reflecting the ephemeral nature of bubbles.

---

[47] We focus our analysis on the monthly time period in part because our data collection for this era is essentially complete, so we do not anticipate major changes in future versions of this paper as we continue to read through earlier historical newspaper articles.

[48] NBER Macrohistory Database series 13002.

[49] NBER Macrohistory Database series 04051.

[50] The standard error bands are the percentiles of a bootstrap distribution, based on 400 draws, so do not impose a symmetry constraint.

Next, consider the response of output to an interest rate shock. In response to a positive *ex ante* real interest rate shock of 62 basis points, output falls dramatically. The estimated impact is a decline of 0.16 percentage points at month 2 ($t = 2.4$).[51]

The main result, however, is the response of the bubble series to shocks in output growth and the *ex ante* real interest rate. The movements of the bubble counter, in response to both types of shocks are strongly significant. In response to a positive output shock, the estimated impact is positive and statistically significant in every month over a one year-window, with the effect being most significant at month 6 (the expected number of bubbles is 0.045 higher than baseline; $t = 2.9$). In response to a positive real interest rate shock, the estimated impact is negative and statistically significant, starting a few months after the real interest rate shock. The estimated impact is -0.027 in month 7 ($t = 2.1$) and remains significant through the end of the year. Together, these findings indicate that a positive output shock and a negative *ex ante* real interest rate shock each predict the occurrence of a bubble. In other words, bubbles are more likely to occur in environments characterized by positive output growth or low real interest rates.

Figure 5 presents the findings from a VAR, analogous to the one described above, except that the aggregate bubble counter is separated into three distinct variables: separate counters for stock, land, and commodity bubbles that count the number of bubbles occurring, by type and by month, based on our chronology.[52] The same basic results hold. Positive output shocks predict the occurrence of bubbles. In response to a positive output shock, the point estimates for all three bubble series are positive, though the point estimates are only significant for the stock bubble series. For the stock bubble series, the estimates are strongly significant, with a rapid impact of 2.5% at month 2 ($t = 3.3$). For the land and commodity bubble series, the impulse response functions are positive, though the effects are not statistically significant at conventional levels (however, 12 months after the output shock, the land bubble IRF has a value of +1% and is marginally significant, $t = 1.9$).

In addition, positive *ex ante* real interest rate shocks reduce the likelihood of the occurrence of a bubble. In response to a positive real interest rate shock, the point estimates for all three bubble series are negative, though, in this case, the estimates are strongly significant for the land bubble series, but only marginally significant for the commodity bubble series and not at all for the stock bubble series. The commodity bubble IRF responds quickly and flattens out at -1% between months 4 and 12 ($t = 1.8$ at month 12). By contrast, the estimated impact of a positive real interest rate shock on the land bubble series grows over time: the estimated impact is -1.2% by month 6 ($t = 2.5$) and -1.9% by month 12 ($t = 3.5$).

IV. Discussion and Future Work

Equipped with our new chronology of asset price bubbles, we have documented that (1) asset bubbles occur with relatively high frequency in the U.S. historical record (one every five years between 1840 and 1929); (2) bubbles are more likely to form in environments characterized by positive output growth (particularly stock bubbles) and low real interest rates (particularly land bubbles); (3) rising aggregate stock prices are neither a necessary nor a sufficient condition for the formation of an industry-specific stock price bubble; and (4) commodity bubbles tend to form during periods of low aggregate stock returns.

---

[51] The movement of the *ex ante* real interest rate in response to a positive output shock is in the same direction: A positive output shock is associated with lower ex ante real interest rates, perhaps because positive output growth raises both inflation, and expected inflation.

[52] There is never more than one bubble of a given type occurring in a given month between 1885 and 1932, so the three counter variables may be interpreted as dummy variables and the IRF estimates as increases above long-run average probabilities.

We are continuing to read historical newspaper accounts to extend our chronology back to 1825. Once this archival work is complete, we will be equipped with a representative listing of when asset price bubbles occurred over more than a century of U.S. economic history. It will then be possible to examine a host of additional, important questions. Do major bubbles only form after a substantial lag following a prior crash—that is, once financial market participants have had sufficient time to forget? Are bubbles more likely to occur in certain regulatory regimes than in others? Moreover, we plan to investigate the macroeconomic consequences of the ends of bubbles. Are banking panics more likely to erupt after the bursting of a bubble? Are certain types of bubbles more likely to be followed by banking panics? Do downturns typically follow the bursting of an asset price bubble? Or, does the behavior of output vary dramatically? And if so, what can explain such variation? Are the output losses larger when the bursting of a bubble coincides with the outbreak of a banking panic? The completion of a new chronology of asset price bubbles will not only help us to understand where and when asset price bubbles occurred throughout U.S. history; it will also serve as a valuable tool to inform the debate concerning whether and how modern policymakers should respond to the formation and collapse of asset price bubbles in the future.

