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The Search for Stock Market Bubbles: An Examination of the NYSE Index

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ABSTRACT

Many have put forth reasons why the stock market has climbed to new and unprecedented heights. Two reason are examine: (1) investors are expecting prices to increase and are bidding up price irrationally; (2) investors have moved to a long-term strategy and are requiring a lower risk premium. For the latter reason, the rise in stock prices is due to a change in the fundamentals, and for the former reason the rise represents the classical bubble. The evidence indicates that risk preferences have changed while price momentum does not appear during bubble periods.

INTRODUCTION

Economic theory is based on the presupposition that humans are rational beings, out to maximize their utility. Yet, the recent volatility in stock prices has called into question the rationale of the investor, and has rekindled the longstanding debate on stock market bubbles—whether they are fact or fiction. In December 1996, Federal Reserve chairman, Alan Greenspan, warned that the market was being driven by "irrational exuberance." Some have explained this characterization of the stock market as excessive speculation or a mania while others have argued that what is often perceived as a bubble is in fact just the stock market reflecting a new or changing fundamental, and not really the symptoms of a market gone astray with speculative exuberance. This debate was most recently observed in two of the March 2001 WSJ issues where Robert J. Shiller asked "Is the bubble fully burst or is it still on the way down?" while James K. Glassman argued that a Dow of 36000 is still a "good bet" and nothing has changed.¹

This paper will examine these two arguments and see if the movement of stock prices over the last 34 years has shown any evidences of "bubble" or "shifts" in the fundamentals. In the next section the fundamental of stock price evaluation model is given. The Gordon discounted cash flow model will provide the framework for key factors that motivate investors in the market. In section three we will examine the two arguments for the recent movements in stock price. In section four, the evidence is presented. It appears that there has been a significant shift in investor’s attitudes towards risk and that this shift may have contributed to the movement in stock prices.

THE FUNDAMENTALIST APPROACH TO STOCK PRICE VALUATION

The price of a share of stock can be calculated using the discounted present value of all future expected dividends. Under the simple assumption that dividends grow at a constant rate, Gordon (1959) has shown that the price of a share of stock is:

```plaintext
\text{Price} = \frac{\text{D}}{\text{r}} \times \frac{1}{1 - (1 + \text{g})^{-T}}
```

where D is the dividend, r is the discount rate, g is the growth rate, and T is the time horizon.
\[ P_t = \frac{D_t + g}{k - g}, \]  

where \( P_t \) is the price of the stock, \( D_{t+1} \) is the expected dividend on the share in the next period, \( k \) is the required return by the average investor on the share of stock, and \( g \) is the expected growth of dividend (assumed to be less than the expected return)\(^{iii}\). Equation (1) states that the investors will assess a firm's expected dividend pay out, the future potential growth of dividends, and will adjust price according to their required return.

For a given portfolio of stocks, equation (1) would be modified such that the price of the portfolio of stocks would equal the expected dividends generated by the portfolio, the required return on the portfolio and the expected growth of the portfolio. If the portfolio represents a market basket of stocks, the required return would equal the "market" required return \( (k_m) \). The market return is decomposed into the risk-free interest rate \( (k_{rf}) \) and the market risk premium \( (RP_m) \):

\[ k_m = k_{rf} + RP_m \]  

For a single share of stock there are two types of risk facing the investor: firm specific (or company unique) risk, and market related risk. Firm specific risk can be eliminated by having a well-diversified portfolio, and is hence often referred to as diversifiable risk. Market risk, however, can never be eliminated and would be the minimum risk exposure facing the investor. Thus, the market risk premium is the "price" investor's desire given the current market risk.

The efficient markets theory argues that financial assets are always priced correctly, given what is publicly known at all times. Assuming that all players in the market buy their stock armed with identical information, no individual investor should be able to beat the market before the market readjusts itself to prices determined by the market fundamentals. For a given portfolio, the portfolio price would be determined by

\[ P_{p_t} = \frac{D_{p,t+1}}{(k_{rf} + RP_m) - g_{m}}, \]  

As per the above equation, ceteris paribus, any increase in the risk-free rate \( (k_{rf}) \) or risk premium \( (RP_m) \) should result in a corresponding decrease in \( P_{p_t} \) while any increase in the expected dividends of the portfolio \( (D_{p,t+1}) \) or the growth of the dividends \( (g_{m}) \) should cause a corresponding increase in \( P_{p_t} \). Shocks to the macroeconomic economy are the primary cause in the movements of the portfolio variables, and would impact the price of the market portfolio.

