Prudential Financial

RESEARCH

Stock Valuation Models

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Topical Study #56

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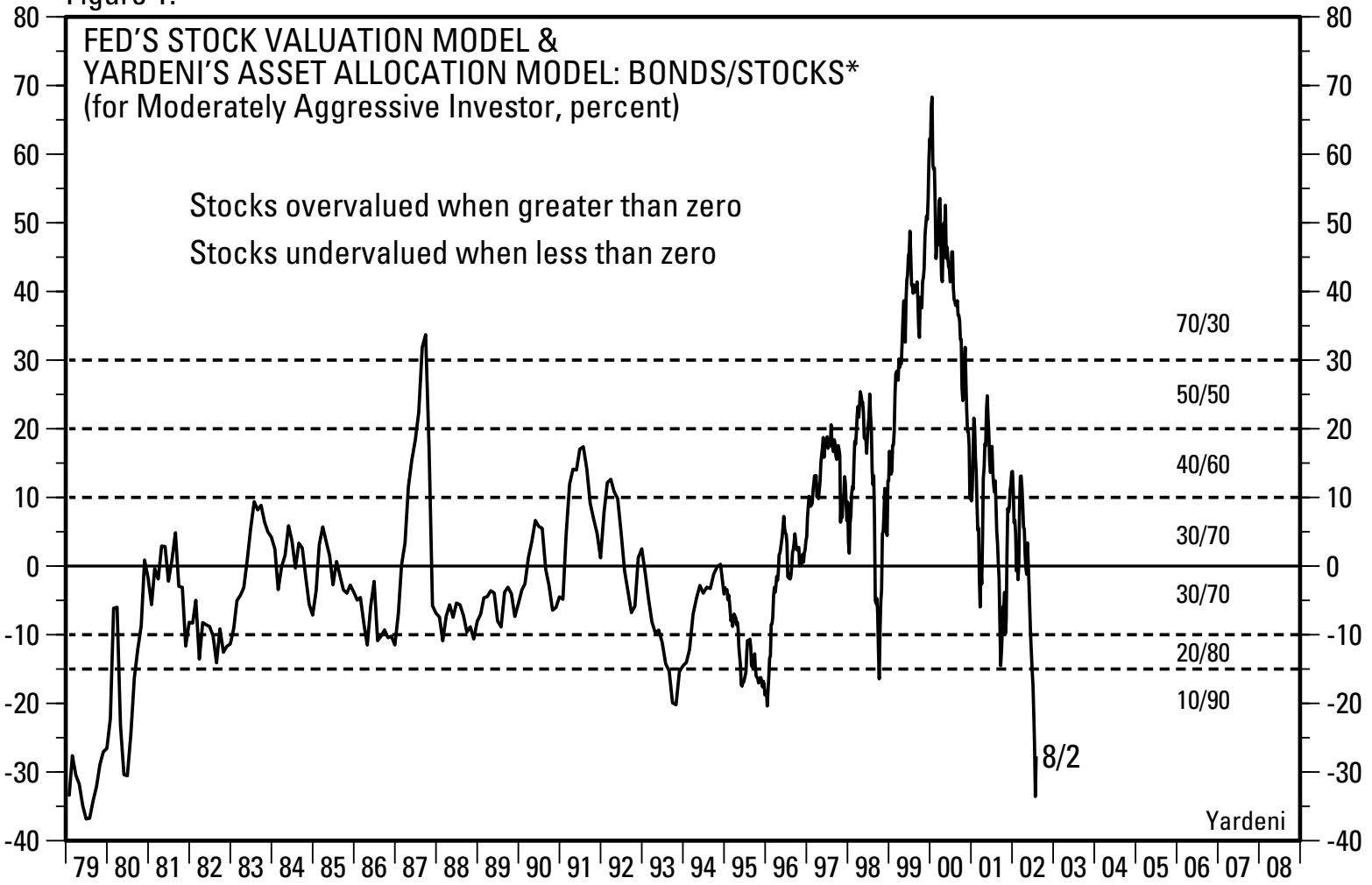
Figure 1.



* Ratio of S&P 500 index to its fair value (12-month forward consensus expected operating earnings per share divided by the ten-year U.S. Treasury bond yield) minus 100. Monthly through March 1994, weekly after.
Source: Thomson Financial.

I. Judging Value

How can we judge whether stock prices are too high, too low, or just right? Investment strategists are fond of using stock valuation models to do so. Some of these are simple. Some are complex. Data on earnings, dividends, interest rates, and risk are all thrown into these black boxes to derive a "fair value" for the stock market. If the stock market's price index exceeds this number, then the market is overvalued. If it is below fair value, then stocks are undervalued. Presumably, investors should buy when stocks are undervalued, and sell when they are overvalued.

In this topical study, I will examine a simple stock valuation model, which has been quite useful and can also be used as a stocks-versus-bonds asset allocation tool (Figure 1). I started to study the model in 1997, after reading that the folks at the Federal Reserve have been using it. If it is good enough for them, it is good enough for me. I dubbed it the Fed's Stock Valuation Model (FSVM), though no one at the Fed ever officially endorsed it.

The FSVM has caught on since then, partly because I have been updating it on a daily basis on my Website.[1] *Barron's* frequently mentions it. The cover page of the September 24, 2001, issue observed that the stock market was "the biggest bargain in years." The bullish article, titled "Buyers' Market" and written by Michael Santoli, was entirely based on the FSVM, which showed that stocks were extremely undervalued when the New York Stock Exchange reopened for trading on September 17, 2001.

A model can help us to assess value. But any model is just an attempt to simplify reality, which is always a great deal more complex, random, and unpredictable. Valuation is ultimately a judgment call. Like beauty, it is in the eye of the beholder. It is also a relative concept. There are no absolutes. Stocks are cheap or dear relative to other investment and spending alternatives. A model can always be constructed to explain nearly 100% of what happened in the past. "Dummy variables" can be added to account for one-time unpredictable events or shocks in the past. However, the future is always full of surprises that create "outliers"; i.e., valuations that can't be explained by the model. For investors, these anomalies present both the greatest risks and the greatest rewards.

More specifically, almost everyone's valuation models went on red alert in 1999 and 2000. Stocks were grossly overvalued. With the benefit of hindsight, it was one of the greatest stock market bubbles ever. Investors simply chose to believe that the models were wrong. The pressure to go with the flow of consensus sentiment was so great that some strategists reengineered their models to show that stocks were still relatively attractive. One widely followed pundit simply replaced the bond yield variable with the lower inflation rate variable in his model to accomplish the alchemy of transforming an overvalued market into an undervalued one.

I fought the urge to fiddle with my adopted model. So I repeatedly warned that the market was extremely overvalued. However, I did observe that while investing in a bubble is dangerous, it

[1] www.prudential.com/yardeni

can be extremely rewarding if you remember to get out just before the bubble bursts.[2] That was easier said than done.

I have to admit that I did fiddle with the simple model to find out if it was missing something as stocks soared well above earnings. This led me to devise an "improved" version of the model: FSVM-2. It convinced me that stocks were priced for perfection as investors increasingly seemed to accept the growing optimism of Wall Street's industry analysts about the long-term prospects for earnings growth. The improved model also demonstrated that investors were giving more weight to these increasingly irrational expectations for earnings in the valuation of stocks! As I will show, analysts have been slashing their long-term earnings growth forecasts since early 2000, and investors are once again giving very little weight to earnings projections beyond the next 12 months.[3]

The question during the summer of 2002 is whether investor sentiment had swung too far from greed to fear. According to the FSVM, stocks were 37% undervalued in late July. This was the most extreme such reading since 1979 and 1980. Despite a huge jump in stock prices at the end of July, the FSVM has become quite controversial. The bears contend that the model is flawed. Stocks are not undervalued at all, in their opinion. Stocks are still overvalued and may fall much lower over the rest of this year and next. Ironically, not too long ago, it was the bulls who declared that stocks were not overvalued, and offered lots of reasons to ignore the FSVM.