References

Allen, Franklin, Stephen Morris, and Andrew Postlewaite. 1993. "Finite Bubbles with Short Sale Constraints and Asymmetric Information." *Journal of Economic Theory* 61 (2): 206–29.

Barlevy, Gadi. 2007. "Economic Theory and Asset Bubbles." *Federal Reserve Bank of Chicago Economic Perspectives* 31 (3): 44–59.

Bordo, Michael D., and David C. Wheelock. 2004. "Monetary Policy and Asset Prices: A Look Back at Past U.S. Stock Market Booms." *Federal Reserve Bank of St. Louis Review* 86 (6): 19–44.

Brunnermeier, Markus K., and Isabel Schnabel. 2015. "Bubbles and Central Banks: Historical Perspectives." *CEPR Discussion Papers* DP10528.

Camerer, Colin. 1989. "Bubbles and Fads in Asset Prices." *Journal of Economic Surveys* 3 (1): 3–41.

Carlson, Mark, Kris James Mitchener, and Gary Richardson. 2011. "Arresting Banking Panics: Federal Reserve Liquidity Provision and the Forgotten Panic of 1929." *Journal of Political Economy* 119 (5): 889–924.

Case, Karl E., and Robert J. Shiller. 1987. "Prices of Single-Family Homes since 1970: New Indexes for Four Cities." *New England Economic Review*, no. Sep: 45–56.

Cole, Arthur H. 1926. "Agricultural Crazes. A Neglected Chapter in American Economic History." *The American Economic Review* 16 (4): 622–39.

Froot, Kenneth A., and Emil M. Dabora. 1999. "How Are Stock Prices Affected by the Location of Trade?" *Journal of Financial Economics* 53 (2): 189–216.

Garber, Peter M. 1989. "Tulipmania." *Journal of Political Economy* 97 (3): 535–60.

———. 1990. "Famous First Bubbles." *Journal of Economic Perspectives* 4 (2): 35–54. http://dx.doi.org.oxy.idm.oclc.org/10.1257/jep.4.2.35.

Gorton, Gary B. 2010. *Slapped by the Invisible Hand: The Panic of 2007*. Financial Management Association Survey and Synthesis Series. Oxford and New York: Oxford University Press. http://search.proquest.com/econlit/docview/821272831/AFEB9B3E0F6D4054PQ/1.

Grebler, Leo, David M. Blank, and Louis Winnick. 1956. "Capital Formation in Residential Real Estate: Trends and Prospects." *NBER Books*.

Harrison, J. Michael, and David M. Kreps. 1978. "Speculative Investor Behavior in a Stock Market with Heterogeneous Expectations." *Quarterly Journal of Economics* 92 (2): 323–36.

Hausman, Joshua K. 2016. "Fiscal Policy and Economic Recovery: The Case of the 1936 Veterans' Bonus." *American Economic Review* 106 (4): 1100–1143. http://dx.doi.org.oxy.idm.oclc.org/10.1257/aer.20130957.

Himmelberg, Charles, Christopher Mayer, and Todd Sinai. 2005. "Assessing High House Prices: Bubbles, Fundamentals, and Misperceptions." *Federal Reserve Bank of New York, Staff Reports: 218, 2005*. http://search.proquest.com/econlit/docview/56717907/12E860C58DC34AAFPQ/1.

Jalil, Andrew J. 2015. "A New History of Banking Panics in the United States, 1825-1929: Construction and Implications." *American Economic Journal: Macroeconomics* 7 (3): 295–330. http://dx.doi.org.oxy.idm.oclc.org/10.1257/mac.20130265.

Jalil, Andrew J., and Gisela Rua. 2016. "Inflation Expectations and Recovery in Spring 1933." *Explorations in Economic History* 62: 26–50. http://dx.doi.org.oxy.idm.oclc.org/10.1016/j.eeh.2016.07.001.

Jordà, Òscar, Moritz Schularick, and Alan M. Taylor. 2015. "Leveraged Bubbles." *Journal of Monetary Economics* 76: S1–20.

Kenny, Sean, Jason Lennard, and John D Turner. 2017. "The Macroeconomic Effects of Banking Crises," Queen's University, , 68.

Kilborne, S. S. 2012. *American Phoenix: The Remarkable Story of William Skinner, A Man Who Turned Disaster Into Destiny*. Free Press.

Knoll, Katharina, Moritz Schularick, and Thomas Steger. 2017. "No Price like Home: Global House Prices, 1870-2012." *American Economic Review* 107 (2): 331–53.

