

CENTER FOR FINANCIAL STABILITY

Wall Street, the Federal Reserve
and Stock Market Speculation:
A Retrospective

By Elmus Wicker



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AND STOCK MARKET SPECULATION:
A RETROSPECTIVE**

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About the Author

Elmus Wicker is Professor Emeritus of Economics at Indiana University in Bloomington, Indiana. He has also been a consultant to the Board of Governors of the Federal Reserve System. He was educated at Louisiana State University; Oxford University; and Duke University, where he earned his Ph.D. He has written many articles, mainly on monetary economics, and six books: *Federal Reserve Monetary Policy, 1917-1933* (1966); *The Principles of Monetary Economics* (with James M. Boughton, 1975); *Recent Developments in Economics* (editor, 1978); *Banking Panics of the Great Depression* (1996—perhaps his best-known work); *Banking Panics of the Gilded Age* (2000); and *The Great Debate on Banking Reform: Nelson Aldrich and the Origins of the Fed* (2005).

Foreword

Professor Wicker wrote *Wall Street, The Federal Reserve and Stock Market Speculation: A Retrospective* in 2008 and 2009. When we first learned that the manuscript existed, we knew that its content would be highly relevant to the challenges of financial stability today. Ill health has unfortunately prevented Professor Wicker from revising this work completely. Although it may be less polished in spots than he would like, the reflections of so eminent a scholar demand to be read.

Professor Wicker has devoted his career to thinking and writing about the Federal Reserve and financial markets. His ideas are of special interest now, as the Federal Reserve seems poised to raise its policy interest rate for the first time since the onset of the Great Recession and central banks are on the verge of gaining new macroprudential powers.

Wall Street, The Federal Reserve and Stock Market Speculation: A Retrospective provides historical insights on the interplay between the stock market and the Federal Reserve as well as fodder for further study and debate.

We thank Jordan Wicker, Ike Brannon, and Kurt Schuler for help in bringing the manuscript to print.

Lawrence Goodman
President
Center for Financial Stability

Preface

This is a propitious time for a retrospective on the Federal Reserve and stock market speculation. The collapse of the housing bubble in 2007, accompanied by a severe contraction in share prices, has sharpened the focus of the debate on the role of the Federal Reserve in forestalling speculative booms. Fed Chairman Alan Greenspan saw no more reason to curb the housing bubble than he did to halt the run-up in share prices in 1995-2000. The Dow Jones Industrial Average suffered more than a 50 percent decline in 2008-09. My book was nearing completion when the housing bubble burst too early to say anything perspicacious about more recent events.

We propose to re-examine the historical evidence for what insight might be gained about the Fed's past responses to stock market speculation. In our search of the historical record we have uncovered a serious gap in the knowledge and understanding of how Federal Reserve policymakers responded to a perceived threat posed by a speculative boom. The gap is especially wide for the period between 1918 and 1974, including even 1928-29. After 1974 there was an effective moratorium on changes in margin requirements and a de facto policy of nonintervention during the 1984-87 and 1995-2000 speculative booms, a policy continued during the most recent bubble in the mortgage market.

The Fed intervened successfully to curb incipient speculative booms in 1919 and again in 1926 without serious macroeconomic side effects. The increase in the discount rate in August 1929, as we shall see, did not terminate the share price boom. And a persuasive case can be made that the Fed's response in 1953-56 successfully ended the speculative boom even although the policy was deliberately aimed at curbing inflation, not stock market speculation. Persistent and continuous increases in the discount rate did not have harmful economic effects during this episode. What conclusion do we draw from the historical evidence? There is little or no support for the Greenspan hypothesis that there is "excessive uncertainty" about the macroeconomic consequences of Fed intervention.

We draw particular attention to how the numerous speculative episodes were terminated. Did they end with a spectacular collapse in share prices? Were there serious economic effects? What role did Fed policy play in terminating a speculative boom? And how did share prices respond on those few occasions when the Fed did not intervene? Indeed a formidable list of questions to guide the narrative! A word about what sparked my interest in these questions is in order. While writing a history of Federal Reserve monetary policy (Wicker 1966) many years ago, I learned that the increase in the discount rate in August 1929, contrary to conventional wisdom, was not a restrictive measure! The Fed had been pursuing an easing policy since June and was preparing to meet the usual fall seasonal demands. This was accomplished by simultaneously raising the discount rate and lowering the buying rate on bankers' acceptances, thereby making the supply of reserves completely elastic. Unfortunately, the episode has been interpreted as a further restrictive measure precipitating the stock market crash.

We construct a format for describing the behavior of nominal and real share prices. The observations are in real time rather than being time series' statistical artifacts. The presumption is that Fed policymakers were responding, when they did respond, to the threat posed by a run-up in nominal share prices. But we intend to identify those few occasions when the distinction between nominal and real prices matters. We identify two main characteristics of the share price data, both nominal and real from 1918 to 2003: intensity as measured by percentage change in share prices, and duration measured in months. From observed peaks and troughs we construct 16 separate share price episodes, both nominal and real. We then rank-order each of the episodes according to these two characteristics. The Fed's response is described within the context of the 16 episodes.

Intensity and duration cannot discriminate between speculative episodes that were followed by crashes and those that were not. Some episodes of almost equal intensity and duration were followed by crashes; some were not. Fed intervention cannot provide the answer. The Fed did not intervene in the 1984-87 and 1995-2000 speculative booms, yet a crash followed the former but not the latter.¹ Why some

¹ "Intervention" as used here does not simply mean any Federal Reserve action raising the policy interest rate. See pages 3-6. (Editor's note)

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speculative booms terminate in a crash and some do not remains an unresolved problem for continued research.

I acknowledge the thoughtful comments on the manuscript at various stages of its progress of David Flynn, Charles Goodhart, Jim Butkiewicz, Ellis Tallman, Richard Sylla and Elyce Rotella.

Bloomington, Indiana
April 2009

Chapter 1

Introduction

1. Overview

The Federal Reserve's relationship with the stock market has a long and checkered history. The first 60 years (1914-74) can be described as ambivalent and contentious: ambivalent about the necessity and extent of intervention and contentious about what the alleged economic effects might be. While Fed officials generally denied any desire to determine the level of stock prices, they did not hesitate to intervene if they perceived a threat of an impending speculative boom. In contrast, over the next 26 years (1974-2000), direct Fed intervention was less frequent. Margin requirements were fixed and more reliance was placed on the endogenous restrictive response of Fed policy to control inflation. The policy shift had been gradual and attracted very little attention before the 1995-2000 run-up in share prices, when Fed Chairman Alan Greenspan began to make the case for nonintervention apart from what was implied by the efforts to control inflation.

The question became more sharply focused: What role should the Fed play, if any, in containing stock market speculation? What we discovered was a significant knowledge gap about when and how policymakers responded to stock market speculation in the past and with what effect, if any, on economic activity. As we shall see, there is no plausible historical evidence that direct Fed intervention ever resulted in a serious contraction of output, the 1929 stock market boom notwithstanding. The argument against Fed intervention must be made on other grounds, not on the grounds of excessive uncertainty about what might happen to economic activity.

Drafters of the Federal Reserve Act had an archaic notion of what constituted permissible lending by member banks to avoid inflation—the “real bills” doctrine. They simply applied the doctrine to lending by Federal Reserve Banks as well. Section 13 of the Act enjoined Reserve Banks from making discounts to member banks the proceeds of which would be used for speculative purposes. Administration of

the discount window required reserve officials to monitor lending to the member banks to exclude discounts for purely speculative and long-term investment purposes. The Securities Exchange Act of 1934 extended the authority of the Federal Reserve Board to vary margin requirements on the purchase of stock exchange securities, an instrument used frequently between 1934 and 1974. Legislative mandates explain in part how speculation provided a nexus between the Federal Reserve and the stock market.

They are also linked by what I call Fed culpability. Fed officials have been blamed for initiating a speculative boom in the stock market in 1928 by having pursued an easy money policy in the previous year and precipitating a stock market crash in October 1929 by raising the discount rate to 6 percent. More recently, Chairman Greenspan was the recipient of sharp criticism for failing to have forestalled the 1995-2000 speculative boom. Neither the discount rate nor margin requirements were called to active duty! By its failure to have pursued a more restrictive monetary policy, the Fed may have contributed to the subsequent collapse of share prices. Our principal concern is to identify the Fed's response to a perceived threat of stock market speculation. By "Federal Reserve response" we mean any action, either discretionary or automatic, whose purpose is to curtail what is perceived as an undesirable run-up in share prices or threat thereof. The measures may be general or specific. The discount rate and open market operations are general measures. A change in margin requirements was a specific measure utilized between 1934 and 1974. Moral suasion is also a specific measure designed to alter expectations about the future behavior of share prices.

Specific measures exert their effects, if there are any effects, solely on share prices. That is not the case with general measures whose effects extend to output and prices and perhaps to share prices as well. A strong deterrent to using the discount rate to forestall stock market speculation has been a perceived threat to output and employment and prices—a threat that we show has been exaggerated, as revealed by the historical evidence.

The Fed's response to share price speculation may be discretionary, automatic or both. A discretionary response refers to purposive actions taken by Fed policymakers to influence share prices. Restrictive action taken specifically to affect the rate of inflation and economic activity—for example, an increase in the discount rate—

may also offset share prices. When this happens we describe the Fed's response as automatic. Disavowed intent to influence share prices refers solely to discretionary action by Fed policymakers. Now we can understand why the terms "intervention" and "nonintervention" may give a misleading description of the Fed's response: they apply to discretionary measures but not to automatic ones. Greenspan's policy of nonintervention pertains, as we shall see, solely to discretionary actions.

The Fed's automatic response requires further explanation. It may work through two channels:

1. Increases in the discount rate and open market purchase and sales affect the term structure of interest rates. An increase in interest rates may deter share price speculation if it alters expectations of future earnings provided Fed policy is credible.
2. If the Fed is committed to an inflation target, a rise in share prices may generate a wealth effect, thereby increasing expenditures. According to the Taylor rule, a discrepancy between actual and potential output implies an increase in the Federal funds rate; the Fed's response is automatic and endogenous.

Embedded in the policy of price level targeting is a passive response by the Fed to alleged excessive stock market speculation. The reason for the tightening is a deviation of the inflation rate from the desired target rate. If the discrepancy is accompanied by a persistent surge in share prices, the tightening may moderate the share price increase. The Fed's response is built in, as it were, to a threat of stock market speculation as well as inflation. However, it may on occasion be an unreliable guide. Stock market booms may not occur simultaneously with an inflation threat. There was no inflation during the 1926-29 share price episode, yet share prices surged. Nor was there a threat of inflation during the 1995-2000 episode. The Fed was successful in maintaining stability partly by pursuing price level targeting. The speculative boom in share prices had the longest duration and greatest intensity of any post-World War I share price episode! And it was followed with a lag by a share price deflation lasting 30 months. Inflation was perceived by the Fed as a serious problem in the share price episodes of 1953-56 and 1962-66 and the

discount rate was raised repeatedly during both episodes. Not all the raises were passive responses by the Fed.

The share price increase of the 1953-56 episode was third in intensity in the 16 share price episodes since 1918. But there was no prescriptive termination of the share price boom. Even if share price speculation accompanies an inflation or threat thereof, we do not know whether the degree of tightening to contain inflation is the same as that required to ward off a speculative boom. The two possible responses—active or passive—must be considered separately.

To describe the Fed's response to share price speculation it is not necessary to identify the run-up in share prices as a speculative boom or bubble. For our purposes, all that we need to do is to track the troughs and peaks in nominal and real share prices, their intensity and duration, and the effectiveness of the Fed's response. Our task differs from that set out by Bordo and Wheelock (2004). They sought to identify the existence of speculative booms by employing arbitrary criteria: 1) an average annual rate of increase in the real stock price index of 10 percent, and 2) at least three years' duration from trough to peak.

An *ex post* criterion is of little use in evaluating the Fed's response, especially for those episodes that did not meet the criteria but may have contained a speculative run-up in share prices. Bordo and Wheelock's main attention was directed at identifying speculative booms rather than in analyzing how effective the Fed's response was in curtailing speculation. Intervention in 1919 and 1926, episodes that do not qualify as speculative booms by the Bordo-Wheelock criteria, was successful. What is indeed surprising is the extent of the knowledge deficit about what the Fed has done. The historical evidence has been either ignored or misinterpreted—ignored with respect to its success in 1919 and 1926, and misinterpreted with respect to the degree of restraint in 1929. The main purpose of our study is to fill this knowledge gap by revealing how successful Fed intervention has been.

2. Origins of Fed Intervention

Fed intervention in the stock market may have both a historical basis and a firm theoretical basis. As we have explained, the historical basis derives from legislative mandates embodied in Section 13 of the

original Federal Reserve Act and the Securities Exchange Act of 1934. The theoretical basis derives from the distinction between market fundamentals and speculative bubbles as determinants of share prices. The existence of speculative bubbles presumably warrants Fed intervention.

Speculation, however, was not the sole grounds for intervention. The framers of the Securities Exchange Act were equally concerned with safety considerations, i.e., protecting the unwary small investor from the vagaries of stock market manipulation. Shiller (2000b) regarded the introduction of margin requirements as mainly a consumer protection policy.

The Fed was constrained from lending to finance stock market speculation. To repeat, Section 13 of the Federal Reserve Act prohibited the Fed from discounting the paper of member banks the proceeds of which would be used for purely speculative or long-term investment purposes. Borrowing by member banks from the Fed to extend loans to brokers or individual investors was not permitted. It must be clear that lending by member banks for purely speculative or long-term investment purposes fell outside the Section 13 provision, which applied solely to lending by the Fed to member banks. Section 13 had its roots in the “real bills” doctrine traceable to early 19th century Britain. Two opposing schools of thought differed about how or whether to control the note issue. The Banking School maintained that the note issue ought to expand and contract with the needs of business, which would be the case if banks confined their activities to short-term self-liquidating commercial and industrial purposes. The currency would adjust automatically to the ebb and flow of trade. On the other side were writers of the Currency School, who rejected the Banking School view as fallacious. They thought the note issue should vary precisely as a pure specie currency would and that the exchanges were the appropriate guide for regulating the currency.

The Banking School view, or “real bills” doctrine, was a theory of bank liquidity that stated banks should make short-term, self-liquidating loans created for the specific purpose of providing funds for producing, purchasing, carrying or marketing of goods, namely to meet the short-term working capital needs of business.

The early years of the Fed were preoccupied with futile attempts to define “eligible paper” to discount. Eventually the issue became irrelevant when advances on the collateral of government securities

largely replaced commercial paper. The heyday of “real bills” influence was reached in February 1929, when two members of the Federal Reserve Board, Adolph Miller and C. S. Hamlin, initiated the policy of “direct pressure” (refusing Federal Reserve credit to banks intending to use it for speculative purposes). The Board eschewed the use of the discount rate to curb speculation for fear it would affect economic activity adversely, and substituted what we now refer to as moral suasion. With the Securities Exchange Act of 1934, the Board was authorized to impose variable margin requirements, a policy that was discontinued in 1974. After World War II the Fed was less and less influenced by “real bills” considerations, and the constraints of Section 13 were largely ignored.

On a purely theoretical level, the Fed’s response to a speculative boom turns on the validity of a distinction between market fundamentals and speculative bubbles as determinants of share prices. By “market fundamentals” we mean expected return, which must be equal to the expected return on other stocks of similar risk and real interest rates. Share prices should respond to changes in market fundamentals. A rise in share prices not attributable to market fundamentals is labeled a bubble and may be the basis for Fed intervention. Psychological factors may be the driving factors accounting for the existence of a speculative bubble.

On two separate occasions in the 1980s and 1990s the Fed refrained from direct pressure to halt a speculative boom: 1984-87 and 1995-2000. Paul Volcker guided the Fed during most of the earlier speculative boom and Alan Greenspan during the latter. To my knowledge, Chairman Volcker left behind no records to justify his policy of nonintervention (mainly during 1984-86), nor did any other Fed official. Why the Fed refrained from controlling the 1984-87 boom is an unfilled information gap. Chairman Greenspan was more voluble, especially after the boom terminated. On his testimony on various occasions, we must rely. His justification for refraining from direct intervention in 1995-2000 speculative boom may be summarized briefly in three simple propositions:

1. Asset bubbles are extremely difficult, if not impossible, to identify *ex ante*.
2. There was “excessive” uncertainty about the macroeconomic consequences of Fed intervention.

3. The Fed should be reluctant to pit its judgment against the combined judgment of millions of investors in the assessment of market fundamentals.

3. Margin Requirements

The Securities Exchange Act of 1934 was the Congressional response to the stock market debacle of 1928-29. It reflected contemporary judgment that speculation was largely responsible for the financial collapse. The objectives of the Act were four-fold: 1) the control of credit going into the stock market; 2) the protection of investors from exploitation by corporate insiders; 3) the protection of investors from evils of the stock market; and 4) the regulation of the over-the-counter market.

In an effort to exercise greater control over credit flowing to the stock market, the Act gave the Federal Reserve Board the discretion to impose margin requirements regulating the amount that could be borrowed by investors for the purchase of stock exchange securities. The Act was a compromise between those who would eliminate all unregulated margin trading and those who favored its retention. But it clearly embodied the philosophy that too much borrowed money on margin was dangerous. The two Federal Reserve officers who testified in the Senate hearings, E. A. Goldenweiser (1934), director of research and statistics, and Woodlief Thomas, an adviser to the Federal Reserve Board, asserted that there was a direct relationship between the amount of credit entering the stock market and the extent of speculation in that market.

Credit-financed speculation supposedly created excess market volatility through a process labeled “pyramiding-depyramiding.” In the absence of margin requirements, optimistic investors with a low degree of risk aversion might borrow a large amount of funds, causing a price rise not justified by fundamentals. Their increased wealth might be used to borrow more to buy more stocks, thereby further raising stock prices. This pyramiding effect would eventually cause a market collapse. Similarly, for a price drop, creditors would ask for more collateral, resulting in stock sales and further price declines. Congress presumably reasoned that the imposition of margin requirements would constrain the amount of borrowing and prevent excessive market volatility.

Shiller (2000b, p. 13) denied that the actual changes in margin requirements had been determined by such considerations. Rather he concluded that on the 12 occasions margin requirements were increased the stock market had gone up in the previous six months. Likewise, the 10 decreases were preceded by market decline in the previous six months. From this he concluded the reaction function of the Fed revealed it was leaning against the wind and not paying consistent attention to levels of stock prices. Fed officials were simply reacting to changes in stock prices in the preceding six month period. But that was not the only consequence of borrowing to finance stock market speculation. It was the potential harm done to small, less well informed investors who on occasion might be reckless with their financing and who needed to be protected. Shiller labeled this function of margin requirements a “consumer protection measure.”

The discount rate was a particularly clumsy regulating device. An increase in the discount rate may have contractionary output effects as well as adverse effects on stock market speculation. The Fed’s reluctance to raise rates to curb stock market speculation in 1929 can be attributed to their anticipated contractionary effects on economic activity. The Securities Exchange Act of 1934 Act created a specific regulatory device through which the Fed could act directly on stock market speculation, by attempting to control the amount of borrowing by investors from banks and brokers. However, not all borrowing flowed from these two sources.

The clear expectation of Congress was that the Fed could react more flexibly to a potential disturbance in the stock market without the risk of generating undesirable output effects. The Fed in fact intervened 22 times between 1934 and 1974.

Meltzer (2003) has narrated the occasions when the Board either raised or lowered margin requirements between 1945 and 1951. The Federal Reserve Board had begun a discussion of increasing margin requirements as early as March 1943; stock prices had risen 20 percent in 1942. By the end of 1944 stock prices were 40 percent above their 1936 peak. No action was taken, however, before February 1945, when margin requirements were raised from 40 percent to 50 percent. Stock prices began to rise rapidly after World War II ended. But the Fed now had a more flexible instrument in margin requirements with which to attempt to control the amount of borrowing for the purpose

of purchasing stocks. No longer did Fed policymakers have to rely solely on the discount rate and open market operations.

