4-26-2002

Bubble Mania or Not?

Justin Leverton '02
Illinois Wesleyan University

Bubble Mania or Not?

Justin Leverton
Honors Research
Final Draft
26 April 2002

I. Introduction

While many economists define a "bubble" as a deviation from stock market fundamentals, Charles Kindleberger defines a bubble as an upward price movement over an extended range that tends to implode (Kindleberger 1996). An extended negative bubble is a crash. The nature of these beasts makes them very important to the investor. Business schools teach students about the efficient market hypothesis and the economically rational individual. Bubbles make investing difficult because prices deviate from their fundamental valuations. If market fundamentals can not predict prices, the investor is forced to learn new ways of investing.

From 1985 until 2000, the price of stocks increased exponentially. Financial analysts wondered if we were in a "new" economy or simply a bubble. Were the fundamentals of stocks changing to support the rapid growth or did a bubble exist?

Three competing viewpoints exist on bubbles. The more traditional theory applied to market bubbles is the adaptive expectation theory. When individuals apply this theory, they look to the past to judge the correct price of a stock. Ratios and trend analysis are important to picking a winning portfolio. Subscribers to the adaptive expectations theory believe investors are backward looking in deciding on the correct price to pay for a stock. In the literature review section, several previous studies will be presented to solidify this argument.

More inclusive than the adaptive expectations theory, the rational expectations theory builds off the concept that investors are forward looking. Investors act on the basis that they realize the correct model of how the world works and that they use all available information in deciding on their actions (Poole 2000). Unlike adaptive expectations, rational expectations incorporates both past performance *and* future earnings into the price evaluation. Investors integrate monetary policy and other macroeconomic variables into their investment decisions. Unlike price to earnings ratios and trend analysis, rational expectation variables are not based solely on past performance. As with the adaptive expectations model, previous studies based on rational expectations will be studied in the literature review.

With both rational expectations and adaptive expectations, investors base the price of a stock on some expected future profits discounted for the time value of money. The equation might look like this:

$$P_{stock} = (\text{Sum future Profits} / (1+ r)^t) / \text{Outstanding Shares}$$

where P is price of stock, r is the interest rate, and t is the future time period that payments are expected to be discounted. The difference between the two theories is how they arrive at the expected future profit sum. Adaptive looks towards the past to judge this sum, while rational expectations looks *both* towards the past and the future while incorporating macroeconomic policies into the valuation. Both theories present a viable explanation of the direction of stock prices over the long run.

Do the long run theories of adaptive expectations and rational expectations present an adequate reason on why stock prices fluctuate so? If the stock market grows

an average of 6% per year, why did S & P 500 prices increase in the 1980s and 1990s so drastically? These changes in price valuation are so dramatic that traditional models have difficulty explaining them (Poole 2000). This is the argument for the third stock price determination model. As Keynes said:

> A conventional valuation which is established as the outcome of the mass psychology of a large number of ignorant individuals is liable to change violently as the result of the sudden fluctuation of opinion due to factors which do not really make much difference in the prospective yield.

So if investors are uninformed, how do I measure the unimportant variables that they use to base their investments on? Furthermore, how do I even discover these extraneous variables? This task of discovery is quite impossible due to the large number of differing opinions on how stock should be priced. However, it is possible to judge the aggregate effect of this "herd mentality" by analyzing how people react after they incorporate their unimportant variables into their investing decision. A good measure of people's reaction is opinion indices like those based on consumer confidence or consumer sentiment. If the crowd feels generally bullish about the market, a bubble might form until it is popped by a general bearish feeling about the market. If I focus on investor confidence and investor sentiment, crowd psychology can be analyzed.

While impossible to illuminate the individual causes of herd mentality, the overall effect can be discovered through opinion polls. My hypothesis is that when investors exhibit herd mentality in choosing stocks, they create a market bubble.

II. Literature Review

The literature I reviewed promotes many different interpretations of how and why bubbles occur. The following categories break down the works into their

respective philosophical foundations.