**EXPLANATIONS FOR THE RECENT MOVEMENT IN STOCK PRICE**

The historical rise in stock prices over the last 5 years has revived the debate on whether the increase is a speculative bubble or due to a shift in fundamentals. Two of the more popular major proponents of the irrational exuberance position are Kindleberger (1996) and Schiller (2000). Both researchers assert that investors will be prone to the psychological elements within the market. This theme is not new and was first argued by Hyman Minsky (1982). Minsky was the first to set up the framework for the theory of bubbles in which the boom bust cycles in the stock market are the result of speculative investing\(^{iv}\).
The Bubble Explanation

Minsky identified five phases of a speculative bubble or as he describes it - mania: the shock, speculation, euphoria, the lull, and the panic.

**The Shock:**

The mania begins with a shock to the macroeconomic system. This shock could be anything: a bumper harvest, the outbreak of war, widespread use of a new invention, surprising financial success etc. The shock brings about an increase in profit opportunities in at least one important sector of the economy. Businesses and individuals rush to take advantage of this new profit opportunity and increase their demands on the financial system.

**Speculative Finance:**

The role of financial intermediaries in financing of the speculation is a very important one. Lenders of short-term credit would have a tendency to reinforce the speculation by financing other investment opportunities. Financial leverage by financial intermediaries and firms continues to grow as long as participants view the inherent risk in the market as low. Overall, in the market, everyone - both sound investors and speculators - appear keen to participate in the optimism.

**Euphoria:**

The over optimistic forecasts of dividends and the growth in dividends causes both the demand for goods and financial assets to rise. This leads to a further increase in profit opportunity attracting even more firms and investors. The positive feedback of increased income from new investments creates an upward spiral of demand for stocks and stock prices in the market. This stage is what Minsky calls “euphoria”.

The more popular notion of euphoria phase is describe by Malkiel:

“Greed run amok has been an essential feature of every spectacular boom in history. In their frenzy for money, market participants throw over firm foundations of value for the dubious but thrilling assumption that they too can make a killing by building castles in the air” (Malkiel 35).

Others, such as Flood and Shiller, have tried to explain euphoria in more rational terms. Flood states,

“A bubble can arise when the actual market price depends positively on its own expected rate of change, as normally occurs in asset markets. Since agents forming rational expectations do not make systematic prediction errors, the positive relationship between price and its expected rate of change implies a similar relationship between price and its actual rate of change. In such conditions, the arbitrary, self-fulfilling expectation of price changes may drive actual price changes independently of market fundamentals…” (Flood 1994, 1)

Although Shiller believes that the increase in market valuations can be caused by changes in fundamentals, he argues that during some periods "indirect stock price changes may tend to be anchored to the price change of other stocks... This kind of anchoring may help explain why
individual stock prices move together as much as they do, and thus ultimately why stock price indexes are as volatile as they are." (Shiller 2000, 138)

The lull before the storm:

Speculation continues as individuals buy securities for resale rather than for their stream of income. They enter the market to purchase shares at "inflated" values. In anticipation of greater gains, several individuals convert their savings from one form of investment to another. At this point, stock prices are driven more by individuals trying to predict the mentality of the crowd, rather than by their fundamentals. However, neither a boom nor such euphoria lasts forever.

Panic:

Some speculators realizing that the market can’t go any higher start selling their stock. Some individuals choose to sell out and leave the market while others find themselves in a state of financial distress. If such a bust encourages "long-term investors" to sell, then it might suggest that the market may have been driven by speculation. If investor psychology and behavior were actually driven by idealistic concepts and fads that change periodically, it would be hard to stand by the efficient markets hypothesis.

Shifting Fundamentals:

James K. Glassman (1999) and others have argued that the increase in prices is due to a shift in the underlying fundamentals. He has pointed out that we are experiencing an information revolution. Over the years, there have been drastic changes in the way both individuals and companies do business, and in the type of individual participating in the stock market. The entire world is emerging into a global economy. It would seem natural then that the stock market would reflect this massive transformation that we as a civilization are going through.

