

Bubbles in Asset Prices

by

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The severe world-wide recession of 2008-09 has focused attention on the role of asset-price bubbles in exacerbating economic instability in capitalist economies. The boom in house prices in the United States from 2000 through 2006 is a case in point. According to the Case-Shiller 20-city index, the inflation-adjusted price of a median-sized house in the United States doubled over the period 2000-2006. House prices rose far more than the underlying fundamental drivers of home prices such as family income and rents. The bursting of the bubble was followed by a sharp rise in foreclosures and massive declines in the value of mortgage-backed securities and a variety of derivatives tied to these securities. The collapse of these prices led to the weakening, and in some cases the collapse, of major financial institutions around the world and contributed to one of the most serious recessions in the United States in the entire post-World War II period.

The housing bubble is the most recent example of the asset-price bubbles that have often afflicted capitalist economies. Sharp increases in asset prices have frequently led to crashes and subsequent sharp declines in economic activity. Many economists have argued, controversially, that central banks should adjust their policy instruments to account not only for their forecasts of future inflation and the gap between actual and potential output, but for asset prices as well.¹

This paper will address three topics. First, I will describe what economists mean when they use the term “bubble,” and I will contrast the behavioral-finance view of asset pricing with the efficient-market paradigm in an attempt to understand why bubbles might persist and why they may not be arbitrated away.

Second, I will review some major historical examples of asset-price bubbles as well as the (minority) view that they may not have been bubbles at all. I will also examine the corresponding changes in real economic activity that have followed the bursting of such bubbles.

Finally, I will examine the most hotly-debated aspect of any discussion of asset-price bubbles: what, if anything, should policy makers do about them? Should they react to sharp increases in asset prices that they deem to be unrelated to “fundamentals”? Should they take the view that they know more than the market does? Should they recognize that asset-price bubbles are a periodic flaw of capitalism and conduct their policies so as to temper any developing excesses? Or should they focus solely on their primary targets of inflation and real economic activity? In my discussion I will pay particular attention to bubbles that are associated with sharp increases in credit and leverage.

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¹ See, for example, the *Geneva Report on the World Economy*, No. 2 by Cecchetti, et. al (2000)

The Efficient Market Hypothesis

Throughout most of the second half of the twentieth century, the efficient market hypothesis (EMH) was broadly accepted by financial economists. Indeed, during the 1970s, Michael Jensen (1978) called EMH “the best established empirical fact in economics.” While the hypothesis was never fully accepted by practicing security analysts, even professional portfolio managers recognized how difficult it was to outperform the broad stock-market indexes. As a result, the investment strategy of indexing – simply buying and holding all the stocks in the entire market in proportion to their capitalization weighting—became increasingly popular, especially among institutional portfolio managers.

According to EMH, when information arises about an individual stock or about the stock market as a whole, investors act on that information without delay, causing the price of each stock to adjust so that it reflects completely all that is known about its future prospects. Thus, one stock is likely to be just as good a buy as another (adjusted for risk), and it will be pointless to attempt to buy “undervalued” stocks or to sell “overvalued” ones in forming an actively-managed equity portfolio that will outperform the market on a risk-adjusted basis.

Similarly, any information that is contained in the past history of stock prices will be fully reflected in current prices. In an efficient market, no arbitrage opportunities are possible. While some investors may not be informed about the news and other investors may not behave rationally, EMH holds that there are a sufficient number of well-financed, rational, profit-seeking traders in the market to assure that no profitable arbitrage opportunities remain unexploited. Stock prices will change when new information arises, but the generation of true “news” is unpredictable. Hence, stock price changes will be unpredictable and will develop over time much like a random walk. Moreover, stock prices at any time will reflect the best estimates possible regarding the future prospects of each company. Hence, stock markets will give correct signals to capital markets to guide the efficient allocation of capital.

The efficient-market hypothesis does not assert that the current tableau of stock prices will prove to have been correct when viewed in hindsight. Stock markets can and do make mistakes. Even in efficient markets we must recognize that today’s stock price can only be estimated by calculating the discounted present value of all cash flows expected in the future. Such flows can only be estimated with considerable imprecision. Thus, many believers in market efficiency may not accept the proposition that bubbles can exist, even when subsequent events demonstrate quite clearly that market prices turned out to be “incorrect” or “mispriced” by a substantial margin.

The Role of Financial Markets in Capitalist Economies

Efficiently-priced financial markets are essential for the smooth functioning of capitalist economies. Firms need permanent financing for their long-run real investment needs. Most providers of capital funds have financial investment horizons that are considerably shorter. Individuals make financial investments for limited time periods, expecting to use the funds for large future expenditures or to provide resources during retirement. Similarly, institutions tend to have limited investment horizons. For example, pension funds face a set of firm payment obligations at specific dates in the future. Securities markets can satisfy the objectives of both the users and

providers of financial capital by what William Baumol (1965) has called “an act of magic.” When firms issue either long-term bonds or permanent equity capital, these securities trade in the capital markets and provide liquidity for the buyers. Thus, common stocks can provide permanent capital for businesses while at the same time providing financial investment instruments that can be converted into cash on short notice. By imparting a measure of liquidity to claims against long-term investments, markets can lower the cost to the firm of acquiring capital funds. If stock markets are not functioning efficiently, however, they will neither be an effective medium for financial investment nor an attractive source of capital.

The financial markets also play an essential role in allocating a nation’s capital resources among competing uses. The efficiency of these markets thus influences the efficiency and growth potential of the economy itself. But stock markets must provide accurate signals to firms and to potential investors. The market will be an efficient allocator only if stocks are valued properly as the present value of the expected future earnings of companies, as determined by the investment opportunities available to them.