I believe that the model is still useful and should not be ignored. Nevertheless, it should be only one of several inputs investors use to assess whether it is a good or bad time to buy stocks. For example, while the FSVM indicated that I should increase my recommended exposure to equities in June and July of this year, I went the other way: I lowered my exposure from 30/70 bonds/stocks to 35/65 for a Moderately Aggressive Investor. For a Moderate Investor, I changed my recommended cash/bonds/stocks allocation from 10/40/50 to 10/50/40. I did so because I concluded that investors might continue to worry about the quality of earnings after WorldCom disclosed on June 26 that the company's earnings for the past several quarters were overstated as a result of fraudulent accounting.

[2] For example, on February 1, 1999, I wrote "I have a deep faith in the wisdom of the public. But it's been shaken by the buying frenzy in the stock market. I like prosperity as much as anyone else does. But the action so far this year has been manic. Of course, manias can be very profitable on the way up. The problem is that it is always very difficult to guess when the bubble is likely to burst. If you get out too early, you feel stupid and poorer. If you stay too long, you feel stupid and poorer. The recent drop in Internet stocks may have been the beginning of the end, or not. For now, I'll go with the flow and conclude that the bubble will inflate some more."

[3] In my *Topical Study #44*, "New, Improved Stock Valuation Model," dated July 26, 1999, I wrote, "My analysis will demonstrate that the market's assumptions about risk, and especially about long-term earnings growth may be unrealistically optimistic, leaving it vulnerable to a big fall….The stock market is clearly priced for perfection. If perpetual prosperity continues uninterrupted, then perhaps the market's exuberant expectations will be realized. I, however, see more potential for disappointment, given the extreme optimism about long-term earnings growth embedded in current market prices."

II. Fed's Stock Valuation Model

After Fed Chairman Alan Greenspan famously worried out loud for the first time about "irrational exuberance" on December 5, 1996, he probably instructed his staff to devise a stock market valuation model to help him evaluate the extent of the market's exuberance. Apparently, they did so and it was made public, though buried, in the Fed's Monetary Policy Report to the Congress, which accompanied Mr. Greenspan's testimony on July 22, 1997.[4] Twice a year, in February and July, the Chairman of the Federal Reserve delivers a monetary policy report to Congress. The Chairman's testimony is widely followed and analyzed. Virtually no one reads the actual policy report, which accompanies the testimony. I regularly read these reports.

The Fed model was summed up in one paragraph and one chart on page 24 of the 25-page document (Figure A). The chart shows an amazingly strong correlation between the ten-year Treasury bond yield (TBY) and the S&P 500 current earnings yield (CEY)—i.e., the ratio of 12-month forward consensus expected operating earnings (E) to the price index for the S&P 500 companies (P).

Figure A: Excerpt From The Fed's July 1997 Monetary Policy Report

> The run-up in stock prices in the spring was bolstered by unexpectedly strong corporate profits for the first quarter. Still, the ratio of prices in the S&P 500 to consensus estimates of earnings over the coming twelve months has risen further from levels that were already unusually high. Changes in this ratio have often been inversely related to changes in long-term Treasury yields, but this year's stock price gains were not matched by a significant net decline in interest rates. As a result, the yield on ten-year Treasury notes now exceeds the ratio of twelve-month-ahead earnings to prices by the largest amount since 1991, when earnings were depressed by the economic slowdown. One important factor behind the increase in stock prices this year appears to be a further rise in analysts' reported expectations of earnings growth over the next three to five years. The average of these expectations has risen fairly steadily since early 1995 and currently stands at a level not seen since the steep recession of the early 1980s, when earnings were expected to bounce back from levels that were quite low.

Source: Monetary Policy Report to the Congress, Federal Reserve Board.

It is relatively easy to calculate 12-month forward earnings for the S&P 500. The data are simply a time-weighted average of the current and next year's consensus estimates produced by Wall Street's industry analysts. Every month, Thomson Financial surveys these folks and compiles monthly consensus earnings estimates for the current and coming year. The consensus data for the S&P 500 companies are aggregated on a market-capitalization-weighted basis. To calculate the 12-month forward earnings series for the S&P 500, we need 23 months of data for each year. For example, during January of the current year, 12-month forward earnings are identical to the expectations for the current year. One month later, in February of the current year, forward earnings are equal to 11/12 plus 1/12 of February's estimates for

[4] http://www.federalreserve.gov/boarddocs/hh/1997/july/ReportSection2.htm

earnings in the current year and the next year, respectively. Of course, forward earnings are identical to the current year's consensus forecast at the start of the current year and converge toward the coming year's expectations.

This method of calculating forward earnings doesn't exactly jibe with actual expectations for the coming 12 months. For example, half of forward earnings in July reflects half of the earnings expected for the current year, which is already half over. Furthermore, in this case, the other half of forward earnings reflects earnings expectations for July through December of next year; i.e., the 6-month period beyond our 12-month horizon for forward earnings. The problem is that there are no data available for July of the current year through June of next year. We can come close using quarterly earnings forecasts, which are also available from Thomson Financial. This is unnecessary, in my opinion. The method used by Thomson Financial is a good enough approximation. The data start in September 1978 on a monthly basis (Figure 2). Weekly data are also available since 1994.

Because write-offs are one-shot events, analysts cannot model them in their spreadsheets. In other words, forward earnings are essentially projections of operating earnings. I use forward earnings, rather than either reported or operating trailing earnings, in most of my analyses because market prices reflect future earnings expectations. The past is relevant, but only to the extent that it is influencing the formation of current expectations about the future outlook for earnings.

Again, the close relationship between the ten-year Treasury bond yield and the current earnings yield of stocks is impressive. The average spread between CEY and TBY is only 25 basis points since 1979 (Figure 3). This suggests that the stock market is fairly valued when:

(1) CEY = TBY

It is undervalued (overvalued) when CEY is greater (less) than TBY. Another way to see this is to take the reciprocal of both variables in the equation above. In the investment community, we tend to follow the price-to-earnings ratio more than the earnings yield. The ratio of the S&P 500 price index to forward earnings (P/E) is highly correlated with the reciprocal of the ten-year bond yield, and on average the two have been nearly identical (Figure 4). This suggests that the "fair value" of the valuation multiple, using forward earnings, is simply one divided by the Treasury bond yield. For example, when the Treasury yield is 5%, the fair value P/E is 20. So, in the Fed's valuation model, the "fair value" price for the S&P 500 (FVP) is equal to expected earnings divided by the bond yield and the fair-value P/E is the reciprocal of the Treasury bond yield:

(2) FVP = E / TBY or,

(3) FVP / E = 1 / TBY

The ratio of the actual S&P 500 price index to the fair value price shows the degree of overvaluation or undervaluation (Figure 1). History shows that markets can stay overvalued and become even more overvalued for a while. But eventually, overvaluation is corrected in

three ways: 1) interest rates can fall, 2) earnings expectations can rise, and of course, 3) stock prices can drop—the old fashioned way to decrease values. Undervaluation can be corrected by rising yields, lower earnings expectations, and higher stock prices.

The Fed's Stock Valuation Model worked quite well in the past. It identified when stock prices were excessively overvalued or undervalued, and likely to fall or rise:

1) The market was extremely undervalued from 1979 through 1982, setting the stage for a powerful rally that lasted through the summer of 1987.

2) Stock prices crashed after the market rose to an all-time record 34% overvaluation peak during September 1987.

3) Then the market was undervalued in the late 1980s, and stock prices rose.

4) In the early 1990s, it was moderately overvalued and stock values advanced at a lackluster pace.

5) Stock prices were mostly undervalued during the mid-1990s, and a great bull market started in late 1994.

6) Ironically, the market was actually fairly valued during December 1996, when the Fed Chairman worried out loud about irrational exuberance, and stock prices continued to advance.