Table 1 reveals the 21 separate occasions when margin requirements were changed and their duration between November 1937 and January 1974, a period of 37 years. There was an upward change in direction 11 times, and a downward change 9 times. No changes were made between 1937 and 1945 during the Depression and World War II, a period of six and a half years. Margin requirements were changed three times in 1958, two times in 1945, 1955 and 1968. No changes were made in 14 of the years. A second long interval of unchanged margin requirements occurred between November 1963 and June 1968. The average duration between margin requirement changes was 19.5 months, with a rather wide dispersion: as low as 2.5 and 3.5 months in three cases; as high as 52, 28.5 and 26.5 months in three other post-1945 cases. Fed intervention to control stock market speculation mainly took the form of changes in margin requirements between 1945 and 1974. Kupsiec (April 1999, p. 2) concluded that "In apparent sympathy with the views of the U.S. Congress, the evidence suggests that until the late 1960s the Federal Reserve Board exercised margin authority in a spirit aligned with the original Congressional intent." In a 1984 study, the Board concluded that margin requirements were ineffective as selective credit controls, inappropriate as rules for investor protection and unlikely to be helpful in controlling stock market volatility. A chronology of changes in margin requirements is an indicator of the Fed's continued commitment to an interventionist policy in the absence of speculative booms that evoked discount rate increases.

How effective were margin requirements in moderating the movement of share prices? We have not found a way to answer that question on the basis of individual episodes, and little effort has been expended on attempting to do so. We simply cannot say that increases in margin requirements during the 1953-56 speculative boom, for example, had any effect on stock market speculation.

The outlook is brighter, however, if we phrase the question to apply to the entire period 1934-74 of variable margin requirements. Empirical work has been done on the relationship between changes in margin requirements and the level of stock prices and stock price volatility. Hardevoulis (1990) attempted to test the robustness of the alleged negative association between margin requirements and

Table 1
Margin Requirements, 1937-74

Start of Period	End of Period	Margin Require- ment (%)	Duration (months)
1937 November 1	1945 February 4	40	87
1945 February 5	1945 July 4	50	5
1945 July 5	1946 January 20	75	6.5
1946 January 21	1947 January 31	100	12.5
1947 February 1	1949 March 29	75	26
1949 March 30	1951 January 16	50	21.5
1951 January 17	1953 February 19	75	25
1953 February 26	1955 January 3	50	22
1955 January 4	1955 April 23	60	3.5
1955 April 23	1958 June 15	70	28.5
1958 June 16	1958 August 4	50	6.5
1958 August 5	1958 October 15	70	2.5
1958 October 16	1960 July 27	90	21.5
1960 July 28	1962 July 5	70	23
1962 July 10	1963 November 5	50	16
1963 November 6	1968 March 10	70	52.5
1968 March 11	1968 June 7	70	2.5
1968 June 8	1970 May 5	80	21
1970 March 6	1971 December 3	65	21
1971 December 6	1972 November 22	55	12
1972 November 24	1974 January 2	65	13
1974 January 3	—	50	—

Source: *Federal Reserve Bulletin*. The March 11, 1968 changes altered some lesser margin requirements but not the headline requirement.

volatility. His regression results show a significant negative relationship between margin requirements and volatility, a relationship which is supported by evidence from vector autoregressions. Schwent (1988) had objected to such a procedure on the grounds that the negative association reflects the effects of volatility on margin requirements. Although Hardevoulis's findings do not argue for Fed intervention on a month-to-month basis, they do support the conclusion that margin requirements dampen long swings in stock prices.

In 2000, Shiller (2000b, p. 14) testified that although he did not recommend going back to the 1934-74 policy of changes in margin requirements, he thought the circumstances were such that "when the market seems to be overpriced and with a speculative element, it is time for the Fed to consider raising reserve requirements." He thought that studies, which showed no effect on volatility in the short run, "seem hardly relevant to the issue."

4. Summary Review

The Fed's response to stock market speculation can be separated into two distinct stages. The first encompasses the period from 1914 to 1974, characterized by direct intervention either in the form or the use of the policy instruments—discount rate, open market operations, margin requirements and moral suasion. Thereafter policymakers were more circumspect. Less attention was focused outright on stock market speculation. Discretionary changes in margin requirements were abandoned. The Fed's response to stock market speculation when there was a response was indirect and largely endogenous exerting its effects through restrictive action whose primary objective was to contain inflation. The second stage is the period since 1974.

In the earlier years the Fed's response had its origins in Section 13 of the original Federal Reserve Act and the Securities Exchange Act of 1934. Section 13 prohibited the Fed from discounting the paper of member banks the proceeds of which would be used for purely speculative or long-term investment purposes. The Securities Exchange Act allowed the Fed to impose variable margin requirements on the purchase of stock exchange securities. The underlying foundation for Section 13 was the classical "real bills"

doctrine. After World War II that doctrine had largely been ignored in determining the amount of borrowing from Federal Reserve Banks.

During Alan Greenspan's tenure as Chairman of the Federal Reserve Board, direct intervention was abandoned, and what remained was a purely endogenous response implicit in a price level targeting objective.

The validity of a Fed response to stock market speculation turns on the distinction between market fundamentals and speculative bubbles as determinants of share prices. A rise in share prices not attributable to market fundamentals, that is, a speculative bubble, may warrant intervention.

We turn next to the question: What information can the share price data reveal that will enhance our understanding of the Fed's response to stock market speculation?

Chapter 2

The Behavior of Share Prices

1. Characteristics of Share Price Behavior

Our initial task is to construct a format for describing the behavior of nominal and real share prices that enhances our understanding of when and how the Federal Reserve responded to stock market speculation. The format we have chosen begins with an attempt to identify observed real-time peaks and troughs in Standard and Poor's (S&P) monthly nominal share price data and Bordo and Wheelock's (2004) real share price adjustment for the period 1918-2003. The timing of the two sets does not always coincide. Nor is there always a continuous rise or fall: a reversal of direction may occur without a serious interruption of a general upward or downward movement of share prices. The behavior of real share prices, however, requires special consideration, to which our attention will be directed later.

The observations of nominal share prices are in real time rather than being a time-series statistical artifact. The presumption is that Fed officials were responding, when they did respond, to an alleged speculative run-up, threat of a run-up or a severe collapse ("crash") in nominal share prices. But that is not to say that nominal share prices alone provide an adequate description of what was happening to share prices.

The timing data provide the basis for dividing the movement in share prices into two separate stages: Stage One, trough-to-peak (expansion), and Stage Two, peak-to-trough (contraction). We measure the intensity and duration of each stage and explore the relationship, if any, between the different measures.²

We need to be clear from the outset that our format does not provide a criterion for distinguishing share price movements that constitute "bubbles" from those attributable to market fundamentals. And we, unlike Bordo and Wheelock, refrain from begging the

² We refer to the two stages as "episodes" to avoid using the term "cycles," with overtones of literal cyclicity.

question by applying any arbitrary criterion, including an acceleration or rate of change of share prices or any particular percentage increase. Speculative booms or bubbles may occur when there is an unsustainable rise in share prices that cannot be attributable to market fundamentals. No matter how strong the urge may be to coax “bubble” information from the raw share price data, our format does not enable us to do so!

Nevertheless, having said that, in lieu of a bubble criterion we can estimate measures of trough-to-peak and peak-to-trough intensity and duration for the purpose of generating a rank ordering of each nominal and real share price episode revealing how consistent the two measures are. Each of the two stages of the movement of share prices has two main characteristics: intensity and duration. We construct measures of each as a basis for the rank ordering of the 16 share price episodes.

However, before we proceed to this task we need a visual display showing the monthly movements of nominal and real share prices from 1915 all the way through to 2008, even if we omit the recent speculative mortgage boom from consideration. Because of the exceedingly large number of monthly observations—over 1,000—a single chart would require a greater width than could be accommodated on a single page. Hence the necessity for a two-chart sequence: Chart 1 plots nominal and real share prices monthly from 1915 to 1960 and Chart 2 from 1960-2008. In the latter the movement of real share prices is obscured.³ To highlight that movement between 1960 and 1984 we introduce Chart 3.

2. Stage One: Share Price Intensity

We use two measures of share price intensity: 1) percentage change in nominal and real share prices from trough to peak and 2) percentage change from the time the previous peak was regained to the new peak. The presumption for the second measure is that a speculative boom or bubble is more likely to have occurred after, not before, the old high was reached. But with real share prices, that has not always been the

³ We are mixing a line with a scale of 0-100 with one of a scale of 0-1600. The 0-100 scale is going to look small. Real prices are nominal prices deflated by the consumer price index (CPI).

Chart 1: Nominal and Real Share Prices, 1915-60

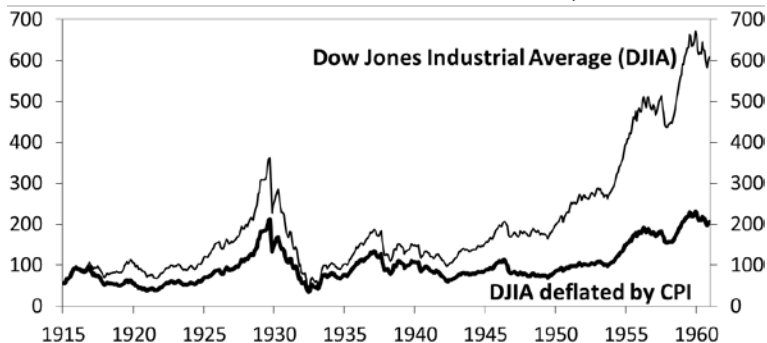


Chart 2: Nominal and Real Share Prices, 1960-2008

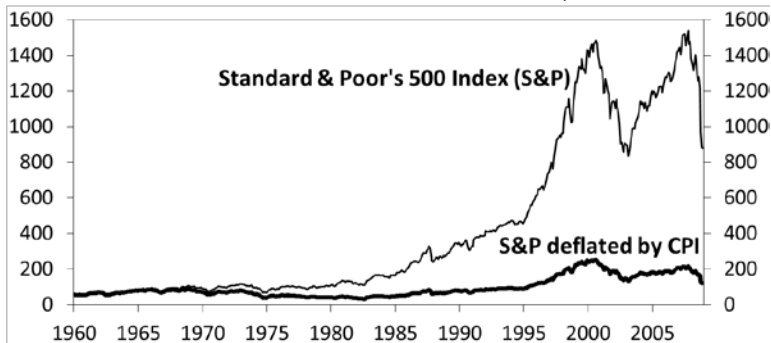
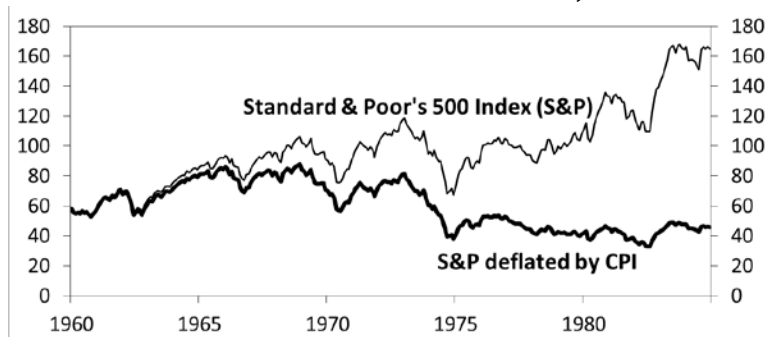


Chart 3: Nominal and Real Share Prices, 1960-84



case.⁴ We calculate three measures of nominal share price intensity: 1) nominal trough-to-peak percentage increase in share prices; 2) real trough-to-peak percentage increase; and 3) nominal regained high to new peak percentage increase.

Appendix Table A reveals the month and year of nominal and real troughs and peaks in share prices for each of the 16 separate share price episodes. The timing of the nominal and real trough-to-peak stages are synchronous in 1926-29, 1962-66, 1923-26, 1982-83, 1966-68 and 1974-76. In one-half, either the peaks or the troughs were the same, but not both. In only two, neither nominal nor real peaks were the same.

Table 2 shows three measures of intensity and their ranking for 16 Stage One episodes from 1918 to 2000. Table 2 also shows the sum of the ranks for each Stage One and the overall rank ordering for the 16 stages.⁵ There are nine columns. The first identifies 16 trough-to-peak Stage One episodes. Columns 2 and 3 show the percentage and rank order of nominal trough to-peak share prices. Columns 4 and 5 do the same for real share prices. Columns 6 and 7 repeat the same calculations for the second measure of share price intensity, that is, regained high to a new peak.

In Table 3, column 2 shows a sum of the three rank orders (from columns 3, 5 and 7 of Table 2) for each of the 16 episodes and is a general overall measure of Stage One intensity and duration. Column 3 shows the overall rank order of the episodes in Table 2.

There are no surprises. The three well-known speculative booms, 1994-2000, 1926-29 and 1984-87, are ranked overall first, second, and third respectively in intensity and duration. The three next in rank order are 1953-56 (fourth), 1948-53 (fifth), and 1962-66 (sixth).

The percentage increase in nominal trough-to-peak share prices traverses an unusually wide range from a modest 9 percent increase in 1989-90 to 214 percent in 1994 2000. Trough-to-peak real share prices range from nearly 15 percent in 1918-19 to 181 percent in 1994 2000. The range is equally wide but not as steep for the third measure of intensity, "regained high to the new peak."

⁴ 1974-76 is the one exception where a high was reached before the old high had been regained.

⁵ See Appendix Table B.

Table 2
Measures of Intensity, Nominal and Real Share Prices
for 16 Stage One Episodes

Episode	Nominal Trough to Peak		Real Trough to Peak		Regained High to New Peak	
	%	Rank	%	Rank	%	Rank
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1994-00	214	1	181.0	2	208.3	1
1926-29	173	2	182.4	1	147.8	2
1948-53	86	5	64.5	5	40.5	5
1953-56	109.5	4	106.5	3	56.7	4
1957-60	48	12	44.2	10	22.0	9
1962-66	67.8	6	59.1	6	28.8	7
1966-68	38	14	27.8	16	12.7	13
1923-26	57.8	7	52.4	8	31.4	6
1970-73	56.6	8	42.9	11	9.8	14
1974-76	54.8	9	41.6	13	13.3	12
1982-84	53	11	48.0	9	26.5	10
1984-87	111	2	98.5	4	85.3	3
1987-90	44	13	33.3	13	2.9	15
1989-90	9	16	22.4	14	2.9	16
1990-94	54	10	42.0	12	28.7	8
1918-19	21	14	14.8	15	14.7	11

Each of the three measures of intensity—nominal and real trough-to-peak, and nominal regained high to the new peak—is an indicator of the seriousness of the upward movement in share prices. For purposes of comparison among the various measures we provide a rank ordering of the three measures and calculate the Spearman rank correlation coefficient.

Table 3
Sum of Rank Orderings for Each Stage One,
and Rank Ordering of the 16 Episodes

Episode	Sum of Ranks	Rank Order
(1)	(2)	(3)
1994-2000	4	1
1926-32	5	2
1948-53	15	5
1953-56	11	4
1957-60	31	9
1962-66	19	6
1966-68	43	14
1923-26	21	7
1970-73	33	10
1974-76	34	11
1982-84	30	8
1984-87	10	3
1987-90	41	13
1989-90	46	15
1990-94	30	8
1918-19	40	12

As shown below, the trough-to-peak percentage increases for four Stage One nominal share price episodes was over 100 percent:

Episode	Percentage	Rank
1994-2000	214	1
1926-29	173	2
1984-87	111	5
1953-56	109.5	4

Wall Street, the Federal Reserve and Stock Market Speculation

The real trough-to-peak share price increases are given below for the four most intense Stage One episodes:

Episode	Percentage	Rank
1926-29	182.4	1
1994-2000	181.0	2
1984-87	106.5	5
1953-56	98.5	4

The nominal and real rankings for 1994-2000 and 1926-29 have been reversed and 1984-87 has dropped to fourth in the real ranking. In terms of real share price intensity, the 1953-56 episode ranks above the 1984-87 episode in real share prices and just below in nominal share prices. For four of the most intense episodes the ranking is remarkably close for both nominal and real share prices. Two of the four speculative booms terminated by a precipitous collapse in share prices: 1926-29 and 1984-87. Two did not: 1953-56 and 1994-2000. The 1926-29 and 1994-2000 booms were about of equal intensity as measured by percentage change in real share prices. The former ended in a “crash” and the latter did not! Likewise, in 1984-87 and 1953-56, both real and nominal share prices were almost equal in intensity, but the 1984-87 boom expired with a “crash” and the 1953-56 boom did not! We must look elsewhere or find another measure of intensity if we are to understand why some especially severe speculative booms terminated with a crash and others did not.

Intervention by the Fed to curtail the speculative boom is one plausible hypothesis. A discount rate increase that effectively revised expectations of future earnings has been blamed for the collapse in stock prices in October 1929. But there was no corresponding increase in October 1987. Some booms may have terminated “naturally.” These individual episodes will be described and analyzed in greater detail in subsequent chapters.

The nominal and real share price rank ordering of intensity is, however, very close for the 16 Stage One episodes. For the first measure of nominal and real trough-to-peak intensity the Spearman rank correlation coefficient is 0.938. For the third measure the nominal rankings are not quite as close: the Spearman rank correlation

coefficient is 0.87 for nominal trough-to-peak and “regained high to the new peak.”

We conclude that the difference between nominal and real is not significant for ranking the intensity of stage one share price behavior. Neither is the distinction between the two measures of intensity—trough-to-peak and regained high to new peak. But the significance of real and nominal must not be assumed, it must have empirical support.

3. Stage One: Duration

The duration in months and ranking of each nominal and real trough-to-peak is shown in Table 4. The range for the nominal trough-to-peak stage is as short as six months and as long as 80 months, the shortest being 1918-19 and 1989-90 and the longest 1994-2000. Five of the 16 episodes, including 1926-29 and 1984-87, fell between 40 and 44 months—only half as long as the 1994-2000 share price boom. Nine of the 16 fell between 20 and 44 months. The median duration was 30 months.

For real trough-to-peak share prices the duration ranged between 7 and 65 months, the shortest being 1918-19 and the longest 1994-2000. Twelve of the 16 episodes had a duration between 20 and 44 months. The median duration was 32 months. The 1926-29 and 1984-87 speculative booms had durations of 42 and 39 months respectively. The rank correlation between nominal and real duration is especially high: 0.98. In seven of the 16 Stage One episodes the timing was identical: 1962-66, 1923-26, 1974-76, 1926-29, 1966-68, 1982-83 and 1948-53.

We do not calculate the “regained high to the new peak” measure of duration, for it fails for real share prices. For two trough-to-peak stages the peak was reached before the old high had been regained. The previous high in December 1968 was not regained until 24 years later! An interim peak, however, was reached in January 1973. Similarly, the old high in January 1973 was not regained until September 1989, 16 years later. These two examples prevent a rank ordering of nominal and real “regained high to the new peak” measures of the 16 stage episodes. For nominal share prices, the rank correlation between trough-to-peak intensity and duration is 0.496. Although the match in rankings is not perfect between nominal and

Table 4
Duration and Rank Ordering of 16 Stage One Episodes

Episode	Nominal		Real	
	Duration (months)	Rank	Duration (months)	Rank
1994-2000	80	1	65	1
1974-76	30	10	30	9
1948-53	60	2	60	2
1962-66	43	4	43	4
1926-29	42	5	42	5
1984-87	40	6	39	5
1953-57	35	8	32	6
1990-94	47	3	46	8
1970-73	31	11	32	3
1966-68	27	12	27	10
1923-26	36	7	36	7
1987-89	34	9	32	8
1957-59	20	13	21	11
1982-83	17	14	17	12
1918-19	6	15	7	14
1989-90	6	15	6	13

real trough-to-peak share prices, the overall correlation for the 16 trough-to-peak episodes is high.