LeRoy, Stephen F. 2004. "Rational Exuberance." *Journal of Economic Literature* 42 (3): 783–804. http://dx.doi.org.oxy.idm.oclc.org/10.1257/0022051042177711.

Lewis, Michael. 2002. "In Defense of the Boom." *New York Times*, October 27, 2002, sec. Magazine.

Macaulay, Frederick R. 1938. "Some Theoretical and Practical Difficulties of Comparing Long Term Interest Rates at Different and Especially at Widely Separated Dates." In *Some Theoretical Problems Suggested by the Movements of Interest Rates, Bond Yields and Stock Prices in the United States since 1856*, 54–84. NBER.

Marsh, Ben. 2012. "The Republic's New Clothes: Making Silk in the Antebellum United States." *Agricultural History* 86 (4): 206–34.

Mathy, Gabriel, and Herman Stekler. 2017. "Expectations and Forecasting during the Great Depression: Real-Time Evidence from the Business Press." *Journal of Macroeconomics* 53: 1–15. http://dx.doi.org.oxy.idm.oclc.org/10.1016/j.jmacro.2017.05.006.

Miron, Jeffrey A. 1986. "Financial Panics, the Seasonality of the Nominal Interest Rate, and the Founding of the Fed." *American Economic Review* 76 (1): 125–40.

Miron, Jeffrey A., and Christina D. Romer. 1990. "A New Monthly Index of Industrial Production, 1884–1940." *The Journal of Economic History* 50 (2): 321–37.

Neal, Larry. 1993. *The Rise of Financial Capitalism: International Capital Markets in the Age of Reason*. Cambridge University Press.

Ramey, Valerie A. 2011. "Identifying Government Spending Shocks: It's All in the Timing." *Quarterly Journal of Economics* 126 (1): 1–50.

Reich, Robert B. 2010. *Aftershock: The next Economy and America's Future*. Vintage.

Reinhart, Carmen M., and Kenneth S. Rogoff. 2009. *This Time Is Different: Eight Centuries of Financial Folly*. Princeton and Oxford: Princeton University Press. http://search.proquest.com/econlit/docview/56983865/83DEE0CC90E24A7FPQ/4.

Richardson, Gary, and William Troost. 2009. "Monetary Intervention Mitigated Banking Panics during the Great Depression: Quasi-Experimental Evidence from a Federal Reserve District Border, 1929-1933." *Journal of Political Economy* 117 (6): 1031–73.

Rockoff, Hugh. 2004. "Until It's over, over There: The US Economy in World War I." National Bureau of Economic Research.

Romer, Christina D. 1990. "The Great Crash and the Onset of the Great Depression." *Quarterly Journal of Economics* 105 (3): 597–624.

Romer, Christina D., and David H. Romer. 1989. *Does Monetary Policy Matter? A New Test in the Spirit of Friedman and Schwartz*. Edited by Olivier Jean Blanchard. Cambridge, Mass. and London: MIT Press.

———. 2004. "A New Measure of Monetary Shocks: Derivation and Implications." *American Economic Review* 94 (4): 1055–84. http://dx.doi.org.oxy.idm.oclc.org/10.1257/0002828042002651.

———. 2010. "The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks." *American Economic Review* 100 (3): 763–801.

———. 2017. "New Evidence on the Aftermath of Financial Crises in Advanced Countries." *American Economic Review* 107 (10): 3072–3118. http://dx.doi.org.oxy.idm.oclc.org/10.1257/aer.20150320.

Samuelson, P. A. 1958. "An Exact Consumption-Loan Model of Interest with or without the Social Contrivance of Money." *Journal of Political Economy* 66: 467–82.

Scheinkman, Jose A., and Wei Xiong. 2003. "Overconfidence and Speculative Bubbles." *Journal of Political Economy* 111 (6): 1183–1219.

Schwert, G. William. 1990. "Indexes of US Stock Prices from 1802 to 1987." *Journal of Business*, 399–426.

Shiller, Robert. 2000. *Irrational Exuberance*. 1st ed. Princeton, New Jersey: Princeton University Press.

———. 2005. *Irrational Exuberance: Second Edition*. Princeton University Press.

Smith, Vernon L., Gerry L. Suchanek, and Arlington W. Williams. 1988. "Bubbles, Crashes, and Endogenous Expectations in Experimental Spot Asset Markets." *Econometrica* 56 (5): 1119–51.

Summers, Lawrence H. 1986. "Does the Stock Market Rationally Reflect Fundamental Values?" *The Journal of Finance* 41 (3): 591–601.