Adaptive and Rational Expectations:

In investing, there has always been a division between the investor that analyzes the past (i.e. By looking at price to earning, earnings per share, and other ratios, etc.) or by being forward looking and studying rational expectations. Under the adaptive expectations model, investors look into the past to judge what a stock will do in the future. Their argument can be clearly illuminated by the statement "what a company will do in the future is best represented by what they've done in the past." If this model is accurate regarding stock price evaluation, then variables that measure past performance should correctly predict and explain variations in stock prices. An economist named Harold Bierman analyzed the Dow Jones Industrial Average from the mid 1980s until the early 1990s. Using the price to earnings ratio for the stocks in the index, he studied whether the crash in October of 1987 was a result of a separation from fundamental stock prices (Bierman 54). Bierman supports the idea that market prices are determined from backward looking investors. The article discusses the use of price to earnings ratios to determine excess market valuations. Bierman concluded that the October 1987 levels of the Dow Jones Industrial Average were not excessive. If a researcher analyzes the growth rate of the highest point in 1987 (2722 points before the crash) to 1994, the annualized return is 5.7% (Bierman 64). As his study concludes, adding in dividends paid makes the return "decent" (Bierman 64).

With rational expectations, investors focus on the future. If a company has hired a top-notch management staff, then they should be profitable in the future. Economic agents predict future events that are not falsified by actual events. Rational expectation theory assumes homogeneous investors who share expectations of an asset's

future price, and who instantaneously and rationally discount all market information into this price (Knapp 1). Investors will construct their opinions in such a way that on the average, they are correct. Because of the focus on forward looking behavior, rational expectation theory has drastic implications for bubbles.

The major implication with rational expectation theory is that future events are already built into the price equation of the stock so that only random news will cause the price change of a stock (Baxter and Davis 1998). This randomness in stock price changes leads to the "random walk" theory of unpredictable stock price movements.

Niamh Brodie stated "Fundamental analysis, broadly speaking, values shares according to three factors; the state of the economy, the state of the industry in question, and the earning power and potential performance of a particular company...*The essence of a correct price is not that it predicts the future, but that it fully captures the uncertainties of the future.*" (Brodie 1). Rational expectations theory suggests that stock prices are correctly valued at all times.

When rational expectations is tested empirically, several conclusions can be reached. The problem with rational expectations theory is when the empirical data does not match the model proposed. The researcher can claim that the model is wrong and that rational expectations still holds (Melberg). The researcher can also conclude that the model is correct, but that the results indicate that agents are not rational (Melberg). If the empirical data match the rational expectations model, then the problems that arise if the model does not match are alleviated.

If expectations are rational, Sheffrin argues that "expectations must be unbiased (no systematic mistakes), efficient (use all past information about the variable), consistent (forecasts at different times should not conflict) and the forecast-error must be unpredictable" (Melberg).

Asymmetric Information Model:

Until recently, economists have avoided the idea that herd mentality creates bubbles. No formal tests existed for asset-priced bubbles because the hypothesis about how asset holders' expectations evolve over time did not exist (Diba 1990). However, the advent of the rational expectations hypothesis provided the foundation for rational bubbles.

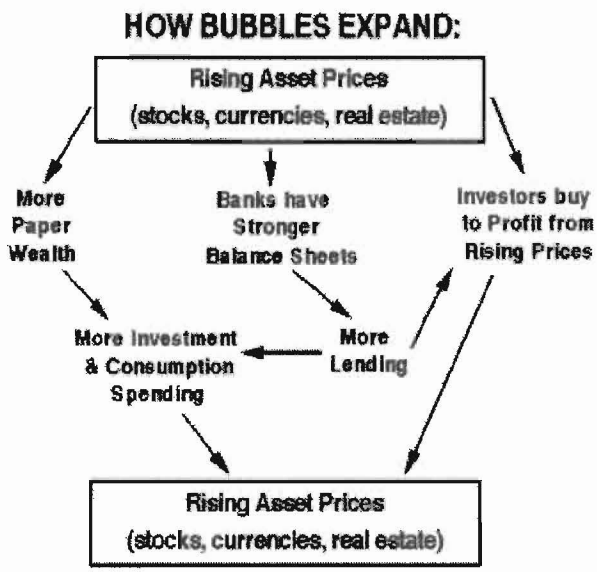
As Shiller points out in his book titled "Irrational Exuberance," completely rational people can participate in herd behavior. The behavior is individually rational, but when combined produces group behavior that mirrors irrationality (Shiller 2000). The reason for herd behavior according to his theory is *information cascade.* His idea of an information cascade is simply reliance of an individual on another's choice. Two people decide to go out to eat. The first chooses one of two empty restaurants simply by tossing a coin. The second person sees the first person eating in the restaurant and concludes that it must be better since the first person is eating in it. As Shiller says, "If all of them had been able to pool their first impressions and discuss these as a group, they might have been able to deduce which restaurant was likely to be the better one. But in this scenario they cannot make use of each other's information, since they do not reveal their own information to others when they merely follow them." The theory of information cascades is a theory of the failure of information about true fundamental value to be disseminated and evaluated (Shiller 2000). Individuals can be rational individuals and still exhibit herd mentality.