Duration did not match intensity rankings for the three most intense speculative booms. The top position for both nominal and real trough-to-peak share prices went to 1994-2000, but 1926-29 was ranked fifth for both, and the 1984-87 speculative boom was ranked sixth for both. Of especially long duration was the 1948-53 episode (60 months).

Table 5 summarizes for Stage One the data on timing, intensity and duration, both nominal and real, for four of the most intense share price episodes, all but one of which were widely recognized as speculative booms. The differences in rankings between nominal and real magnitudes are negligible for both intensity and duration. The

Table 5
Characteristics of Four of the Most Intense
Stage One Share Price Episodes

Episode	Nominal Duration		Real Duration	
	Months	Rank	Months	Rank
1926-29	42	5	42	5
1984-87	40	6	39	3
1994-2000	80	1	65	1
1953-56	35	8	32	8
	Nominal Intensity		Real Intensity	
	Percent	Rank	Percent	Rank
1926-29	173	2	182.4	1
1984-87	111	3	90.5	4
1994-2000	214	1	181.0	2
1953-56	109.5	4	106.5	3
Timing: Nominal and Real				
1926-29	Same peak			
1984-87	1 month difference peak			
1994-2000	5 month difference peak			
1953-56	4 month difference peak			

timing of nominal troughs is the same for all four episodes. What differences there are reside in the timing of real peaks. The timing is the same for 1926-29; the lags are one month in 1985-87, five months in 1984-87, and four months in 1953-56.

4. Peak-to-Trough Share Prices

Stage One describes the run-up in share prices from the previous trough to the new peak in terms of intensity and duration. But Stage Two—the change from peak to trough—is of equal interest. Did the rise in share prices terminate abruptly by a sharp contraction, or “crash”? Was the share price adjustment of short duration and mild in its intensity? Did the Fed share any responsibility for the termination of stock market speculation? Table 6 gives peak to-trough measures of intensity and duration for the 16 Stage Two contractions in share

prices. However, there is not enough information to tell us very much about post-peak effects generated by an induced contraction in economic activity. Serious depressions accompanied the termination of the speculative booms in 1920 and 1929. A moderate recession accompanied the termination of the boom in 1973-74 and lagged a year behind the termination of the boom in 2001-03.

For the 16 Stage Two episodes, the disparity in the range of nominal share price contraction was wide, ranging from 85 percent for 1929-33 to 1.1 percent for 1953. The range was similar for real share prices. For both nominal and real share prices, nine of the 16 episodes had contractions of less than 21 percent. The 1929-33 contraction in share prices was the most severe, twice the amount of the next largest decline (49 percent in 2001-03) and four times the third largest decline (1989). For eight of the ten peak-to-trough Stage Two contractions, nominal share prices declined by less than 10 percent; half were less than 21 percent. The rank correction coefficient for the intensity of nominal and real share prices is 0.738.

5. Stage Two Contractions

The two longest peak-to-trough movements in nominal share prices were 1929-33 (34 months) and 2000-03 (31 months).⁶ Four of the 16 separate contraction phases had durations of between one and three years, and seven lasted 12 months or less.

For real share prices, the longest contraction phase was 35 months (2000-03). The second-longest was 1929-32 (34 months) and the third-longest was 1973-74 (24 months). The 16 separate nominal and real contraction phases classified by duration in months are given below:

Duration (months)	Number of Episodes	
	Nominal	Real
30 and above	2	2
24-26	2	1
13-24	5	7
12 and under	7	6

⁶The timing of Stage Two peaks and troughs is in Appendix B to this chapter.

Table 6
Measures of Intensity and Duration: Nominal and Real Share
Prices Peak-to-Trough of 16 Stage Two Episodes

Episode	Intensity			
	Nominal (%)	Rank	Real (%)	Rank
2000-03	43.6	2	46.4	3
1973-74	43.4	3	53.5	2
1966-70	29.0	4	35.4	4
1966	17.3	8	20.1	10
1987	24.4	6	27.4	7
1976-78	14.8	9	23.4	8
1980-82	19.1	7	29.3	6
1989-90	11.6	10	7.3	11
1956-57	17.32	8	20.3	9
1957-59	10.1	12	11.9	13
1982-84	9.9	13	12.9	12
1990-94	3.8	14	4.8	15
1953	1.1	15	20.3	9
1926	10.36	11	10.5	14
1919-21	32.2	4	35.1	5
1929-32	84.76	1	80.6	1

(Table continues on next page)

Table 6
(concluded)

Episode	Duration				Sum of rankings
	Nominal (months)	Rank	Real (months)	Rank	
2000-03	31	2	35	1	8
1973-74	24	4	24	3	12
1966-70	19	7	20	5	21
1966	10	11	10	10	39
1987	4	14	5	12	39
1976-78	21	5	21	4	26
1980-82	20	6	20	5	24
1989-90	12	10	12	9	40
1956-57	19	8	21	4	29
1957-59	16	9	16	7	41
1982-84	10	11	10	10	46
1990-94	7	13	13	8	44
1953	9	12	9	11	37
1926	3	15	3	13	53
1919-21	26	3	18	6	18
1929-32	34	1	34	2	6

Table 7
Sum of Rank Orderings for Each Stage Two Episode
and Rank Order for All 16 Episodes

Episode	Sum of Ranks	Rank Order
1929-32	6	1
2000-03	8	2
1973-74	12	3
1919-21	18	4
1966-70	21	5
1980-82	24	6
1976-78	26	7
1956-57	29	8
1966	39	9
1987	39	10
1989-90	40	11
1957-59	41	12
1990-94	44	13
1982-84	41	14
1953	47	15
1926	53	16

The overall rank correlation is 0.80 between nominal trough-to-peak intensity and duration and 0.81 between real peak-to-trough intensity and duration, from which we may reasonably conclude that the run-up of share prices, both nominal and real, is accompanied by an average contraction of comparable intensity and duration.

Table 7 shows the ranking of the 16 share price episodes for peak-to-trough Stage Two in a sum of the ranks test, as set out in Table 6. Nominal and real intensity ranks and nominal and real duration ranks are summed and then ranked. The ranking is one measure of seriousness of the response of share prices to the termination of share price upsurge.

The speculative boom in share prices in 1926-29 and 1994-2000 is matched by an equally serious collapse in 1929-32 and 2000-03. The order is simply reversed. The relatively high ranking of the 1919-20

Table 8
NBER Reference Cycles and
Nominal Share Price Episodes, 1919-2000

Reference Cycle	Nominal Share Price Episode
1. March 1919- January 1920	February 1919-July 1919
2. July 1924-October 1926	October 1923-February 1926
3. November 1927-August 1929	April 1926-September 1929
4. October 1949-July 1953	February 1948-January 1953
5. May 1954-August 1957	September 1953-July 1956
6. April 1958-April 1960	December 1957-July 1959
7. February 1961-December 1969	June 1962-January 1966 January 1966-December 1968
8. November 1970-Nov. 1973	June 1970-January 1973
9. March 1975-January 1980	September 1971-September 1976
10. November 1982-July 1990	July 1982-October 1983 July 1984-September 1987 December 1987-October 1989 February 1990-June 1990
11. March 1991-March 2001	October 1991-January 1984 January 1994-August 2000

speculative boom was followed by a low ranking (fourth) for 1973-74. The collapse in nominal share price was practically the same as the 2000-03 episode.

The adjustment of share prices after the collapse of the speculative boom in 1987 was next to last in duration, only four to five months, eleventh in the sum of the ranks test. The 1953-57 trough-to-peak episode ranked fifth by the sum of the ranks but descended to fourteenth in the peak-to-trough ranking.

6. Timing of NBER Reference Cycles and Nominal Share Price Episodes

Table 8 shows the timing of National Bureau of Economic Research (NBER) reference cycles and nominal share price episodes. There were marked run-ups in nominal share prices in every NBER reference cycle. We might expect *a priori* the timing to be close.

Persistent and continuous economic expansion is conducive to a robust upward movement of nominal and real share prices by generating optimistic expectations of prospective future earnings and vice versa for output contractions. Both the reference cycle and nominal share prices have single peaks, although they fail to coincide in eight of the 11 reference cycles. In three separate reference cycles there were multiple nominal share price peaks. Multiple peaks occurred during the 106-month reference cycle from February 1961 to December 1969, the 92-month reference cycle from November 1982 to July 1990, and the 120-month reference cycle from March 1991 to March 2001.

Table 9 summarizes for Stage Two (contraction) episodes the data on timing, intensity and duration, both nominal and real, for four of the most intense share price episodes. Two lack reputations as speculative booms: 1919-26 and 1973-74. The nominal and real intensity rankings are the same for 1929-32, except that the real intensity ranking was 2, not 1. The real duration and intensity rankings are the same for 2000-03. The nominal and real rankings for 1919-21 differ by only one rank. That is also true for 1973-74. We may conclude that the nominal and real rankings for the four most intense share price contraction episodes are consistent without awkward differences.

In the February 1961-December 1969 cycle there were two nominal share price episodes: the first from June 1962-January 1966, lasting 43 months with a 68 percent share price increase; the second from January 1966-December 1968, lasting 36 months with a 14 percent increase in share prices.

During the November 1982-July 1990 NBER reference cycle (92 months) there were four nominal share price expansion episodes: the first from July 1982-October 1983, which lasted 17 months with a 53 percent run-up in nominal share prices; the second from July 1984-September 1987, with a duration of 40 months and a 111 percent increase in share prices; and the third from December 1987-October 1989, which lasted 34 months and saw a 44 percent increase in share prices. The fourth, 1989-90, was relatively short, with a duration of only six months and a share price increase of 9 percent.

There were two separate share price expansion episodes within the March 1991-March 2001 NBER reference cycle (120 months). The first, from October 1991 to January 1994, had a duration of 47

Table 9
Characteristics of Four of the Most Intense
Stage Two Share Price Episodes

Episode	Duration, nominal		Duration, real	
	Months	Rank	Months	Rank
1929-32	34	1	34	2
2000-03	24	4	24	3
1919-21	26	3	18	6
1973-71	24	4	24	3
Episode	Intensity, nominal		Intensity, real	
	%	Rank	%	Rank
1929-32	84.7	1	80.6	1
2000-03	43.6	2	46.4	3
1919-21	32.2	4	35.1	5
1973-71	43.4	3	53.5	2
Episode	Timing: Nominal and Real			
1929-32	Same peak			
2000-03	Trough same; peak 5 month difference real			
1919-21	Peak same; trough 5 month difference real			
1973-71	Same			

months and a share price increase of 54 percent; the second, from January 1994 to August 2000, lasted 80 months with a 214 percent rise in nominal share prices.

Of the three most intensive share price booms—1926-29, 1984-87, and 1994-2000—only in the first was there a single reference cycle and nominal share price peak. In the eight-year reference cycle November 1982-July 1990, the 1984-87 share price boom was only the most intense of the four. In the ten-year reference cycle March 1991-March 2001, the January 1994-August 2000 boom was the more intense of the two. There is no prototype that is a single reference cycle nominal share price peak.

7. Bordo-Wheelock and Wicker Rankings

In this section we compare the rank ordering of Bordo and Wheelock's (2004) designated speculative booms with that of our own classification (Table 10). They are, however, not strictly comparable. The measures of real share price intensity are different. Bordo and Wheelock mainly use average annual percentage change, while we use trough-to-peak percentage change. The timing also varies, as in a three-year difference in the onset of the run-up in share prices: October 1923 versus April 1926. They are the same in the 1984-87, 1962-66 and 1953-56 episodes, and differ by a month in the ending of the 1994-97 boom. Except for the 1923-29 boom, duration was the same.

The Wicker rankings are more compatible with the conventional wisdom of share price intensity during the 1926-29, 1994-2000 and 1984-87 episodes. Nevertheless, 1953-56 and 1962-66 appear in the top six. The severity of the 1926-29 and 1994-2000 share price episodes is without significance, yet that is not the public's perception. The 1953-56 episode is almost on a par with 1984-87, yet in the latter stock prices crashed and in the former they did not!

Direct intervention by the Fed only occurred in 1928 and 1929. It was absent in 1984-87 and 1994-2000. In 1953-56 and 1962-66 intervention was passive. Restrictive monetary policy increases in the discount rate and were geared to forestall inflation, with concerns about stock market speculation taking a back seat. An arbitrary criterion to identify speculative booms throws no light on how or when the Fed responded (would respond) or what the economic consequences might be.

Our description of the behavior of nominal and real share prices during the 16 separate trough-to-peak episodes enabled us to rank each using various measures of intensity and duration, but we could not discriminate between speculative booms and bubbles and share price increases generated by market fundamentals. The usefulness of the ranking resides solely in identifying the intensity and duration of share price increases when the Fed intervened and when it did not intervene directly to forestall stock market speculation.

We thought we could make some progress in that direction by using as a measure of intensity regained high to the new peak compared to simple trough-to-peak increase. But the rank correlation

Table 10
Bordo-Wheelock and Wicker Rankings

Bordo and Wheelock		
Speculative Boom	Average Annual \square Change (%)	Rank
September 1953-April 1956	29.3	1
October 1923-September 1929	24.4	3
July 1984-August 1987	22.9	4
April 1994-August 2000	17.1	5
June 1962-January 1966	13.3	6
March 1935-February 1937	30.2	1

Wicker		
Share Price Episode	Trough to Peak \square Change (%)	Rank
April 1926-September 1929	182.4	1
December 1994-April 2000	181	2
July 1984-August 1987	111	3
September 1953-April 1956	106.5	4
June 1962-January 1966	59.1	6
February 1948-September 1953	64.3	5

coefficient between nominal and real intensity and trough-to-peak and “regained high to the new peak” is 0.65 for the former and 0.69 for the latter.

Similar difficulties emerge when we attempt to interpret the peak-to-trough share price contraction. We have to separate the immediate effect on share prices from the longer run effects. Did the peak terminate suddenly, i.e., was there a “crash”? Did share prices move downward slowly and continuously?

Depressions followed the termination of the speculative booms in 1920 and 1929 and recessions in 1973-74 and 2001-03. Whether the observed association between the end of the speculative boom and the subsequent depression was causal, we do not know. No empirical work has been done to identify the relationship, if any.

8. What Have We Learned?

We have identified 16 nominal and real share price episodes between 1918 and 2000. Our attention focused on nominal share prices. The presumption supported by the available evidence is that Fed policymakers responded, if they responded at all, to the behavior of nominal share prices. Each episode was ranked according to two characteristics, intensity as measured by percentage increase in nominal and real share prices and duration in months. Intensity and duration were calculated for two separate stages: Stage One, trough-to-peak (expansion), and Stage Two, peak-to-trough (contraction).

The rank correlation coefficient between trough-to-peak nominal intensity and nominal duration was an impressive 0.925. It was much less so, however, for real trough-to-peak intensity and duration: 0.65.

For the peak-to-trough episodes coefficients were most consistent: 0.80 for nominal and 0.91 for real. These findings suggest caution in placing a duration constraint to identify a speculative boom or bubble. The rank correlation coefficient between nominal and real trough-to-peak intensity is 0.938. For the “regained high to the new peak” it is slightly less, 0.87. Discriminating between nominal and real share prices does not appear to affect the rankings. The share price data are not sufficient to identify a speculative bubble, nor does they tell us anything about when a boom/bubble will terminate in a crash. Some share price episodes of more or less equal intensity terminated in a crash; others did not!

Each share price episode coincides with at least one NBER reference cycle. There were multiple nominal share price peaks in three separate reference cycles.

Appendices to Chapter 2

Table A
Timing of Stage One: Nominal and Real
Trough-to-Peak Share Prices, 1918-2000

Episode	Nominal		Real	
	Trough	Peak	Trough	Peak
1918-19	Feb. 1919	July 1919	Jan. 1919	July 1919
1923-26	Oct. 1923	Feb. 1926	Oct. 1923	Feb. 1926
1926-29	Apr. 1926	Sept. 1929	Apr. 1926	Sept. 1929
1948-53	Feb. 1948	Jan. 1953	Feb. 1948	Sept. 1953
1953-56	Sept. 1953	July 1956	Sept. 1953	Apr. 1956
1957-59	Dec. 1957	July 1959	Nov. 1957	July 1959
1962-66	June 1962	Jan. 1966	June 1962	Jan. 1966
1966-68	Oct. 1966	Dec. 1968	Oct. 1966	Dec. 1968
1970-73	June 1970	Jan. 1973	July 1970	Jan. 1973
1974-76	Sept. 1974	Sept. 1976	Sept. 1974	Sept. 1976
1982-83	July 1982	Oct. 1983	July 1983	Oct. 1983
1984-87	July 1984	Sept. 1987	July 1984	Aug. 1987
1987-89	Dec. 1987	Oct. 1989	Dec. 1987	Aug. 1989
1989-90	Feb. 1990	June 1990	Aug. 1989	Oct. 1990
1990-94	Oct. 1990	Jan. 1994	Oct. 1990	Dec. 1993
1994-00	Jan. 1994	Aug. 2000	Dec. 1994	Apr. 2000

Table B
Timing of Stage Two: Nominal and Real
Peak-to-Trough Share Prices, 1919-2003

Episode	Nominal		Real	
	Peak	Trough	Peak	Trough
1919-21	July 1919	Aug. 1921	July 1919	Dec. 1920
1926	Feb. 1926	April 1926	Feb. 1926	April 1926
1929-32	Sept. 1929	June 1932	Sept. 1929	June 1932
1953	Jan. 1953	Sept. 1953	Jan. 1953	Sept. 1953
1956-57	July 1956	Dec. 1957	April 1956	Dec. 1957
1959-60	July 1959	Oct. 1960	July 1959	Oct. 1960
1966	Jan. 1966	Oct. 1966	Jan. 1966	Oct. 1966
1968-70	Dec. 1968	June 1970	Dec. 1968	July 1970
1973-74	Jan. 1973	Dec. 1974	Jan. 1973	Dec. 1974
1976-78	July 1976	Mar. 1978	July 1976	May 1978
1980-82	Nov. 1980	June 1982	Nov. 1980	June 1982
1983-84	Oct. 1983	July 1984	Oct. 1983	July 1984
1987	Sept. 1987	Dec. 1987	Aug. 1987	Dec. 1987
1989-90	Oct. 1989	Oct. 1990	Oct. 1989	Oct. 1990
1994	June 1994	Dec. 1994	Dec. 1993	Dec. 1994
2000-03	Aug. 2000	Feb. 2003	April 2000	Feb. 2003

C. Why the 1932-37 Share Price Episode Was Omitted

Nominal share prices as measured by Standard & Poor's index reached a peak of 31.3 in September 1929. The following two months they fell 34.2 percent. Between November 1929 and April 1930 they regained more than half of what had been lost through November. Thereafter, share prices fell over 80 percent, attaining a low of 4.77 by June 1932.

The extremely low level to which share prices had fallen raises an interesting question. How shall we interpret the subsequent rise in share prices? Until the old 1929 peak was regained, did speculation pose a serious threat? Measuring the intensity of the share price increases by percentage change can be misleading. For example, a 40 percent increase occurring from a low point, that is, as low as that of June 1932, cannot be interpreted in the same way as a 40 percent increase in 1928-29 or 1995-2000.

Between March 1933 and July 1933 share prices had risen over 80 percent, but they had not regained a third of their previous high—hardly a warning signal of a perceived threat of undue speculation. Between March 1935 and March 1937 share prices increased 115 percent (from 8.41 to 18.09), still substantially below the September 1929 high.

Share prices collapsed in February 1937, falling 83 percent by April 1938, a little below the level that had been reached five years earlier in December 1933.

The high volatility of share prices between 1932 and 1938 was unique, making our measure of intensity suspect. There is no evidence from the Fed's official records, including Federal Reserve Board minutes, Federal Open Market Committee (FOMC) minutes, and the George Harrison Papers, that the rise in share prices was a cause for serious concern. The increase in reserve requirements in 1936 and 1937 was not motivated either by inflation concerns or speculation in the securities market. Fed officials never tired of insisting that the increases represented a change to an easier monetary policy. Its purpose was precautionary, that is, to prepare the Fed in the event of a furtive "injurious credit expansion." Massive excess reserves posed a future threat to monetary control, and policymakers did not think action should be delayed until the threat became a reality where control would be more defined.