As firms seem to become more and more shareholder oriented, simultaneously, with the expansion of stock ownership, the investor has evolved into a far more informed and educated player in the market for financial assets. Once again, technology and personal computers play a very important role in this evolution. PC’s have become a very important tool to the individual investor, both as a source of information through the Internet, and as a vehicle of transaction. The Great Depression generation is dying out. The players in the market today are not as scared of the market. Investors have a better understanding of the stock market than previously, thanks mainly to more consumer friendly brokerage firms, banks, discount brokers, journalists, scholars and even the mass media.

Relevant Risk

Glassman also notes that the relevant risk of long-term investing in the stock market has dropped significantly, and is still continuing to decline. In the short run, however, the investment is still fully susceptible to the short-term volatility of the stock market, giving no guarantee of positive returns to the short-term investor. The risk premium for the long-term investor, however, is lower than that for the short-term investor. This would indicate that the required return for the long-term investor is lower and hence, the real value of a share of stock to the long-term investor would be higher than what the short-term investor would evaluate its (the stock’s) price to be.
The duration for which a player intends to maintain his investment in the market is based on several demographic and perhaps even institutional factors. There are various groups of investors in the market resulting in several different "fundamental values." As the baby boomer generation starts to plan for retirement, and as the government provides incentives to invest for the long-term through retirement programs such as IRA's, a larger portion of the investor population will have a greater incentive to invest in stocks for the long-run. As the risk premium for stocks falls, long-term traders begin to purchase more and more stock from short run investors, thus pushing up prices. Given that a large proportion of the earning population, (the baby boomer generation,) is fast heading towards retirement, it does seem reasonable to assume that they would have a preference towards purchasing long-term stocks at seemingly inflated values.

Thus, the recent publicity by Glassman, and others notably Siegel (1998), have persuaded investors that holding a stock portfolio for long periods of time was the best investment alternative:

"the longer you hold on to stocks, the less volatile your returns and the more likely you will make money. Stocks have appeared to obey a kind of reversion to the mean - whatever goes down, must go up. Assume you hold a diversified portfolio of stocks - such as S&P 500 – for ten years instead of one year. Risk shrinks significantly. For the sixty-four overlapping ten-year periods between 1926 and 1998, (1926-1935, 1927-1936, etc.), the S&P stocks scored positive returns sixty-one times. For the fifty-eight versions of fifteen years, they were positive every year. In fact, over the worst twenty-year period from 1929 to 1948, the total gain was 84 percent" (Glassman 27).

This gradual promotion of receiving high returns with lower risk for long-term investors along with the influx of long-term investors lends support to the argument that the market risk premium of investors may have declined over time.

**EMPIRICAL SECTION:**

As established in the theory section, the price of a share of stock is calculated as the time adjusted present value of the sum of its anticipated future earnings. Certain market "fundamentals" determine the expected earnings of a financial asset. Any deviation of actual stock prices from the price determined by the fundamentals is said to be as a result of speculation. These prices, however, should correct themselves, in time, conforming to the prices determined by the fundamentals. A sustained deviation of stock prices from the fundamental price is what we refer to as a speculative bubble. However, it is conceivable, that what is perceived as a speculative bubble, may in fact be nothing more than the stock market reflecting a new or changing fundamental, and not the symptoms of a market unstable due to speculative excess. Understanding and individually analyzing the fundamentals might help us better understand the issue of speculative bubbles in the stock market. The empirical model developed in this paper uses the fundamental relationship and examines the theories related to stock price momentum, and risk premium on stock prices.

The basic model tested

\[
\text{Portfolios Price} = f \left( k_{ur}, R_{m}, D_{p+ij}, g_{m} \right)
\]

\[ (-) (-) (+) (+) \]
indicates that the portfolio price is negatively related to the risk free rate of return in the market and market risk premium, and is positively related to expected dividends and expected growth in dividends.

Data and Modifications

The period under examination extends from January 1966 to July 2000. The NYSE index was used to represent the market portfolio. Since this study examines the phenomenon of speculative bubbles in the entire stock market, as opposed to an individual firm or industry, the NYSE composite index was used in order to capture stock price movements across the board. The monthly average of the index was calculated from end-of-day prices.