Extraneous factors can be incorporated into the bubble model without violating rational expectations or long-run equilibrium towards fundamental valuation. The creation and destruction of a bubble arises from some extraneous event that is of little

significance to the fundamental valuation of a stock (Diba 1990). The very same reason why a bubble forms may destroy the bubble. The growth of a bubble and its deviation from fundamental valuation can be studied through herd mentality. The nature of the bubble's self-perpetuation is described in the next paragraph.

The key to understanding how bubbles operate is that the individual investor realizes that the asset is overpriced. Bubbles form because of herd mentality that exists in crowds. This herd mentality can be explained by how investors view their overvalued assets. A bubble grows at an exponential rate greater than the fundamental valuation growth rate, because an agent would not hold an overvalued asset unless they expect it to be overvalued a sufficiently greater amount next period (Diba 1990). Another way of stating this concept is called the greater fool theory (National Automobile, Aerospace and Agricultural Implement Workers Union of Canada).[1] The investor realizes that the stock is overvalued, but is willing to pay the amount because he thinks that there is a greater fool that will pay even more for the price of the stock. The realization of the overvaluation, but willingness to invest is herd mentality. Figure 1 is a diagram of how bubbles expand:

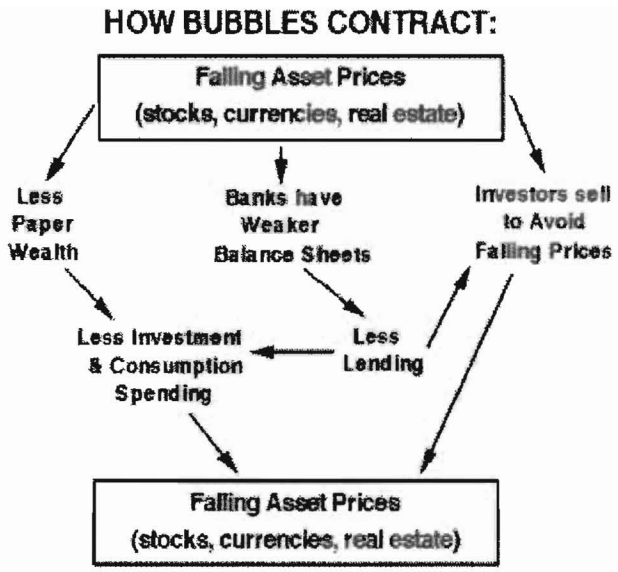
[1] National Automobile, Aerospace and Agricultural Implement Workers Union of Canada's acronym is CAW TCA and will be referred to as such in the rest of the article.



****Note: This diagram also incorporates the effect that banks have on bubble expansion. Source: CAW TCA Newsletter. December 1998 v4 n2.*

Figure 1

The cyclical nature of the bubble is evident from the diagram. Initially, asset prices rise (either by a general rise in fundamental prices or herd mentality). However, the bubble forms when investors "jump on the bandwagon" to profit from rising prices (CAW TCA). They borrow money from investment institutions because of their increased wealth. This borrowing leads to even greater asset prices. However, the bubble will eventually burst. Figure 2 shows how and why bubbles burst:



****Note: This diagram also incorporates the effect that banks have on bubble contractions. Source: CAW TCA Newsletter. December 1998 v4 n2.*

Figure 2

Bubbles can pop because of any extraneous factor that has little correlation with how stocks are valued (Diba 1990). Bubble can also pop when previous information unknown to most investors becomes known. (Information that was asymmetrical becomes symmetrical.) However, the downward spiral of stock prices mirrors the upward expansion in a bubble. As seen from the diagrams, bubbles are self-perpetuating once they form.