Tirole, Jean. 1982. "On the Possibility of Speculation under Rational Expectations." *Econometrica* 50 (5): 1163–81.

———. 1985. "Asset Bubbles and Overlapping Generations." *Econometrica: Journal of the Econometric Society*, 1499–1528.

Townsend, Robert M. 1980. "Models of Money with Spatially Separated Agents." *Models of Monetary Economies*, 265–303.

Velde, Francois R. 2009. "Chronicle of a Deflation Unforetold." *Journal of Political Economy* 117 (4): 591–634.

Weil, Philippe. 1990. "On the Possibility of Price Decreasing Bubbles." *Econometrica* 58 (6): 1467–74. https://doi.org/10.2307/2938325.

White, Eugene N. 2009. "Lessons from the Great American Real Estate Boom and Bust of the 1920s." National Bureau of Economic Research.

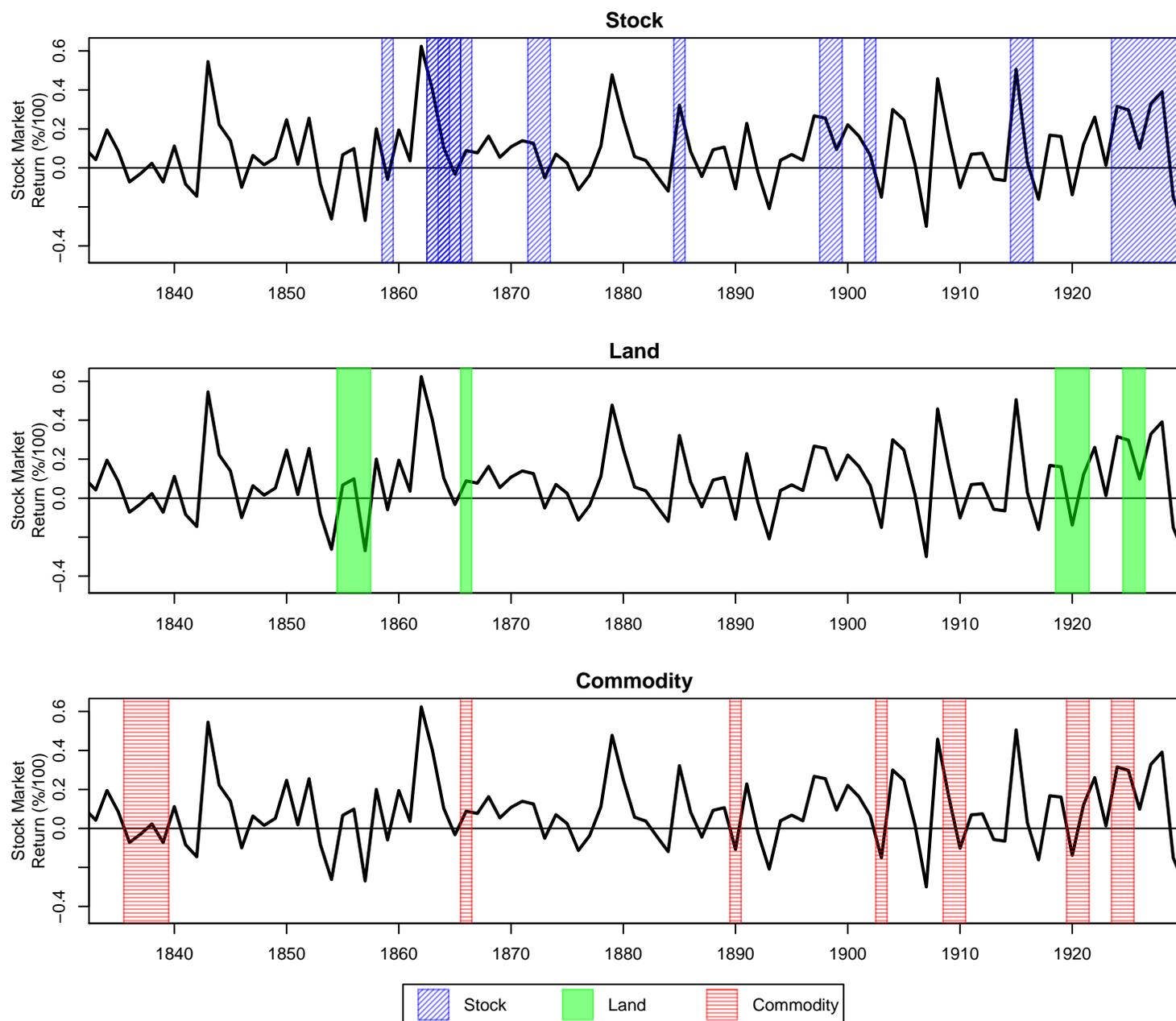Figure 1. The New Chronology of Bubbles vs. Historical Stock Market Returns, 1836-1929