Corporate dividends collected by the U.S. Department of Commerce was used as a proxy for dividends of the NYSE portfolio. The NYSE represents over 70% of the total market value of publicly traded firms in the economy; thus we would expect that the dividends of the economy should approximate the movement in dividends of the NYSE portfolio. Since the Department of Commerce’s series is reported on a quarterly basis, monthly estimates were made based on the quarterly reports and since these monthly estimates are calculated from the actual reports, they would also approximate the expected movement in dividends.

Two variables were used for the risk free interest rate: the yield of a ten-year Treasury Bond and the yield on the three-month Treasury Bill. Empirical studies have employed both short-term and long-term rates as the risk free rate. Short-term security rates are used because they reflect the risk-free liquidity choice of investors. Long-term security rates are used because long-term securities are a closer match to the maturity profile of stocks.

Since the ex-ante market risk premium cannot be directly observed, two proxy variables were created in an attempt to capture any changes in the market risk of the stock market that might have occurred over the years. Ex-ante risk premium on bonds can be calculated from their yields. The first proxy is a traditional measure of relative risk (BBB/10YR TB); henceforth called relative risk. It was calculated by dividing the yield of BAA by the yield of the ten-year risk-free Treasury Bond. As the measure increases, we would expect that the risk premium on stocks to increase by the same amount. The second proxy is a measure of the relative risk between the different classes of risk (RISKIND); henceforth called the risk index. If investors are taking a long-term view of investing, as Glassman suggests, then the traditional measure of relative risk may not capture the shift in the premium between bonds and stocks. An index of the relative risk was created by taking the ratio of the yields of a BAA bond and an AAA bond and dividing it by the ratio of AAA and a 10-year risk-free Treasury bond. This risk index shows the relative risk premia within the market among securities. An index equal to one suggests that the market has given relatively equal weight to the risk premium of the higher risk security relative to the lower risk security. As the index moves above one, investors are requiring a higher risk premium on the higher risk securities relative to the lower risk securities - this movement has been called the "flight to quality". As the market moves below one, investors are requiring a relatively smaller risk premium on the high-risk security. In this case investors are selling off low-risk (high quality) securities and purchasing high-risk (low quality) securities. We argue that an increase in the risk index implies that the market risk premium on stocks is increasing relative to the high-risk security.

Finally, a proxy was used for expected growth in dividends: the difference in the log of the NYSE index lagged one period. Under the constant growth model, the growth in expected
dividends is equivalent to the expected capital gain yield of the stock. Thus, the proxy would measure the total capital yield one-month prior to the current index.

Glassman's Assertion of Smaller Risk Premiums Driving Higher Stock Price

Before testing the stock-pricing model directly, we need to assess Glassman's assertion that there was a shift in risk preference of the investor. If risk in the stock market has been declining over time, as Glassman suggests, we should observe this directly by the movement of the relative risk between high-risk and low-risk securities. We would expect both the traditional measure of risk and the index to shrink. The relative risk measurement is given in Figure 1. Over the last 34 years the risk premium has moved within a narrow range and does not show any decreasing trend. Since 1981 when IRA's were allowed as a tax-free vehicle for long-term savings, the average risk premium increased slightly. Towards the end of the century, it appears that the premium was moving slightly above the norm.

When the risk index is graphed for the same period (Figure 2), the findings were more consistent with Glassman's observations. There has clearly been a drop in the risk premium offered on high-risk bonds relative to low-risk bonds. This trend seems to start in 1985 and continued to decline throughout the 1990's. If this trend were extended to the premium between stocks and BBB bonds, the Glassman argument would appear to have some merit.

These movements, however, may not be solely due to the change in the investor's long-term time horizon, but due to the changes in the general economy. In a strong economy short-term investors would be willing to accept a smaller risk premium as wellxvii. To test to see if the default premium was caused by the changes in the general economy, the proxies were regressed against the log of monthly industrial production, log of M2, and the log of the ratio of the 10-year and one-year Treasury securities, a set of dummy variables, and an interaction variable to assess the Glassman theory:

\[
\text{Log of Default Prem}_t = a_0 + a_1 \text{LIP}_t + a_2 \text{LM2}_t + a_3 \text{LEXP}_t + a_4 \text{D82-86}_t + a_5 \text{D87-92}_t \\
+ a_6 \text{D93-97}_t + a_7 \text{D98-00}_t + a_8 \text{DLIP}_t + u_t
\]