The two examples of market bubbles are the tulip mania and the South Sea land speculation bubble. Mackay's book studies the herd mentality of both of these events (Mackay 1996). Mackay's description of the growth rate of the bubble in the South Sea land speculation relates to the greater fool theory. John Law informed the public of the great prosperity of the company and the people believed that the price could be supported at an even higher level (Mackay 1996). This belief of price support in overvaluation is once again illuminated by herd mentality. As Diba points out, over

reliance on outside recommendations is a signal of the presence of herd mentality.

One of the most famous bubbles in history is the rise and fall of the stock market in 1929. From 1926-1929, the stock market rose 300% (Smant). Like the tulip and South Sea bubble; however, economists debate on the presence of a bubble. Smant argues that the panic selling on October 24th, 28th, and 29th are indicators of a bubble. The famous economist Irving Fisher argued that stocks were undervalued even at their peak in September 1929. He stated that "the market went up principally because of sound, justified expectations of earnings, and only partly because of unreasoning and unintelligent mania for buying." (Gorman) Whether or not a bubble existed is up for debate. Some stocks imploded after the 1929 crash while other "speculative" stocks like General Motors turned into the ordinary blue chips we see today.

A legend of Wall Street, Phillip Carret offers insight into successful speculation. His book defines the machinery of markets and the vehicles of speculation to better understand market bubbles (Carret 1997). Chapter 4 and 5 of his book deal with market movements in terms of "ripples and waves." Instead of using the term market bubble, Carret defines market separation from economic fundamentals as a "tide of speculation." An example of the "tide of speculation" is demonstrated in the virtual model constructed by an economist from the University of Bonn named Thomas Lux. Lux created a virtual model of 500 agents trading one commodity (Chang). Some of the traders used a strategy that hinged upon the commodity's fundamental value, which fluctuated randomly. Others traded based on market trends, a sort of "trader see, trader do" strategy (Once again, the greater fool theory arises). Virtual traders could also switch strategies depending on which seemed to be doing better (Chang). "We see in our model, the price dynamics reflect fundamental values but only to an extent," Lux says. "We think this shows one needs to pay more attention, one has to stress more the

interaction of agents, which has been neglected in economics up to now" (Chang).

III. Research Design

Whether or not a deviation exists from the fundamental stock price is the central theme of this research paper. For my research, actual S&P 500 prices will be compared with the price predicted by fundamental variables.

Dependent variable

The fundamental price equation relies on the actual S&P 500 price. The regression analysis presumes that the S&P 500 prices can be explained through fundamental variables like book value, earnings, dividends, the federal funds rate, and productivity.

Dependent Variable

Dependent Variable	Description
S&P 500 Price*	Actual monthly S&P 500 prices from 1985-2000

**Source: S&P 500 official website. www.spglobal.com.*

Table 1

Through fundamental analysis, the exponential increase in S&P 500 prices from 1985-2000 should be explained. If the fundamental equation does not explain the price increase (a low r^2), then either a bubble exists or the model is incorrect.

The premise of a bubble is a growing and persistent deviation of stock prices from their fundamental values. However, some interesting questions arise. What is the fundamental value of a stock and how is it determined? When is the deviation from the fundamental price a bubble and when is it simply a random fluctuation? In my model, a

deviation that grows in consecutive periods is a bubble.

The definition of when a bubble is present and when it does not exist is highly debated. Some economists argue that a bubble is present when a 5% deviation occurs from actual stock prices and their fundamental prices (Kindelberger). Others argue that the deviation must be greater. Since the literature I have read often refers to the bubble that the market has been in since the mid 1980s, I will interpret a persistent and growing deviation as a market bubble. The first step of running the regression is to identify a "fundamental" stock price valuation for the S&P 500. By finding the fundamental price, I can compare the actual price to the fundamental price. The deviation of the price between the two represents a market bubble.