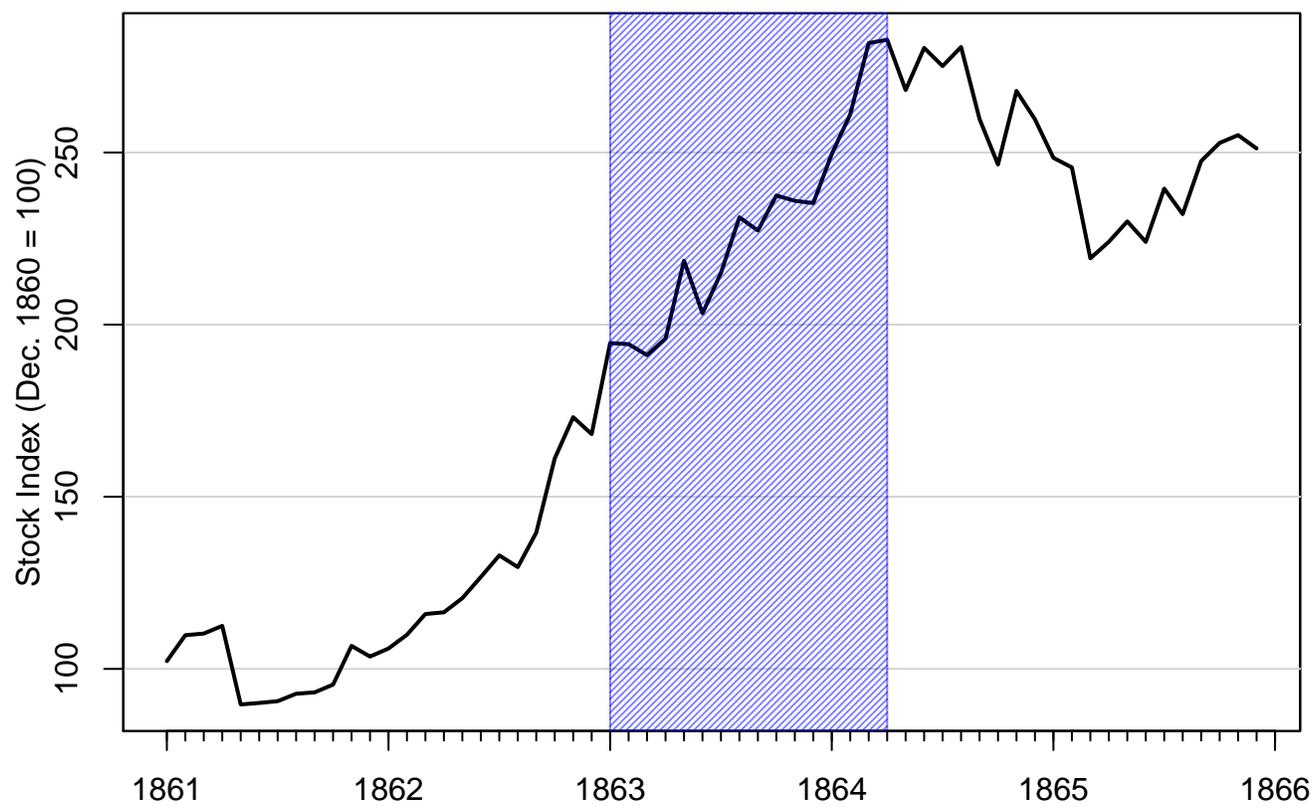Figure 2. The Civil War Stock Bubble (January 1863-April 1864)