Chairman Marriner Eccles in 1936 introduced for the first time the question of the desirability of an increase in reserve requirements (Federal Reserve Board Minutes, 3117/36). He requested the opinion of the Reserve Bank presidents. Six favored an increase. The other six did not think it was appropriate at the time. Eccles thought a reduction in the discount rate would make it clear that the increase in reserve requirements did not imply a reversal to a tight monetary policy.

Eccles also inquired about the possibility of inflation. Did the fear of inflation result in investments in real estate and stocks? The response of the presidents was that the fear of inflation was still present but more “quiescent” than a year ago. A few responded by saying there was some hedging against inflation, but that it was not sufficient to affect the availability of mortgages or long-term credit.

Eccles further pointed out that failure to take action now might result in undesirable speculation in real estate and securities later.

Neither the immediate threats of inflation nor stock market speculation played a role in the increase in reserve requirements. The intensity of the increases in March-July 1933 and March 1935-March 1937 are simply not comparable to those in the 16 episodes we have identified. For these reasons I omitted them.

Chapter 3

Three Speculative Booms: 1919, 1924-26, 1926-29

1. The 1919 Speculative Boom

The Federal Reserve Board had been in operation for a little more than a year when the subject of stock market speculation was addressed for the first time. According to C. S. Hamlin (Diaries, Jan. 6, 1916) two members of the Board, Paul Warburg and Frederic Delano, sent a letter to the Federal Advisory Committee asking for their recommendations about the discount rate to prevent speculation by member banks. Hamlin objected, on the grounds that the Federal Reserve had no power over the speculative activities of member banks. No more was heard about stock market speculation until the speculative boom at the end of World War I. The surge in share prices which began in February 1919 extended over a period between seven and ten months, depending upon which peak in share prices we use.

Speculative activity became apparent during the first half of 1919 and extended to the stock market, where trading escalated; the number of shares traded accelerated from 19.4 million shares in 1915 to over 26 million in 1919. Trading activity reached a million shares a day on March 7, 1919. By April 21 there had been 17 one-million share days. Trading reached two million shares a day a month later. The *Wall Street Journal* concluded that speculative trading had been 7 percent in February 1919, rising to 15 percent in June, 18 percent in July and 30 percent in November.

Samuelson and Hagen (1940) labeled the 1919-20 episode a speculative bubble characterized by excesses in both the stock and commodities markets. Contributing to the increase in inventories was a surge in consumer buying and a wartime shortage of freight cars that persisted until mid 1920. They concluded (pp. 32 and 34): "Amid the hysteria of speculation we reached a peak in the first half of 1920" and "It was clearly the pricking of a speculative bubble, for no readjustment of real supply and demand could have produced so extreme an effect." Wholesale prices had peaked but did not collapse.

Table 11
Cowles Monthly Index of All Stocks and Industrials, S&P 500,
Nominal and Real, 1919-20

	Cowles				Standard & Poor's 500			
	All-Stocks		Industrials		Real		Nominal	
	Ind- ex	% chg.	Ind- ex	% chg.	Ind- ex	% chg.	Ind- ex	% chg.
1919								
Jan.	63.2		60.3		7.85		4.67	
Feb.	63.4	0.0	60.6	0.1	7.89	0.0	4.77	2.1
Mar.	65.4	3.0	63.2	4.3	8.12	2.9	4.86	1.9
Apr.	67.6	3.4	66.9	5.9	8.39	3.3	4.93	1.4
May	72.2	6.0	72.2	7.9	8.97	6.9	5.21	5.7
June	74.2	2.8	75.8	5.0	9.22	2.8	5.35	2.8
July	76.6	3.2	79.9	5.4	9.51	3.2	5.37	0.3
Aug.	71.4	-7.3	74.7	-6.5	8.88	-7.1	4.92	-7.3
Sept.	72.6	1.7	76.8	2.8	9.02	1.6	4.97	1.0
Oct.	76.2	5.0	82.5	82.5	9.48	5.1	5.14	8.9
Nov.	74.0	-2.9	80.0	-3.0	9.19	-3.1	4.88	-5.1
Dec.	71.8	-3.0	78.0	-2.5	8.92	-3.0	4.63	-5.1
1920								
Jan.	71.0	0.1	76.9	-1.4	8.83	-1.0	4.49	-3.0
Feb.	65.1	-8.3	68.8	-10.5	8.10	-9.4	4.08	-8.9
Mar.	69.8	7.2	74.4	8.1	8.68	7.2	4.32	5.9
Apr.	69.3	-0.1	74.6	0.0	8.60	-0.1	4.16	-3.7
May	64.9	-6.3	69.0	-7.5	8.06	-6.3	3.84	-7.7
June	63.8	-1.7	67.5	-2.2	7.92	-1.7	3.72	-3.1
July	63.7	0.0	66.7	-1.2	7.91	0.0	3.73	0.3
Aug.	61.2	-3.4	61.7	-7.5	7.60	-3.9	3.68	-1.3
Sept.	63.4	3.4	63.5	2.9	7.88	-3.7	3.86	4.9

Sources: Cowles and associates (1938), pp. 67, 69; Standard & Poor's. " % chg." is monthly percentage change.

Table 11 shows the behavior of three monthly indices of share prices between January 1919 and September 1920: the Cowles monthly index of all stocks and industrials and the Standard & Poor's 500, both nominal and real. The S&P 500 tracks very closely the Cowles index of all stock prices, as measured by monthly percentage increase. Both indices of nominal share prices increased 21.2 percent between February and July. The Cowles index of industrials rose 30.5 percent in seven months, increasing 5.9 percent in April, 7.9 percent in May, 5.0 percent in June and 5.4 percent in July. After a 6.5 percent collapse in August, share prices resumed, increasing 7.4 percent in September and 7.6 percent in October, when the peak was reached. The ten-month increase (January to October) was 37 percent. The S&P 500 real share price index increased almost 15 percent between January and July, compared with a more than 20 percent increase in nominal share prices. Neither the S&P 500 nominal index nor the real index regained its July high, unlike the Cowles all-stock and industrial indices, which regained their July highs in October. In November 1920, S&P 500 share prices were about the same as they had been 21 months earlier, after which the descent quickened, reaching a low in August 1921, 22 percent below the January 1919 level.

The end of hostilities in Europe in November 1918 did not bring an end to wartime financial policies. The continuation of large war-budgeted expenditures required, or so the Treasury thought, no change in Treasury borrowing plans—that is, borrowing below rates prevailing in the market. During the war the Federal Reserve had agreed to support a low interest rate policy. When the war was over, Fed officials attempted unsuccessfully to reassert their prerogative of monetary control. Treasury policymakers urged the Fed to cooperate in funding new issues of securities at existing rates, thereby ruling out changes in the discount rate. The Fed was increasingly uneasy about supporting a low-interest rate policy in view of rising wholesale prices and stock and commodity market speculation. The debate came to a head on November 3, 1919, when the New York Fed increased the discount rate to 4 percent on commercial paper for the first time in more than a year. The increase in the discount rate effectively terminated the stock market boom. Stock prices turned down thereafter. To track closely the decline, we used the Dow Jones daily index of 20 industrials extracted from the *Wall Street Journal* (Table 12). Between November 4 and November 10 the index fell 5.6 percent.

Table 12
Dow Jones Industrial Average Daily,
November 1919, February and June 1920

Day of month	November 1919	February 1920	June 1920
1			90.20
2		103.82	90.65
3		99.96	90.90
4	119.62	97.23	91.90
5		95.50	92.20
6	117.76	95.75	
7	117.18	96.13	91.13
8	115.54		91.46
9		95.75	92.20
10	112.93	92.12	91.92
11		90.66	93.06
12	107.00		93.20
13	110.75	92.66	
14	110.49	94.21	91.76
15	109.81		91.68
16		92.60	91.75
17	109.09	93.56	91.37
18	107.45	94.44	92.00
19	106.15	90.16	91.92
20		95.57	
21	107.73	95.63	
22	108.42		90.16
23			90.83
24	108.86	92.98	90.88
25	109.02	89.98	90.95
26	107.50	91.37	90.88
27		91.18	
28	103.72	91.31	90.48
29	103.69		90.36
30			

Stock prices tumbled another 5.3 percent by November 12. Call money shot up as high as 30 percent, and some speculative stocks dropped 30 to 60 points. General Motors fell to 280; it had been 400 the previous week. American Woolens fell from 145 to 113, and Fisher Body from 162.5 to 123. In the commodity market, cotton trading was suspended because prices had fallen to the prescribed limit. Although share prices had suffered a moderate break, the retreat was orderly. By the end of the month stock prices had fallen only 3 percent. The highs reached on November 4 were not reached again until the mid 1920s. The Fed had terminated the stock market “bubble” without generating a “crash” and without real effects.

The Fed raised the discount rate for a second time to 6 percent on January 23, 1920. There was no immediate response of the Dow Jones Industrials. However, there was a sharp break in stock prices on February 3, 4, and 5 (Table 12). The *Wall Street Journal* attributed the 7.3 percent decline mainly to fluctuations in the price of sterling. Sterling opened at \$3.49 on February 11, a decrease of 12.7 percent since February 3.

The rate was raised again to 7 percent on June 4. There were no discernible effects on the Dow Jones index throughout the month of June (Table 12). There was no precipitous decline in the price level when the inflationary boom terminated in May. The Bureau of Labor Statistics (BLS) wholesale price index fell 1.5 percent in June, 2.2 percent in July, and 2.3 percent in August—a 5.8 percent decline in three months. For the first six months following the ending of the inflationary boom, wholesale prices declined almost 2.5 percent.

The decline in prices in May 1920 and the onset of the 1920-21 depression was attended by a liberal lending policy by the Fed.⁷ The Fed showed no qualms about intervening to ward off a looming financial crisis, which was the immediate goal. The Fed succeeded by making funds freely available through the discount window at relatively high discount rates; there was no liquidation of bank credit or decline in the money stock during the first six months of the downswing. Loans at commercial banks continued to increase and member bank indebtedness continued to rise. The interventionist action taken by Fed officials effectively forestalled a banking panic. Intervention by the Fed in the wake of a financial shock had been built

⁷ See Wicker (1966).

into the banking reform movement that had created the Federal Reserve System to prevent just such an impending crisis.

The Fed's response to the 1919 speculative boom is an unheralded success story. An increase in the discount rate terminated the speculative boom without fomenting a crash in share prices or a serious contraction in economic activity. Its success can be attributed at least in part to the fact that restraint was applied before momentum had been allowed to build up. The delay in raising the discount rate was due entirely to the resolution of the conflict between the U.S. Treasury and the Federal Reserve on Treasury financial plans.

2. The 1924-26 Speculative Boom

The Cowles index of industrial stock prices increased 58 percent between May 1924 and February 1926. Share prices peaked in February 1926, after which they suffered a 10 percent decline in March and April. By August they had exceeded their February high. With the exception of two months in 1924—September and October—and three months in 1925—March, April and May—the increase was continuous. The increase was greater (30 percent) between May 1924 and February 1925 than it was between May 1925 and February 1926 (27 percent). Discount rates were raised by the New York Fed on two occasions, to 3.5 percent on February 26, 1925 and to 4 percent in January 1926. The Cowles index fell 4.7 percent between February and April 1925 and 10 percent in March and April 1926 (Table 13).

Standard and Poor's nominal stock price index increased 58 percent during the 29 months between October 1923 and February 1926. Real share prices increased slightly less, 52.4 percent. The surge in nominal share prices was greatest (50 percent) between June 1924 and February 1926.

The boom in the stock market began in June 1924, four months prior to the upturn in the Federal Reserve Board's production index. The recovery of industrial production, once it got underway, was unusually rapid. The index of production in basic industries, the only index available at the time, was 35 percent higher in January 1925 than it had been in the preceding August, and was equal to the peak level attained in May 1923; wholesale prices rose 7 percent, an amount just sufficient to regain the ground lost during the previous 1923-24 recession.

Table 13
Monthly Index of Stock Prices and
Average Number of Shares Traded Daily, 1925-26

	1924		1925		1926	
	Index	Shares (mn)	Index	Shares (mn)	Index	Shares (mn)
January	69.7		82.7	1.774	102.2	1.766
February	70.0		83.9	1.688	102.4	1.806
March	67.9		80.9	1.651	96.3	1.790
April	65.3		80.4	1.088	92.6	1.339
May	64.7		83.0	1.007	92.6	1.083
June	65.6		85.1	1.313	96.9	1.614
July	68.9		88.2	1.353	99.9	1.626
August	71.7		89.0	1.458	103.1	
September	70.7		91.8	1.711	104.2	
October	69.7		96.0	2.303	101.5	
November	73.6	2.080	99.6	2.428	102.9	
December	78.0	1.788	100.4	1.883	105.4	

Source: *Federal Reserve Bulletin*. "Index" is a common stock industrial index; "shares" is the average of daily figures.

The surge in economic activity prompted the question, Should the discount rate be raised? Both the Federal Reserve Board and the Federal Advisory Council were opposed in November 1925 to any change in the discount rate. Governor Benjamin Strong, President of the Federal Reserve Bank of New York, said that an increase would probably injure Europe, for Great Britain was making preparations to return to the gold standard. C. S. Hamlin, a Federal Reserve Board member, feared that an increase would endanger confidence, thereby inhibiting economic activity. The Federal Advisory Council noted that "extreme care" was indicated in New York, where activity in the stock market had reached "substantial proportions."

When the Federal Open Market Investment Committee (FOMIC)⁸ met in mid December, Governor Strong said that he was

⁸ This body, created in 1923, was the predecessor to the Federal Open Market Committee (FOMC), created in 1933. (Editor's note)

Chart 4
Brokers' Loans, 1917-26



Curves for January, 1926; are shown both for about 40 daily reporting banks and for about 60 weekly reporting banks. Earlier figures are based entirely on the daily reports, later figures on the more comprehensive weekly reports. Figures used through March, 1921, are for the last Friday in each month; thereafter for the last Wednesday

Source: *Federal Reserve Bulletin*, November 1926, p. 779.

reconsidering the question of an increase in the discount rate. He thought it more appropriate to sell securities "to test the market." Walter Stewart, the Board's director of research and statistics, also recommended security sales—\$44 million in December and an additional \$150 million in January. No reference to the behavior of share prices or other reason was given.

The economy appeared, however, to some optimistic observers to be poised in January 1925 for a new spurt of expansion. The index of production was 10 percent higher in January than it had been the preceding December. The Federal Reserve Bank of New York raised its discount rate to 3.5 percent in February 1925. The Cowles index

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fell 4.7 percent between February and April. A very modest downturn set in.

The evidence is lacking that Fed intervention in the first stage of the speculative boom was specifically directed at controlling stock market speculation. The rate increase did, however, halt temporarily a further rise in stock prices.

Share prices resumed their upward thrust in May and continued through August, rising 27 percent during that interval. A significant feature was an unusually rapid increase in loans on securities, \$600 million during the first nine months of 1925. The rate of increase of loans on securities to total loans was greater than in any pre-1929 year. Fed officials became increasingly concerned about the extension of Federal Reserve credit for purely speculative purpose, which was contrary to Section 13 of the Federal Reserve Act. Ninety percent of reserve bank credit in 1925 took the form of loans on securities.

The average number of shares traded daily, a measure of speculative activity, more than doubled from April to the peak month of November, when nearly 2.5 million shares traded daily (Table 13). Another indicator of stock market speculation was the behavior of brokers' loans, which nearly doubled between mid 1924 and February 1926 (see Chart 4).

Consideration was given to raising the discount rate in October 1925, when the Federal Reserve Bank of Boston requested an increase in the discount rate. Action on the request was postponed until November, when the rate was increased to 4 percent. The directors of the New York Fed were opposed to any increase. They preferred to use direct pressure or moral suasion to reduce stock exchange loans. When the Federal Reserve Board met on October 16, Walter Stewart admitted that some stock speculation resulted from the use of Federal Reserve credit, but he said there was absolutely no reason for increasing the discount rate. Production was slowly recovering and prices remained stationary. He agreed with the New York directors that direct pressure was preferable. Reluctance to use the discount rate did not imply any reluctance to respond to stock market speculation. The Board was equally divided on the wisdom of raising the discount rate.

When the FOMC convened in December, Governor Strong argued that no change in policy was necessary. He gave the following reasons: 1) stock speculation was under control; 2) stock prices were

not far from their 1913 level; 3) an increase in the discount rate would put up customer rates and bring about deflation; 4) it might also bring about gold inflows and interfere with Britain's efforts to return to the gold standard. Other members of the Committee agreed with Strong and no change was made. But the next day the Bank of England increased its discount rate to 5 percent, and the situation changed. The New York Fed sought and obtained an increase in the discount rate on January 8, 1926. No explanation was given for the increase.

Strong had written to Montagu Norman, Governor of the Bank of England, on November 20, 1925 that there was a dangerous speculative development in the stock market, and some evidence that it extended to commodities, but he was reluctant to raise the rate (Chandler, 1958, p. 329). He thought that the other Reserve Banks should raise their rates first and then New York would follow. His reason for the delay was funds would flow out of New York when the regional banks raised their rates, thereby making conditions tighter in New York. Then New York could raise its rates later. A threat of an increase in New York, he thought, acted as a "sword of Damocles" over the speculators.

In a previous letter to Norman on November 7, Strong (Chandler, 1958, p. 328) said that his comments about stock market speculation might read like an attempt to regulate the stock market. He stated that doing so was repugnant to him in every possible way. Chandler (1958, pp. 427-28) attributed his reluctance to assume responsibility for stock market behavior to two considerations: 1) the System should concern itself with general economic conditions—the price level, general business conditions, and the balance of payments; 2) Strong was unwilling to sacrifice other objectives he considered more important. Chandler doubted that Strong would have sacrificed the various stabilization objectives to combat speculation. Nevertheless, he had overcome such reluctance to intervene in November 1919, having an even greater antipathy to direct pressure. Apparently he overcame his reluctance again in 1926 when it did not conflict with domestic and international objectives.

There was no immediate response of share prices to the discount rate increase. The setback occurred in March, two months later. The Cowles index fell 10.5 percent. The downward adjustment continued through May. By the end of the year, share prices had more than regained their previous high; stock prices had risen more than 13

percent. Brokers' loans reflected the effects of the discount rate increase, having dropped \$650 million between February 17 and March 10, with a further \$300 million decrease by the end of the year. Production and employment remained high until April and then began to decline.

At a meeting of the FOMIC in March, Strong said that a business recession had started and that the Committee ought to be prepared to purchase securities if required. In April the New York Fed lowered the discount rate coupled with a \$70 million purchase of government securities. C. O. Hardy (1932) attributed the rate decrease to what had happened in the stock market and not to the level of business activity.

In May 1926 the Board had available for its own use (though it was not published for another 12 months) a revised index of production made up of 60 individual series, measuring production in 35 industries, including measures of output in automobiles, petroleum, rubber tire and the boot and shoe industries. The economy during the first six months of 1926 reached a high degree of output stability, though well below capacity and with an unsatisfactory level of factory employment. The production index turned up sharply in August and September only to fall back in the final quarter. It remained relatively constant at an average level well above the amount attained in 1925 and equal to the peak output prior to the 1923 recession.

Contemporary observers of Fed policymaking were reluctant to acknowledge Fed intervention to control stock market speculation. E. A. Goldenweiser (1951, p. 144) concluded that "consciousness of the System's concern with speculation had not yet developed and the expansion of stock market was permitted to proceed with little interference by monetary authorities." Walter Stewart emphasized the critical importance of these years when he said, "I feel, in general, that the mistake of blaming the Reserve System for 1920 is now less dangerous than of praising it for 1925 and 1926." The praise he is referring to is not obvious; is it praise for doing too little to contain the speculative boom? C. O. Hardy (1932, p. 122) also thought Fed officials were generally unsympathetic to any effort to control the use to which member bank funds were put, as long as the provisions of the Federal Reserve Act were observed.