Independent Variables

The independent variables represent the fundamental price of a stock. Under rational expectations theory, investors evaluate the price of a stock based on a past and future performance. To measure this performance, the fundamental price equation will incorporate four variables from 192 observations. These variables are listed in table 2:

Independent Variables

Independent Variable Name	Description	Expected Sign
Earnings*	Monthly index of earnings for S&P 500 from 1985-2000	Positive
Book Value**	Average monthly book value for S&P 500 companies from 1985-2000	Positive
Dividends*	Total dividends distributed monthly for S&P 500 from 1985-2000	Positive or Negative
Federal Funds Rate***	Monthly federal funds rate from 1985-2000	Negative
Productivity****	Quarterly productivity of labor from 1985-2000	Positive

** Source: Shiller's Irrational Exuberance market data. http://aida.econ.yale.edu/~shiller/data/ie_data.htm*

***Source: Barra Investor Research. http://www.barra.com/research/fundamentals.asp*

****Source: Federal Funds Interest Rate, Monthly, NSA, Percent. www.economagic.com*

*****Source: Productivity and Costs. www.bls.gov*

Table 2

As a company increases its earnings, the price of its stock should go up. This increase in price is represented by the sum of future earnings increases. An increase in book value should behave much the same way. When the book value of a company increases, its expected future earnings stream increases. Therefore, the price of the stock should go up.

Intuitively, the increase in dividend payments should increase the price of a stock. With a higher payment stream, a commodity is more valuable. Further analysis may prove otherwise. Starting in the early 1990s, many boards of directors decreased dividend payments. The rationale of this decision was that the reinvestment of corporate profits was money better spent. Capital gains were a better means of returning more

value to the shareholder. Furthermore, capital gains tax is far less than income tax charged against dividends. Because of the reduction in dividends, a stock's price should reflect a greater portion of the earnings stream. Hence, the price of a stock should increase when dividends are decreased. Whether dividends have a positive or negative effect on stock prices will be observed in the rational expectations regression.

The cost for a company to borrow should influence the price of a stock. The cheaper the cost is to borrow, the more a company can borrow to invest in themselves. The cost of borrowing is represented by the federal funds rate. The lower the federal funds rate, the cheaper a company can borrow. Also, a low federal fund rate illustrates the fact that the fed is willing to accommodate growth with expansionary monetary policy. Therefore, the federal funds rate should have an inverse relationship to the S&P 500 price level.

Finally, an increase in productivity should create an increase in the price of a stock. As technology increases every year, workers become more efficient. Efficient workers can produce more output with the same amount of input. This increased output means more revenue for a company. According to our model, increased revenue means an increase in price. The productivity variable should have a positive effect on price.

V. Results

If all of the variables are significant and correlated to the rapid increase in the S&P 500 prices from 1985-2000, then a bubble does not exist. However, if the equation does not explain the increases in prices, either:

a) The model is not set up properly and expectations are still rational

b) The model is correct and expectations are a rational response to asymmetric information (a bubble exists).

Initially, rational expectations regression results proved very promising. A high r^2 in the 0.96 range meant that the increase in S&P 500 prices was almost entirely due to rational expectations theory. Investors estimated past performance and the future earnings stream and incorporated them into the price of a stock. Contrary to the herd mentality theory, investors are rational agents that pick stocks based on their fundamental basis—not because of the greater fool theory.

However, autocorrelation was present in the dataset. The most likely cause for autocorrelation in the stock data is the concept of momentum. Momentum arises when the stock price of one month depends on the price of the previous month (Bernstein). As William Bernstein stated, "US security prices exhibit some momentum over periods of one month" (Bernstein). Bernstein's previous work shows that momentum-induced autocorrelation in the stock market is a plausible scenario.

All hope is not lost when autocorrelation is concerned. There are methods for correcting the autocorrelation that afflicts the data. The two methods I am using are the Cochrane-Orcutt method and the Prais-Winsten method.

The Cochrane-Orcutt method runs an initial regression, and then takes the estimated residuals and reruns the regression (Boyd 5). An estimate of rho (the autocorrelation coefficient) is obtained and the process is iterated until the residual sum of least squares is not reduced significantly (Boyd 6). The result is a regression model that separates the autocorrelation coefficient from the other variables. The significance and correlation of the independent variables with the dependent variables can be analyzed apart from the correlation that exists between the lagged values of the same variable (Boyd 1).

Much like the Cochrane-Orcutt method, the Prais-Winsten method corrects for autocorrelation by applying the ordinary least squares method to transformed variables

(Dielman and Rose 1). The two methods are nearly identical except how the regression treats the first variable. With the Cochrane-Orcutt method, the first independent variable is omitted. In the Prais-Winsten, the first variable is transformed. As Diehl and Rose state, "Asymptotically, there is no difference in the efficiency of estimators produced by the two methods. In previous studies of small sample behavior; however, the superior performance of the Prais-Winsten procedure has been documented" (Diehl and Rose 1). Since my regression includes 192 observations, the autocorrelation should converge with the two methods (The Cochrane-Orcut rho should be close to the Prais-Winsten rho).