Figure 3. Land and Real Estate Bubbles vs. Shiller's Nominal House Price Index, 1890-1930
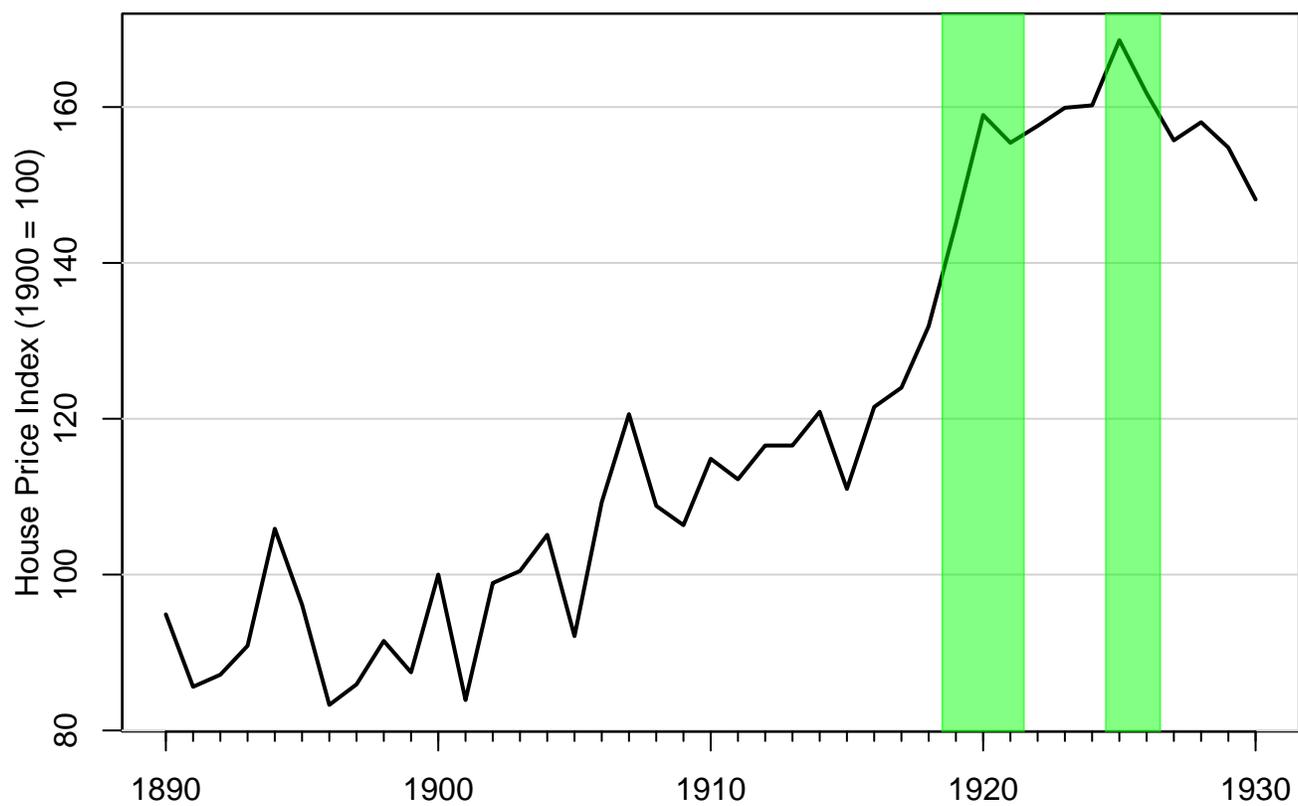
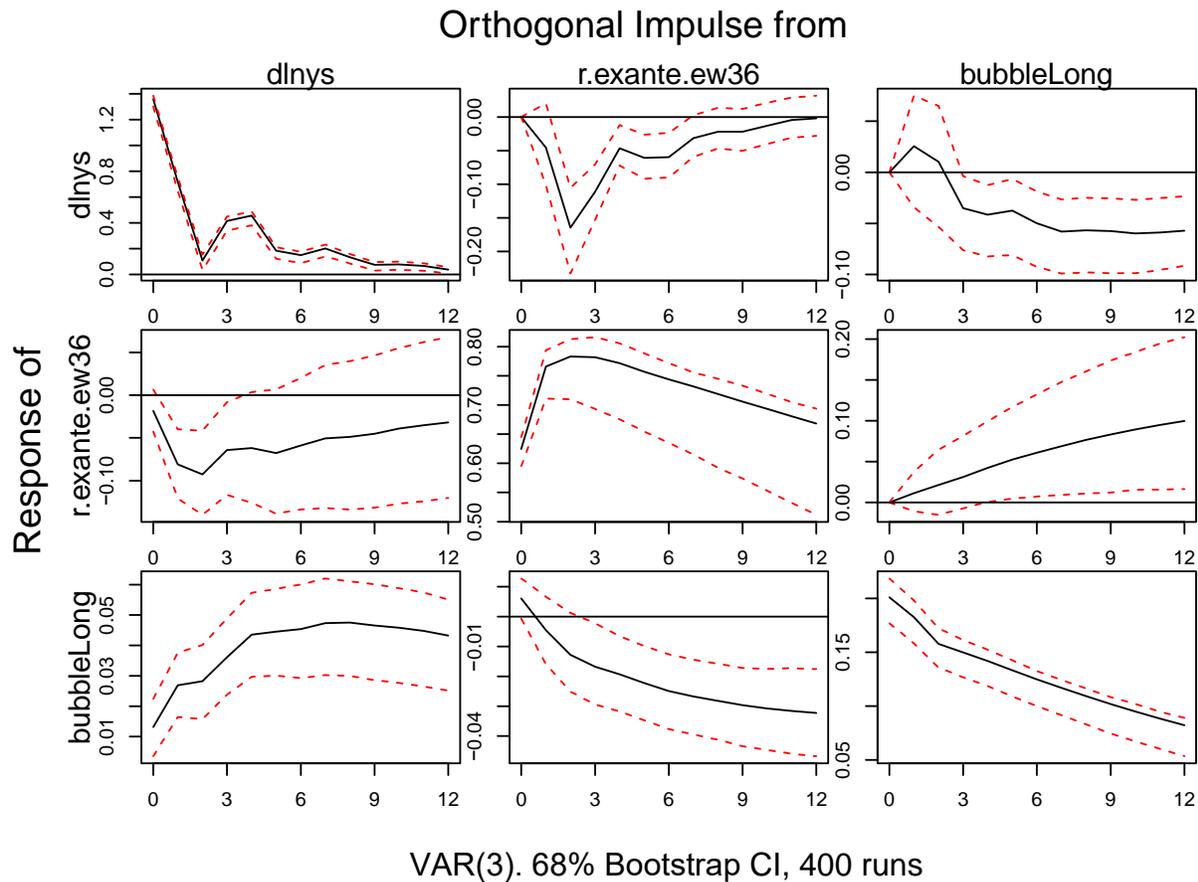Figure 4. IRFs from Monthly VARs, Jan. 1885 - Aug. 1932.

