The Role of Finance in the Investment Bust of 2001

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A recurring topic of debate among economists and finance experts is the role of financial markets in cycles of boom and bust in the real economy. This discussion has flared up once again in the wake of the recession of 2001. The performance of the U.S economy in the 1990s was remarkable, and so was the performance of the stock market. Starting in spring of 2000, both the stock market and real economic activity weakened considerably. In the real economy, we observed a sharp drop-off in private business fixed investment. In the financial sector, we witnessed the stock market delivering disappointing returns for two consecutive years. The number of initial public offerings (IPOs) fell dramatically, and the market for venture capital dried up. In fact, given that the financial indicators turned ahead of real investment, there is a prima facie case that financial stringency contributed to the decline in physical investment spending. Of course, the financial environment does not come out of the blue; weakening prospects of the tech companies had a lot to do with the financial stringency they faced starting in early 2000.

Real private nonresidential investment fell by 9.2 percent from its peak level in 2000 Q4 to 2001 Q4. To put this decline in perspective, from the quarter in which investment peaked to the quarter in which it hit bottom, the decline connected to the 1991-92 recession was 7.3 percent. However, the recessions of 1948-49, 1957-58, 1973-75 and 1981-82 all saw declines of 12 percent or more. Thus the investment bust of 2001 was not extreme in the context of U.S. business cycle experience.

Before proceeding, I want to emphasize that the views I express here are mine and do not necessarily reflect official positions of the Federal Reserve System. I thank my colleagues at the Federal Reserve Bank of St. Louis, especially Frank Schmid, for their comments, but I retain full responsibility for errors.

The link between the financial sector and the real economy is currently most visible in the telecommunications industry. From December 1990 through March 2000, the Nasdaq Telecommunications Index increased by more than 816 percent, compared with an increase of 317 percent in the Wilshire 5000 Stock Market Index. Then, in April 2000, the Nasdaq Telecommunications Index began a steep decline in which it shed about 75 percent by the end of January 2002. By comparison, the Wilshire 5000 Price Index lost a much smaller 26 percent of its value over the same time period.

The boom in telecommunications stock prices reflected optimistic judgments about the industry, and helped to finance its expansion. Between 1990 and 2000, private fixed investment in communications equipment as a share of GDP increased by 52 percent, or 41 basis points. In comparison, during the prior 30 years the share of investment in telecom equipment in GDP grew by only 33 basis points.

Judgments about telecom turned out to be excessively optimistic. During the last 12 months, eight major telecommunications services providers went bankrupt; as a measure of the scale of these bankruptcies, observe that the total pre-bankruptcy book value of assets of these companies amounted to about $55 billion. It is noteworthy that all eight

of these corporations went public between 1990 and 2000, a time when the telecom sector enjoyed spectacular growth rates.

As the telecom industry expanded in the 1990s, the stocks of telecom services providers and equipment makers were in high demand. The parallel performance of the telecom industry in the real economy and in the stock market raises a couple of questions about the interaction between financial markets and the real sector. To what extent were the financial markets driving the boom and subsequent bust in the telecom industry? What does the interaction between the financial markets and the real economy imply for the efficiency of resource allocation?

I'll begin by reviewing what seems, at least in retrospect, to be excessive variance in stock market values. Then, I'll discuss the link between stock market valuation, corporate finance, and resource allocation. I'll make a few general comments on the relevance of stock price volatility for monetary policy. Finally, I'll finish with my thoughts on the outlook for business fixed investment spending.

MARKET SENTIMENT

The history of banking and financial markets is cluttered with bouts of investor optimism that have led to extraordinary and temporary appreciation of financial and real assets. Famous asset price bubbles are the Dutch "tulipmania" of the 1630s, the first British railway boom of the mid-1840s, and the bubble in Argentine loans in the 1880s, to name but a few. We can also find, of course, cases in which strong performance of individual stocks did turn out to be justified. We call the asset price run-ups that end badly "bubbles."