It is expected that the default premium will move inversely with real economic activity denoted by the log of industrial production (LIP), and positively with the liquidity (LM2) denoted by the log of M2.\textsuperscript{xvi} As noted by Cook and Hendershott (1978) if there is an increase in interest rate expectations (LEXP) by the same amount for long-term securities, the spread may not change, but relative risk would decline. For our risk index, since the index is a ratio of relative risks, we would expect little change in the index when interest rate expectations change by the same amount. The proxy for interest rate expectations is the spread between the 10-year and one-year treasury securities. Dxyears are dummy variables taking on the value of one for the period of time indicated. Since Glassman argued that it was the long-term investor that was moving the market risk premium lower, we started with 1982 when the Treasury issued rules to allow IRA's to be more accessible to the public\textsuperscript{xviii}. Five-year periods were used to show the publics' adjustment to investing in the stock market. We would expect the dummy variables to have negative coefficients. Finally, DLIP is an interaction variable where industrial production (LIP) is multiplied times a dummy variable taking on the value of one during the 1982 to 2000 period. A positive coefficient on the interaction variable would suggest that investors are less sensitive to percentage changes in industrial production since 1982. A negative coefficient would suggest investors are more sensitive to percentage changes in industrial production.
The results of the relative risk measurement regression (given below with standard errors) confirm most of the expected hypotheses except for the dummy variables over the 18-year period.

\[
\text{BBB/10YR}_t = \beta_0 + \beta_1 \text{LIP}_t + \beta_2 \text{LM2}_{t-1} + \beta_3 \text{LExp}_{t-1} + \beta_4 \text{D82-86}_t + \beta_5 \text{D87-92}_t + \epsilon_t
\]

\[
= -.067 - .264 \text{LIP}_t + .093 \text{LM2}_{t-1} - .0017 \text{LExp}_{t-1} + .0018 \text{D82-86}_t + .0183 \text{D87-92}_t
\]

\[
+ .0628 \text{D93-97}_t + .1461 \text{D98-00}_t - .0043 \text{DLIP}_t
\]

\[
\text{DW: 1.54} \quad \text{AR(2) Coefficients: -.918} \quad + .096 \quad (.049) \quad (.049)
\]

After accounting for movements in industrial production, liquidity and interest expectations, relative risk increased between 1993 and 2000. This evidence suggests that stock premium would have also increased during the later part of the 1990’s and the stock market could not have been linked to the shift in the risk premium.

To assess whether there was a change in the relative risk among various risk classes, the Risk Index was used as a dependent variable. The results, given below, suggest that there were significant changes among the risk classes during the 1990’s.

\[
\text{RISKIND}_t = \gamma_0 + \gamma_1 \text{LIP}_t + \gamma_2 \text{LM2}_{t-1} + \gamma_3 \text{LExp}_{t-1} + \gamma_4 \text{D82-86}_t + \gamma_5 \text{D87-92}_t
\]

\[
- .0655 \text{D93-97}_t - .1019 \text{D98-00}_t - .0128 \text{DLIP}_t
\]

\[
\text{DW: 1.44} \quad \text{AR(1) Coefficients: -.838} \quad \text{(.027)}
\]

There was slight decline between 1987 and 1992, but this shift is not statistically significant. Relative risk did show a sharp and significant decline after 1992. The index between 1993 and 1997 declined on average by .065 while it declined on average by .10 between 1998 and 2000. The dummies clearly show that investor’s preference towards the high-risk classes dropped relative to the low risk class even when we account for economic activity.

Unlike the first model, the interaction variable was statistically significant. The negative coefficient on the interaction variable suggests that investors showed a slight increase in sensitivity to changes in economic activity. This higher sensitivity could be a result of the shift in preference of the investor to a long-term horizon. With fewer short-term traders, changes in economic activity result in wider swings in premiums while long-term investors sit on the sidelines even when risk premiums look favorable.

Thus, the recent movements in the stock market could have been caused, as Glassman argued, by the shifting of the risk premium required by investors among the different risk classes of securities.
To test Minsky’s theory concerning stock price momentum, the identification of "bubble periods" was needed. We defined an (ex post) "positive bubble period" when the stock index had a positive return for at least a year followed by a drop in the index by at least 10% for the next two months. The 10% drop over a two-month period was a rare event - the average two-month change in the index was 1.5% with a standard deviation of 5.6%. This suggests that prior to the drop the market may have "overvalued" stocks. The twelve-month period prior to the drop should have been enough time to capture the euphoria effect that Minsky asserted. We also include "negative bubbles" in which price momentum moved in the opposite direction. Ex post negative bubbles were defined when the index rose by at least 9% over a two month period after the index had declined over the last year. These period were when the market "undervalued" stocks. A summary of the periods are given in Table 1.