3. The 1926-29 Speculative Boom

The run-up in stock prices began in April 1926 and ended with the Crash of October 1929, extending over a period of 42 months. Standard and Poor's monthly index of stock prices rose 173 percent. Stock prices accelerated in June 1927 as a result of the Fed's response to a "clearly defined recession." The FOMC purchased \$200 million of securities between May and August. Stock prices rose immediately by six percent and another nine percent between August and December. Some Board members attributed the increase to the easing actions initiated for both domestic and international reasons. Neither the behavior of prices nor production called for a policy shift. Although wholesale prices rose between July and September, they remained stable throughout the remainder of 1927. Industrial production in December was still 10 percent below its May high and factory employment fell 4 percent between May and December.

The behavior of brokers' loans was perhaps the object of greatest concern as a leading indicator of speculative fever. Between October and December, brokers' loans by New York City banks increased by \$380 million. Loans "by others," including corporations, added another \$150 million for a grand total of \$530 million, a significant increase by historical standards.

The Fed responded to the run-up in share prices and brokers' loans by inaugurating a "firm money policy" barely two months after the recession trough in November 1927. There were concerns about curtailing the recovery, but curbing speculation was regarded as requiring immediate attention. The policy of restraint was reflected in the behavior of the discount rate and open market sales. Between February and July the discount rate was raised in three steps from 3.5 to 5 percent. Sales of securities in the Special Investment Account fell from \$423 million in January to a low of \$75 million by the middle of July. The Board approved a request in February to increase the discount rate to 4 percent at all Federal Reserve Banks except Cleveland, Richmond and Chicago. That was followed by increases to 4.5 percent in April at Boston, Richmond and Dallas. New York, Philadelphia, Cleveland, Atlanta and Dallas raised the rate to 4.5 percent in May. In July rates went to 5 percent except at Minneapolis, Kansas City, Dallas and San Francisco. No further changes in the discount rate were made in the banks that increased to 5 percent.

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The FOMIC sold \$127 million in January 1928. Sales were discontinued in early February and not resumed until the second week in April. By the end of May the securities in the investment portfolio had fallen to \$100 million. Sales continued until the middle of July, after which the Committee withdrew from the market. There was only \$75 million left in the Special Investment Account. The Committee had spent almost all of its ammunition.

What were the effects of the firm money policy during the first half of 1928? The policy was successful in slowing the growth of brokers' loans at New York City and other banks; brokers' loans declined \$400 million. But the decline was more than offset by the \$500 million increase "by others," mainly corporations. Call money rates increased from 4.5 percent in January to 6.33 percent in June, providing additional incentive for corporate treasurers to place funds in Wall Street. This channel became increasingly a significant source of funds fueling stock market speculation. One of the effects of the sale of over \$500 million of securities was to raise member bank indebtedness to \$1 billion, a sum greater than at any time since 1921. Reserves fell less than \$100 million. There was only a slight increase in government bond yields and a 74 basis point rise in the commercial paper rate. Stock prices rose 8 percent from January through June 1928, slightly less than the 9 percent increase in the last five months of 1927. The Fed cannot be faulted for lack of vigilance in pursuing a policy of restraint. By Fed standards money was very tight. Member bank indebtedness was \$1 billion, and the Special Investment Account was almost exhausted. The last round of discount rate increases came in July. New York raised its rate to 5 percent. But its effects were quickly reversed in anticipation of the increased seasonal demands. Policymakers preferred to ease through the purchase of bankers' acceptances rather than through the purchase of government securities. On July 20 the buying rate for acceptances was increased from 4.25 to 4.5 percent. This action created a gap between the 5 percent discount rate and the 4.5 percent acceptance buying rate sufficient to induce banks to sell acceptances to the Fed. Had the buying rate on acceptances not been increased, the gap would have been even wider. Fed officials apparently thought that a 4.25 percent buying rate would have induced too large an inflow. Paradoxically the easing policy was the result of an increase in both the discount rate and the buying rate on acceptances!

The Fed's purchase of \$300 million of acceptances between August and November was greater than anticipated, thereby leading to some involuntary ease, as reflected in a \$100 million decline in member bank borrowing. The effect on interest rates was minimal. The commercial paper rate was the same in December as it had been in August. Three- to six-month Treasury notes rose at first from 4.36 percent in August to 4.70 percent in October, but fell back to 4.36 in December. Stock prices had fallen 5 percent between May and June. Stock prices rose between July and December, about 18 percent—double the amount of the preceding six months.

A preliminary memo prepared for the meeting of the Open Market Investment Committee on November 14, 1928 concluded that it was too early to judge whether the business situation and the behavior of the stock market was “upon a sound economic basis or represented “boom psychology.” Nevertheless, the absence of such knowledge did not deter Fed policymakers during the first half of 1928 from initiating tighter monetary conditions for the specific purpose of slowing the growth of security loans. But that policy had been thwarted by the avalanche of loans to the stock market from nonbank sources.

Some Federal Reserve officials at least were well aware of the distinction between economic fundamentals and bubble psychology as determinants of share prices. However, they did not conclude, as Chairman Greenspan later did, that bubbles could not be identified, or more precisely could only be identified with great difficulty, if at all.

4. The Fed's Response in 1929

In February 1929 the Board inaugurated a controversial policy to curb stock market speculation without resorting to changes in the discount rate or sales of securities. Adolph Miller, a member of the Federal Reserve Board, seized the initiative from Chairman Roy Young and drafted a letter to be sent to all member banks advising them to restrain the expansion of loans for purely speculative purposes, and warning that member banks that did not do so might be denied access to the Fed's borrowing facilities. Paragraphs 2, 4, and 5 of the letter (*Federal Reserve Bulletin*, February 1929, 94) are reproduced below.

The extraordinary absorption of funds in speculative security loans, which has characterized the credit movement

during the past year or more in the judgment of the Federal Reserve Board, deserves particular attention lest it become a decisive factor working toward a still further firming of money rates to the prejudice of the country's commercial interests.

...

The Federal Reserve Act does not, in the opinion of the Federal Reserve Board, contemplate the use of the resources of the Federal Reserve Banks for the creation or extension of speculative credit. A member bank is not within its reasonable claims for rediscount facilities of the Federal Reserve Bank when it borrows either for the purpose of making speculative loans or for the purpose of maintaining speculative loans.

The board has no disposition to assume authority to interfere with the loan practice of member banks so long as they do not invoke the Federal Reserve banks. It has, however, a grave responsibility whenever there is evidence that member banks maintain speculative security loans with the aid of Federal Reserve. When such is the case the Federal Reserve banks become either a contributing or a sustaining factor in the current volume of speculative security credit. This is not in harmony with the intent of the Federal Reserve. Nor is it conducive to the wholesome operation of the banking and credit system of the country.

A constrained version of the "real bills" doctrine is manifest in the Board's interpretation of the Federal Reserve Act. It does not presume to interfere with the loan practices of member banks, whatever the purpose of the loans: speculative, commercial or industrial. But in its opinion, the Act does not sanction the use of the resources of the Reserve Banks for purely speculative purposes. Banks that extend such loans may be denied access to the discount window. The "real bills" version of the Federal Reserve Act does not state that all bank loans for speculative purposes are not warranted; what is not warranted is the use of Federal Reserve credit for speculative purposes. Paragraph 4 was widely interpreted by member banks to mean borrowing facilities might be denied if banks were found to be making or maintaining speculative loans.

The label for the new policy was “direct action” or “direct pressure.” C. S. Hamlin, a member of the Board, said that its object was to gradually liquidate Federal Reserve credit, not to break the stock market abruptly through a rise in the discount rate. If the banks were successful in reducing the volume of brokers’ loans, the supply of funds feeding the stock market would decline. If Reserve Banks restricted the amount of borrowing by member banks to support speculative lending by banks, stock market speculation might thereby be moderated.

The reception of the new policy by Board members was mixed. The Miller-Hamlin policy of direct pressure was at first supported by governors George James and Edward Cunningham. Governor Young would have preferred to do nothing and Vice Governor Edmund Platt favored control through the discount rate. Secretary of the Treasury Andrew Mellon, who by the law of the time was an *ex officio* member of the Federal Reserve Board, was an unenthusiastic supporter of the new policy, but he thought an increase in the discount rate was inevitable. The most persistent opposition came from the Reserve Banks, especially from Governor George Harrison, who had succeeded Benjamin Strong in New York after Strong’s death. Harrison thought the only effective remedy for stock market speculation was an increase in the discount rate.

To measure the effectiveness of the policy of direct pressure we may observe the behavior of stock prices, Federal Reserve credit, and broker’s loans in two periods: February-May and May-July 1929, immediately prior to the discount rate increase in August. Stock prices remained virtually unchanged between February and May; they rose 11 percent between May and August. E. A. Goldenweiser, director of the Board’s Division of Research and Statistics, told the Board in mid May that there had been a considerable decline in Federal Reserve credit. Between February 9 and May 11 Federal Reserve credit declined by \$180 million, attributable largely to gold imports. He concluded that the decline had been undoubtedly the cause of the lack of any material increase in security loans. The entire increase in brokers’ loans was due to “loans to others,” mainly corporations. Hamlin concluded that direct pressure was working. Federal Reserve credit decreased an additional \$116 million through June.

Despite the alleged success of the policy of direct pressure, the Board’s majority dwindled to 5-3, Mellon, Young and Platt voting

against the policy of direct pressure. However, Harrison's opposition was relentless. He told the Board that the New York Fed could not accommodate the banks whose reserves were being depleted by security loans to customers. He did not think that direct pressure could be applied to customer security loans. Banks felt that they had a right to lend to customers uncontrolled by anything except the established discount rate. He also insisted that New York banks were afraid to borrow from the Fed. The Board had rejected numerous requests by the New York Fed to raise the discount rate.

A compromise was in the making. Miller was thinking of combining an increase in the discount rate with a reduction in the buying rate on bankers' acceptances to accommodate the normal increase in seasonal demands. Hamlin, in what appeared to be a dramatic reversal of position, said that he would support a rate increase to 6 percent in New York combined with a 5.125 percent bill rate. He insisted, however, that the Board had not relented; direct pressure had been suspended since the end of June. The only reason the Board had not acted earlier was out of fear of paralyzing business. That fear, he and Miller agreed, had ended. Goldenweiser (1929) wrote in a memo on the August 7 meeting of the governors of the Reserve Banks: "The net result was a loss of leadership by Miller to Young, a victory for Harrison and a heightened prospect for effective system policy." For some reason White (1990a, p. 80) failed to recognize the shift to a policy of ease in June and reconfirmed in August.

The motivation for the easing action on August 9 was to accommodate seasonal demands. But according to National Bureau of Economic Research dating techniques, a recession had begun in the same month. At a meeting of the Open Market Investment Committee on September 24, Federal Reserve officials acknowledged the possibility of an impending recession, and the Committee favored the purchase of government securities rather than acceptances.

For reasons not entirely clear, the Fed's response in 1928-29 has not been well understood. White (1988), Shiller (2000a) and Bordo and Wheelock (2004) have attributed the stock market crash in part to an excessively restrictive monetary policy, but the record speaks otherwise, as we have demonstrated.

C. S. Hamlin (Diaries, 1931, 173) testified:

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On August 2nd Governor Harrison came before the Board. He favored easing policy, because as he said there was need for more Federal Reserve credit. He asked to have the discount rate increased to 6 percent, and that was done, as you remember, three days later on August 9, 1929. The increase was not made, however, to curb speculation. The increase was part of an easing policy. We determined to ease by lowering acceptance rates. The 6 percent discount rate was suggested merely to encourage the banks to use acceptance money in paying off, in part at least, their discounts. It was not any new change of the policy of the Federal Reserve board.

In Senate hearings (1931) H. Parker Willis, a Senate committee staff member, asked Governor Harrison, "Why was the open market buying rate on bankers' acceptances cut down in the fall of 1928 and during 1929, while the discount rate was advanced so that finally the buying rate was a full 1 percent above the bill rate?" Harrison acknowledged that the acceptance policy interfered with the general policy of restriction. When Willis asked him why then did the Fed raise the discount rate, he replied that there was a difference of opinion within the Federal Reserve Board and among the directors of the New York Fed.

The evidence from the testimony of both Governor Harrison and C. S. Hamlin supports the view that the increase in the discount rate was not intended as a restrictive measure. At best, the effect would have been neutral had the change in the rate on bankers' acceptances provided the estimated amount of reserves to meet the anticipated seasonal demands. At worst, as indeed was the case, the injection of reserves exceeded the required amount, turning out to be an easing action.

Where does that leave us with respect to the discount rate as a cause of the termination of the speculative boom? The information about the adjustment of the acceptance rate was available and presumably, assuming rational expectations, was the basis for interpreting the rate increase was at best a policy of neutrality, at worst a policy of ease.

5. Was the Stock Market Overvalued?

Fed officials concluded, at least for the year 1928, that there was no identifiable asset bubble. Nevertheless, they intervened during the first six months of the year to restrain stock market speculation. They reversed course during the second half for the specific purpose of meeting seasonal demands. It is clear that in the second half of both 1928 and 1929 policymakers put controlling stock market speculation temporarily on the back burner. The Crash came before a firm money policy could be reinstated. Intervention by the Fed did not seem to turn on whether stock prices were over- or undervalued.

Most students of the stock market boom have concluded that a bubble existed; they include Galbraith (1955), Chandler (1970), and Wigmore (1985), though Santoni (1987) and McGrattan and Prescott (2003) are exceptions. Galbraith (1955) repeatedly referred to the speculative boom as a “bubble,” by which he meant “a world of make believe, self-reinforcing expectations of future prices and a refusal to recognize that the end had occurred.” Although there is no mention of market fundamentals, the “world of make believe” implies their absence. He was content to describe the boom’s three characteristics: 1) a persistent and continuous rise in stock prices; 2) an accelerated increase in brokers’ loans; and 3) an increase in the daily volume of stock market transactions. All may be necessary conditions for the existence of a bubble, but what is missing is any reference to market fundamentals.

Chandler (1970, pp. 17-18) conjectured:

Even with the benefit of hindsight, it is impossible to say when stock prices reached levels that could not have been maintained if full employment and economic growth had continued. An estimate would be no earlier than mid-1928 and probably later. Yet by the autumn of 1929 the prices of many speculative stocks had reached levels that could not be justified by any reasonable forecast of future earnings.

He failed, however, to explain why stocks were overvalued. Barrie Wigmore (1985, pp. 27-28) concluded:

Whoever created the market, it was evident to sober people whose minds had not been formed by the desire for quick profits that stock prices were too high. One could perhaps account for the booming volume, the massive public participation in the stock market, the high NYSE seat prices, the high call loans, and the flood of speculative new issues of a new industrial prosperity which would last indefinitely, but even then stock prices were too high.... A 16½% return on equity in the business boom of 1928-29, compared with the 5%-6% yields on corporate bonds, did not justify a multiple 30 times earnings.

Meltzer (2003), in his recent history of the Federal Reserve, avoided the question of whether stocks were overvalued. By concentrating on the conflict between the Board in Washington and the Federal Reserve Bank of New York he obviously was being critical of the Federal Reserve System's failure to have acted more decisively by raising the discount rate. He attributed the failure to a fundamental ambiguity in the Federal Reserve Act about the division of responsibility between an individual Federal Reserve Bank and the Federal Reserve Board. At a deeper level Meltzer thought it was a conflict over how policy operated and what it should have accomplished. He preferred to remain neutral in the interventionist/noninterventionist debate.

In the absence of any empirical test for overvaluation, it is difficult to see how the debate can be resolved. Controversy would be confined to the behavior of individual or groups of stocks and their characteristics. Santoni (1987) designed a simple test of the bubble hypothesis during the 1928-29 stock market boom. Efficient market theory predicted that stock prices followed a random walk, whereas the bubble hypothesis, he contended, implied that stock prices were positively correlated. Time series analysis of the behavior of stock prices in 1928-29 rejected the bubble hypothesis. The power of the Santoni tests has been questioned by Warman (1990) and Blanchard and Watson (1982). McGrattan and Prescott (2003) constructed a measure of the capital stock and compared it to market capitalization to identify the bubble, if there was one. To their surprise they had to conclude that the stock market was *undervalued* in 1929! According to them, the Crash was caused by severe tightening. But as we have

shown, there was no severe tightening during the five months preceding the Crash.

It would be interesting to speculate on the implications of Santoni's findings for an evaluation of the Fed's response to the speculative boom. Santoni's results reveal that market fundamentals alone can account for the run-up in share prices in 1928 and 1929. The fault of the Fed was not, therefore, that its response was weak and inadequate but that the Fed intervened at all. But this raises as many questions as it answers. How then do we account for the serious stock market collapse? If share prices were not out of line with earnings forecasts, why the Crash? If price earnings ratios were not excessive, why the necessity for the sharp price adjustments?

A reconsideration of the Fed's 1928-29 experiment in controlling stock market speculation has revealed that its interventionist response was not consistently applied and was hampered by interminable strife between the Federal Reserve Board and the Federal Reserve Bank of New York. The alleged association between the increase in the discount rate to 6 percent in August 1929 and the bursting of the bubble and ultimate descent into depression is, to say the least, questionable. As we have attempted to explain, the increase in the discount rate continued a temporary policy of ease initiated in June, not increased restraint.

Chapter 4

The Fed's Response to the Behavior of Share Prices: A Narrative, 1945-74

Speculation in the stock market did not evoke a direct response from Fed officials between March 1937 and February 1945. Margin requirements had remained unchanged at 40 percent. Just prior to the ending of hostilities in Europe the Federal Reserve Board raised the requirement to 75 percent in February 1945 and to 100 percent in January 1946, the only occasion when the rate was set at its maximum.

The S&P 500 reached a peak in May 1946, having risen 139 percent from its low of April 1942. Thereafter, share prices tumbled more than 30 percent by February 1948. They did not regain their previous high until June 1950.

Almost all price controls were eliminated in late 1946, followed by a sharp run-up in prices. The consumer price index (CPI) rose 35 percent between February 1946 and September 1948. Real S&P share prices fell 35 percent, though nominal share prices fell only by 12 percent.

The average annual level of share prices remained virtually unchanged in 1947, 1948 and 1949, during which time the Board lowered margin requirements first from 100 to 75 percent and then from 75 to 50 percent on March 31, 1949. The use of the discount rate was constrained by the continuation of the wartime price support program for long-term government securities agreed to at the beginning of World War II. Not until the Treasury-Federal Reserve Accord in 1951 was monetary policy free (but not entirely so) to control inflation and stock market speculation.

1. 1948-53

The 1948-53 run-up in share prices cuts across both a relatively mild recession in November 1948-October 1949 and a vigorous economic recovery from October 1949 to June 1953. Unemployment fell from 5.6 percent in the second quarter of 1950 to a low of 2.7 percent in

Table 14
Discount Rate Changes, 1953-59 (%)

Date	Change	New Rate
January 15, 1953	0.25	2.00
February 3, 1954	-0.25	1.75
April 13, 1954	-0.25	1.50
April 13, 1955	0.25	1.75
August 3, 1955	0.25	2.00
September 8, 1955	0.25	2.25
November 17, 1955	0.25	2.50
April 13, 1956	0.25	2.75
August 23, 1956	0.25	3.00
August 8, 1957	0.50	3.50
November 14, 1957	-0.50	3.00
January 21, 1958	-0.25	2.75
March 6, 1958	-0.50	2.25
April 17, 1958	-0.50	1.75
August 14, 1958	0.25	2.00
October 23, 1958	0.50	2.50
March 5, 1959	0.50	3.00
May 28, 1959	0.50	3.50
September 10, 1959	0.50	4.00

Source: Federal Reserve Board of Governors (1976).