Asset price bubbles start with good news and substantial profits for some investors early in the boom. For instance, the 17th-century tulipmania had its origin in a mosaic virus, which generated interesting-looking tulips that fetched high prices among tulip growers. Because the virus-infected tulip bulbs were difficult to reproduce, they appreciated sharply, generating a windfall profit among those who happened to own them. The initial capital gains created optimistic expectations about the profitability of growing and trading these strains of tulip bulbs. There are reports of extensive trading in derivative contracts written on tulip bulbs. Eventually, the interesting-looking tulips lost their appeal and the price of the erstwhile highly valued bulbs fell, ending the speculative bubble. Peter M. Garber, who has investigated the tulipmania more thoroughly than anyone else, is not convinced that the pricing of the rare tulips was irrational; still, whatever the correct facts of this case may be, the stylized story is helpful in understanding the concept of an asset price bubble.

The British railroad boom was caused by a major technological advance. There was not only excitement about the new means of transportation, but the British also welcomed the economic stimulus of the railroad boom because it marked the end of a period of economic depression. In those days, each railroad project had to be approved by a parliamentary bill. As a consequence of this official blessing, investors misperceived the risk of railroad investments. Also, as is often the case in periods of rapidly rising stock prices, questionable business activities were tolerated—activities that would have received greater scrutiny in normal times. A striking example was the dubious accounting practices of George Hudson, who at one time was chairman of four railroads. Hudson, who may not even have realized exactly what he was doing, made dividend payments out of capital, a practice that was legal at the time and has since been prohibited. Perhaps because Charles Ponzi knew that his 1920 scheme was fraudulent, we now call an arrangement in which earlier investors are paid high returns out of capital contributed by later investors a Ponzi scheme rather than a Hudson scheme.

The bubble in Argentine loans in the 1880s began with increased demand in the world market for Argentine agricultural products. Rising world demand led to an economic boom in Argentina, which gave the Argentine government easy access to the world debt market. Argentina also

raised equity capital through initial public offerings of companies that specialized in developing land. When one of these IPOs failed in 1888, the Baring Brothers helped out with credit. Two years later, the Argentine government failed to meet these debt obligations because of falling prices of raw materials in the world markets. This default led to the famous Baring crises, which gave rise to an early example of the central bank—the Bank of England in this case—serving as a lender of last resort.

All three bubbles—and history has recorded many more—started with good news that created high hopes but eventually ended in tears. In general, bubbles are driven by positive market sentiment—that is, widespread investor optimism. Positive market sentiment gives rise to a sharp appreciation of asset prices, which eventually regress to their fundamental values. Regression to the fundamental value is often followed by unwarranted asset depreciation as market sentiment turns overly negative. Hence, market sentiment causes both asset mispricing and excessive volatility. The problem for the economist trying to study these issues is that mispricing and excessive volatility are always easy to identify ex post, but rarely so ex ante. However, even when cases are identified ex ante investors may or may not be able to profit from trading against the mispricing.

The consequences of asset mispricing and excessive volatility are not confined to financial markets, but can affect fixed investment and production. Financial markets are critical for directing scarce resources to their most productive use. The efficiency by which financial markets achieve this goal depends on the accuracy of the prices that financial markets signal to the investors. The price signals of the stock market allow corporations to calculate the cost of equity capital and evaluate the profitability of potential projects. Although the focus of my attention in this lecture is on the role of the stock market in the recent investment bust, it is also clear that bond market mispricing can affect business investment.

In a 1981 study, Yale economist Robert Shiller showed that the valuation of the U.S. stock market exhibits pronounced fluctuations around its fundamental value. Multi-year periods of stock market overvaluation alternate with equally extended periods of stock market undervaluation. An example of a period of bearish market sentiment was the early 1970s, when the four-quarter trailing price-to-earnings ratio of the S&P 500 stock price index was as low as 7; indeed, the stock market remained low until a sustained market rise began in mid 1982. During the late 1990s, on the other hand, the trailing P/E ratio climbed well above 30, even before earnings dropped as the economy started slowing in 2001. Such an elevated stock market valuation might be viewed as excessively optimistic, given that the median value of the postwar P/E ratio in the S&P 500 runs at around 15.

The recognition of market sentiment as a potent force in financial markets warrants the question as to why arbitrageurs don't bet against it. This question needs to be answered before one accepts the possibility of stock market overvaluation (or undervaluation, for that matter) and its implication for the allocation of resources.