7) During the summers of both 1997 and 1998, overvaluation conditions were corrected by a sharp drop in stock prices.

8) Then a two-month undervaluation condition during September and October 1998 was quickly reversed as stock prices soared to a remarkable record 70% overvaluation reading during January 2000. This bubble was led by the Nasdaq and technology stocks, which crashed over the rest of the year, bringing the market closer to fair value in late 2000 through early 2002.

9) While the model suggested that stock prices were fairly valued in the spring of 2002, stock prices plunged in the summer. By late July, the FSVM showed that stocks were 37% undervalued, the lowest reading since 1979. On Wednesday, July 24, the Dow Jones Industrials Average fell to an intra-day low of 7490, and then rallied dramatically to close at 8191. By Tuesday the Dow had regained 1317 points intra-day, or 17.6%, the biggest four-day rally since 1933.

According to Ned Davis Research, when the FSVM has shown stocks to be more than 5% undervalued since 1980, the average one-year gain in the S&P 500 has been 31.7%. When the model has been more than 15% overvalued, the market has dropped 8.7%, on average, in the following year.[5]

[5] Michael Santoli, "Good-Looking Models," *Barron's*, August 5, 2002.

III. New Improved Model

The stock market is a very efficient market. In efficient markets all available information is fully discounted in prices. In other words, efficient markets should be always "correctly" valued, at least in theory. All buyers and all sellers have access to exactly the same information. They are completely free to act upon this information by buying or selling stocks as they choose. So the market price is always the correct price, reflecting all available information. In his June 17, 1999, Congressional testimony, Federal Reserve Chairman Alan Greenspan soliloquized about valuation:

> The 1990s have witnessed one of the great bull stock markets in American history. Whether that means an unstable bubble has developed in its wake is difficult to assess. A large number of analysts have judged the level of equity prices to be excessive, even taking into account the rise in "fair value" resulting from the acceleration of productivity and the associated long-term corporate earnings outlook. But bubbles generally are perceptible only after the fact. To spot a bubble in advance requires a judgment that hundreds of thousands of informed investors have it all wrong. Betting against markets is usually precarious at best.[6]

This is another one of the Chairman's ambiguous insights, which may have contributed to the very bubble he was worrying about. He seems to be saying that the stock market might be a bubble, but since the market efficiently reflects the expectations of "thousands of informed investors," maybe the market is right because all those people can't be wrong. They *were* wrong, and so was the Fed Chairman about the judgment of all those folks. However, at the time, the available information obviously convinced the crowd that stocks were worth buying. The crowd didn't realize that it was a bubble until it burst. In other words, efficient markets can experience bubbles when investors irrationally buy into unrealistically bullish assumptions about the future prospects of stocks.

Of course, individually, we can all have our own opinions about whether stocks are cheap or expensive at the going market price. Perhaps we should consider replacing the terms "undervalued" and "overvalued" with "underpriced" and "overpriced," respectively. I think in this way, we acknowledge that the stock market is efficient and that the market price should usually be the *objective* fair value. At the same time, the new terminology allows us to devise valuation models to formulate *subjective* opinions about market prices. If my model shows that the market is overpriced, I am simply stating that I disagree with the weight of opinion that has lifted the market price above my own assessment of the right price.

Now let's formulate a new, improved model (FSVM-2) that more explicitly identifies the variables that together determine the value of the stock market. If, for example, the FSVM shows that stocks are 50% overvalued, we need to add variables that can explain why the aggregate of all buyers and sellers believe that the price is right. Once we agree on what is "in" the market, we can each make our own pro or con case, and invest accordingly.

[6] http://www.bog.frb.fed.us/BOARDDOCS/TESTIMONY/1999/19990617.htm

The simple version of the FSVM is missing some variables, which might explain why the current earnings yield might diverge from the Treasury yield. We clearly need to account for variables that differentiate stocks from bonds. If the government guarantees that stock earnings will be fixed for the next ten years, then the price of the S&P 500 would be at a level that nearly equates the current earnings yield to the ten-year Treasury bond yield. But there is no such guarantee for stocks. Earnings can go down. Companies can lose money. They can also go out of business . Earnings can also go up. We need variables to capture:

1) business risk to earnings, and

2) earnings expectations beyond just the next 12 months.

The new, improved valuation model (i.e., FSVM-2) reflecting these variables should have the following structure:

(4) $CEY = a + b \cdot TBY + c \cdot RP - d \cdot LTEG$

where CEY is the current earnings yield defined as 12-month forward earnings of the S&P 500 divided by the S&P 500 price index. TBY is the ten-year Treasury bond yield. The two new additional variables are the risk premium (RP) and long-term expected earnings growth, beyond the next 12 months (LTEG). My assumption is that the current earnings yield ("the dependent variable") is a linear function of the three independent variables on the right of the equation above. There are several other ways to specify the model. But this should do for now.

How should we measure risk in the model? An obvious choice is to use the spread between corporate bond yields and Treasury bond yields. This spread measures the market's assessment of the risk that some corporations might be forced to default on their bonds. Of course, such events are very unusual, especially for companies included in the S&P 500. However, the spread is only likely to widen during periods of economic distress, when bond investors tend to worry that profits won't be sufficient to meet the debt-servicing obligations of some companies. Most companies won't have this problem, but their earnings would most likely be depressed during such periods. So the new improved model can be represented as follows:

(5) $CEY = a + b \cdot TBY + c \cdot (CBY - TBY) - d \cdot LTEG$

where CBY is the corporate bond yield. Which corporate bond yield should we use in the model? We can try Moody's composites of the yields on corporate bonds rated Aaa, Aa, A, or Baa. I found that the spread between the A-rated corporate composite yield and the Treasury bond yield fits quite well. This spread averaged 131 basis points since 1960. It tends to widen most during "flight-to-quality" credit crunches, when Treasury bond yields tend to fall the fastest (Figure 6).

The final variable included in FSVM-2 is one for expected earnings growth beyond the next 12 months. Thomson Financial compiles data on consensus long-term earnings growth for the S&P 500 (Figure 7). The monthly data start in 1985 and are based on industry analysts' projections for the next three to five years (Figure B).

In equation (5) above, my presumption is that a = 0 and b = c = 1. So,

(6) CEY = CBY– d · LTEG or,

(7) CEY = TBY + RP – d · LTEG

In other words, in this version of FSVM-2, investors demand that the current earnings yield fully reflect the Treasury bond yield and the default risk premium in bonds less some fraction of long-term expected earnings growth. In this model, the market is always fairly valued, the only question is whether the implied value of "d" and the consensus expectations for long-term earnings growth are too pessimistic (excessively cautious), too optimistic (irrationally exuberant), or just about right (rational).

We can derive "d" from equation (5) as follows:

(8) d = (CBY – CEY) / LTEG

Plugging in the available data since 1985, "d" has ranged between 0.33 and -0.27, and averaged 0.13 (Figure 8). This means that on average, investors assign a weight of 0.13 to LTEG. They don't give it much weight because historically it has been biased upward (Figure B). They also don't give it much weight because long-term earnings are harder to forecast than earnings over the coming 12 months. Notice that in 1999 and early 2000, investors effectively gave LTEG a weight of 0.23, or nearly twice as much as the historical average. Actually, up until 1999, "d" averaged only 0.10. This supports my observation at the beginning of this study that investors were irrationally giving more weight to irrationally high long-term earnings expectations in the late 1990s.

We can derive a set of fair-value time series for the S&P 500 and for the valuation multiple for different values of "d" using the following formula:

(9) FVP = E / (CBY– d · LTEG)

(10) FVP / E = 1 / (CBY– d · LTEG)

Obviously, to avoid nonsensical results like a negative fair-value price or an infinite P/E, CBY > d · LTEG. We can draw fair-value price series for the S&P 500 using equation (9). We have data for all the variables except the d-coefficient. Nevertheless, we can proceed by plotting a series for various plausible fixed values of d. Based on the analysis above, I've chosen the following values: 0.10, 0.20, and 0.25. Now we can compare the matrix of the three resulting FVP series to the actual S&P 500. At the end of July, the latest fair value, using d = 0.10, was 968.02. The S&P 500 was 6.7% below this level (Figures 9 and 10).