To determine if there was price momentum during these periods, an interaction variable was created. This variable is constructed by multiplying a dummy variable times the proxy variable for expected growth in dividends. If investors were influenced by price momentum, then the coefficient on the interaction variable would be positive. This would indicate that an increase (decrease) in the capital yield would have a larger impact on stock prices due to investor euphoria (depression).

In order to capture both the short-run and long run dynamics of stock price adjustments an error correction model (ECM) was used. An ECM follows a two-step procedure. The first step is to estimate the long-run equilibrium stock price model (equation 4) using log levels of the variables:

\[
\text{LSPPort}_t = \alpha_0 + \alpha_1 \text{LDIV}_t - \alpha_2 \text{LRF}_t - \alpha_3 \text{LDefPrem}_t + \alpha_4 \text{LSPricet}_1 + \varepsilon_t
\]

Where:
- \(\text{LSPPort}_t\) is the log of monthly average NYSE Index,
- \(\text{LDIV}_t\) is the log of monthly corporate dividends,
- \(\text{LRF}_t\) is the log of the monthly risk-free rate 3-M T-Bill or 10-Yr T-Bond,
- \(\text{LDefPrem}_t\) is the log of BBB/10Yr (relative risk)xx,
- \(\text{LSPricet}_1\) is the difference in the log of the monthly index lagged one period

The second step is to take the error series from equation 5, lagged one period, and to include it in the final regression using the first difference of the log of each variable. When the error is positive, it implies that the actual price index exceeds the estimated long-run equilibrium price. Consequently, we would expect the market price to drop in the next period as it adjusts to the long-run equilibrium value. Thus, the coefficient on the lagged error term should be negative.

Two ECM were estimated: the basic model and the price momentum model for each of the risk-free securities:

\[
\Delta\text{LSPPort}_t = B_0 \varepsilon_{t-1} + B_1 \Delta\text{LDIV}_t - B_2 \Delta\text{LRF}_t - B_3 \Delta\text{LDefPrem}_t + B_4 \Delta\text{LSPricet}_1 + u_t
\]

\[
\Delta\text{LSPPort}_t = C_0 \varepsilon_{t-1} + C_1 \Delta\text{LDIV}_t - C_2 \Delta\text{LRF}_t - C_3 \Delta\text{LDefPrem}_t + C_4 \Delta\text{LSPricet}_1 + C_5 \text{Mom}\Delta\text{LSP}_{t-1} + z_t
\]

where, \(\text{Mom}\Delta\text{LSP}_{t-1}\) is an interaction variable designed to capture the "Minsky bubble" effect of past changes in stock prices on the current change in stock price. The results, given in Table 2,
indicate that the Gordon constant growth theory is supported in the basic models (Models 1 and 3). The Dickey-Fuller t-statistic from the augmented Dickey-Fuller regression indicates that the errors are uncorrelated and the relationship is cointegrated in both models.

In Model 1, as expected, expected dividends had a positive impact on the NYSE Index. A one percent change in the growth of expected dividends resulted in a .467 percent increase in the growth of stock prices. The coefficient for the 10-year T-Bond was −0.549, indicating that the change in the risk free rate of one percent would cause a negative change in the monthly NYSE composite index by .549 percent, ceteris paribus. The change in relative risk in the market had a similar impact on the monthly NYSE index; a change in the relative risk in the market of one percent would cause an opposite change in the NYSE index by .512. Theory suggests that there is unit elasticity between stock prices and the market return, which is close to the summation of the risk-free and default premium coefficients found in Model 1. When there was an increase in the appreciation of the NYSE Index by 1% - indicating a change in the expected growth in the NYSE - the NYSE increased by .22.

It also appears that the changes in the NYSE index are impacted by deviations in the long-run relationship. When the actual index exceeded the expected index, suggesting an overevaluation, there was a decrease in the market the following month by .037 percent. Likewise, when the actual index was less than the expected index, there was an increase in the market the following month.