Using the word "arbitrage" here is potentially misleading, and so let me explain what is meant in the context of this discussion. Economists think of a classic arbitrage as a risk-free set of transactions, such as simultaneously buying wheat in Kansas City and selling it in Chicago for a higher price. The arbitrageur then ships the wheat from Kansas City to Chicago to deliver on his Chicago contract. Knowing the transportation costs, the simultaneous purchase in one city and sale in the other is risk free.

By extension, other types of arbitrage transactions are based on the assumption that some relationship will return to normal. For example, if the spread between the yield on an 11-year Treasury bond and a 10-year Treasury bond becomes unusually large, purchase of one issue and sale of the other promises an arbitrage profit. However, this case differs from the classic arbitrage, in which the good purchased in the cheap market can be delivered against the sale contract in the dear market. Nothing guarantees that the arbitrage transaction between two Treasury issues will be profitable, because the spread could widen

and stay that way indefinitely. In the futures markets literature, the variable relationship between the price of one asset and another held as a hedge causes what is known as basis risk.

The issue at hand, then, is the economic forces that tend to return price relationships to some concept of "normal"; when we define normal by the historic mean, we are relying on a statistical regularity that could in fact be changing for good economic reasons.

In a seminal treatment on the role of the stock market for investment and growth, John Maynard Keynes in the *General Theory of Employment, Interest, and Money* discusses several factors that bear on the accuracy of the stock market's price signals. In brief, Keynes hypothesizes that market sentiment is carried into financial markets by uninformed investors, causing mispricing and excessive volatility. Although it appears that mispricing and the ensuing excessive volatility offer arbitrage opportunities for informed investors, arbitrageurs are unable to exploit these opportunities due to liquidity constraints.

Keynes attributes the persistence of asset mispricing and excessive volatility to a lack of liquidity, which is another way of saying that there is a dearth of trades that lean against the prevailing market sentiment. Why do arbitrageurs—hedge funds, for instance—not put on aggressive trades that push the market back to its fundamental value? Certainly, it is not for an initial lack of funds, because arbitrage trades are self-financing, at least to some extent. For instance, an investor who goes long on off-the-run Treasury securities and short on on-the-run Treasuries can use the long position as collateral. However, as observed in the near collapse of Long Term Capital Management in 1998, when the positions are large relative to the firm's capital a spread may widen rather than narrow to such an extent that capital is wiped out. Only a pure arbitrage where the good held in a long position can be delivered against the short position is completely self-financing.

There are two answers to the question of why arbitrageurs do not bet aggressively against market sentiment. First, arbitrageurs have limited wealth and limited time horizons. Asset prices might take a long time—possibly years—to regress to their fundamental value. Worse yet, asset mispricing might deepen along the way. In the meantime, arbitrageurs that invest their own money may develop liquidity needs for other reasons. An individual, for example, might need to draw on his capital as he nears retirement; hedge funds might be faced with withdrawals as investors become impatient. As Keynes stated, "Markets may stay irrational longer than you remain solvent."

Another reason why informed investors might not bet aggressively against the prevailing market sentiment is uncertainty about the assets' fundamental values. Some apparently overpriced ventures turn out well, and betting against them would turn out badly. Even the most sophisticated investor cannot rule out the possibility that the way he looks at financial markets is inadequate. The fact that the world in which we live is not well-charted leads informed investors to tread cautiously when putting on their trades.

THE RECENT SPELL OF BULLISH MARKET SENTIMENT

A compelling object of study for the interaction between financial markets and the real economy is the market for initial public offerings. In countries with sophisticated financial markets, periods of excessively optimistic market sentiment tend to be accompanied by extraordinarily strong activity in the market for initial public equity offerings. During these so-called "hot issue" markets, the vast majority of companies going public have just recently been established and operate in the very industries that are exciting the exuberant investors.