Figure B: Long-Term Earnings Growth

In the long-run, profits don't, and can't, grow faster than GDP. Historically, this growth rate has averaged about 7%. So why do Wall Street's industry analysts collectively and consistently predict that corporate earnings will grow much faster than 7%? From the start of the data in 1985 through 1995, analysts estimated that S&P 500 earnings will grow between 10.8% and 12.1% (Figure 7). This range well exceeds 7%. The collective forecast of industry analysts for long-term earnings growth is obviously biased to the upside. Wall Street's analysts are extrapolating the earnings growth potential for their companies, in their industries. It is unlikely that most analysts will have the interest and staying power to cover companies and industries they believe are likely to be underperformers for the next several years. So, naturally, their long-term outlook is likely to be relatively rosy. This bias is best revealed when the consensus data are compiled and compared to reality.

If the projected earnings growth overshoot is constant over time, then investors can make an adjustment for the overly optimistic bias of analysts, and invest accordingly. This is harder to do during a speculative bubble, when even the best analysts can get sucked into the mania. As stock prices soared during the second half of the 1990s, analysts became more bullish on the outlook for their companies. As they became more bullish, so did investors and speculators. Analysts increasingly justified high stock prices and lofty valuation multiples by raising their estimates for the long-term potential earnings growth rates of their companies.

Long-term earnings growth expectations for the S&P 500 companies started to rise steadily after 1995 up to 14.9% by the end of 1998. Then they soared through 2000, peaking at 18.7% during August of that year. Analysts, investors, and speculators ignored the natural speed limits imposed by the natural growth of the economy and earnings. They forgot that nothing on our small Planet Earth can compound at such extraordinary rates without eventually consuming all the oxygen in the atmosphere.

Once the speculative bubble began to burst in March 2000, analysts scrambled to reassess their wildly optimistic projections. Consensus long-term earnings growth expectations plunged to 13.3% for the S&P 500 by July 2002 from the all-time 18.7% peak in August 2000. The reversal for the technology sector of the S&P 500 was even more dramatic, with growth expectations dropping to 17.9% in July 2002 from the 2000 peak rate of 28.7%.

Source: Edward Yardeni, Prudential Securities.

Notice that equations (9) and (10) describing the same FSVM-2 both morph into the Fed's Stock Valuation Model when RP—the corporate bond's default risk premium—is equal to the long-term earnings growth term $d \cdot LTEG$. Historically, on average, this is the case, which is why the simple version of the model has worked surprisingly well.[7]

The FSVM is a very simple stock valuation model. It should be used along with other stock valuation tools, including FSVM-2. Of course, there are numerous other more sophisticated and complex models. The Fed model is not a perfect market-timing tool. As noted above, an overvalued (undervalued) market can become even more overvalued (undervalued). However, the Fed model does have a good track record of showing whether stocks are cheap or

[7] Since 1985, RP and $d \cdot LTEG$ have averaged 165 and 177 basis points, respectively. Not an exact match, but close enough.

expensive. Investors are likely to earn below (above) average returns over the next 12 to 24 months when the market is overvalued (undervalued).

IV. The Quality of Earnings

In my *Topical Study #45*, "Earnings: The Phantom Menace," dated August 16, 1999, I once again observed that according to the FSVM "the market is extremely overpriced and vulnerable to a significant fall." I also explained that the model uses the market's earnings expectations, not mine. I argued again that the market's expectations were unrealistically optimistic and that earnings were inflated by phantom revenues and unexpensed stock options:

> A related problem is that many companies are overstating their earnings by using questionable accounting and financial practices. Some are significantly overstating their profits, and they tend to have the highest valuation multiples in the stock market. This suggests that investors are not aware that the quality of earnings may be relatively low among some of the companies reporting the fastest earnings growth.

This suggests an interesting twist on the valuation model. Let's assume that the stock market is always fairly valued; i.e., the P/E is always equal to the reciprocal of the ten-year Treasury bond yield. Using the FSVM, we can easily calculate the market's estimate of forward earnings (E) by multiplying the level of the S&P 500 (P) by the ten-year bond yield (E/P). Currently, with the S&P 500 closing price at 876.8 on August 7 and the yield at 4.35%, the market's assessment is that earnings are actually $38.14 per share, or 32% below the analysts' consensus forecast (Figure 11).

I seriously doubt that earnings are so overstated. Nevertheless, from this perspective, the market isn't a screaming "Buy" as suggested by the FSVM. Rather, over the past few months, it has adjusted to a lower and more realistic level of earnings. If this is correct, then the good news is that any downward adjustments made by companies and analysts may already be largely discounted.

V. Asset Allocation

The next logical step is to convert the FSVM into a simple asset allocation model (Figure 1). I do so by subjectively associating the "right" bonds/stocks asset mixes with the degree of over/undervaluation as shown in Figure 1. At Prudential Securities, we recommend cash/bonds/stocks asset distributions for five distinct investor profiles (Figure C). I use the model mostly for a Moderately Aggressive Investor with a benchmark mix of 00/30/70 during "normal" times. While the model is an important input into my investment strategy work, I have sometimes resisted following it blindly. For example, the model suggested more aggressive exposure to stocks in June. Instead, on June 24, I reduced my recommended exposure to 00/35/65 even though the model is currently at 00/10/90. I hope to get more aggressive on stocks again in the fall when, I expect, the corporate accounting and governance crisis might be over.

Figure C: Asset Allocation Matrix (As Of June 24, 2002)

Investor	Cash/Fixed Income/Equities	
	PSI Benchmark	PSI Recommended
Conservative	40/60/00	40/60/00
Moderately Conservative	20/80/00	20/80/00
Moderate	10/40/50	10/50/40
Moderately Aggressive	00/30/70	00/35/65
Aggressive	00/10/90	05/15/80

Conservative: Prefer little risk and low volatility in return for accepting potentially lower returns.
Moderately Conservative: Willing to take some risk to seek enhanced returns. Reduced exposure of principal to loss or fluctuation.
Moderate: Willing to assume an average amount of market risk and volatility or loss of principal for higher returns.
Moderately Aggressive: An above-average amount of risk and volatility or loss of principal is tolerated to take advantage of potentially higher-return opportunities.
Aggressive: Willing to sustain substantial volatility or loss of principal and assume a high level of risk in pursuing higher returns.

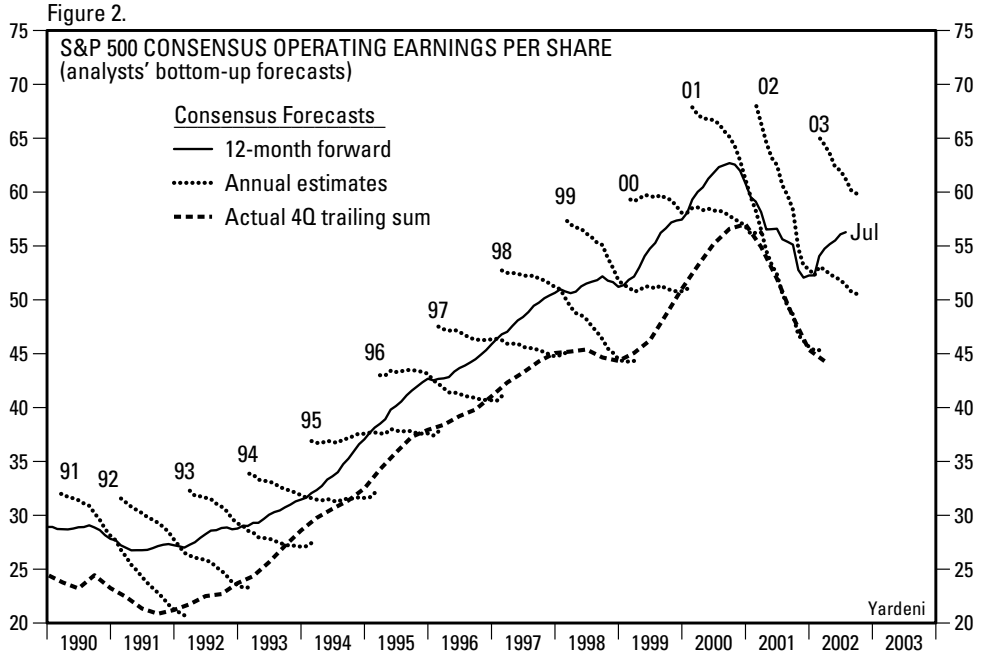
Source: Edward Yardeni, Prudential Securities.