1953. Margin requirements were raised to 75 percent in January in 1951, where they remained fixed for the next two years.

1. 1948-53

The 1948-53 run-up in share prices cuts across both a relatively mild recession from November 1948-October 1949 and a vigorous economic recovery from October 1949-June 1953. Unemployment fell from 5.6 percent in the second quarter of 1950 to a low of 2.7 percent in 1953. Margin requirements were raised to 75 percent in January in 1951, where they remained fixed for the next two years.

Nominal share prices rose 86 percent over the five-year interval, while real share prices rose a little over 64 percent. Both reached a low in February 1948 and a peak in January 1953. The “regained high to new peak” measure of intensity was 40.5 percent, less than half the “nominal trough-to-peak” measure of intensity. (The intensity of the 1948-53 share price episode was the same for all three measures). The ranking was the same for all three measures of intensity in five out of the 16 episodes. In the overall test of intensity—the sum of the three rankings—it was ranked fifth.

2. 1953-56

Real share price intensity was almost the same in the 1953-56 episode as in the 1984-87 speculative boom, yet it was not accompanied by a crash in stock prices. Real share prices increased 106.5 percent from 1953-56, compared with 98.5 percent from 1984-87. The duration of the two episodes was almost the same, 38 and 37 months respectively. The sum of the rankings test gives only a slightly higher ranking to the latter: third rather than fourth.

The Fed raised margin requirements twice—from 50 to 60 percent in January 1955 and again in April to 70 percent—three and a half months later, where it remained fixed until June 1958, after which it was reduced to 50 percent. The discount rate was raised seven times—four times in 1955, twice in 1956 and once in 1957. The cumulative effect was to increase the rate from 1.5 percent to 3.5 percent (Table 14).

Meltzer (2003, pp. 53-54) could find no explanation in the Board’s minutes for the change in margin requirements in January 1955. Being in executive session, the Board’s deliberations were omitted. However, we can infer its concern for growing stock market speculation from the public announcement, which explained that the increase “was designed to prevent the recovery from being hampered by excessive speculative activity.” At a later date Allan Sproul, Governor of the Federal Reserve Bank of New York, commended the Board for issuing a “warning” concerning the use of stock market credit.

Meltzer’s (2003) extensive discussion of discount rate policy in both 1955 and 1956 contains no reference in either the Board or Federal Open Market Committee (FOMC) minutes to excessive speculation in the stock market as a motivation for a change in the

discount rate. Nominal trough-to-peak share prices peaked in April 1956, but the last increase in the discount rate to 3.5 percent did not come until 17 months later in August 1957. The boom in stock prices terminated without a precipitous retreat falling 5.2 percent in the following two months, and 13 percent for the year as a whole. A recession began the third quarter, a year after the run-up in share prices ended.

Although perhaps not deliberately initiated to curb stock market speculation the persistent and gradual increases in the discount rate cannot be dismissed as an important factor contributing to the termination of the boom without serious side effects on stock prices. Increases in the discount rate did not generate excessive uncertainty about the future of stock prices and certainly did not cause a serious collapse of prices in financial markets.

3. 1957-59

Economic activity peaked in August 1957. The downturn was brief; the trough was reached in April 1958. Share prices had touched bottom in December 1957, four months after the peak in economic activity. Nominal trough-to-peak share prices rose 46.4 percent and real share prices 41.5 percent. The duration of the run-up was relatively short, 20 and 21 months respectively. The rank order of intensity and duration was approximately the same, tenth and twelfth, fairly far down in the ranking of the 16 episodes. The regained high to the new peak was half of both nominal and real trough-to-peak measures, with a relative rank ordering of eighth.

Economic expansion continued at a vigorous pace during the first six months of 1959. In constant prices, GNP was 10 percent higher in the second quarter of 1959 than a year earlier and 5 percent greater than the last quarter of 1958. Unemployment still remained high through much of 1959.

Inflation or the threat of inflation preoccupied Fed policymakers during the four years from July 1955 to July 1959. The CPI rose 8.9 percent. Stock market speculation was a lower level priority. Midway through the 1957-59 run-up in share prices the Federal Reserve Board raised margin requirements from 50 to 70 percent and the discount rate from 1.75 to 2 percent. Meltzer (2003, p. 96) inferred that the

Board was responding to Representative Wright Patman's concern about stock market speculation, but he maintained:

Although stock prices had increased rapidly in July and August there was neither a sign of increased volume before the change nor an effect of change or prices on the volume of trading.

Meltzer (2003, pp. 97-98) nevertheless noted Chairman William McChesney Martin's statement that "he saw certain similarities to 1929." But Chairman Martin did not identify what those similarities were. The Federal Advisory Council "cited rising stock prices as evidence that the public expected higher inflation."

The FOMC minutes for September stated that the Fed's main problem was to "curb inflation and speculative developments before gaining a headway" (Meltzer, 2003, p. 98). Margin requirements were raised again in October 1958 to 70 percent. It was no coincidence that the discount rate was raised simultaneously to 2.5 percent. Woodlief Thomas (Meltzer, 2003, p. 99), advisor to the FOMC, explained the necessity for the rate increase in terms of the "unknown motive of many agents of prospective economic development citing the budget deficit, the gold outflow and stock market speculations..."⁹ Discount rates were raised again on three separate occasions: March, May and September moving the rate from 2.5 to 4 percent.

By early spring 1959 the inflation rate had accelerated at an annual rate of 3.5 percent. Share prices continued to rise during the second quarter at a 20-30 percent annual rate. At the May 26 meeting of the FOMC a staff report prepared by Woodlief Thomas highlighted the rise in stock prices, and the President of the Federal Reserve Bank of New York called attention to "inflationary dangers, especially strong growth of credit and rising stock prices" (Meltzer 2003, p. 105). Discount rates were raised again to 3.5 percent in June, followed in

⁹ Meltzer (2003, p.74) quoted from a Board staff report: "margin changes appeared to have had an immediate impact on the level of stock market credit but no consistent or sustained effect on stock price or trading volume." The Board concluded in April 1975 that no further increases should be made in margin requirement which remained at 70 percent until January 1958.

September by a further increase to 4 percent. Interest rates, according to Meltzer, rose to levels not seen in a generation.

The National Bureau of Economic Research dated the peak of the expansion April 1961, but that was clearly more than a year after the peak in share prices in July 1959. The run-up in share prices terminated without a stock market crash and without a serious contraction in economic activity. The persistent use of discount rate changes can claim some credit for generating a smooth financial landing.

4. 1962-66

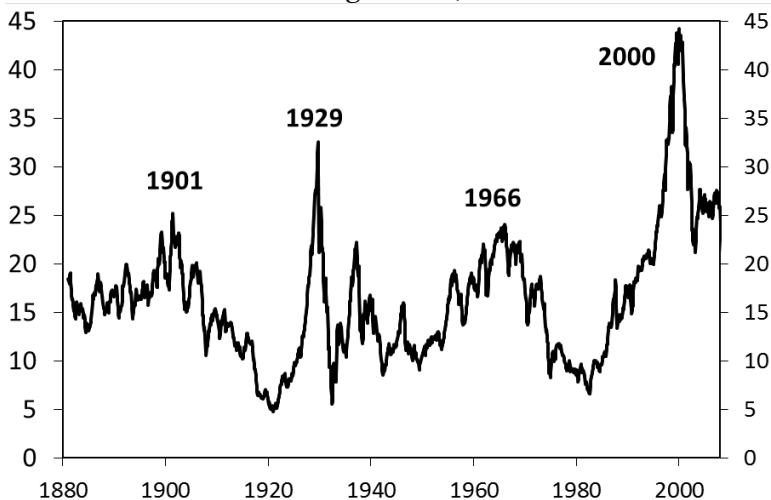
Shiller (2000a, p. 81) characterized the 1962-66 run-up of share prices as a “dramatic bull market.” The nominal share price index rose 68 percent and the real share price 59 percent. Its most striking feature, he thought, was the behavior of the price-earnings (P/E) ratio, which reached a high of 24.1 in January 1966. Chart 5 traces the price-earnings ratio for the extended period from 1860 to 2000. Peak ratios were attained in 1901, 1929, 1966 and 2000. Shiller attributed the rise in 1966 to the corresponding surge in earnings of over 50 percent. Real share prices did not regain their January 1966 high until May 1992.

The Fed responded to rising share prices by raising margin requirements from 50 to 70 percent in November 1963, where they remained for the next 52 months. Share prices had risen 26.5 percent in the preceding 12 months.

The surge in share prices was accompanied by persistent increases in the discount rate, six times between June 1963 and December 1965 (three times in 1963, twice in 1964, and once in 1965). But there is no archival evidence that these increases were directed deliberately at curbing stock market speculation. Meltzer (2009a, p. 414) quoted Martin as having said at the June 17, 1963 FOMC meeting:

No matter whether one looked at the stock market or the real estate market, small business activities or some of the fringe activities of defense operations, there was a speculative movement around the country that was in a way reminiscent of the 1929 period.... [He] hoped that he was too pessimistic.

Chart 5
Price-Earnings Ratios, 1880-2008



Source: Web site of Robert Shiller. See Shiller (2015, p. 7, Figure 1.3).

Meltzer (2009a, pp. 421-422) noted that stock prices continued to rise at an annual rate of 15 percent, slower than the 20 to 25 percent earlier in the year—evidence of rising profit expectations. Martin again compared the similarities of the economic practice in 1965 and 1928-29 in a speech delivered at Columbia University. According to Meltzer (2009a, p. 448) he emphasized the similarities—not the differences—with 1929. These continuous and persistent increases in the discount rate for whatever reason neither led to a traumatic collapse of stock prices nor serious contraction in economic activity. Stock prices achieved a “soft landing.”

5. 1966-68

The 1966-68 run-up in share prices was one of least intense of the 16 share price episodes. Nominal share prices increased 58 percent and real share prices 28 percent, with an equal duration of 27 months. The share price peak lagged the reference cycle peak by one year.

In June the Board raised margin requirements from 70 to 80 percent. Only on two previous occasions had the rate been raised

higher: to 100 percent in 1946 and to 90 percent in 1960. The discount rate was raised from 4 to 4.5 percent in December 1967, where it remained through June 1968. Share prices reached a peak in December 1968, at which time the discount rate was reduced 25 basis points to 5.25 percent.

6. 1970-73

Nominal S&P 500 share prices increased 57 percent between June 1970 and their new high in January 1973. Real share prices increased 43 percent. The duration was almost the same, 31 and 32 months, respectively. Nominal share prices had fallen 41 percent over a period of 19 months extending from December 1968 to the low in June 1970. While share prices were still falling, the discount rate had been raised to 6 percent in May 1969, where it remained until October 1970, after which the rate was reduced to 4.5 percent in 1972, the middle of the share price boom.

Between December 1971 and April 1972, stock prices rose 17 percent. Meltzer (2009b, p. 827) described the Board's reaction in an extended discussion of the necessity for an increase in margin requirements. The staff had called the Board's attention to the "speculative character of the increase," and recommended an increase in margin requirements. The Board declined to take any action.

The discussion continued in May. Although stock prices fell, stock market credit increased. The Board was divided over what action, if any, to take. Chairman Arthur Burns did not think that there was a problem. In June two members wanted margin requirements raised to 70 percent. Although Burns favored the latter he deferred action to consult the Securities and Exchange Commission. The increase was delayed until November, five months later.

Between March 1972, when the old nominal share price was regained, until the new high in January 1973, the Fed raised margin requirement in November 1972 from 55 to 65 percent, the last increase prior to the Board's decision to abandon discretionary changes in margin requirements in June 1974.

In intensity, the 1970-73 share price episode, as measured by trough to-peak percentage increases, ranked at the midpoint of the 16 separate episodes for nominal share prices and eleventh for real share prices.

Table 15
Annual Change in Consumer Price Index, 1972-84

Year	Change (%)
1972	3.4
1973	8.7
1974	12.3
1975	6.9
1976	4.9
1977	6.7
1978	9.0
1979	13.3
1980	12.5
1981	8.9
1982	3.8

Source: *Economic Report of the President*, 1995.

7. 1973-80

The decade of the 1970s traverses what Meltzer has labeled the Great Inflation. The CPI almost doubled (up 90 percent) between January 1973 and April 1980. The annual percentage change in CPI from 1972 to 1983 is shown in Table 15. The doubling of the CPI however was not accompanied by an equivalent rise in nominal and real share prices, nor was the increase in share prices continuous.

Between January 1973 and September 1974 (21 months), nominal share prices fell 19 percent, then rose 55 percent from September 1974-September 1976—and fell 18.9 percent from September 1976-March 1978. Share prices rose 15.7 percent from March 1978-March 1980 (two years).

Nominal share prices in April 1980 were still 13 percent below their January 1973 high, and real share prices were 54 percent below. Inflation had taken a serious toll on the real value of stock exchange securities. The January 1973 high was not regained until seven and a half years later (July 1980). Real share prices did not regain their 1973 high until four years later (August 1987).

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The 1984-87 speculative boom in real S&P 500 share prices commenced and terminated before the January 1973 high had been regained! Regaining the old high was not a necessary condition for generating a speculative boom. The Federal Reserve Board had raised margin requirements from 55 to 65 percent in November 1972. No further changes were made thereafter. The Board declared a moratorium on the use of margin requirements after 1974, when the requirement was fixed at 50 percent.

There were numerous increases in the discount rate in 1973. It rose from 4.5 to 7.5 percent solely in reaction to the behavior of consumer prices, for share prices had fallen. The rate was increased to 8 percent in April 1974 and to 8.5 percent in December. Share prices then rose rapidly and the discount rate was reduced to 5 percent by the beginning of 1975. Thereafter, the rate increased continuously through May 1980, when the rate stood at historical high of 13 percent.

Chapter 5

The 1984-87 and 1994-2000 Speculative Booms

1. The 1984-87 Speculative Boom

The second stage of the Federal Reserve-stock market relationship we have designated “noninterventionist” with full knowledge that it is not strictly correct. Although the Fed refrained from using the discount rate to curb speculation, monetary policy was still restrictive but focused on containing inflation. Curbing speculation was not a main policy objective. The second stage includes two of the longest speculative booms in the U.S. financial history, one of which vies with 1929 for ending in the most serious stock market crash. In neither speculative boom did Fed officials express a desire to halt the run-up. Nor did Chairman Paul Volcker or Chairman Alan Greenspan feel any necessity to give a defense. We still do not know what motivated Chairman Volcker. Fortunately, Greenspan has been uncharacteristically voluble since the boom terminated, and it will be to Greenspan we must turn for an explanation of Fed policy during the 1994-2000 speculative boom.

Our first task will be to identify the characteristic features of the 1984-87 boom. While stock prices were escalating in 1985 and 1986, the discount rate was lowered, and interest rates both long- and short-term, were falling! The economy was slowly emerging from a serious setback generated by Volcker’s bold initiative in terminating runaway inflation in the late 1970s. The economy’s growth rate was regarded as still too low even after 45 months of economic expansion. It is indeed curious that the October 1987 crash drew more attention than the speculative boom itself. While share prices more than doubled between 1984 and the October 1987 crash, the discount rate was lowered once in 1985 and four times in 1986. The S&P 500 increased 111 percent between July 1984 and September 1987. Even more anomalous in an economic recovery was the behavior of long- and short-term interest rates. Short-term rates fell continuously from 1982-87, and long-term rates fell from 13 percent in 1982 to 7.6 percent in 1987. Volcker’s policy to eliminate inflation had been successful, as

evidenced by the 500 basis point reduction in the ten-year bond rate and the rise of the unemployment rate to 10 percent. Unemployment remained as high as 7.5 percent in 1984 and fell to 6.1 percent in 1987. During the early and middle stages of economic recovery, emphasis was placed on accelerating the growth rate of GNP and reducing both the unemployment percentage and interest rates. Stock market speculation was not a chief worry of Fed policymakers. Had it been a main concern, we might have expected a fuller discussion in the minutes of the FOMC. From a reading of the minutes one might conclude that there was no speculative boom in the stock market. As late as August 1987, when Alan Greenspan replaced Paul Volcker as chairman of the FOMC, he expressed surprise when he met with the Committee for the first time:

We spent all morning, and no one mentioned the stock market, which I find quite interesting in itself. I think it important in the sense that as an economic force history tells us that sometimes it works and sometimes it doesn't. It is conceivable to me, however, that this may be one of the times in which we may begin to see some opening up in the capital goods market.

There was no full-fledged discussion of stock market speculation in either the 1986 or 1987 minutes of the FOMC. In April and May, Ed Boehne, President of the Federal Reserve Bank of Philadelphia, made a passing comment about what was happening in the stock market (FOMC Minutes 1986, p. 5): "We have had a 25 percent run-up in stock prices this year, and that, to say nothing of oil prices, has to have positive impact on consumer spending."

The remark elicited no further comment. In May Gerald Corrigan, President of the Federal Reserve Bank of New York, resorted to the vernacular in referring to events in the stock market:

I guess this is a lot of a problem—is a concern that basically says that maybe these go-go financial markets has [sic] gotten a little too much go-go-in them. The concern is not just in terms of prices but in terms of all the exotic activity and implied uncertainty and risk associated with these various

patterns of behavior; it is a kind of nagging feeling that there are vulnerabilities that perhaps are not fully understood.

In February 1986 a controversy erupted within the Federal Reserve Board. The four Reagan appointees approved a decrease in the discount rate; they felt, as well as the administration, that the economy needed an additional stimulus. The growth rate of real GNP had slowed from 6.5 percent in 1983 to 3.3 percent in 1985. Chairman Volcker and two other members were opposed. This was Volcker's first major defeat. The minority feared that rate cuts not matched by similar reductions in Japan and Germany would accelerate the fall in the dollar and thereby create new inflationary pressures. He suggested again in April and May that rates might be raised, but his suggestion was rejected. Stock prices continued to escalate while discount rates were falling.

Monetary policy shifted to restraint in 1987. There was a sharp reduction in the growth rate of both total reserves and the monetary base, 3 and 4.7 percent, respectively. M1 slowed to 2.7 percent in the first six months of 1987 and M2 fell below its targeted rate. Treasury bill rates increased 51 basis points and the ten-year bond rate rose 176 basis points. Between February and August 1987 the three-month Treasury bill rate lay above the discount rate. The gap widened to 50 basis points in August. The discount rate increase in September to 6 percent simply brought the discount rate into line with the Treasury bill rate. The Federal funds rate remained well above the discount rate—almost 120 basis points during most of 1987. For serious Fed watchers, the discount rate increase did not signal increased restraint; it simply confirmed previous restrictive measures. It is most unlikely that the discount rate increase in September terminated the speculative boom in October.

The *New York Times* reported that the rate increase was widely anticipated. On September 2 the dollar had fallen to its lowest level against the German mark. Data for the second quarter showed that the U.S. trade deficit had reached \$157 billion. In the three months ending July 31, the Fed and the Treasury had bought \$800 billion of securities. The alleged purpose of the rise in the discount rate was to strengthen the dollar, whose further decline raised the specter of rising import prices and additional inflation. The increase in the discount rate might quell speculative dollar selling and thereby encourage

foreign investment. Some traders interpreted the move as bullish; others thought the rate should have been increased a full percentage point to prevent a further fall in the dollar. No consideration was given as to its effects on the stock market.

The market collapsed commencing on Wednesday, October 14 and continuing through Tuesday, October 20. Events that occurred from October 14-16 were the catalysts for the October 19 crash in the stock market. The announcement of a U.S. merchandise trade deficit of \$157 billion and rumors late Tuesday that legislation was pending that might eliminate tax benefits associated with leveraged buyouts contributed to the market adjustment. The Dow Jones Industrial Average closed down 95 points for the day, its largest ever one-day point decline. On Thursday it fell another 57 points. And at the end of the day on Friday the Dow was 17.5 percent below its August 25 high, the largest correction since the low reached in August 1982.