Hot issue markets are characterized by high volume, unusually high returns on the first trading day—known as "initial returns"—and, typically, poor long-run performance in the secondary market. Empirical evidence for long-run underperformance of initial public offerings in the wake of hot issue markets has been provided in a seminal study published in 1991 by Jay Ritter. Given the date of this study, the poor performance

of IPOs in the secondary market was public knowledge long before the frantic IPO activity in the U.S. stock market in the late 1990s. Consistent with Ritter's findings, the IPOs with the highest initial returns during the hot issue market of the late 1990s were among the worst performing stocks in the secondary market. From 1998 to early 2000, the top ten IPOs—ranked by initial return—climbed between roughly 400 to 700 percent on the first day of trading. As of August 2001, nine of these 10 stocks had depreciated by at least 80 percent from their offering price; one stock was delisted after a competitor acquired the company.

The recurrence of hot issue markets leads to the question of why history repeats itself in such an obvious manner. To bet against overvalued stocks, the investor would have had to sell the issues short, maintain the short positions in the face of further price increases for these stocks and be willing and financially able to wait for some time, several years in some of these cases. The short positions could be partially hedged, by going long on an S&P 500 Index fund, for example; but in the late 1990s and on other occasions the spread between the two positions would have increased for quite some time, and that risk could not be diversified away.

Whatever the mechanism or mechanisms creating the mispricing, it is simply not easy for arbitrageurs to take positions the other way. Moreover, informed investors who understand this process may find it more profitable to trade with rather than against the mispriced stocks. This way, market sentiment creates its own space, obtaining the capacity to distort asset prices in a sustained manner.

A valuable gauge of market sentiment in the stock market is the P/E ratio. In March 2000, the Nasdaq 100—which accounted for more than 10 percent of the U.S. stock market—traded at a P/E ratio of about 100. Certainly, there has always been a handful of stocks that trade at elevated levels. However, when 10 percent of the entire market trades at such a lofty level, some questions might be in order. A group of finance scholars who studied the earnings growth of U.S. corporations drew up the following examples. Assume the P/E ratio of a company takes ten years to revert from 100 to 20, which is still a somewhat generous level given that historically the P/E ratio of the S&P 500 has averaged about 15. If we assume that the annualized return on this stock over the next ten years is zero, then the company's earnings have to grow at an annual rate of 17.5 percent to bring its P/E ratio back to 20. Alternatively, if the investor demands a 10 percent annual return on the stock over the next ten years, the earnings of this company have to grow by an average 29.2 percent per year.

These simple calculations raise warning flags. Unless the earnings of a company, or a group of companies such as those in the Nasdaq 100 index, are abnormally depressed for reasons that can be investigated and understood, a P/E ratio of 100 seems unlikely to be justified, because future earnings growth high enough to provide a reasonable rate of return are unlikely. But I do think it important that we look behind the numbers and not rely on the P/E ratio or any other simple number in reaching these judgments. Investors are willing to hold stocks with high P/E ratios if they expect these companies to grow at an above-average rate. Given that investors disagree about which companies will be the fast-growing ones, many companies may trade at elevated prices at the same time. This brings us to the question of how predictable earnings growth at the company level really is. In a recent academic study, it has been shown that there is virtually no predictability, based on publicly available information, in earnings growth rates at the company level at the five- and ten-year horizons. Thus, unless an investor has some special talent or inside information, he is no more likely to pick the next IBM or the next Microsoft from the population of fast-growing companies through rational deliberation than by chance.

The unpredictability of earnings growth had been known long before the Nasdaq 100 traded at a P/E ratio of 100. Keynes, in the *General Theory*, said, "The outstanding fact is the extreme precariousness of the basis of knowledge on which our estimates of prospective yield have to be

made. Our knowledge of the factors which will govern the yield of an investment some years hence is usually very slight and often negligible. If we speak frankly, we have to admit that our basis of knowledge for estimating the yield ten years hence of a railway, a copper mine, a textile factory, the goodwill of a patent medicine, an Atlantic liner, a building in the city of London amounts to little and sometimes to nothing; or even five years hence." Given that there is no predictability in earnings growth beyond the very short horizon, it is not surprising that stocks with high P/E ratios tend to underperform the market, as academic studies have shown.

STOCK MARKET VALUATION, INVESTMENT, AND GROWTH

The median ratio of stock market valuation to nominal GNP in the period 1920 to 2000 runs at 48 percent. In 1990, the ratio was at about its long-term median level, but by the first quarter of 2000 had increased to an unprecedented 186 percent. By comparison, in the third quarter of 1929, the ratio of stock market valuation to GNP amounted to only 68 percent. The historic peak before the run-up of the 1990s was recorded in the fourth quarter of 1972 at a value of 78 percent.