In Model 3, in which we examine the basic model using the three-month T-Bill, our general results still hold, but the size and the significance of the coefficients differ on some of the variables. The coefficients on expected dividends, expected growth in the NYSE, and error-correction term were similar in size and significance to coefficients in Model 1. The coefficients on the risk free and default premium had the correct signs, but they were smaller than those estimated in Model 1, and the coefficient on the default premium was insignificant.

In the price momentum regressions (Models 2 & 4), which examines Minsky's theory, the coefficients had the correct sign, but were statistically insignificant. This suggests that during the periods where prices were appreciating, the identifiable (ex-post) "bubble periods", investors did not increase their investment due to the price appreciation. Consequently, we could not find the Minsky effect.

CONCLUSION:

Two key areas of the debate over what has caused the recent stock market movements have been reviewed: shift in risk preference or price momentum. During the last decade it appears that there was a shift in the risk preference of investors. While the relative differential between high-risk securities and low-risk securities increased during the last decade, the relative risk between classes of securities declined. In other words, investors were requiring a smaller risk premium on high-risk securities for a given risk premium on low-risk securities. This could have been due to the increased involvement of long-term investors who were willing to require a smaller premium on stocks.

The evidence did not support the contention that the recent bull market was due to herd mentality where the movement in prices led investors to invest more thereby driving up price. The
"bubble periods" did not show any additional and significant impact on prices prior to a significant fall.

These results have two key policy implications. First, for those who believe in "bubbles" and have argued that the Fed should help deflate the over-evaluated market, their policy recommendation is misguided. It appears that the market does price stocks based on the fundamentals. Second, even if the Fed were to intervene, it appears that monetary policy has a small impact on stock prices. The short-term risk-free rate, a key tool of the Fed, does not influence the market as much as the longer-term risk-free market. The effect of short-term interest rates is over six times smaller than long-term rates. This suggests that the Fed should focus on long-term inflation expectations, which drives long-term rates, rather than the current movement in stock prices.

REFERENCES


### Table 1

**Bubble Breaks**

<table>
<thead>
<tr>
<th>Two Month Period</th>
<th>Drop in NYSE Index Two Month Change</th>
<th>Change in NYSE Index Prev Year</th>
<th>Prev 6 mths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct, Nov 1978</td>
<td>-10.2%</td>
<td>14.0%</td>
<td>13.1%</td>
</tr>
<tr>
<td>Mar, April 1980</td>
<td>-11.6%</td>
<td>17.6%</td>
<td>6.7%</td>
</tr>
<tr>
<td>Oct, Nov 1987</td>
<td>-24.5%</td>
<td>34.4%</td>
<td>10.7%</td>
</tr>
<tr>
<td>Aug, Sept 1990</td>
<td>-12.2%</td>
<td>1.9%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Aug, Sept 1998</td>
<td>-14.0%</td>
<td>21.7%</td>
<td>10.2%</td>
</tr>
</tbody>
</table>

**Increase in NYSE Index**

<table>
<thead>
<tr>
<th>Two Month Change</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>July, Aug 1970</td>
<td>+ 9.4%</td>
<td>-21.1%</td>
<td>-15.6%</td>
</tr>
<tr>
<td>Dec 1974, Jan 1975</td>
<td>+19.0%</td>
<td>-31.0%</td>
<td>-18.1%</td>
</tr>
</tbody>
</table>

| Two Month Average Return | 1.5%          |                              |            |
| Two Month Standard Deviation | 5.6%          |                              |            |