The crash came on Monday, October 19: the Dow fell 508 points, or 22 percent, on a record volume of 604 million shares. Confusion and uncertainty continued on Tuesday; the market closed up for the day by 103 points. By October 20 the total value of all listed stocks had fallen by half a trillion dollars. Trading in many stocks and index futures halted.

The Fed's immediate response to the crash was to supply \$17 billion to the banking system to ward off a financial debacle. Bank reserves increased 25 percent and the monetary base 7 percent. Chairman Greenspan acted on his own initiative and thereby prevented a serious money market disturbance as well as a banking panic. On one previous occasion, in 1929, the Fed had intervened immediately following the stock market crash. The Federal Reserve Bank of New York had purchased \$132 million of government securities without the prior approval of the Board and outside the Federal Open Market Investment Committee (FOMIC) investment account. Governor George Harrison of the New York Bank acknowledged later that he made the decision to purchase securities after consultation with a few directors of the Bank. This was done partly for psychological reasons and partly to prevent tightening of the money market while loans on stock exchange securities were transferred to many New York banks. The reaction of the Board in Washington was less than enthusiastic. The majority of the Board favored a rediscount policy of liberality and quick action. Between

October and November the FOMC purchased securities at the rate of \$25 million a week. On both occasions of a stock market calamity, 1929 and 1987, the Fed intervened without hesitation. There has never been any question raised about the necessity for such intervention.

2. The 1995-2000 Speculative Boom

The 1995-2000 run-up in stock prices is to my knowledge without precedent both in size and duration. Shiller (2000a, p. 8) called it the most dramatic bull market in U.S. history. It began, by my dating, in January 1995 and ended five years later in January 2000. The starting date is always more difficult to ascertain than the terminal date, which is not perhaps as dramatic as the 1929 crash but is nevertheless fairly easily identifiable. There are more alternative measures of the increase in stock prices than for 1928-29, including the Dow Jones industrials, S&P 500 and the New York Stock Exchange composite index. The Dow almost tripled between January 1995 and January 2000, escalating from 3,872 to 11,281. The S&P 500 (Chart 6 and Chart 7) more than tripled, increasing from 465 to 1425. The NYSE composite increased two and a half times. No matter which index we use, the rise was spectacular by historical standards.

When the boom collapsed the Dow declined 800 points, or 7 percent, between January and March 2000, but turned up thereafter. The 7 percent decline compares with a 33 percent decrease in the Federal Reserve Board's index of stock prices in October and November 1929. The behavior of stock indices must be placed in the context of what was taking place in the macroeconomy. Table 16 shows the behavior of real GDP, civilian unemployment, CPI and interest rates (short- and long-term) from 1995-99 and for the first three quarters of 2000. The inflation rate was effectively constrained, as shown by the CPI falling from 2.9 percent in 1996 to 1.6 percent in 1998. Real GDP growth increased from 2.7 percent in 1995 to 4.4 percent in 1997, where it remained about unchanged through 1999. The three-month Treasury bill rate fell from 5.5 percent in 1995 to 4.6 percent in 1999. Ten-year Treasury bond yields fell from 6.57 percent in 1995 to a low of 5.2 percent in 1999. Monetary policy was focused on keeping inflation under control and preventing the emergence of imbalances that might jeopardize continued expansion.

Chart 6
Share Price Indices, 1990-2000 (December 31, 1994 = 100)

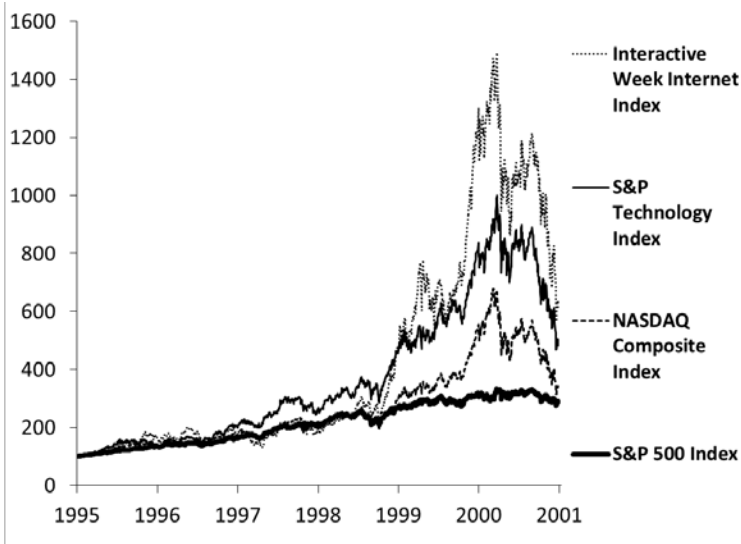


Chart 7
Share Price Indices, 1999-2000 (December 31, 1998 = 100)

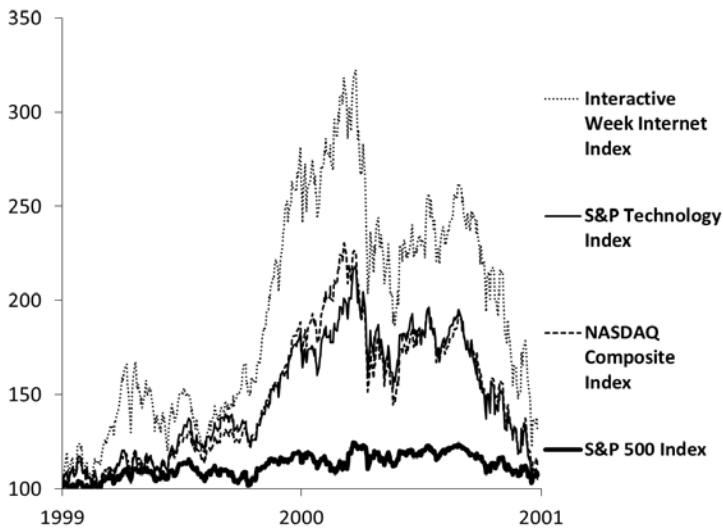


Table 16
Measures of Output, Unemployment,
Prices and Interest Rates, 1995-2000

Year	Real GDP (%)	Unem- ploy- ment (%)	CPI (%)	Interest Rate, 3-Month Treasury Bill (%)	Interest Rate, 10-Year Treasury Bond (%)
1995	2.7	5.6		5.5	6.57
1996	3.6	5.4	2.9	5.02	6.44
1997	4.4	4.9	2.3	5.07	6.35
1998	4.4	4.5	1.6	4.81	5.26
1999	4.2	4.2	2.2	4.66	5.65
2000	Q1 4.8	Jan. 4.3	Jan. 2.7	Jan. 5.34	Jan. 6.60
	Q2 5.6	Feb. 4.4	Feb. 3.2	Feb. 5.57	Feb. 6.52
	Q3 2.2	Mar. 4.2	Mar. 3.8	Mar. 5.72	Mar. 6.28

Source: *Economic Report of the President*, 2000.

The Fed's response to the 1995-2000 increase in stock prices was embedded in its inflation targeting policy—that is, to the extent that inflationary pressures were generated by a boom in asset prices. Bernanke and Gertler (1999) demonstrated how a speculative boom can stimulate spending through the traditional wealth effect and the effect on the net wealth of potential borrowers, thereby raising output. If the output gap (actual output minus potential output) increases, the Taylor rule policy guide calls for an increase in the Federal funds rate. There is, therefore, an automatic stabilizing Fed response to the increase in asset prices operating through the output and inflation gap channels. The appropriate question to ask is not whether the Fed should respond to an increase in asset prices, but whether or not an inflation targeting strategy is sufficient to maintain macroeconomic and financial stability. And this is a question to be settled by empirical testing. The inflation-targeting strategy defines a built-in interventionist response by the Fed to a run up of asset prices, the instrument being the Federal funds rate. A discretionary response is replaced by a policy rule. And the Federal funds rate replaces the

discount rate as the preferred instrument. This inflation-targeting policy contrasts sharply with a strictly noninterventionist stance where the Fed does nothing in response to an acceleration of asset prices; it also contrasts sharply to a policy where policymakers respond directly, as they attempted to do in 1928-29, by increases in the discount rate, open market sales, and moral suasion. Greenspan opposed a policy of direct intervention and relied solely on the response embedded in the inflation targeting strategy. His critics have regarded the new policy as one of his worst mistakes during his tenure as Chairman. To the best of my knowledge we still have no official explanation of the Fed's failure to have responded more positively to the speculative boom. My examination of the available transcripts of FOMC minutes did not turn up any full discussion of the Fed's policy, so I have had to rely almost exclusively on the statements and speeches of Chairman Greenspan, who waited until after the bubble burst to articulate the underpinnings of his policy.

Greenspan dated his rising concern about share prices to mid October 1996. An opportunity had arisen, he said, to address the issue directly. The occasion was an invitation to speak at the American Enterprise Institute's annual dinner on December 5. Only a dozen sentences of the speech were devoted to asset values, but one contained the memorable phrase "irrational exuberance." He had told the FOMC in the same month that there was a stock market bubble problem. However, the current problem was not the existence of a bubble, but whether or not the bubble could be identified. He raised two questions, neither of which he attempted to answer: How do we know when irrational exuberance has unduly escalated asset prices? And how do we factor that assessment into monetary policy? The first question seems to imply a distinction between irrational exuberances that unduly escalate share prices and those that do not! It is clear that "irrational exuberance" was meant to imply a bubble only in those cases of an undue escalation of share prices. Greenspan also warned against underestimating the complexity of the interaction between asset markets and the real economy. He later acknowledged that his American Enterprise Institute speech had caused a sell-off around the world mainly because it raised the suspicion that the Fed would raise rates. According to Shiller, the last time such a warning had been given by a Federal Reserve chairman had been William McChesney Martin's statement in 1965 that he found "disquieting similarities" between the

mid 1960s and the economy during the 1920s. If Shiller is correct, Volcker never issued such a warning!

Greenspan was exceedingly reluctant to suggest that rates would be raised to rein in the stock market. He thought it would raise a political firestorm. Moreover, the Fed, in his judgment, had no direct mandate under the law to contain a stock market bubble. For it to act, the bubble had to be tied to the inflation problem, that is, to a belief that stock prices moved in tandem with inflation. Avoiding a bubble would then be consistent with the mission to control inflation. Stock market speculation and inflation were intertwined.

When the FOMC met in March 1997 it raised the Federal funds rate by 0.25 percent to 5.5 percent. The announcement of the increase was written by Greenspan and he deliberately refrained from saying a word about asset values, although the market suffered a 7 percent dip in March and April; it regained its former level within several weeks.

He claimed the experience in 1997 was similar to the effects of the increases between 1993 and 1995: when the increases ceased, the market surge resumed. “We seem in effect to be ratcheting up the long term price trend.” Fed action simply set the stage for further increases in stock prices. A strategy of modest tightening had failed and a “great rate high” was too risky. Greenspan (2007, p. 201) concluded:

I was reasonably certain that seeking to defuse a mounting bubble with incremental tightening, as many had recommended, would be counterproductive. As a result of that experience we did not raise [rates] any further, and we never tried to rein in stock prices again.

But that not did mean no further increases in rates. Between mid 1999 and mid 2000 rates were raised in steps from 4.75 to 6.5 percent—not, however, to curb stock market speculation but to remove liquidity injected during the international financial crisis. Stock prices continued to escalate.

Greenspan (2000) attributed the stock market boom to at least three considerations: 1) greater propensity for risk taking by investors induced by anticipations of greater economic macro stability in the decade of the 1990s; 2) improved prospects for earnings growth due to the increased pace of innovation; and 3) the decline in the cost of equity capital, which spurred a rise in capital investment and

productivity growth. He assigned a key role to increased productivity growth in the acceleration of expected earnings. The price-earnings ratio of the S&P 500 doubled from 15 to 30 between 1995 and 2000. But he was unwilling to attribute the entire increase to revised earnings expectations. Nevertheless, Greenspan (2002, p. 7) warned of the dangers of an unwarranted, perhaps euphoric, extension of these developments could drive equity prices to levels unsupportable by market fundamentals.

Greenspan remained unconvinced that the situation as it developed during the 1994-2000 speculative boom warranted any Fed intervention. His case against intervention can be summarized in four propositions.

1. Asset bubbles are extremely difficult to identify. The central bank would be pitting its own assessment of fundamentals against the combined judgment of millions of individual investors. Betting against the market was precarious, at best.

2. Even if the Fed identified a bubble early, it was far from obvious that pre-empting a bubble could be accomplished without a substantial contraction of economic activity. Uncertainty of the outcome was excessive.

3. Allowing a bubble to burst naturally need not have serious economic effects.

4. A moderate and steady increase in the Federal funds rate would have no effect on controlling stock market speculation.

Greenspan's first proposition was the key to the Fed's reaction to asset bubbles. Could Fed officials recognize when share prices were rising more rapidly than market fundamentals? In his view, the extreme difficulty of identifying an asset bubble precluded the Fed's direct intervention. In the absence of unambiguous indicators, Greenspan (1999) stated that Fed policymakers would be "pitting their own assessment of fundamentals against the combined judgment of millions of investors," and he was reluctant to confess that millions of investors could be wrong. His reluctance to pit the judgment of the Fed against the combined judgment of millions of investors comes dangerously close to a commitment to the market not being wrong even if it cannot be demonstrated except *ex post*.

Fed intervention required a high degree of certainty about the presence or absence of an asset bubble, Greenspan thought, and he acknowledged that he did know no reliable indicators that would deliver the requisite certainty. He rejected the equity premium as a reliable indicator. The equity premium he defined as the total expected return on a common stock minus the rate of return on riskless debt—presumably a measure of the risk aversion of investors. Greenspan (2002, p. 10) found problems with the equity premium: it was not observable; it should be redefined to include the unrealistic part of profit projections, and the unsustainably low segment of discount factors. In the absence of such a redefined measure, Greenspan could find no adequate basis for a preemptive strike to terminate an alleged speculative bubble. He concluded:

It is by no means evident to us that we currently have or will be able to find a measure of equity premium or related indicators that convincingly presage an emerging bubble. Short of such a measure I find it difficult to conceive of an adequate degree of central bank certainty to justify that scale of preemptive tightening that would likely be necessary to neutralize a bubble.

Greenspan had introduced a new element to constrain central bank direct intervention to halt a speculative boom. What constitutes “an adequate degree of central bank certainty?” This question is seldom asked: how much certainty about future inflation is required to evoke a Fed response? The same question could be asked about an impending recession. Unavoidably these questions are wrapped in a penumbra of doubt—the costs of refraining from intervening versus the costs of intervention.

Not only did Greenspan maintain that an interventionist response by the Fed was precluded by an alleged high degree of uncertainty about the identification of an asset bubble, he also attributed an excessive amount of uncertainty to the outcome of pre-emptive action to terminate a speculative boom. His second proposition assumes that we do not know enough about the output and employment effects of a pre-emptive strike to halt a speculative boom. A severe economic contraction may outweigh the effects of allowing the boom to run its course unrestrained. There are no paradigmatic models that relate

outcomes to pre-emptive acts to terminate a bubble. Neither central bank experience nor purely theoretical considerations throw any light on the seriousness of outcomes of pre-emptive Fed actions. It has been argued by Shiller and others that the increase in the discount rate to 6 percent in August 1929 was the catalyst for the subsequent Crash in October and the ensuing severe contraction in economic activity. Greenspan rejected that explanation. He attributed the post-Crash economic contraction to the failure of Fed policymakers to pursue a sufficiently expansionary policy. Friedman and Schwartz (1963, p. 393) also faulted the Fed for the same reasons. They thought that if Fed officials had purchased \$1 billion of securities, the subsequent plunge into depression might have been avoided. There was no necessary connection between the stock market crash and the slide into depression.

Greenspan's third proposition stated that allowing the asset bubble to terminate naturally need not have serious economic effects. He offered as evidence the Japanese experience in the late 1980s and the U.S. stock market crash in 1929. As we have shown, the rise in the discount rate to 6 percent in August 1929 was a pre-emptive act by the Fed, but it initiated an easing policy, not one of additional restraint! Tight money did not terminate the speculative bubble. Fully three months elapsed between the rise in the discount rate and the stock market crash. The alleged bubble died a natural death. The rise in the discount rate to 6 percent tells us nothing about the cause of the crash.

His fourth proposition stated that a moderate and steady increase in the Federal funds rate would have no discernible effects in controlling stock market speculation. But the staff of the FOMC did not share Greenspan's skepticism. The Greenbooks (analyzing current economic conditions) prepared for the August and November 1998 meetings of the FOMC contained forecasts of the effects of a 100 basis point increase in the Federal funds rate in 25 basis point steps over the course of the year. The purpose of the rate increase was to curb inflation, not to control stock market speculation. The staff predicted a 20 percent downward correction in the stock market, presumably the result of an increase in the equity premium. This exercise was reported at the November meeting, but with a baseline assumption of a 0.75 percent increase in rates and a predicted 20 percent correction in stock prices. The FOMC minutes report that the

staff stated, “This isn’t a lot, but we expect the effects will be some deflation in the stock market bubble.”

3. The Empirical Evidence

There is now a burgeoning literature on the wisdom of central banks responding to asset prices in a regime of inflation targeting. Bernanke and Gertler (1999, 2000) have argued that asset price changes should affect monetary policy only to the extent they affect the central bank’s forecast of inflation; otherwise, monetary policy should remain neutral with respect to asset prices. In sharp contrast, Cecchetti et al. (2000), using the same model as Bernanke and Gertler, maintain that the central bank should respond to asset price misalignments, that is, a discrepancy between market fundamentals and nonfundamentals (bubbles). Their disagreement with Bernanke and Gertler is due to different assumptions about the central bank’s ability to identify an asset bubble with an acceptable amount of uncertainty. Goodfriend (2000), Shiller (2000) and McGrattan and Prescott (2003) all agree that the Fed should ignore the stock market, but Goodfriend and Shiller offer no empirical evidence. Rigobon and Sack (2003) and Hayford and Malliaris (2004) conducted empirical tests of Greenspan policy and the evidence is conflicting.

Bernanke and Gertler

Bernanke and Gertler (1999, 2000) construct a standard neo-Keynesian dynamic model with credit market frictions. Equity prices can differ from market fundamentals because of the existence of bubbles. The market price of capital S may differ from capital’s fundamental value Q ; a bubble exists when $S > Q$. The bubble may affect real activity through a wealth effect on consumption and through balance sheet effects. Bernanke and Gertler emphasize the household wealth effect channel, for which they maintain there is neither strong nor reliable evidence. In its place they substitute a “balance sheet channel.” Because of the existence of credit market frictions, asset price changes are transmitted to the economy through the effects on balance sheets of households, business firms, and financial intermediaries and, in time, aggregate spending.

They begin by simulating the effect of a stock market bubble with a one percentage point increase in stock prices above fundamentals. The bubble component doubles each period. It is assumed that the bubble lasts five periods and then bursts. Policy rules include: 1) asset bubbles responding only to inflation targeting and 2) asset bubbles responding to stock prices and then the asset bubbles burst. Bernanke and Gertler grade the three policy rules by how each reduces the volatility of prices. The policy rule that responds best focuses on stabilizing inflation rather than asset prices. They find that aggregate inflation targeting “greatly moderates” the effects of the bubble. A positive response of the central bank to asset prices may be destabilizing. The bursting of the bubble wipes out the output gains from the bubble but not much more.

The empirical evidence does not constitute a strong case against bubble bursting by the central bank. Bubble bursting responds marginally to output variability. The effect is much stronger for inflation variability, but the channels through which these effects are transmitted are not fully specified (Dornbusch 1999).

Cecchetti et al.