Stock prices should be more favorable for well-run firms with very attractive real investment opportunities, making it easier for them to raise equity capital. Alternatively, firms that have been poorly run should be punished by the stock market. This will facilitate the development of a market for corporate control. If the stock market correctly disciplines the firms that are inefficient and unprofitable, opportunities will arise for more competent managers to make a tender offer for the firm at its low stock price and take over its assets and operations. Such corporate takeovers can not only benefit the new management but also lead to a more optimal allocation of the economy’s resources. In sum, efficiently priced stocks are critical if markets are to be effective resource allocators. The existence of bubbles, on the other hand, will interfere with the ability of the capital markets to help ensure an efficient allocation of an economy’s resources.

Bubbles in Asset Prices

An asset-price bubble—if one exists—represents a mispricing of asset values relative to prices that would be consistent with the existence of efficient markets. Bubbles are typically associated with substantial and long-lasting divergences of asset prices from valuations that would be determined from the rational expectation of the present value of the cash flows from the asset (or assets). Bubbles are therefore associated with some form of irrationality.

There are discussions in the literature of so-called “rational bubbles” that result from the possibility that expectations of rising prices can be self-fulfilling.² But such bubbles require the unrealistic assumption that there is no upper limit to the size of the bubble. In contrast, the bubbles considered here rest on the possibility of heterogeneous beliefs and the existence of market participants who can be considered behavioral traders. The insights of behavioral finance are therefore helpful in informing our understanding of how these bubbles might arise and how they propagate.

² See, for example, Blanchard and Watson (1982) and Blanchard (1979).

Bubbles often start with some exogenous factor that can be interpreted rationally as presenting large future prospects for profit. In England in the early 1700s, it was the formation of the promising new corporation, the South Sea Company, and the rise of its stock price. The wave of new companies that followed was expected to provide profitable investment outlets for the savings of individuals. In the United States during the late 1990s, it was the promise of the Internet, which was expected to revolutionize the way consumers obtained information and purchased goods and services. The generation of sharply rising asset prices that followed, however, seemed to have more to do with the behavioral biases emphasized by scholars such as Kahneman and Shiller.

Tversky and Kahneman (1974) argued that people forming subjective judgments have a tendency to disregard base probabilities and make judgments solely in terms of observed similarities to familiar patterns. Thus, investors may expect past price increases to continue even if they know from past experience that all skyrocketing stock markets eventually succumb to the laws of gravity. Investors also tend to enjoy the self-esteem that comes from having invested early in some “new era” phenomenon, and they are overconfident of their ability to predict the future.

Shiller (2000) emphasized the role of “feedback loops” in the propagation of bubbles. Price increases for an asset lead to greater investor enthusiasm, which then leads to increased demand for the asset and therefore to further price increases. The very observation of past price increases alters the subjective judgment of investors and reinforces their belief that the price increases will continue. The news media play a prominent role in increasing the optimism of investors. The media are, in Shiller’s view, “generators of attention cascades.” One news story begets another, and the price increases themselves (whether of common stocks or single-family houses) appear to justify the superficially-plausible story that started the rise in the price of the asset (s). According to Shiller, bubbles are inherently a social phenomenon. A feedback mechanism generates continuing rises in prices and an interaction back to the conventional wisdom that started the process. The bubble itself becomes the main topic of social conversation, and stories abound about certain individuals who have become wealthy from the price increases. As the economic historian Charles Kindleberger has stated, “There is nothing so disturbing to one’s well-being and judgment as to see a friend get rich.”³

The question naturally arises why the arbitrage mechanism of EMH doesn’t prick the bubble as it continues to inflate. Enormous profit opportunities were certainly achievable during the Internet bubble for speculators who correctly judged that the prices of many technology stocks were “too high.” But the kind of arbitrage that would have been necessary was sometimes difficult to effect and, in any event, was very risky. There appear to be considerable “limits to arbitrage.”⁴ For example, in one celebrated case during the Internet bubble, the market price of Palm Pilot stock (which was 95 percent owned by the company 3Com) implied a total capitalization considerably greater than that of its parent, suggesting that the rest of 3Com’s business had a negative value. But the arbitrage (sell Palm stock short and buy 3Com stock) could not be achieved because it was impossible to borrow Palm Pilot stock to accomplish the short sale.

³ See Kindleberger (1978).

⁴ See, for example, Shleifer and Vishny (1992) and DeLong, Shleifer, Summers and Waldmann (1990).

Arbitrage is also risky; one never can be sure when the bubble will burst. The mantra of hedge fund managers (the natural arbitragers) in the United States was “markets can remain irrational much longer than we can remain solvent.” Moreover, some arbitragers may recognize that a bubble exists but are unable to synchronize their strategies to take advantage of it.⁵ They might prefer to ride the bubble for as long as possible. Indeed, one empirical study by Brunnermeier and Nagel (2004) found that rather than shorting Internet stocks, hedge funds were actually buying them during the late 1990s. Hedge funds were embarking on a strategy of anticipating that the momentum of the price increases would continue and thus were contributing to the mispricing rather than trading against it.

Some Putative Bubbles

Here we describe a sample of some of the classic bubbles that are generally believed to illustrate the occasional irrationality of the speculative markets that are an integral part of capitalist market systems.

The Tulip-Bulb Craze

The classic historical bubble had nothing to do with common stocks or real estate; it was a speculative mania involving tulip bulbs.⁶ While tulip bulbs had been popular in Holland for years, the frenzy erupted when some bulbs became infected with a nonfatal virus that produced rather bizarre contrasting colored stripes. The Dutch valued these infected bulbs highly, and the more bizarre the bulb, the greater was the price it fetched in the market. As prices rose, people began to view tulip bulbs as sound investments, and prices rose even further, inducing more and more investors to enter the market. Charles Mackay (1841), who chronicled the events in *Extraordinary Popular Delusions and the Madness of Crowds*, noted that the ordinary industry of the country was dropped in favor of speculation in tulip bulbs: “Nobles, citizens, farmers, mechanics, seamen, footmen, maid-servants, even chimney sweeps and old clothes women dabbled in tulips.” The feedback mechanism was in full swing. Everyone imagined that the passion for tulips would last forever and that buyers from all over the world would come to Holland and pay whatever prices were asked for them.