In my research, I ran two regressions. The first regression was using the Cochrane-Orcutt transformation and the second regression used the Prais-Winsten transformation. The results of the two regressions can be seen in Table 3:

Regression Results

Regression	Variable	Coefficient	Significance	R^2	Estimated Rho
Cochrane-Orcutt	Constant	990.372	.194	.45[2]	.995
	Real Earnings	8.019	.015		
	Federal Funds Rate	-16.662	.041		
	Real Book Value	.549	.048		
	Real Dividends	14.163	.646		
	Productivity	.883	.557		
Prais-Winsten	Constant	-857.798	.036	.72[3]	.985
	Real Earnings	11.604	.000		
	Federal Funds Rate	-20.988	.011		
	Real Book Value	.612	.033		
	Real Dividends	62.950	.019		
	Productivity	2.348	.118		

Table 3

After running both regressions, many interesting results appear. First, the signs of the independent variables match the predicted signs of the variables in both

[2] The r^2 value was computed using the equation (1-(Error Sum of Squares/Total Sum of Squares))
[3] The r^2 value was computed using the equation (1-(Error Sum of Squares/Total Sum of Squares))

regressions. Real earnings, real book value, real dividends, and productivity all have a positive impact on the S&P 500 price index. Furthermore, the federal funds rate has a negative impact on the price of the S&P 500 price index in both regressions.

The difference in the significance of the coefficients becomes apparent when comparing the two regressions. The Cochrane-Orcutt transformation has only three significant variables at the 0.05 level: real earnings, federal funds rate, and real book value. However, all of the Prais-Winsten independent variables' coefficients are significant at the 0.05 level except productivity. In both regressions, productivity was insignificant.

The Prais-Winsten method has an r^2 value of 72% compared to the Cochrane-Orcutt transformation of 45%. The reason for the Prais-Winsten superior explanatory results is unknown and should be analyzed in future research.

To visually understand the results of the two regressions, figure 3 shows the predicted S&P 500 prices for 1985-2000 using the Prais-Winsten transformation model and the Cochrane-Orcutt transformation model compared to the actual S&P 500 price level.