### Table 2

**Stock Evaluation E.C.M. Model**

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Model 1 BASIC</th>
<th>Model 2 PRICE MOMENTUM</th>
<th>Model 3 BASIC</th>
<th>Model 4 PRICE MOMENTUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lagged Error</td>
<td>-.037</td>
<td>-.037</td>
<td>-.027</td>
<td>-.028</td>
</tr>
<tr>
<td></td>
<td>(.011)*</td>
<td>(.011)*</td>
<td>(.008)*</td>
<td>(.008)*</td>
</tr>
<tr>
<td>ΔLDIVIDENDS</td>
<td>.467</td>
<td>.467</td>
<td>.479</td>
<td>.479</td>
</tr>
<tr>
<td></td>
<td>(.156)*</td>
<td>(.157)*</td>
<td>(.164)*</td>
<td>(.165)*</td>
</tr>
<tr>
<td>ΔL10Yr T-BOND</td>
<td>-.549</td>
<td>-.548</td>
<td>-.087</td>
<td>-.090</td>
</tr>
<tr>
<td></td>
<td>(.077)*</td>
<td>(.078)*</td>
<td>(.029)*</td>
<td>(.029)*</td>
</tr>
<tr>
<td>ΔL3-M T-BILL</td>
<td>-.512</td>
<td>-.511</td>
<td>.087</td>
<td>.087</td>
</tr>
<tr>
<td></td>
<td>(.120)*</td>
<td>(.120)*</td>
<td>(.078)</td>
<td>(.078)</td>
</tr>
<tr>
<td>ΔRELISK</td>
<td>.222</td>
<td>.221</td>
<td>.279</td>
<td>.271</td>
</tr>
<tr>
<td></td>
<td>(.046)*</td>
<td>(.052)*</td>
<td>(.047)*</td>
<td>(.054)*</td>
</tr>
<tr>
<td>LAGASTKINDEX</td>
<td>.007</td>
<td>(.102)</td>
<td>.036</td>
<td>(.108)</td>
</tr>
<tr>
<td>L MOMENTUM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-Stat</td>
<td>26.09</td>
<td>21.7</td>
<td>16.28</td>
<td>13.56</td>
</tr>
<tr>
<td>Dickey Fuller t-stat</td>
<td>-10.32</td>
<td>-10.32</td>
<td>-10.50</td>
<td>-10.48</td>
</tr>
</tbody>
</table>

( ) Standard Error  *, **, *** Significant at the 99%, 95%, and 90% levels
Figure 1: Relative Risk Premium: BBB/10yrTB

Figure 2: Relative Risk Index


Given an equilibrium price, the expected return to the investor can be determined from equation (1). Rearranging equation (1) yields the expected return is equal to the dividend yield plus g where g would be the expected capital gain yield.

Malkiel, Burton (1999) has popularized this fundamental theory.


John Y Campbell (1997) has defined a rational bubble as a stock whose value is equal to the discounted value of expected dividends (Equation 3) plus a "bubble" value based on a higher expected price next period independent of dividends. (p. 258)

Shiller (2000) Chapter 2. Shiller also notes there are times when the market could be undervaluing stocks which he calls "negative bubbles". (p.62)

See Carlson and Pelz (2000)


Peterba, Venti, and Wise (1992) found that the government incentive retirement programs resulted in new savings and not a transfer of savings. This suggests an increase in long-term participants.

Daily NYSE index data was obtained from the NYSE web site while all other data was gathered from the St. Louis Federal Reserve Bank.

Financial economists have not come to consensus on the appropriate risk-free rate. As one textbook notes: "Theory calls for the use of a short-term rate, but if that rate is used here [in equity evaluations], a difficult practical questions arises: how does one reflect the premium required for expected inflation over long horizons...it is probably easier to use intermediate or long-term riskless rates..." (Palepe, Healy, Bernard, 2000, pp 1222-1223)

Cook and Hendershott (1978) note that either the spread or ratio can be used to measure the default premium. However, when working with the spread in empirical estimations, the level of interest rates must be included as an independent variable to account for the spread at a constant level of risk. (p.1180)

Cook and Hendershott (1978) on the empirical evidence. The model used in this paper follows Cook and Hendershott.

Holding real economic activity constant, and interest rate expectations, an increase in liquidity will push down the risk-free rate relative to risky securities.

We started with the year 1982 when the Treasury Department clarified retirement accounts that made it easier for firms to allow their employees to participate in a 401(k) plan. The dummies were in 5 year increments so the changes in demographics and adjustments to the new rules can be observed.

Analyst would call this kind of market as being under valued. See Shiller (2000) p 62.

The log form was used because theoretically, the variables are nonlinear in their levels. However, a linear approximation can be made using the log form. First differences of the variables were used after the test of stationary showed that the errors of the log levels followed a random walk. When using transforming to first-differences, the intercept can be omitted.

Regressions using the risk index were also tested. The main results did not change, expect that dividends were statistically significant and risk was insignificant. Since the adjusted R-squared was about 40% lower that the model presented, the best model was given.