At the height of the bubble, in early 1637, a single rare bulb sold for an amount equivalent to the price of a nobleman’s castle. Eventually, as happens in all speculative crazes, prices got so high that some people decided they would be prudent and sell their bulbs. Soon others followed suit. The process continued in a negative feedback loop; bulb deflation grew at an increasingly rapid pace, and in no time at all, panic reigned. Most bulbs became almost worthless, selling for no more than the price of a common onion. According to Mackay, the episode was followed by a severe decline in economic activity from which it took many years to recover.

The popular account of the bubble is not without controversy, however. The economist Peter Garber (1990, 2000) has suggested that tulip-bulb pricing in seventeenth-century Holland was far more rational than it was commonly believed. The *Semper Augustus*, for example, was a

⁵ See Abreu and Brunnermeier (2003).

⁶ The following description of historical bubbles follows the discussion of bubbles in my book (2007), *A Random Walk Down Wall Street*.

particularly rare and beautiful bulb and, as Garber reveals, was valued greatly even in the years before the tulip mania. Moreover, Garber's research indicates that rare individual bulbs commanded high prices even after the general collapse of bulb prices, albeit at levels that were only a fraction of their peak prices. But Garber can find no rational explanation for such phenomena as a twenty-fold increase in tulip-bulb prices during January of 1637, followed by an even larger decline in prices in February.

The South Sea Bubble

Our next example took place in England three-quarters of a century later. Established in 1711, the South Sea Company helped restore faith in the government's credit worthiness by purchasing £10 million of government bonds. As a reward, the company was given a monopoly over all trade to the South Seas. There was great enthusiasm over the profits that might be made from trade with the New World, especially after the war between England and Spain ended. As word spread among investors about the fortunes to be made, the stock of the South Sea Company soared almost ten-fold. The speculative craze was in full bloom.

While the bubble started with one particular stock, it quickly spread to other enterprises. Investors looked for other new ventures where they could get in on the ground floor. Just as speculators today search for the next Google, so in England in the 1700s they looked for the next South Sea Company. Promoters obliged by organizing and bringing to the market a flood of new issues to meet the insatiable craving for investment.

As the days passed, new financing proposals ranged from ingenious to absurd – from importing a large number of jackasses from Spain to a new offering of a machine-gun company that promised to revolutionize the art of war. The machines could discharge both round bullets (to be used against Christians) and square ones (to be used against infidels). The prize, however, must surely go to the promoter who started “a company for carrying on the undertaking of great advantage, but nobody to know what it is.”

As in all speculative manias, eventually the bubble popped, and investors suffered massive losses in most of the new issues of the period. Big losers in the South Sea Bubble included Isaac Newton, who exclaimed, “I can calculate the motions of heavenly bodies, but not the madness of people.”



Source: Larry Neal, *The Rise of Financial Capitalism* (Cambridge University Press, 1990).

The U.S. Stock Market Bubble and Crash, 1928-1932

Turning to more modern markets, the great bull market in the United States that collapsed in 1929 is generally regarded as one of the biggest stock-market bubbles of all time. Beginning in 1928, stock-market speculation became a national pastime. From early March 1928 through early September 1929, the market's percentage increase equaled that of the entire period from 1923 through early 1928. The price increases for the major industrial corporations sometimes reached 10 or 15 percent per day. A future of endless prosperity was taken for granted. The speculative spirit was at least as widespread as in the previous crazes and was certainly unrivaled in its intensity. More important, stock-market speculation was central to the culture. John Brooks, in *Once in Golconda*,⁷ recounted the remarks of a British correspondent newly arrived in New York: "You could talk about Prohibition, or Hemingway, or air conditioning, or music, or horses, but in the end you had to talk about the stock market, and that was when the conversation became serious."

Unfortunately, there were hundreds of smiling operators only too glad to help keep the speculative spirit alive. Manipulation on the stock exchange set a new record for unscrupulousness. On September 3, 1929, the market averages reached a peak that was not to be surpassed for a quarter of a century. The "endless chain of prosperity" was soon to break. General business activity had already turned down months before. Prices drifted for the next day, and on the following day, September 5, the market suffered a sharp decline known as the "Babson Break," named in honor of Roger Babson, a financial adviser from Wellesley, Massachusetts. At a financial luncheon that day, Babson repeated his prediction that sooner or later "a crash is coming." At 2 o'clock, when Babson's words were quoted on the Dow-Jones news tape, the market went into a nosedive. It was a

⁷ Golconda, now in ruins, was a city in India. According to legend, everyone who passed through it became rich.

prophetic episode, and after the Babson Break, the possibility of a crash, which was entirely unthinkable a month before, suddenly became a common subject for discussion. Just as the amplification feedback loop made the bubble grow, the downward feedback loop was equally powerful.

Confidence faltered. September had many more bad than good days. At times the market fell sharply. Bankers and government officials assured the country that there was no cause for concern. Professor Irving Fisher of Yale, one of the leading economists of the time, offered his soon-to-be immortal opinion that stocks had reached what looked like a “permanently high plateau.”

By Monday, October 21, the stage was set for a classic stock-market break. The declines in stock prices had led to calls for more collateral from margin customers, who had purchased stocks with borrowed money. Unable or unwilling to meet the calls, these customers were forced to sell their holdings. This depressed prices and led to more margin calls and finally to a self-sustaining selling wave.