Predicted vs. Actual S&P 500 Prices

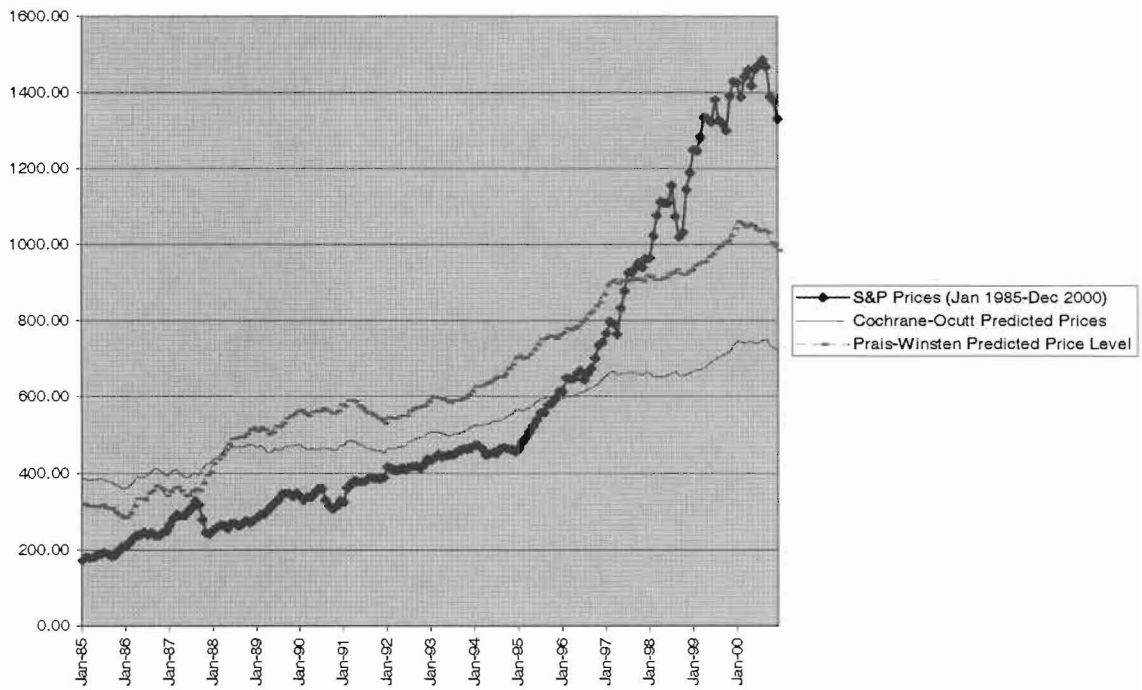


Figure 3

****Note: The insignificant constant variable was removed from the Cochrane-Orcutt Predicted Price graph to more accurately portray the fundamental price estimation of the S&P 500 from 1985-2000.*

As seen from figure 3, both regressions do a decent job at predicting the S&P 500 price levels through the end of 1997. However, a dramatic increase in price occurs near the beginning of 1998. Previously stated, a market bubble is a persistent and growing deviation of actual prices from their fundamental value. Is it plausible that a bubble started in the middle part of 1997? As Alan Greenspan noted on December 5 1996, the economy was experiencing an "irrational exuberance" (Warde). By 1999, Amazon.com, yet to make a single penny in profit, was worth more than all the major book chains combined. A day after its initial public offering, Priceline.com, a discount airline ticket seller, was worth $11.7 billion-more than any other airline (Warde). All of these examples support the idea that a bubble was forming.

VI. Conclusion

While investors, economists, and researchers are grappling with the idea of "what is a bubble," this project has tried to clarify the definition and measure their existence. I defined bubbles as the persistent and growing deviation of actual S&P 500 stock prices from their fundamental valuations.

The results showed a large deviation of S&P 500 prices from their fundamental valuation. Since rational expectation theory explains the fundamental price of a stock, a bubble is the only explanation of the large increase in price from 1985-2000.

Throughout the paper, the focus has been on predicting and measuring bubbles. But for the investor, what should be the course of action? Shiller suggests a radical approach of getting out of the stock market.

> The high recent valuations in the stock market come about for no good reasons. The market level does not, as so many imagine, represent the consensus judgment of experts who have carefully weighed the long-term evidence. The market is high because of the combined effect of indifferent thinking by millions of people, very few of whom feel the need to perform careful research on the long-term investment value of the aggregate stock market, and who are motivated substantially by their own emotions, random attentions, and perceptions of conventional wisdom.

Contrary to Shiller's opinion, Phillip Carret opines about a different solution. When asked during a time of persistently declining prices whether the stocks would rally, he laconically responded "They always have." (Carret 1996). It is up to the individual investor to decide whose opinion weighs with more importance.

VI. Future Research

While the rational expectation argument presented in this paper gives a rough estimate of the fundamental price of the S&P 500 index, did a decent job of predicted the actual S&P 500 prices. However, the deviation of stock prices from their fundamentals can often be explained through the concept of herd mentality. In the future, a model can be built to understand the deviation of stock prices from their fundamental value based on the concept of herd mentality.

The presence of autocorrelation is extremely high in the data set. In the future, Durbin-Watson tests can be applied to the new regression equations. If autocorrelation still exists, second order autocorrelation may be present. Second order correlation usually denotes the need to add other variables to the equation.

Appendix

The stock market boom is made up of a multitude of factors. To suggest that herd mentality alone drives stock prices would be unfounded and absurd. While herd mentality may start the process of bubble formation and destruction, other factors like momentum, amplification mechanisms, and cultural influences affect the deviation of stock prices from their fundamentals. Shiller's book Irrational Exuberance lists twelve different causes for the great expansion of stock prices in the 1990s. To fully comprehend how bubbles operate, it is necessary to review these theories. Otherwise, the concept that herd mentality, measured by consumer confidence, can predict bubbles will be overly relied upon. As Phillip Carret points out:

> Prices on the New York Stock Exchange are affected by French politics, German banking conditions, wars and rumors of wars in the Near East, the Chinese monkey market, the condition of the wheat crop in The Argentine, the temper of the Mexican congress as well as by a host of domestic influences. The successful speculator must carefully weigh the effect of all these influences, set down the pros and cons and arrive at a sound conclusion as to the side on which the balance lies. When he has done all this he has made only a beginning. If he concludes that the balance favors an upward movement, he must still decide which stocks he is to buy for maximum profit.