VAR(3). 68% Bootstrap CI, 400 runs

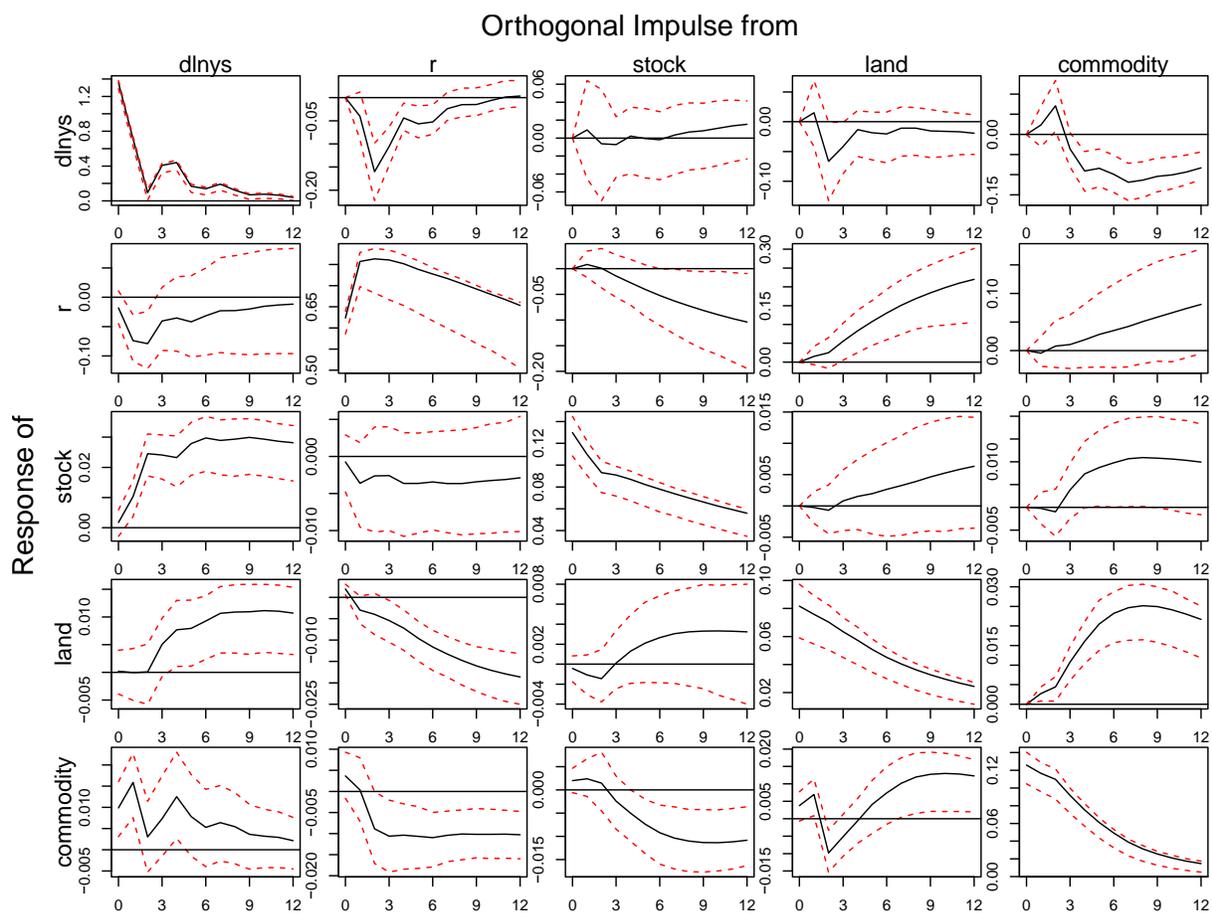Figure 5. IRFs from Monthly VARs, Jan. 1885 - Aug. 1932.