The volume of sales on the exchange soared to a new record on October 21, and prices declined sharply. The indomitable Fisher dismissed the decline as a “shaking out of the lunatic fringe that attempts to speculate on margin.” He went on to say that prices of stocks during the boom had not caught up with their real value and would go higher. Among other things, the professor believed that the market had not yet reflected the beneficent effects of Prohibition, which had made the American worker “more productive and dependable.”

On October 24, later called “Black Thursday,” the market volume more than doubled its record earlier in the week, and many stocks dropped 40 or 50 points (as much as 25 percent) during a couple of hours. The next day, President Herbert Hoover offered his famous diagnosis: “The fundamental business of the country...is on a sound and prosperous basis.”

Tuesday, October 29, 1929, was among the most catastrophic days in the history of the New York Stock Exchange. Only October 19 and 20, 1987, rivaled in intensity the panic on the exchange. Compared with its high price one month earlier, even blue-chip General Electric had lost 60 percent of its value. By the time the decline ended in 1932, GE had lost 98 percent of its market value. The stock-market crash was followed by the most devastating depression in the history of the country.

But the view that the stock-market boom of the late 1920s was a bubble is not universally shared. Harold Bierman Jr., for example, in his book *The Great Myths of 1929*, has suggested that, without perfect foresight, stocks were not obviously overpriced in 1929, because it appeared that the economy would continue to prosper. After all, very intelligent people, such as Irving Fisher and John Maynard Keynes, believed that stocks were reasonably priced. Bierman goes on to argue that the extreme optimism undergirding the stock market might even have been justified had it not been for inappropriate monetary policies. The crash itself, in his view, was precipitated by the Federal Reserve Board’s policy of raising interest rates to punish speculators. There are at least grains of truth in Bierman’s arguments, and economists today often blame the severity of the 1930s depression on the Federal Reserve for allowing the money supply to decline sharply. Nevertheless, history teaches us that very sharp increases in stock prices are seldom followed by gradual return to

relative price stability. Even if prosperity had continued into the 1930s, stock prices could never have sustained their advance of the late 1920s.

My own view is that the anomalous behavior of closed-end investment company shares provides clinching evidence of wide-scale stock-market irrationality during the 1920s. The “fundamental” value of these closed-end funds consists of the market value of the securities they hold. In most periods since 1930, these funds have sold at discounts of about 20 percent from their asset values. From January to August 1929, however, the typical closed-end fund sold at a premium over net asset value of 50 percent. Moreover, the premiums for some of the best known funds, such as the Goldman Sachs Trading Corporation and Tri-Continental Corporation, sold at up to 2 ½ times the value of their underlying assets. Clearly, it was irrational speculative enthusiasm that drove the prices of these funds far above the value at which their individual security holdings could be purchased.

The Japanese Real Estate and Stock Market Bubble of the 1980s

In Japan during the 1980s, all asset prices rose rapidly. The Nikkei stock market index soared close to the 40,000 level, having risen almost 500 percent for the decade. At their peak in December 1989, Japanese stocks had a total market value of about \$4 trillion, almost 1.5 times the value of all U.S. equities and close to 45 percent of the world’s equity-market capitalization.⁸ Japanese stocks sold at more than 60 times earnings, almost 5 times book value, and more than 200 times dividends. In contrast, U.S. stocks sold at about 15 times earnings, and London equities sold at 12 times earnings. The high prices of Japanese stocks were even more dramatic on a company-by-company comparison. The value of NTT Corporation, Japan’s telephone giant, which was privatized during the boom, exceeded the value of AT&T, IBM, Exxon, General Electric, and General Motors put together. Dai Ichi Kangyo Bank sold at 56 times earning, whereas an equivalent U.S. bank, Citicorp, sold at 5.6 times earnings.

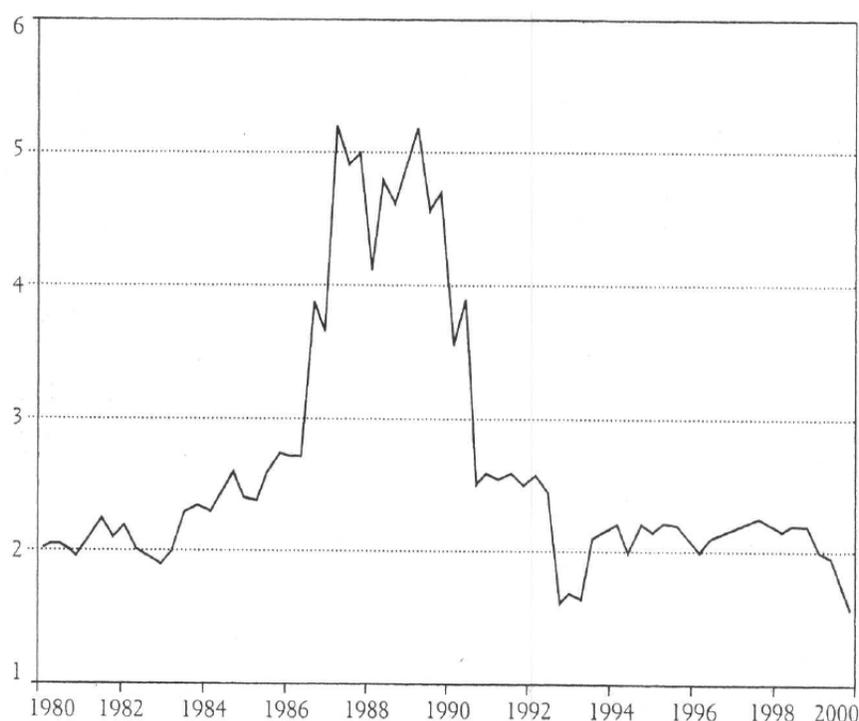
The boom in real estate prices was even more dramatic. From 1955 to 1990, the value of Japanese real estate increased more than 75 times. By 1990, the total value of all Japanese property was estimated at nearly \$20 trillion – equal to more than 20 percent of the entire world’s wealth and about double the total value of the world’s stock markets. While the United States was five times bigger than Japan in terms of physical acreage, Japan’s property in 1990 was appraised to be worth five times as much as all U.S. property. Theoretically, the Japanese could have bought all the property in America by selling off metropolitan Tokyo. Just selling the Imperial Palace and its grounds at their appraised value would have raised enough cash to buy all of California.