VI. Overseas

The model can be used to assess several major overseas stock markets for which forward earnings data are available since 1989 (Figures 12 and 13). Not surprisingly, there is some correlation between the FSVM results for the United States and Canada (0.40), the United Kingdom (0.27), Germany (0.32), and France (0.46). The correlation is (-0.48) with Japan. The model doesn't work for Japan because deflationary forces have pushed the ten-year bond yield to under 1.5% in recent years, which implies a nonsensical valuation multiple.

The stock market tends to discount forward earnings, which are the time-weighted average of the current and next years' consensus expected earnings.

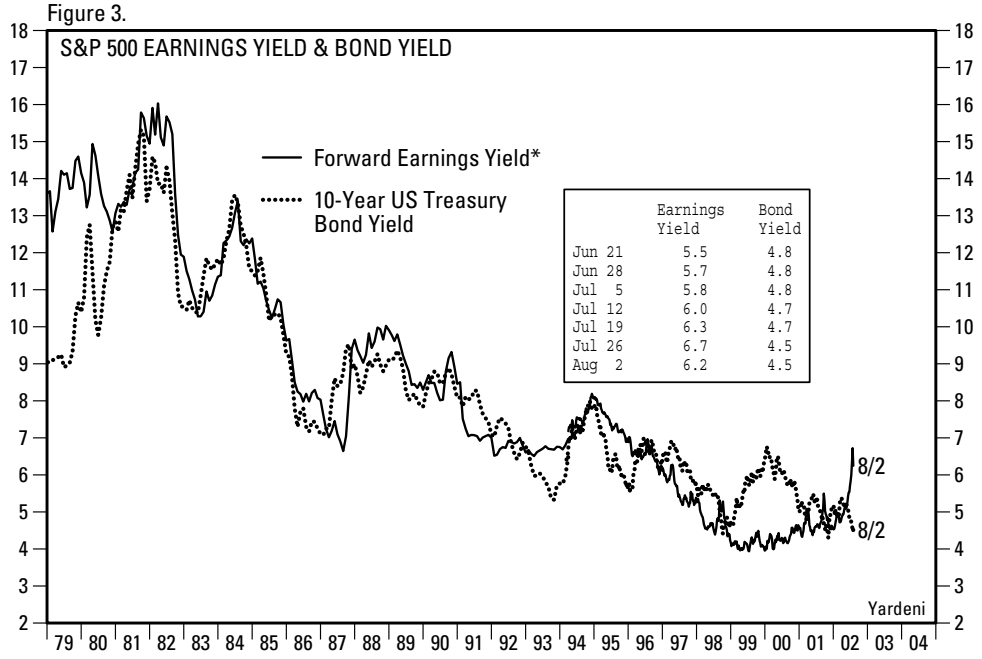
Figure 2.



Source: Thomson Financial.

This chart appeared in the Fed's July 1997 Monetary Policy Report to the Congress. It shows a very close correlation between the earnings yield of the stock market and the 10-year Treasury bond yield. Another, more familiar way to look at this relationship follows.

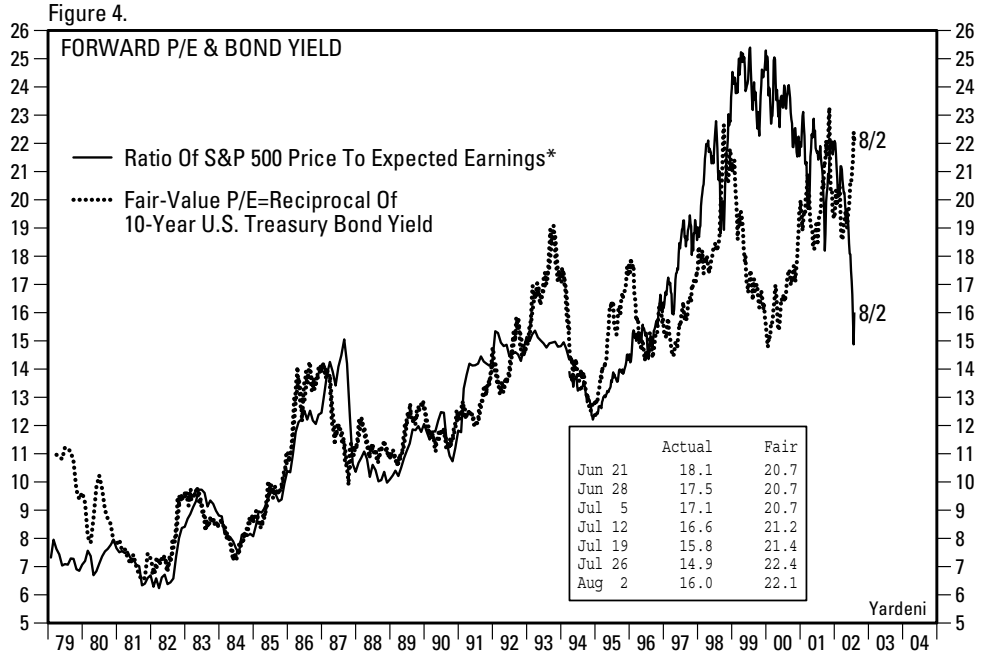
Figure 3.



* 52-week forward consensus expected S&P 500 operating earnings per share divided by S&P 500 Index. Monthly through March 1994, weekly after.
Source: Thomson Financial.

The S&P 500 P/E (using forward expected earnings) is highly correlated with the reciprocal of the 10-year Treasury bond yield.

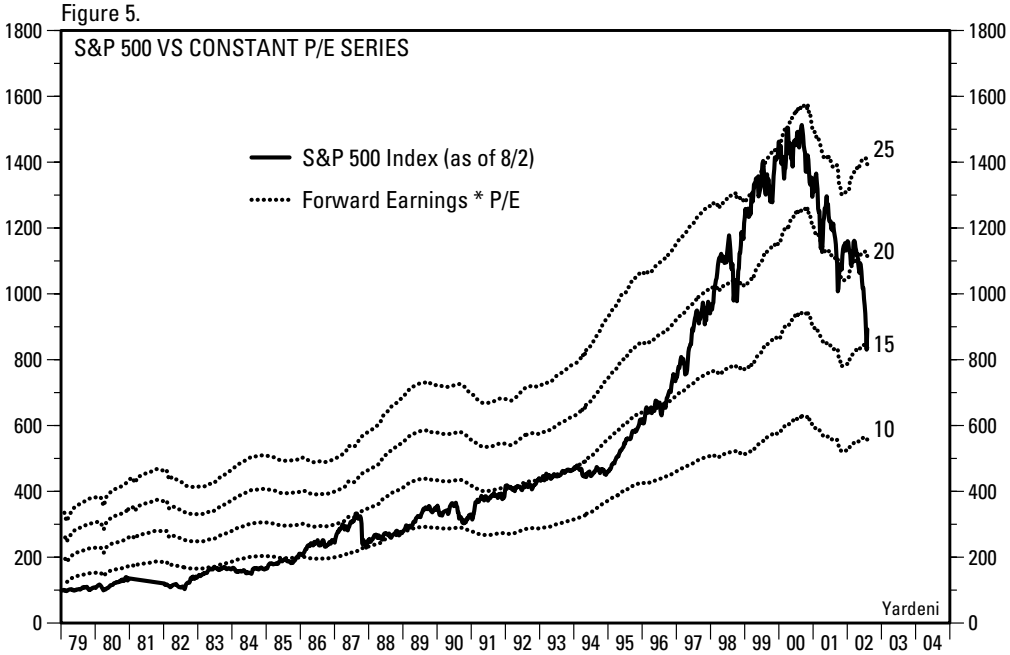
Figure 4.