WORKS CITED

Baxster, R.E. And Evan Davis. The Penguin Dictionary of Economics. 1998.

Bernstein, William J. "Momentum: How Random a walk?" Efficient Frontier. http://www.efficientfrontier.com/ef/199/momentum.htm. 1999.

Bierman Jr, Harold. "Bubbles, Theory, and Market Timing." Journal of Portfolio Management 22.1 (1995): 54-61.

Boyd, Derik. "Economic Theory EC 206." University of East London. http://homepages.uel.ac.uk/D.A.C.Boyd/206auto.pdf.

Brodie, Niamh. "Speculative Bubbles, Irrationality & Chaos." http://econserv2.bess.tcd.ie/SER/1996/nbrodie.htm.

"Bursting Bubbles." Editorial. The Economist 332 6 Aug. 1994: 64.

Carret, Phillip L. The Art of Speculation. New York: John Wiley and Sons, Inc., 1997.

Chang, Kenneth. ABC News February 15, 2001 http://abcnews.go.com/sections/science/DailyNews/markets990215.html

Diba, Behzad T. "Bubbles and Stock-Price Volatility." The Stock Market: Bubbles, Volatility, and Chaos. Norwel, MA: Kluwer Academic Publishers, 1990.

Dielman, Terry E. and Elizabeth L. Rose. "A Note on Hypothesis Tests after Correction for Autocorrelation: Solace for the Cochrane-Orcutt Method?"

Dreman, David. Contrarian Investment Strategies: The Next Generation. New York: Simon & Schuster, 1998.

"Financial Meltdown, Financial Redemption: Making sense of the chaos: Why are

global financial markets so unpredictable?" CAW-TCA. v2. n4. December 1998.

Fisher, Phillip A. Common Stocks and Uncommon Profits. 6 ed. New York: John Wiley and Sons, Inc., 1996.

Ferguson, Niall. The House of Rothschild: The World's Banker 1849-1999. New York: Penguin Books, 2000.

Gorman, Linda. "Bubble, Bubble, Forth and Trouble." 28 December 1999. http://i2i.org/failsafe/SuptDocs/OpEdArcv/Gorman/Bubble.htm.

Graham, Benjamin. The Intelligent Investor. 4 ed. New York: Harper & Row, 1973.

Kindleberger, Charles P. Manias, Panics, and Crashes. 4 ed. New York: John Wiley and Sons, Inc., 1996.

Knapp, Edward. "New Directions in Science." Santa Fe Institute. 1-13. http://linac96.web.cern.ch/Linac96/Compendium/PAPERS/THURSDAY/THSPEC.PDF

Lynch, Peter. One Up on Wall Street: How to Use What You Already Know to Make Money in the Market. New York: Penguin Books, 1989.

Melberg, Hans O. "Why (dis)belive rational expectations? A Review of Steven M. Sheffrin's *Rational Expectations.*" *http://www.geocities.com/hmelberg/papers/970307.htm*

Mackay, Charles and Joseph De La Vega. Extraordinary Popular Delusions and the Madness of Crowds & Confusión de Confusiones. New York: John Wiley and Sons Inc., 1996.

Ormerod, Paul. Butterfly Economics. New York: Basic Books, 2000.

Poole, William. "Expectations." Twenty-second Henry Thorton Lecture. 28 November 2000.

Ramanathan, Ramu. Introductory Econometrics with Applications. San Diego: Dryden Press, 1998.

Shiller, Robert J. Irrational Exuberance. New York: Broadway Books, 2000.

Smant, D.J.C. "Famous First Bubbles: The Stock Market Crash of 1929." http://www.few.eur.nl/few/people/smant/m-economics/crash1929.htm.

Warde, Ibrahim. "Seventy Years after the Crash: the Rise and the Rise of the Dow." La Monde Diplomatique. October 1999.

White, Eugene N. "Stock Market Bubbles? A Reply." Journal of Economic History 55.3 (1995): 655-665.

Youssefmir, Michael, Bernardo A. Huberman, and Tad Hogg. "Bubbles and Market Crashes." Computational Economics. 12.2 (1998): 97-114.