It appears, certainly, that the high stock market valuation in the late 1990s left its mark on the real economy. By reducing the cost of capital, the stock market appreciation of the 1990s fueled the longest investment boom in postwar history. From a trough in the first quarter of 1990, the fraction of fixed private nonresidential investment in GDP increased from 9.7 percent to a peak value of 13.2 percent in the third quarter of 2000. This peak was just a bit below the previous peak of 13.9 percent in the fourth quarter of 1981. By comparison, the median postwar value was 10.5 percent.

As a result of the investment boom of the 1990s, the real capital stock of the economy expanded sharply. The rate of increase in real capital stock climbed steadily from a trough in 1992 at 1.5 percent to 4.2 percent in 2000. When the economy slowed, it became evident that a capital overhang had developed, at least in some sectors. As I noted earlier, by the fourth quarter of last year real private nonresidential fixed investment had declined by 9.2 percent. Real investment in information processing equipment and software was hit particularly hard, with an annual rate of decline of 19.5 percent in the second quarter, 10.4 percent in the third quarter and 2.8 percent in the fourth quarter. As estimated by the Council of Economic Advisors, in 2001 the reduced rate of investment meant that the growth rate of the real capital stock dropped to 2.6 percent.

Like other investment booms in history, the rapid expansion of the capital stock in the 1990s followed on the heels of a major technological advance—the digital revolution. In the early stages of the boom in computers and communications, there were extraordinary corporate success stories as epitomized by the rise of Microsoft and IBM in an earlier era. On the financial side, these admirable corporate achievements were reflected in equally impressive capital gains in the stock market. In recent years, the new technology, which gave rise to new, fast-growing corporations, created expectations about a "new era" in the real economy and high returns in the stock market. During a boom, investors rarely remember Schumpeter's dictum of creative destruction. Eventually, the benefits of technological advances are passed on to the consumer. Busts are the inevitable consequence of the erosion of corporate profits through competition and mean-reverting rates of growth.

Clearly, no company can indefinitely offer an earnings growth rate that exceeds the sum of the dividend yield and the growth rate of potential GDP. Inevitably, earnings growth rates of individual companies must revert to means reflective of the aggregate economy's rate of growth. Against this background, a P/E ratio of 100 in the Nasdaq 100 is difficult to explain without some kind of new era thinking. The risk in new-era thinking is that it is an attempt to rationalize high stock market valuation. Although the productivity growth of the U.S. economy has been impressive over the last couple of years, including the most

recent period of recession, bursts of productivity growth have happened before. More importantly, even a permanently higher level of productivity growth in the neighborhood of the rate enjoyed from 1995 to 2000 does not justify outsized P/E ratios. Past technological innovations had no lasting impact on the growth rates of corporate earnings, which inevitably converge to the growth rate of the overall economy.

Over the last couple of years, the decline in corporate profits has been accompanied by a rise in corporate leverage. The ratio of credit market debt to net worth for nonfarm nonfinancial corporations rose from a trough of 47.4 percent in the third quarter of 1997 to a postwar high of 59.1 percent in the third quarter of 2001—the latest number available. By comparison, the median postwar value is only 34.2 percent. Note that the current number might underestimate the actual rise of debt obligations at the company level because of the increased use of leasing and the proliferation of special financing vehicles. The rise of corporate debt is in part a consequence of the soaring stock market of the 1990s. As the equity capital of corporations appreciated, their borrowing capacity increased. Corporations that dipped deeply into their borrowing capacity in the days of the boom found themselves highly leveraged after their equity depreciated in the stock market. Excessive use of debt, along with overcapacity, contributes significantly to the current wave of bankruptcies—in particular in the telecom sector. Another implication of the rise of high leverage is the increased share of interest payments out of current income. At a time of tightening lending standards and debt downgrades in the bond market, high debt obligations might put a drag on capital spending as corporations find it difficult to finance investment projects out of current cash flow.