* 52-week forward consensus expected S&P 500 operating earnings per share. Monthly through March 1994, weekly after.
Source: Thomson Financial.

The P/E is back down to 15, the lowest level since 1996.

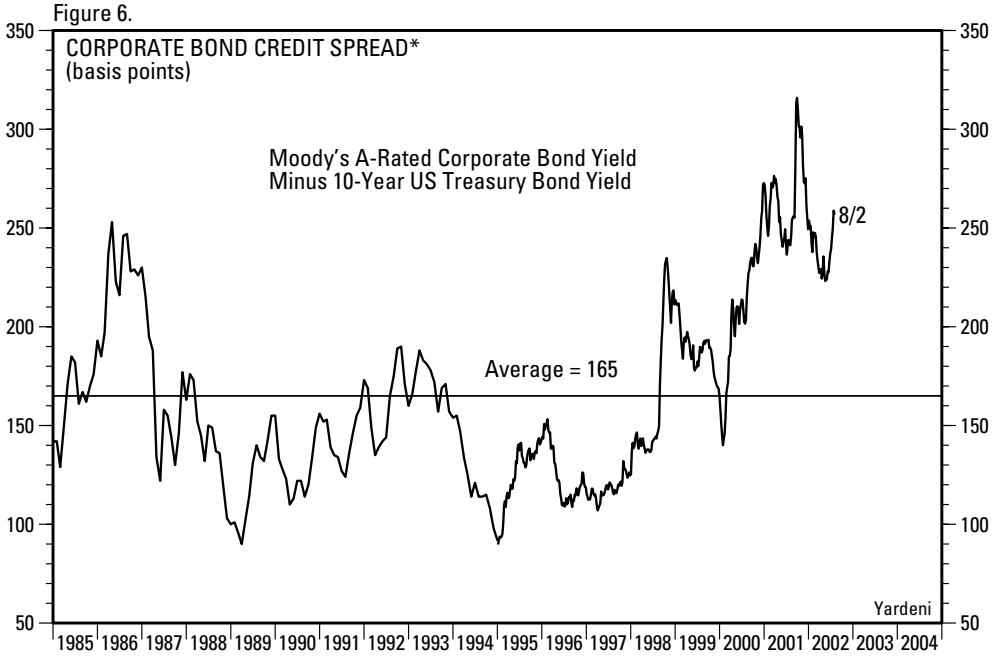
Figure 5.



* 52-week forward consensus expected S&P 500 operating earnings per share. Monthly through April 1994, weekly thereafter.
Source: Thomson Financial and Standard & Poor's Corporation.

This corporate credit quality spread remains well above its historical average.

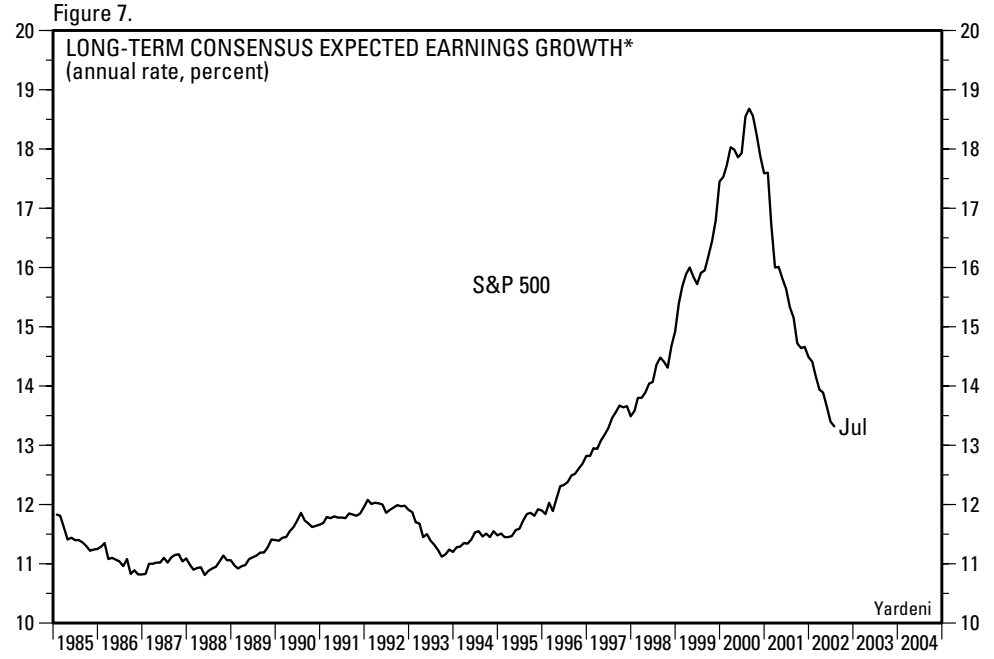
Figure 6.



* Monthly through 1994, weekly thereafter.
Source: Board of Governors of the Federal Reserve System and Moody's Investor Service.

Long-term earnings growth expectations rose sharply during 1990s. They fell sharply from 2000-2002.

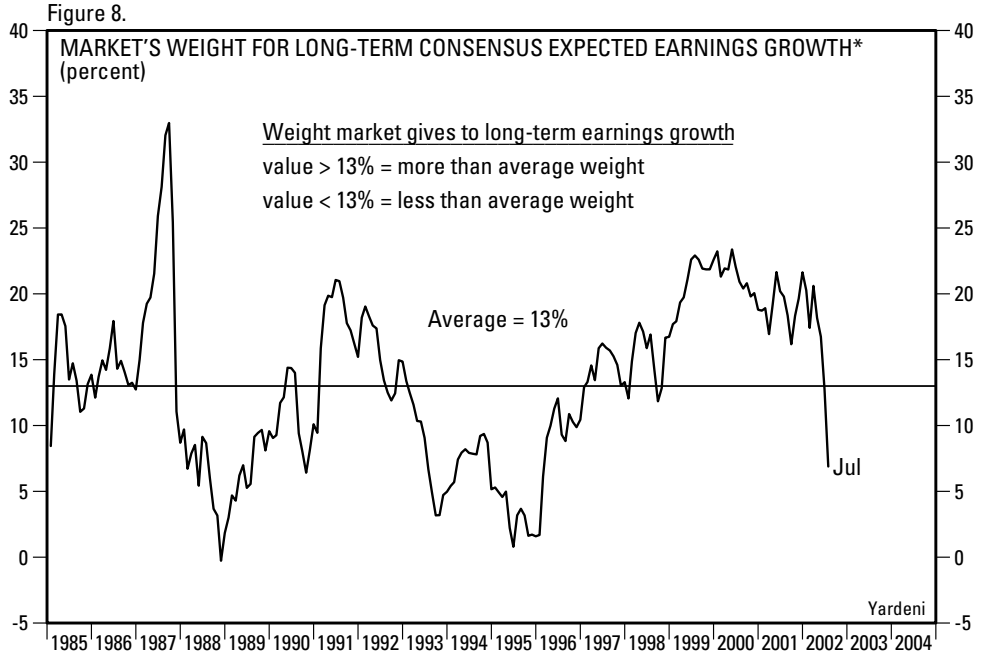
Figure 7.



* 5-year forward consensus expected S&P 500 earnings growth.
Source: Thomson Financial.

Investors have on average over time subtracted 13% of their long-term earnings growth expectations from the corporate bond yield to determine earnings yield.