Using a modified version of Bernanke and Gertler’s model, Cecchetti et al. (2000) show that it is desirable for a central bank to respond to stock market bubbles over and above its reaction to inflation. Their sample period is the same as Bernanke and Gertler’s: 1960-88. They attribute their reaching a different conclusion from Bernanke and Gertler about the role of asset prices to assumptions about the ability to identify the existence of asset bubbles. Bernanke and Gertler maintain that it is hopeless, whereas Cecchetti et al. argue that useful information can be extracted about asset prices. They cite as recent examples Japanese stock and bond prices in 1989 and the NASDAQ index in 1999 and 2000, where there were “egregious misalignments.” “While some portion of these high prices levels may have been justifiably based on fundamentals, few people would deny that a significant component was due to asset market disturbance.” They conclude it is important that central banks respond to these market misalignments. Furthermore, they acknowledge that predicting the degree of misalignment is difficult, but no more difficult than

estimating the output gap in NAIRU (the nonaccelerating-inflation rate of unemployment).

A serious limitation of both the Bernanke-Gertler and Cecchetti et al. models is the assumption that asset bubbles randomly inflate and burst, hence they cannot address the question about the role of central banks in preventing bubbles (Lansing 2003).

Goodfriend

Marvin Goodfriend (2003) agrees with Greenspan that monetary policy should not react directly to asset prices. He attempts to show that there can be no presumption that interest rate policy ought to be correlated with asset price movements. His evidence consists of an impressionistic historical account of two periods: Japan in the 1980s and the U.S. in the late 1990s, from which he concludes that monetary policy could not have been improved by reacting to asset prices. At the later stage of the rise in equity prices in the United States, macroeconomic data were signaling a sharp tightening. But at that point, he thinks it would have been inadvisable to move short-term rates higher in reaction to higher equity prices because equity prices then seemed at risk of falling, perhaps considerably, with a potentially large adverse effect on economic activity. Why, he does not say.

Shiller

Shiller (2000a, p, 223) does not think the Fed should attempt to burst a speculative bubble through an aggressive tightening of monetary policy. However, he does not rule it out completely, for he qualifies his objection by inserting the word “generally,” as if there might be some circumstances where a sharp increase in rates may be permissible. He admits that “A small, but symbolic increase in interest rates by monetary authorities at a time when markets are perceived by them to be overpriced may be a useful step, if the increase is accompanied by a public statement that is intended to restrain speculation.” He thinks a speculative bubble did exist in the 1995-2000 episode.

Two Recent Tests: Hayford and Rigobon

The two most recent tests, by Hayford and Malliaris (2004) and Rigobon and Sack (2003), give conflicting evidence about the Fed's response to a rise in stock prices. Hayford and Malliaris find no evidence that the Fed attempted to moderate stock market speculation during the 1990s, whereas Rigobon and Sack find a significant policy response.

Hayford and Malliaris conduct two empirical tests. In the first, they add a price-earnings ratio to a forward-looking monetary policy rule. The results indicate a negative correlation between the Fed funds rate and the price-earnings measure of stock market valuation. In the period 1987 to 2001 the Greenspan policy accommodated the run-up in stock prices rather than deflated it. In the second test, they employ a four-equation vector autoregression (VAR) model and find that the Fed funds rate responds negatively to a positive shock in the price-earnings ratio.

Rigobon and Sack use an identification procedure based on heteroskedasticity of stock market returns. The results indicate that an unexpected increase in the S&P index by 5 percent increases the probability of a 25 basis points tightening by just over one-half, while a 5 percent decline in stock prices increases the probability of a 25 basis points easing by just over one-half.

The results of the empirical tests are silent, inasmuch as they do not allow us to discriminate between direct and automatic intervention by the Fed to affect share prices. Nor do they tell us anything about the effectiveness of the measures taken. The object of the tests is simply to identify a response, if any, without saying anything about its success or failure in preventing a sharp and severe reversal in the movement of stock prices.

The speculative 1994-2000 boom ended in March 2000, and we know that there was no precipitous fall in share prices nor any immediate output response. A minor recession followed and lasted eight months.

The ending of the boom raises an interesting question about how to interpret the controversial findings of Rigobon and Sack and Hayford and Malliaris. The Rigobon and Sack tests are consistent with the view that the speculative boom ended in due course without observable effects either on stock prices or output. Fed officials can

claim that the successful termination of the speculative boom was due to the policies pursued.

The opposite conclusion can be drawn from the Hayford and Malliaris tests. The negative correlation between the price-earnings ratio and the funds rate and vector autoregression estimates are consistent with the view that Federal Reserve accommodated the increase in share prices.

4. Why Did Some Booms End in a Crash and Others Did Not?

Of the four share price episodes having the highest intensity (percentage increase), two ended in spectacular crashes and two ended without fanfare. The most intense, 1994-2000, had an uneventful ending, whereas the next in intensity, 1926-29, terminated in a historic crash. It is indeed anomalous that the two episodes with the greatest share price intensity had sharply contrasting terminations.

The contrast extends to the booms in 1952-56 and 1984-87: share price intensity and duration were almost identical, yet the former ended without incident and the latter ended in a crash. Why did two of the speculative booms end in a crash and the other two did not? We may not expect to find the answer solely in the behavior of the share price data, but there is no better place to begin.

One plausible clue may be found if prices accelerated before reaching their peak and subsequent crash. That is, did the speculative mania grow in intensity as the boom progressed? Anecdotal evidence suggests that was what happened in 1929. Accelerating share prices created expectations of greater gains—windfall profits—and increased volume of security purchases without interruption. At some point, for whatever reason, the mania balloon deflated. Speculative fever vanished and the psychology of fear replaced it.

To confront the hypothesis with the share price data, we looked at what happened to share prices in each of the twelve-month intervals preceding the peak in the four booms: 1926-29, 1952-56, 1984-87 and 1994-2000. A brief summary of the results reveals that share prices accelerated prior to the peaks and crashes in 1929 and 1987 and decelerated without a crash in 1953-56 and 1994-2000. A note of caution: we must be especially careful not to generalize from so limited a set of observations. The hypothesis is merely suggestive and warrants more consideration.

In 1953-56, share prices decelerated in the last 11 months (September 1955-July 1956) from a 40.9 percent gain in the preceding 13 months to 10 percent in the final 11 months. Deceleration is also obvious in 1994-2000, from 35.9 percent in the third year preceding the termination of the boom to 19 percent in the second year, to 8.4 percent in the final 12 months. Neither boom terminated in a crash.

In 1953-56, share prices decelerated in the last 11 months (September 1955-July 1956) from a 40.9 percent gain in the preceding 13 months to 10 percent in the final 11 months. Deceleration is also obvious in 1994-2000, from 35.9 percent in the third year preceding the termination of the boom, to 19 percent in the second year, to 8.4 percent in the final 12 months. Neither boom terminated in a crash.

Why, we may ask, did 1984-87 terminate in a crash and 1953-56 did not? Both episodes were of equal intensity as measured by percentage increase in nominal share prices—109.6 percent in 1953-56 and 110 percent in 1984-87. Duration was nearly the same, 35 months in 1953-56 and 40 months in 1984-87. In the latter boom, share prices were gaining in momentum in the final year and in the former they were not. A coincidence? It is not possible at this stage to say.

Nominal share price intensity was 20 percent greater in 1994-2000 than in 1926-29, although real share price intensity was nearly identical. And nominal duration was only half as long in 1926-29. Yet there was a serious crash in 1929 and none in 2000! A higher nominal share price intensity did presage a crash.

We examine the behavior of share price in each of the last two years preceding the termination of the boom, and we ask, did share prices accelerate or decelerate? Table 17 shows the timing and percentage increase in share prices in each of the last two years preceding the termination of the boom. Acceleration is clearly evident in 1926-29 and 1984-87, and deceleration in 1953-56 and 1994-2000. Share prices clearly accelerated, almost doubling their rate of increase between 1928 and 1929, from 23.7 to 44 percent. The increase is also apparent between October 1986 and October 1987, but is by no means as dramatic, rising from 27.6 to 34.2 percent. Both booms terminated in spectacular crashes.

Table 17
Timing and Percentage Increase in Share Prices in
Last Two Years Preceding Termination of the Boom

Episode	Duration (months)	Change in Share Prices (%)
1926-29		
I. December 1927-October 1928	11	23.7
II. October 1928-September 1929	12	44.9
1953-56		
I. September 1954- September 1955	13	40.0
II. September 1955-July 1956	11	10.0
1984-87		
I. October 1985- October 1986	13	27.6
II. Oct. 1986- September 1989	12	34.6
1994-2000		
I. March 1997-March 1998	13	35.9
II. March 1998-March 1999	13	19.0
III. March 1999-February 2000	12	8.8

5. Summary Review

What have we learned, if anything, about the effects of Fed intervention on the stock market? We have examined in detail ten episodes, three before World War II and seven after, of stock market speculation and the Fed's responses. Intervention characterized Fed behavior in 1919 and 1926, when policymakers adopted a restrictive monetary policy to control a speculative boom. In both instances they were successful: there was no crash in share prices and no serious macroeconomic effect. The Fed's response in 1928 and 1929, as we have showed, was inconsistent—tight in the first half of each of the two years and loose in the second half. Contrary to the conventional interpretation, the rise in the discount rate in August 1929 did not initiate a policy of increased restraint! Rather, the Fed lowered the rate on bankers' acceptances to expand reserves to meet regular seasonal demands. The collapse of the stock market occurred during a period of ease, not increased restraint. The boom terminated naturally and was accompanied by a severe crash in the stock market and a serious

economic contraction. An attempt to control a speculative boom was not to blame for the contraction because no consistent attempt occurred.

There is no persuasive evidence before World War II that pre-emptive action by the Fed to control speculative booms had serious economic effects. Greenspan's argument that there is "excessive uncertainty" about the economic consequences of terminating speculative booms is without empirical support. Nonintervention characterized the Fed's response to speculative booms in 1984-87 and 1994-2000. Neither Paul Volcker nor Alan Greenspan saw a positive role for the Fed in moderating or terminating speculative booms in the stock market. The increase in the discount rate to 6 percent in September 1987 was not aimed at controlling stock market speculation, though it is conceivable it might have exerted some indeterminate effect. The macroeconomic consequences were relatively minor. The 1995-2000 speculative boom terminated naturally without Fed intervention. There was no crash in share prices. The economic effects, however, were delayed but not serious.

Long and extended speculative booms have distortionary real effects on the economy. Speculative orgies in certain stocks, for example technology stocks in 1994-2000, led to overexpansion and affected the pace of investment in the aftermath. The precipitous decline in the valuation of Internet companies and their slow recovery illustrates the distributional impact of the adjustment. A speculative run-up in asset prices over a prolonged period also exaggerates the increase in permanent wealth and consumption spending, thereby generating an unsustainable level of income.

Our objective has not been to defend the Fed policy of intervention. We have attempted to demonstrate that there is no historical evidence to support the claim that pre-emptive action by the Fed to contain stock market speculation had serious economic effects during the three pre-World War II speculative booms in 1919, 1926, and 1929. On two of these occasions the Fed successfully terminated the boom without a stock market upheaval or contractionary economic consequences. During the third the Fed was pursuing an easy monetary policy.

6. Epilogue

Two positive objectives have shaped the argument of this book: 1) to identify and describe major movements in share prices between 1918 and 2000 without begging the question of cyclicity or the existence of bubbles; and 2) to discern the role, if any, the Federal Reserve played in responding to these movements, particularly upswings. Only after these two objectives have been successfully achieved can we address the normative question: What role should the Fed play in forestalling speculative booms and bubbles in share prices? What does the historical evidence tell us about the effects of Fed action to terminate what was perceived as unsustainable speculation in the stock market?

Share price episodes coincided with NBER reference cycles. There was at least one single share price episode in each of the 11 reference cycles between 1919 and 2001. In eight there were single share price peaks. Multiple peaks occurred in the remaining three: two in each reference cycle, February 1961-December 1969 and March 1991-March 2001, and three in the 120-month cycle November 1982-July 1990. Two of the most intense share price episodes, 1984-87 and 1991-2000, took place within multiple share price peak reference cycles, the significance of which is not clear.

The meaning of Fed intervention in the stock market is clouded with ambiguity, since intervention may be either deliberate and discretionary or automatic and endogenous. Discretionary action implies a restrictive stance brought about by an increase in the discount rate, sale of government securities, increases in margin requirements and moral suasion presumably to curb stock market speculation. Policymakers take purposive action.

Intervention may also be automatic and endogenous in the pursuit of a policy rule—the Taylor rule, for example, which calls for a rise in the Fed funds rate when there is a discrepancy between actual and optimal output. An increase in share prices may generate a wealth effect, thereby stimulating actual output and inducing a rise in interest rates. Although not designed for the purpose of responding to stock market speculation, the Taylor rule may have an unintended desirable side effect.

The pursuit of any restrictive policy, whether through a rule or discretion, for whatever purpose, like curbing inflation, may also curtail speculation as well. A noninterventionist policy by the Fed must exclude both discretionary and nondiscretionary action. By broadening the net of nonintervention, it becomes increasingly difficult to identify any episode of a run-up in share prices as meriting some form of Fed response, no matter how weak and ineffective.

The relevant question is not whether to intervene or not, but the form that intervention should take. Discretionary action to curb stock market speculation occurred in 1919, 1926 and 1928-29 in the form of increases in the discount rate, open market sales, and moral suasion. Margin requirements were raised in 1945-46, 1952, 1955, 1958, 1963, 1968, and 1972.

Discount rates were increased seven times: four times in 1955, twice in 1956, and once in 1957. Inflation and not stock market speculation was the acknowledged motive for the increases. Discount rates were also raised on four occasions in 1958, twice in 1959, once in 1967 and again in 1968. Rates were raised again in 1973 and 1974, while share prices were falling. The increase in the discount rate, though not perceived by the policymakers as a curb to speculation, may very well have contributed to the soft landing in each of the share price episodes 1957-60 and 1966-68.

The 1928-29 speculative boom was the only unsuccessful attempt by the Fed to curb stock market speculation by discretionary action. The Fed had been successful in 1919 and 1926 and was later inadvertently successful in terminating the run-up in share prices in 1957 and 1968.

We have deliberately restricted our observation of share prices to real time rather than invoking time-series statistical artifacts. The presumption is that Federal Reserve officials were responding, when they did respond, to a run-up in nominal share prices as well as to a severe collapse. Since we pay special attention to how and when they responded, it is important that we correctly identify how they responded. We have been unable to uncover any evidence from the official records that anything other than observed nominal share prices dictated their behavior, although nominal and real share prices frequently moved in tandem.

From the nominal and real share price data we extract a two-stage process, trough-to-peak (expansion) and peak-to-trough (contraction).

We have measured two characteristics, intensity and duration. And we have rank ordered each share price episode according to these two properties.

Two of the four most intense speculative booms terminated in a precipitous collapse of share prices: 1926-29 and 1984-87. Two did not: 1953-56 and 1994-2000. The 1926-29 and 1994-2000 booms were about equal in intensity as measured by percentage change in real share prices, but the former ended in a crash and the latter did not! Likewise, in 1984-87 and 1953-56, both nominal and real share prices were almost equal in intensity, but 1984-87 ended in a crash and the 1953-56 boom did not. Fed intervention cannot explain the abrupt collapse of share prices in 1987. The Fed's response in 1928 and 1929, as we have shown, was inconsistent—tight in the first half of each year and easy in the second half. Contrary to the conventional interpretation, the rise in the discount rate in August 1929 did not initiate a policy of increased restraint! The boom terminated naturally and was accompanied by a severe crash in the stock market and a serious economic contraction. The allegedly serious macroeconomic consequences of addressing speculation have been exaggerated.

There is no persuasive evidence before World War II that pre-emptive action by the Fed to control speculative booms had serious economic effects. Greenspan's argument that there is "excessive uncertainty" about the economic consequences of terminating speculative booms is without empirical support. Nonintervention characterized the Fed's response to speculative booms in 1984-87 and 1992-2000. Neither Paul Volcker nor Alan Greenspan saw a positive role for the Fed in moderating or terminating speculative booms in the stock market. The increase in the discount rate to 6 percent in September 1987 was not aimed at controlling stock market speculation, though it is conceivable it might have exerted some indeterminate effect. The immediate macroeconomic consequences as distinct from the delayed consequences were relatively minor. The 1994-2000 speculative boom terminated naturally without Fed intervention. There was no crash in share prices. The economic effects, however, were delayed but not serious.

Long speculative booms have distortionary real effects on the economy. Speculative orgies in certain stocks, for example technology stocks in 1994-2000, led to overexpansion and affected the pace of investment in the aftermath. The precipitous decline in the valuations

of Internet companies and their slow recovery illustrates the distributional impact of the adjustment. A speculative run-up in asset prices over a prolonged period also exaggerates the increase in permanent wealth and consumption spending, thereby generating an unsustainable level of income.

We have attempted to demonstrate that there is no historical evidence to support the claim that pre-emptive action by the Fed to contain stock market speculation had serious economic effects during the three pre-World War II speculative booms in 1919, 1926, and 1929. On two occasions the Fed successfully terminated the boom without a stock market upheaval or contractionary economic consequences. During the third the Fed was pursuing a monetary policy of easing, not restraint in the months preceding the stock market crash in October 1929! The Greenspan conjecture that the uncertainty of the macroeconomic consequences of Fed intervention was “excessive” has no historical support in U.S. experience. His conjecture, though indefensible on historical grounds, may have support on the basis of purely theoretical considerations.

Since serious economic consequences of what may follow from bursting a speculative bubble are the single most persuasive deterrent to intervention, the case for nonintervention by the Fed is severely weakened.

The deflation of share prices following a peak for the 16 share price episodes displayed an extremely wide variance, from a low of 1.1 percent in 1953 to a high of 85 percent in 1929-32, but we were not able to separate the effects of the termination of the boom from the longer run effects induced by a prolonged contraction of economic activity. Stock prices regained one-half of what they had lost through April 1930. Stock prices had fallen 35.6 percent between September and November 1929. Between November 1929 and April 1930 they increased almost 25 percent, cutting the loss between September 1929 and April 1931 to 18.7 percent. Thereafter they declined continuously until June 1932, a decrease of over 80 percent.

Share prices fell 28 percent between December 1999 and February 2000 but regained more than what had been lost in the following month, reaching a new peak in August 2000. Thereafter the decline was continuous through February 2003, reaching 43 percent. In both 1929-33 and 2000-03, share prices regained 30 percent or more of

what had been lost, but after six months share prices began an extended decline over the next two to three years.

Now we can turn to the normative question: Should the Fed intervene to curb stock market speculation? The question can be partially answered by reviewing how the Fed responded in the past to what was perceived to be unsustainable speculation in the stock market and what effect its actions had on stock prices and output and employment. The historical record for the U.S. since 1918 has revealed that the Fed was successful in terminating perceived excessive speculation in 1919 and 1926, and probably in 1956 and 1968, without immediate harmful residual effects on economic activity. The collapse of prices in June 1920 cannot be attributed to the Fed's restrictive action in the previous November. And the seemingly restrictive measure of raising the discount rate in August 1929 was more than offset by the simultaneous reduction in the rate at which the Fed was prepared to purchase bankers' acceptances. In the months immediately preceding the stock market crash, Fed policy was one of ease, not restraint!

There is simply no historical evidence to support Greenspan's claim that there is excessive uncertainty about the economic effects of intervention. If there is excessive uncertainty, it cannot be deduced from the historical evidence. Although the evidence may be lacking that the Fed's restrictive measures to curb stock market speculation resulted in a serious contraction in economic activity we do know that restrictive monetary policy, if persistent, can terminate an inflationary boom with serious output and employment effects. The most recent example is the successful Volcker policy of terminating an inflationary boom, which was accompanied by a serious economic contraction, more serious than at any time since the Great Depression. But the seriousness of the consequences depended on the timing of the intervention: the longer the delay, the more serious the effects. Greenspan was successful in achieving price stability without harmful economic consequences.

Greenspan's reluctance to move forcefully to terminate the alleged bubble of 1994-2000 was probably due more to ideological considerations, that is, a commitment to market discipline apparent in his unwillingness to pit his judgment against that of the market.

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