VAR(3). 68% Bootstrap CI, 400 runs

Table 1. List of Bubbles, 1839-1929

Episode	Asset Class	"Bubbly" Language Used in News Articles to Describe the Episode
1836-39 *Morus multicaulis*	Commodity	*Real-time:* n/a. *Retrospectively:* bubble [1860], mania [1860, 1865]
1855-57 Land	Land	bubble
1863-64 Civil War Stocks	Stock	bubble
1863-65 Mining Fever	Stock	fever
1859/1864-65 Petroleum Mania	Stock	bubble, (oil) fever, (petroleum) mania
1866 Speculative Mania	Stock, Land, Commodity	(speculative) mania
1872-73 Railroad Stocks	Stock	bubble, mania
1885 Railroad Stocks	Stock	speculative fever, speculative mania
1890 Silver	Commodity	bubble
1898-99 Industrial Trust Stocks	Stock	wild speculation
1902 Curb Market	Stock	bubble
1903 Cotton	Commodity	mania, wild speculation
1909-10 Cotton	Commodity	bubble
1915 War Stocks	Stock	bubble, speculative mania
1919-21 Midwest Land	Land	land boom
1920 Sugar	Commodity	bubble
1924 Grain	Commodity	bubble
1924-29 Stocks	Stock	bubble, speculative mania
1925-26 Florida Land	Land	feverish boom, land boom

Notes. This table lists every episode we identify that satisfies our definition of a "bubble" (see text) from systematically searching and reading all relevant articles in *Hunt's Merchants' Magazine* and *The Commercial and Financial Chronicle*, between 1839 and 1929, along with the general asset class (second column), and "bubbly" language used by contemporaries to describe the specific episode (third column). Words in parentheses were sometimes, but not always, used as modifiers. Other search terms described in text also pulled up relevant articles.

Table 2. Episodes Not Classified as Bubbles

Episode	Asset Class	Bubble Criteria:		Notes
		Speculative activity bidding up prices	P>V	
1867-69 Railroad Watering Mania	Stock	unclear	X	
1869 Gold Clique	Commodity		X	Corner
1880 Import Mania	Goods			Trade deficit in April 1880
1880-81 Railroad Stocks	Stock	X		
1884 Wheat	Commodity	X		
1887 Coffee Corner	Commodity	X		Corner
1887 Wheat Corner	Commodity	X		Corner
1897-98 Leiter Wheat Bubble	Commodity			Corner
1899 Railroad Stocks	Stock		X	
1901 Stock Market Crash	Stock	X		No evidence of a preceding bubble
1919 Stock	Stock	X		

Notes. This table lists every potential bubble episode we identify that does not satisfy our definition of a "bubble" (see text) from systematically searching and reading all relevant articles in *Hunt's Merchants' Magazine* and *The Commercial and Financial Chronicle*, between 1839 and 1929.

Table 3. Macroeconomic Conditions in Months with vs. without a Bubble, Jan. 1885 - Aug. 1932

	Bubble	No bubble	**Difference**
%ΔIP (SA monthly %)	0.42	0.22	**0.20**
	(1.9)	(1.7)	
Stock market return (monthly %)	1.11	0.46	**0.66**
	(4.8)	(5.6)	
Ex ante real interest rate (%)	1.95	3.94	**-2.00*****
	(2.94)	(4.11)	
N (months)	141	435	

Notes. This table reports summary statistics of macroeconomic conditions between January 1885 and August 1932. Months with a bubble are measured from the start date to the end date (trough to trough). SDs in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Data sources. %Δ(IP) is log difference in seasonally-adjusted monthly IP index from Miron & Romer (1990). Monthly stock returns are from Schwert (1990). *Ex ante* real interest rate is the commercial paper rate minus a 36-month lagged, equal-weighted moving average of (annualized) actual inflation, where: commercial paper rate is 60-90 day prime rate until 1923, 4-6 month thereafter, in New York City, from Macualay (1938); and inflation is log difference in FRBNY monthly general price level index (NBER macrohistory database, series 04051).