As in the previous bubbles we have considered, the inflation of prices was a social phenomenon. Playing the stock market became a national preoccupation. It is said that in Britain there is a betting shop (or turf accountant) on every corner. In Japan, there was a stockbroker on every corner. The stock market was an integral part of the Japanese culture.

⁸ The Japanese system of cross ownership undoubtedly makes the total capitalization of the market unrealistically high. To the extent that company A owns half the stock of company B and vice versa, there will be considerable double counting. Moreover, the capitalization of the stock market also reflected the inflated value of the real estate holdings of Japanese companies.

The exhibit below shows how the bubble represented a change in valuation metrics (illustrated by the price to book value ratios), rather than price increases generated by the fundamental growth in the value of the assets (or earnings) of Japanese corporations.

The Japanese Stock-Market Bubble
Japanese Stock Prices Relative to Book Values, 1980-2000



Source: Morgan Stanley Research and author's estimates.

We will consider below the issue of what response, if any, the monetary authorities should take if they recognize that a bubble is inflating. The experience of Japan is therefore relevant. The Japanese monetary authorities did believe that a dangerous bubble existed, and they decided to take deliberate action. The Bank of Japan judged that easy credit and a borrowing frenzy were underwriting an unsustainable rise in land and stock prices. And so the central bank restricted credit and engineered a rise in interest rates. The hope was that further rises in property prices would be choked off and the stock market might be eased downward.

Interest rates, which had already been going up during 1989, rose sharply in 1990. But the stock market was not eased down; instead, it collapsed. It is not easy to let the air out of a bubble gradually. The fall was almost as extreme as the U.S. stock-market crash of 1929 to 1932. The Japanese (Nikkei) stock-market index reached a high of almost 40,000 on the last trading day of the 1980s. By mid-August 1992, the index had declined to 14,309, a drop of about 63 percent. In contrast, the Dow Jones Industrial Average fell 66 percent from December 1929 to its low in the summer of 1932 (although the decline was over 80 percent from the September 1929 level). As the preceding chart shows, the decline reflected a return of price to book value relationships to those that were typical in the early 1980s.

The collapse of the bubble in Japan had profound effects on the financial system and on the Japanese economy. Japanese commercial banks, life insurance companies, and even nonfinancial corporations had large stock and real estate holdings. The bursting of the bubble weakened the entire financial system and was followed by a severe recession that lasted into the next century.

The Internet Bubble

The biggest stock-market bubble of all time burst in March 2000. During the next two and one-half years, over \$7 trillion of market value evaporated. Most bubbles have been associated with some new technology or with some new business opportunity (as when profitable new trade opportunities sparked the South Sea Bubble). The Internet was associated with both: it represented a new technology, and it offered new business opportunities that promised to revolutionize the way we live. The promise of the Internet generated both one of the largest creations and the largest destructions of wealth of all time.

There was such fascination with the Internet that companies that changed their names to include some Web orientation (such as .com or .net) doubled in price overnight. One new offering, VA Linux, rose over 730 percent from its issue price in its first day of trading. (By 2002, the stock traded at less than a dollar a share.) Investors were willing to throw their money at almost anything that claimed an Internet link. The volume of new issues during the period was unprecedented. And, as was the case at the time of the South Sea Bubble, many companies that received financing were absurd. These ranged from a company called Digiscents (that offered a computer peripheral that would make Web sites smell) to ezboard.com, which produced Internet pages called toilet paper to help people “get the poop” on the Internet community. All became dot-com disasters.⁹

As in other bubbles, the media contributed to the sense of excitement. Across the world, health clubs, airports, bars, and restaurants were permanently tuned into financial news channels. While the bubble undoubtedly encouraged a large number of useful new technology start ups, it also encouraged considerable misallocation of resources. Most of the new companies were not viable; even those that were engaged in considerable overinvestment. Enough long-distance fiber optic cable was laid to circle the earth 1500 times. About one trillion dollars was poured into telecom investments during the bubble. The dot-com bust also led to a recession in economic activity, albeit one that was relatively short and mild.

The Great Real Estate and Leverage Bubble of 2007

The last bubble we will consider is the recent real estate and leverage bubble that originated in the United States. The bubble was associated with a fundamental change in the way the U.S. banking system operated.

Under the old system, which might be called the originate-and-hold system of banking, banking institutions would make mortgage loans to individual home-owners and then keep those loans as assets on their books. During the 2000s, that system changed to what might be called an

⁹ It is important to note that even when a new industry is wildly successful, most individual companies are likely to fail. It was true of the automobile and computer industries in the United States. Similarly, most Internet service companies failed.

originate-and-distribute system of making mortgage loans (as well as other kinds of loans). Banks would continue to originate mortgage loans but would hold them for only a brief period of time, after which they would be sold to an investment banking institution, which would package the mortgages into mortgage-backed securities. The mortgage-backed securities themselves would be sliced into various “tranches.” The first (or senior) tranches would have first claims on principal and interest payments and the lower tranches would have only residual claims. Through this system, by a kind of alchemy, the investment banks would produce very highly-rated securities on the senior tranches, even though the underlying mortgages might be of relatively low quality (so-called sub-prime mortgage loans). The system led to a deterioration in lending standards. If the originating institution was only holding the mortgage for a few days, the lending officers were far less careful to ensure the credit worthiness of the borrower of the mortgage debt instrument over the long term. As originators, banks were joined by other lenders, especially mortgage-finance companies.