MONETARY POLICY IMPLICATIONS

Since the beginning of the 19th century, academic experts and policymakers have been discussing the role of money and credit in financial bubbles. The debate has been rekindled by events in Japan, where an asset price bubble in the late 1980s has been followed by more than a decade of sub-par growth and declining asset prices. It has been argued that the Bank of Japan could have prevented—or at least tempered—the bubble through aggressive monetary tightening in the second half of the 1980s. We will never know whether such policy action would indeed have alleviated the consequences of the bubble on the real economy in Japan. We can say with some confidence, though, that such aggressive monetary tightening was not warranted at the time based on standard inflation gauges. In fact, in 1987, Japan's rate of consumer price inflation was close to nil.

Returning to the United States, a pertinent question might be to what degree has monetary policy contributed to excessive valuation in the U.S. stock market and the ensuing misallocation of resources. Is it possible that there was excess money growth that made its way into asset prices, rather than the prices of goods and services? Paradoxically, it seems that the more successful a central bank is in keeping the rate of inflation low and stable, the more likely monetary overhang will lead to appreciation of assets. When expectations about low and stable rates of inflation are deeply ingrained, asset prices might serve as a vent for excess money growth.

How can we tell whether a stock market boom is internal to the stock market—a market bubble—or a consequence of excessive money growth? Excessive money growth should spill over to assets in general, and not just to one class of assets. In the United States in the late 1990s, we did not see outsized increases in residential and commercial real estate values, or in bond prices, or in prices of foreign exchange. Indeed, the dollar was strong rather than weak in the foreign exchange markets. The fact that the stock market boom was somewhat concentrated in particular segments—especially high tech—and was not echoed in other asset markets suggests to me that the stock market boom was not primarily a monetary phenomenon.

When the behavior of asset prices, along with other information, suggests that monetary policy is excessively easy or tight, then obviously it makes sense for policymakers to change course. But it does not make good sense, I am convinced, for a central bank to take a position on the appropriate level of the stock market and attempt to guide the market to the "right" level. A central bank has only one independent policy instrument, which you can think of in terms of money growth or the interest rate depending on your preference. Attempting to use that instrument for multiple purposes muddies the policy direction and risks losing control over the rate of inflation. Compromising on the goal of low and stable inflation is a recipe for trouble—sustained inflation or deflation creates problems far greater that those likely to arise from mispricing in an asset market.

THE OUTLOOK FOR BUSINESS FIXED INVESTMENT

The current recession is the most persuasive example in the last 50 years of an economic contraction that originated from a business investment bust rather than consumer retrenchment. Recessions typically exhibit major declines in housing construction and consumer durables. This time, the recession was led by a decline in business investment spending and accompanied by a sharp drop in factory orders for capital goods, both new and unfilled. The latest numbers, released two days ago, for new orders of nondefense capital goods, excluding the volatile aircraft orders component, show an increase of 1.5 percent in January; shipments of capital goods, excluding aircraft, rose by 2.5 percent. These data suggest that the capital spending part of the economy is on the mend.

Business investment last year was driven by a reassessment of long-run prospects in certain sectors, especially telecom, and by adjustment to excess capacity resulting from the prior exuberant investment boom. That adjustment is now well along. Assuming final consumption demand continues to grow, excess capacity will be absorbed over the next few years. It is important to remember that much of the information technology capital stock has a relatively short life, due to the rapid rate of technical change in this area. Desktop computers and servers are replaced every few years, which means that replacement demand places a high floor under total investment.

It appears that the rate of return from investment to enhance efficiency is still high. Thus we can expect to see continued capital deepening in firms that have not yet taken full advantage of the new technologies. As prospects for final demand growth become clearer and the recession in corporate profits comes to an end, we can expect to see firms once again resume heavy investment in information technology. In short, there is every reason to believe that we have ahead of us a healthy revival of investment and the continued productivity gains such investment will bring.

This outlook is predicated on my belief that the Fed will be successful in adjusting policy in timely fashion to maintain a climate of low and steady inflation. Price stability is a prerequisite for sustained economic growth; if inflation expectations break out on the high side, all bets are off as we would then see a classic period of unsustainable exuberance followed by the usual inflation hangover. That is not the future I see, but the Fed will have to stay alert and on the job.