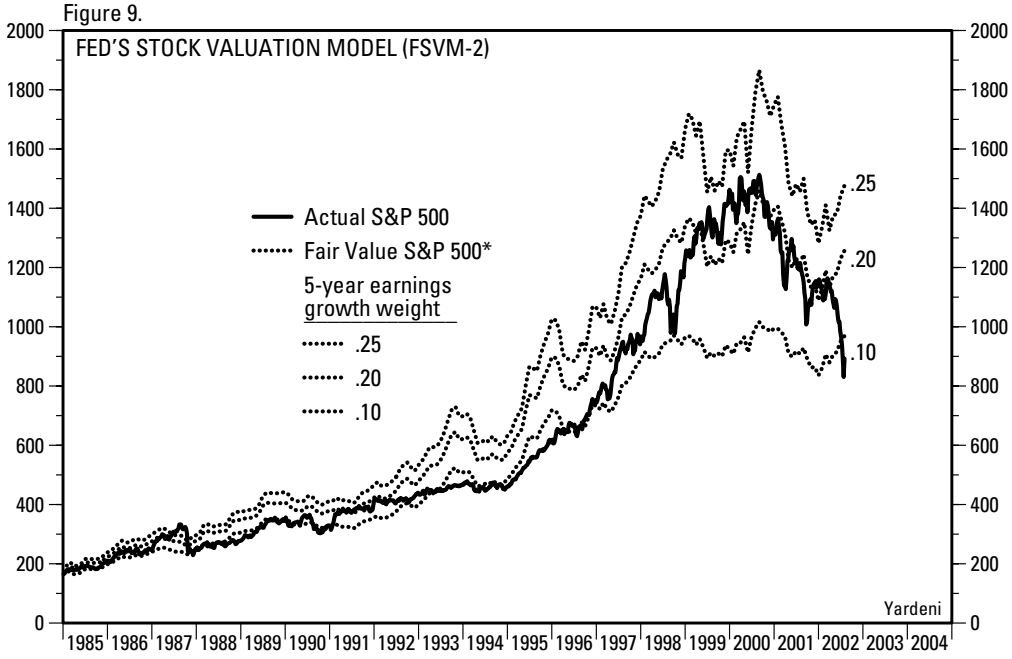
Figure 8.



* Moody's A-rated corporate bond yield less earnings yield divided by 5-year consensus expected earnings growth.
Source: Standard and Poor's Corporation, Thomson Financial and Moody's Investors Service.

This second version of the Fed's Stock Valuation Model builds on the simple one by adding variables for long-term expected earnings growth and risk, as measured by the corporate credit quality spread. Fair-value lines can be drawn using different assumptions for long-term growth weight.

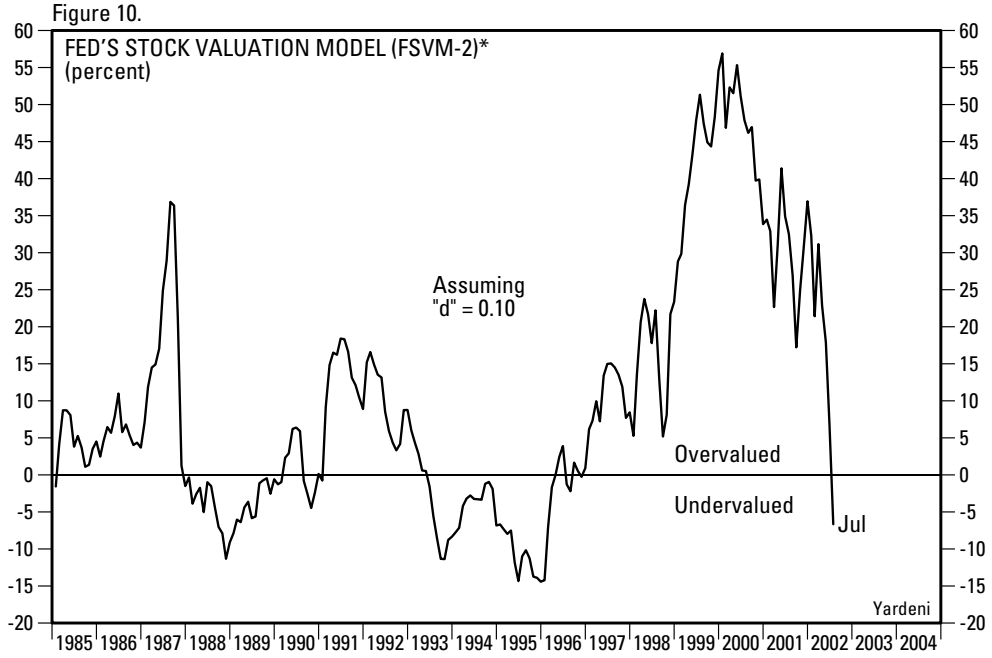
Figure 9.



* Fair value is 12-month forward consensus expected S&P 500 operating earnings per share divided by difference between Moody's A-rated corporate bond yield less fraction (as shown above) of 5-year consensus expected earnings growth.
Source: Thomson Financial

This version of the Fed's Stock Valuation Model includes variables for earnings risk and long-term earnings growth. It shows stocks were 6.7% undervalued in July.

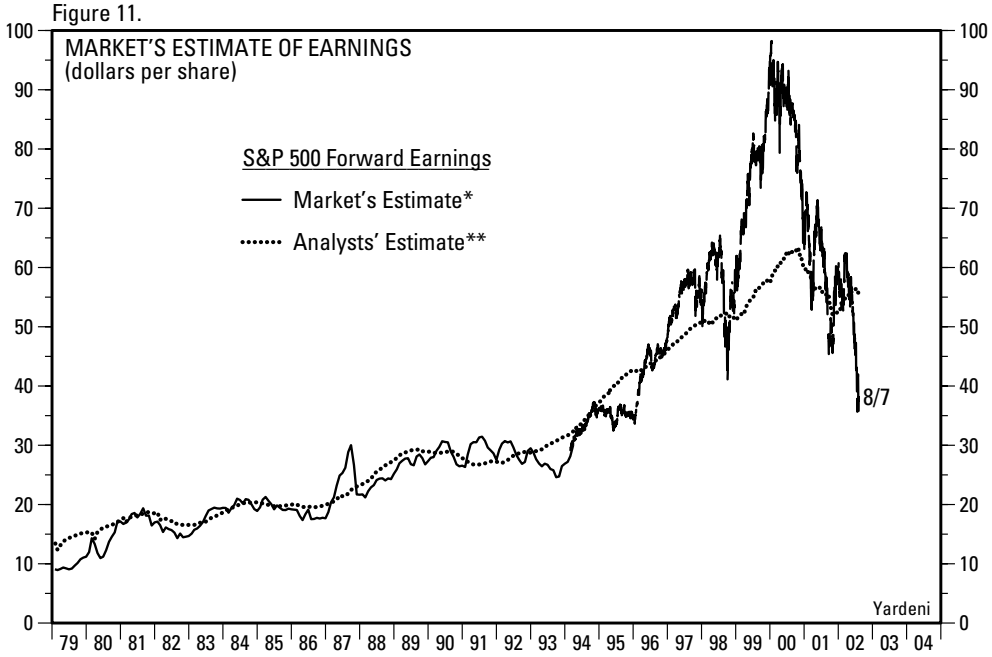
Figure 10.