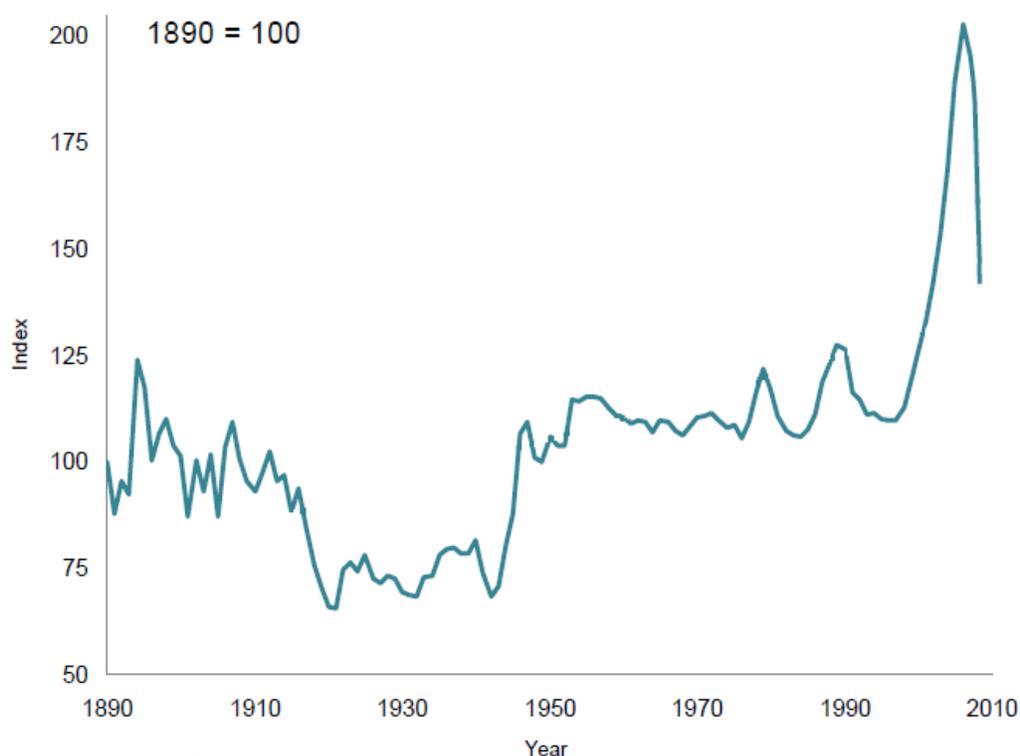
At the same time that the private sector had devised ways to securitize mortgages, and thus bring a tremendous amount of new capital into the industry, the federal government was contributing as well. Government-sponsored enterprises (GSEs) such as the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac) also securitized home loans and encouraged originators to make credit available to borrowers with less than perfect credit. Since the bonds of the GSEs had implicit government backing, they could continue to sell their mortgage-backed debt at relatively low interest rates.

The result of all of these changes was to make vast additional sums of money available for the purchase of housing. In addition, homeowners who already had first mortgages were encouraged to increase the size of their mortgages or to take out second mortgages on their houses, thus increasing the amount of debt carried by consumers. It was said that consumers in the United States used their homes as an ATM machine. The investment banks and commercial banks themselves decided to eat their own cooking, holding considerable amounts of mortgaged-backed securities they had underwritten and increasing their leverage ratios. Investment banks, life insurance companies, and even commercial banks tended to carry a far lower equity cushion than in previous years with a correspondingly large increase in debt. Moreover, a substantial share of the debt was short-term rather than long-term, subjecting these institutions to the possibility that they would be unable to roll over their indebtedness during a time of crisis.

The lowered lending standards and the vast increase in the amount of funds available for mortgages led to an enormous bubble in the prices of single family houses. As the chart below, based on the Case-Shiller home price index, indicates, the inflation-adjusted price of a typical single family home was approximately the same in 1999 as it was in 1899. Between 2000 and 2006, however, inflation-adjusted home prices doubled.¹⁰

¹⁰ While the Case-Shiller index may have exaggerated the volatility of house prices, other data provide estimates that are qualitatively the same.

The Housing Bubble in the United States



Source: Case-Shiller Home Price Index

When the bubble burst, house prices began to plummet. By the middle of 2009, house prices had declined by over one-third from their peak. As prices declined and many homeowners found that their houses were worth less than the amount of the money owed on their mortgage, defaults began to increase, and some homeowners simply returned the keys to their houses to the lenders and stopped servicing their loans. As defaults increased, the value of the vast amounts of mortgage-backed securities declined precipitously. Since these securities were held by highly leveraged institutions (which were holding long-term assets and financing themselves with short-term liabilities), a major panic ensued. With the exception of the U.S. Treasury securities market, all credit markets froze up and institutions became unable to roll over their short-term indebtedness. Only because of the provision of credit by the U.S. central bank was a collapse of the financial system averted. And these mortgage-backed securities were sold throughout the world, thus weakening banking systems, not only in the United States, but in Europe, Asia, and Australia as well. A severe world-wide recession followed and unemployment rates soared, especially in the United States.

Bubbles and Economic Activity

Our survey of historical bubbles makes clear that the bursting of bubbles has invariably been followed by severe disruptions in real economic activity. The fallout from asset-price bubbles has not

been confined to speculators. Bubbles are particularly dangerous when they are associated with a credit boom and widespread increases in leverage for both consumers and financial institutions.

The experience of the United States during the early 2000s provides a dramatic illustration. Increased demand for housing raised home prices, which, in turn, encouraged further mortgage lending, which led to further price increases in a continuing positive feedback loop. The cycle of increased leverage involved loosening credit standards and even further increases in leverage. At the end of the process, individuals and institutions alike became dangerously vulnerable.

When the bubble bursts, the feedback loop goes into reverse. Prices decline and individuals find not only that their wealth has declined but that in many cases their mortgage indebtedness exceeds the value of their houses. Loans then go sour and consumers reduce their spending. Overly exposed financial institutions begin a deleveraging process. The attendant tightening of credit weakens economic activity further, and the outcome of the negative feedback loop is a severe recession. Credit boom bubbles are the ones that pose the greatest danger to real economic activity.

Should the Monetary Authorities Attempt to Deflate Asset Bubbles?

The history of asset-price bubbles informs us that destabilizing influences in an economy arising from asset-price bubbles can occur with little or no general price inflation. For example, wage and price pressures were absent in the United States during the 1920s and were only moderate in Japan during the 1980s. In both cases, however, the collapse of the bubble ushered in a decade or more of stagnating economic performance. Periodic asset bubbles are one of the costs of capitalism. The natural question that arises is whether bubbles in financial markets and the subsequent dislocations in the real economy can be reduced if central bankers react in advance to prevent asset-price bubbles from inflating.

The answer of former Federal Reserve Chairman Alan Greenspan was that central bankers should not react to asset-price bubbles themselves, but rather should be prepared to take vigorous action to offset the economic dislocations that might follow. The question considered here is whether a more symmetric reaction is called for. Rather than simply addressing the hangover, would it be better to avoid the drunkenness in the first place?

The answer of Cecchetti et. al., authors of the *Geneva Report on the World Economy*, No. 2 (2000), is definitely yes. They believe that a central bank concerned about stabilizing inflation around a specific target level will achieve superior performance by adjusting its policy instruments, not only in response to forecasts of future inflation and the output gap, but to asset prices as well. Financial cycles brought about in part by asset-price movements can and do create real economic imbalances. One way to consider asset prices explicitly is suggested by Lansing (2008). He recommends using the Taylor (1999) framework that explains the conduct of central-bank policy. An augmented Taylor rule would have monetary policy react not only to anticipations of inflation and the output gap, but to asset prices as well. He would explicitly include stock market variables to guide monetary policy.

Similar views have been offered by Borio and Lowe (2002) and by Bordo and Olivier (2002). They stress that asset-price bubbles tend to be associated with overly high investment and a

buildup of debt. Moreover, appreciating asset values raise the value of the collateral that facilitates the accumulation of debt. Therefore, balance sheets may look unrealistically healthy as the appreciated asset values offset the buildup of debt. But when the bubble bursts, the consequence will be a deterioration of net worth and financial distress.

Asset-price bubbles then create distortions in both investment and consumption and ultimately have substantial effects on real output and inflation. The central bank then is advised to raise interest rates when asset prices rise above what are considered “warranted” levels and lower rates when asset-prices fall below those levels. By this kind of augmented “leaning against the wind,” the central bank might be able to reduce the probability of bubbles arising in the first place and contribute to greater economic stability. To be sure, asset-price misalignments are difficult to measure, but so are central bank forecasts of inflation and the output gap. According to this view, there are clearly times when egregious misalignments exist.¹¹ Examples would be the Japanese stock and land prices in 1989, the height of the NASDAQ market in late 1999 and early 2000, and the U.S. real estate market in 2006.

Arguments Against Having the Central Bank React to Perceived Bubbles in Asset Prices

For all the possible arguments in favor of asking the monetary authorities to take preemptive actions against bubbles, there are powerful arguments to suggest a very cautious approach. The major problem is that bubbles are not easy to identify in advance. Indeed, as our survey of bubbles indicated, it is not even certain that they can be identified *ex post*. Even some of the most famous bubbles such as the tulip bulb craze and the 1928-29 United States stock market can be explained by fundamentally justified expectations in the view of some analysts. The extreme difficulty of identifying asset-price bubbles should make monetary policy makers hesitant to take preemptive actions.

But wasn't the technology-Internet stock market bubble easy to identify as it was inflating? Robert Shiller published his book *Irrational Exuberance* in early 2000, just at the peak of the market. True, but the same models that identified a bubble in early 2000 also identified a vastly “overpriced” stock market in 1992, when low dividend yields and high price-earnings multiples suggested that long-run equity returns would be close to zero in the United States.¹² In fact, from 1992 through 2004, annual stock market returns were over 11 percent, well above their historical average. In December of 1996, those same models predicted *negative* long-run equity returns, leading Federal Reserve Chairman Greenspan (1996) to wonder whether the stock market was “irrationally exuberant.”¹³ From the date of the chairman's speech through December 2009, the stock market returned over 7 percent per year, even after withstanding two sharp bear markets. It is only in retrospect that we know that it was during 1999 and early 2000 when stock prices were “too high.”

Randall Kroszner (2003) also questions our ability to identify incipient bubbles. He shows that the boom in stock prices that peaked in March of 2000 looked very similar to a number of stock

¹¹ Of course, by the time such misalignments can be recognized, it may be too late to do anything useful to ameliorate the situation.

¹² See Shiller (2003) and Campbell and Shiller (1998a, 1998b).

¹³ See Greenspan (1996).

price patterns in the past. Some of those previous rising stock markets continued to go up even after their initial advance. Kroszner also points out that a historical pattern of flat prices could be followed by a devastating loss in value. He recounts that the Argentine peso was pegged to the dollar from 1997 to 2002 and therefore its chart pattern was perfectly flat. After January 2002, the peg was removed and the peso depreciated sharply to move the price of the currency close to a value that the market assessed to be fundamentally warranted. In this case, a sharp change in the asset price can represent a restoration toward a more appropriate value, rather than the adjustment from a bubble. Thus, identifying asset-price bubbles from their time series behavior as suggested by Kindleberger (1978) is simply not possible.