* Ratio of S&P 500 index to its fair value (12-month forward consensus expected S&P 500 operating earnings per share divided by difference between Moody's A-rated corporate bond yield less fraction (0.10) of 5-year consensus expected earnings growth.
Source: Thomson Financial

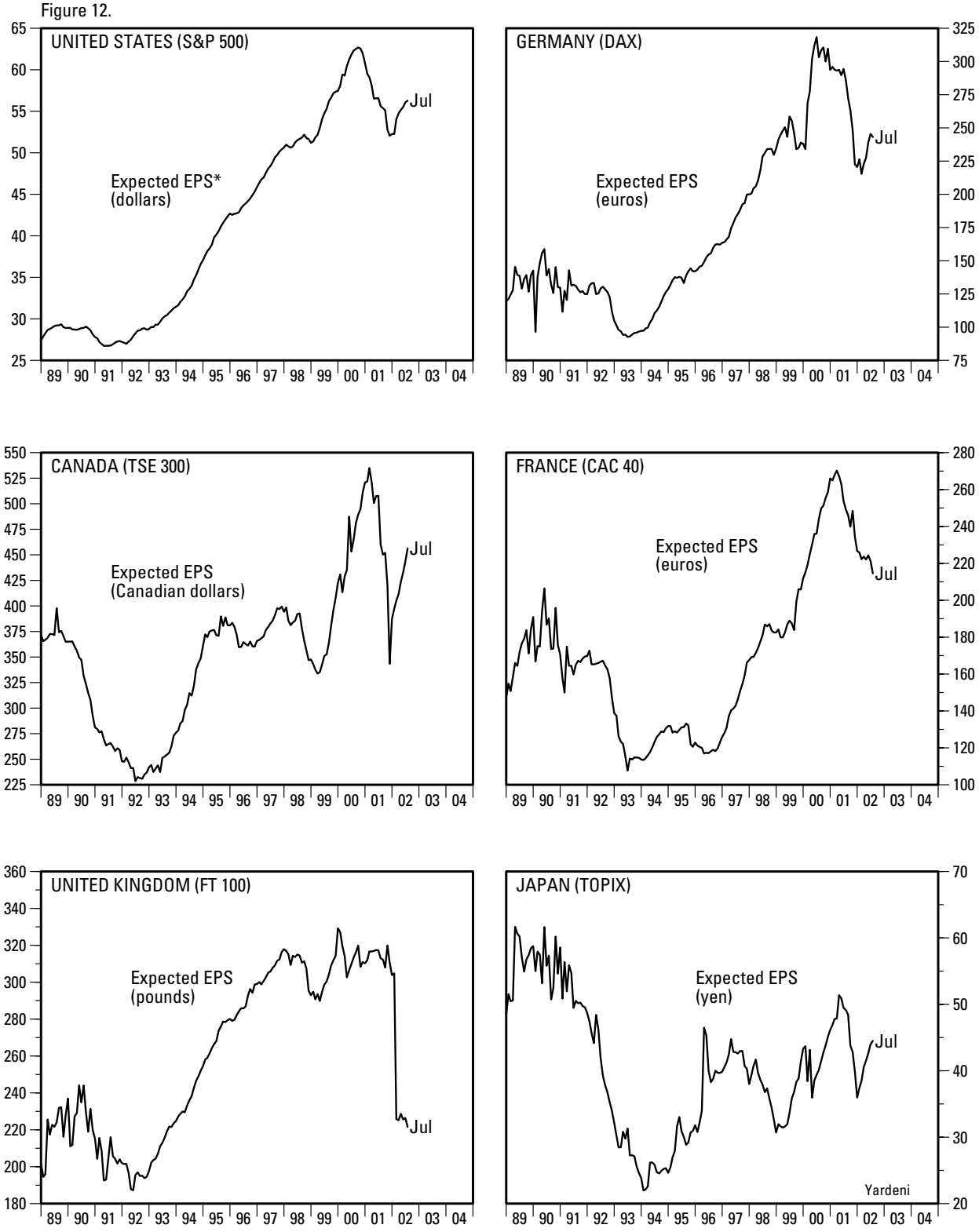
Assuming that the market is always fairly valued, then the market's estimate is that forward earnings should be well below the analysts' consensus forecast.

Figure 11.



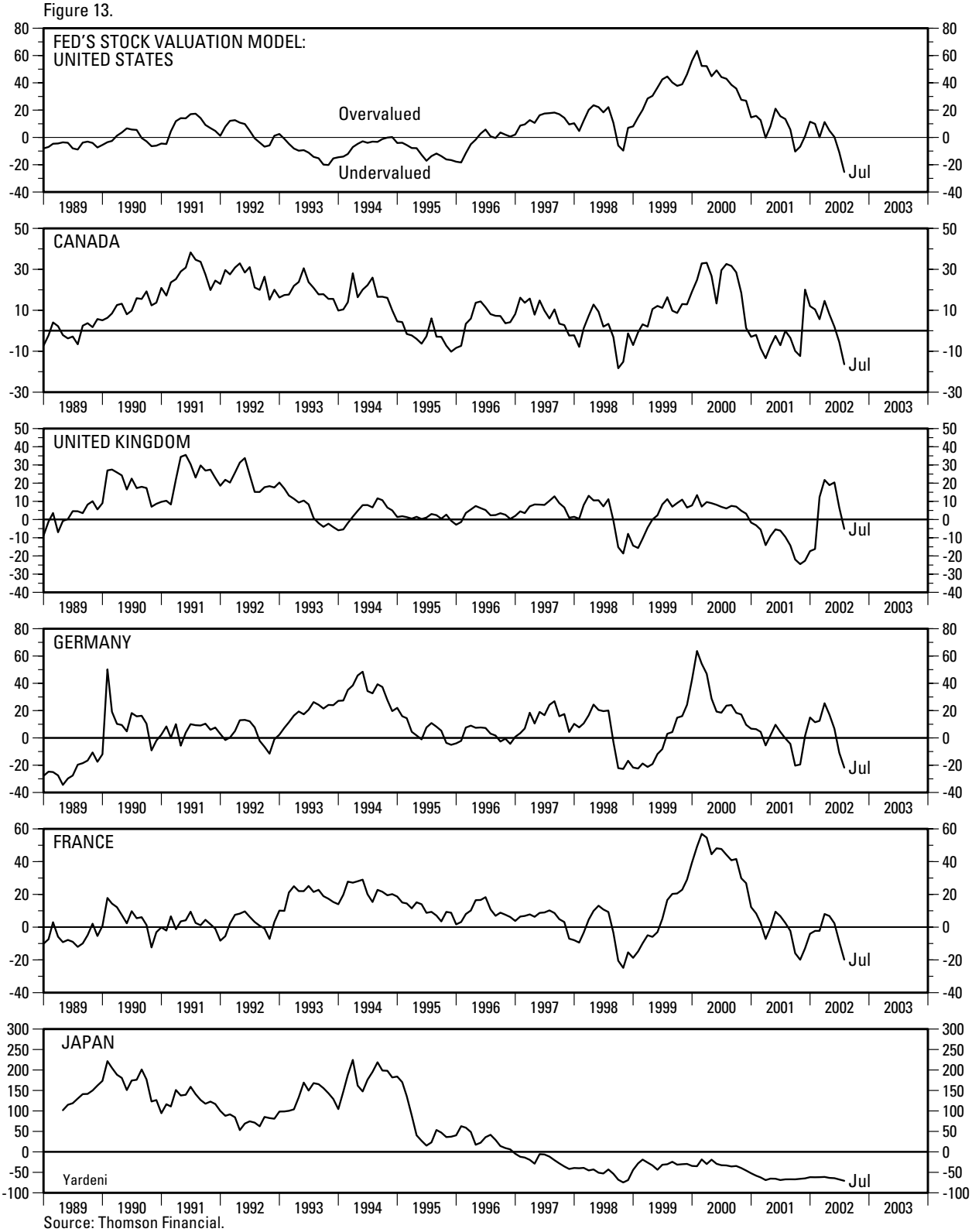
* S&P 500 index multiplied by ten-year government bond yield. Monthly through March 1994, weekly after.
** 12-month forward consensus expected S&P 500 operating earnings per share. Monthly through March 1994, weekly after.
Source: Standard & Poor's Corporation and Thomson Financial.

Figure 12.



* 12-month forward consensus expected operating earnings per share. Source: Thomson Financial.

Figure 13.



Source: Thomson Financial.

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