It is also difficult for the central bank to distinguish rising asset prices that result from technology shocks from those due to financial shocks. There is a big difference between the collapse of asset prices resulting from a change in economic fundamentals and a crash in prices resulting from a bubble and the negative feedback mechanism described above. The difficulty then in identifying asset-price bubbles *ex ante* should make central bankers extremely cautious about taking preemptive actions. This point has been vigorously argued by Kohn (2006, 2008).

Even if the monetary authorities could identify bubbles, there is a question of how soon preemptive action could be taken. By the time that asset prices rise so much that they appear unduly elevated, other data may already be signaling that monetary policy should be tightened sharply. And given the lags in the operation of monetary policy, it may be highly unlikely that the effects of the action take place in time. Indeed, policy actions reacting to perceived asset-price bubbles could increase the volatility of asset prices rather than reducing them.

It is also important to keep in mind that monetary policy is a very blunt instrument. It cannot be made to operate on the particular asset prices that may be misaligned. Again, the 1999-2000 technology-Internet bubble is instructive to examine. During this period, it was only the high technology stocks that experience proved were overpriced. So called "value" stocks, those with low price earnings multiples and price-to-book value multiples, were, in fact, quite reasonably priced. And after the bubble burst, "value" stocks produced satisfactory positive rates of return, even while many high technology stocks lost 80 or 90 percent of their value. Finally, it is virtually impossible to let the air out of a bubble gradually, as the experience of Japan in the 1990s illustrates. It is easy to imagine circumstances where a monetary authority that tried to prick incipient bubbles might well do more harm than good.

The work of Stock and Watson (2001) makes clear that it is extremely difficult to link current asset prices with future inflation. Even when a relationship is found in a particular sample, that relationship often breaks down in more realistic out-of-sample forecasting tests. Finally, the work of Bernanke and Gertler (2001) shows a number of simulation results indicating that central banks should not respond to movements in asset prices. Bernanke and Gertler argue that reacting to stock prices *instead* of reacting to expectations of inflation and the output gap results in inferior economic performance. Their conclusion is that the changes in asset prices should affect monetary policy *only* to the extent that they affect the central bank's forecasts of inflation.

Selective Central Bank Policies

If broad monetary measures are considered inappropriate instruments to restrain asset-price bubbles, are there selective measures that could usefully be implemented? For example, could margin requirements, the minimum equity that must be put up to finance stock-market purchases, be raised when stock prices appear to be approaching bubble levels? Or could transaction taxes on short-term trading be imposed to restrain speculative purchases?

Clearly, the first problem with such approaches is the aforementioned difficulty in recognizing that a bubble, in fact, exists. But, in addition, there is scant evidence that margin requirements can be altered so as to successfully manipulate stock prices. Research by Schwert (1989) and Hsieh and Miller (1990) suggests that there is no reliable evidence that altering margin requirements is an effective instrument to influence stock prices. The Federal Reserve in the United States has consistently expressed skepticism about the effectiveness of changes in margin requirements as instruments to control stock-price bubbles.

Another selective policy that is sometimes suggested is to impose some form of “Tobin Tax,” i.e., some tax on short-term speculative stock-market transactions. Supporters of such a tax, such as Westerfall (2003, 2006), argue that such a tax could reduce the volatility of stock prices. But such a tax could reduce liquidity, and in some cases, increase volatility. Moreover, in an environment of global capital markets, writers such as Frankel (1996) have questioned how well a reliable enforcement mechanism can be imposed. Such a selective policy might cause more problems than it would solve.

Conclusion

I have argued that asset-price bubbles do, in fact, exist. They are a periodic flaw of capitalist systems. I have suggested, however, that they are virtually impossible to identify *ex ante*. Therefore, monetary authorities are unlikely to have informational advantages over market participants, and an attempt by the monetary authorities to prick incipient bubbles is likely to do more harm than good. It is my view, then, that changes in asset prices should affect monetary policy only to the extent that they affect the central bank’s forecast for inflation and the output gap.

It is important to understand, however, that some asset-price bubbles are particularly dangerous. Bubbles are likely to be costly if they are associated with high leverage, which was certainly the case in the housing price bubble in the United States during the early 2000s. During that episode both individuals and institutions became dangerously overleveraged. Moreover, the institutions that took on an inordinate amount of debt were, in many cases, “too big to fail” and thus they caused systemic risks to the entire financial system. These kinds of bubbles should surely be of concern to the central bank because, ultimately, they engender economic instability. Housing and finance are central to the United States economic system. Moreover, the financial innovations that securitized mortgages and other loans into a complex set of collateralized securities led to very heavy financial losses, not only for U.S. financial institutions, but for financial institutions throughout the world. Very large increases in debt that create risks for the financial system are clearly matters that fall within the traditional concerns of monetary policy.

In my view, preemptive action was required in this particular case. But the failure was less one of monetary policy in general and more one of adequate regulation. Financial institutions, which pose systemic risks to the economy, were allowed to take on leverage ratios far beyond those that were warranted. The failure then was not in letting a bubble inflate, but rather in inadequate regulation that allowed both financial institutions and individual home buyers to take on undue risk. We need to rethink the way in which capital requirements are administered, and we may need to supplement them with minimum liquidity standards. Similarly, there was a failure to monitor the lending standards that allowed many individual homeowners to take on exceptional risk as their consumption expenditures surged. The solution is one of better regulation, not of having the central bank attempt to influence asset prices themselves.

Monetary policy, therefore, should not react directly to asset price developments, but should clearly take into consideration all the consequences of these developments for inflation, aggregate demand, and the fragility of the entire financial system. Asset prices and their effects on the balance sheets of individuals and institutions may well give the central bank incremental information about the macroeconomic goals of monetary policy. On that proposition, I believe, most analysts would agree.

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