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STOCK PRICES AND SOCIAL DYNAMICS

Robert Shiller

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Stock Prices and Social Dynamics

Robert J. Shiller*

Yale University

Fashion is the great governor of this world; it presides not only in matters of dress and amusement, but in law, physic, politics, religion, and all other things of the gravest kind; indeed, the wisest men would be puzzled to give any better reason why particular forms in all these have been at certain times universally received, and at others universally rejected, than that they were in or out of fashion.

Henry Fielding,
The True Patriot #1, 1745

Investing in speculative assets is a social activity. People who invest spend a substantial part of their leisure time discussing investments, reading about investments, or gossiping about others' successes or failures in investing. It is thus plausible that investors' behavior (and hence prices of speculative assets) would be influenced by social movements. Attitudes or fashions seem to fluctuate in many other popular topics for conversation, such as food, clothing, health or politics. These fluctuations in attitude often occur widely in the population and often appear without any apparent logical reason. It is plausible that attitudes or fashions regarding investments would also change spontaneously or in arbitrary

social reaction to some widely-noted events.

Most practitioners who actually deal in speculative markets seem to take it for granted that such social movements are of great importance for the behavior of prices. Popular interpretations of the recurrent recessions that we observe often include ideas that the same sorts of swings in attitudes (say, of consumer confidence or optimism) are at work in other aspects of the business cycle. Academic research on market psychology, however, appears to have more or less died out at about the time the expected utility revolution in economics was born, or in the 1950's. Those academics who write on financial markets today are usually very careful to dissociate themselves from any suggestion that market psychology might be important, as if notions of market psychology had been discredited as unscientific.¹ There is instead an enormous recent literature in finance which takes one of the various forms of the efficient markets model for motivation, and a related literature in macroeconomics which is based on the assumption of rational expectations. There has certainly been an interest in academic circles in speculative bubbles, but this interest has been pursued within the framework of rational expectations models with unchanging tastes.²

Despite the large literature on the efficient markets hypothesis, it is hard to find in the literature any discussion of an alternative hypothesis involving social psychology in financial markets.³ Yet the impression persists in the literature and in casual discussions that there are very powerful arguments

against such social-psychological theories. Any arguments which are confined to an oral tradition, tacitly accepted by all parties, and not discussed in the scholarly literature, are particularly vulnerable to error. It is thus important to bring these arguments against a major role for mass psychology in financial markets into explicit consideration.

The most important argument (to be discussed below) in the oral tradition against a role for such mass psychology takes as evidence that returns (variously defined) on speculative assets are nearly unforecastable. One form of this argument claims that it follows from the near unforecastability of real returns that the real price of stocks is close to its intrinsic value, i. e., the present value with constant discount rate of optimally forecasted future real dividends. This argument for the efficient markets model represents one of the most remarkable errors in the history of economic thought. It is remarkable in the immediacy of the logical error, in the sweep and implications of its conclusion and in its contradiction of common sense.

I will discuss here this and other arguments for the efficient markets hypothesis and claim that mass psychology may well be the dominant cause of movements in the price of the aggregate stock market.

This paper is divided into four major sections: a section which argues from a social-psychological standpoint for the importance of fashions in financial markets, a section which examines the argument for the efficient markets model, a section

which proposes an alternative social-psychological model, and a section which reports some exploratory data analysis suggested by the alternative model.

In the first section, I will discuss what we know about changing fashions or attitudes in light of everyday experience, research in social psychology and sociology, and evidence from postwar stock market history. This will not be direct evidence that people violate the principle of expected utility maximization, nor is the evidence of great value in judging how far we should carry the assumption of rationality in other areas of economics. (I do like to think that this evidence is of value in understanding the business cycle.) Rather, I will be motivated here by the relatively narrow question as to why speculative asset prices fluctuate as much as they do.

In the second section, I will evaluate the efficient markets model and the presumed evidence against a role for social psychology in determining prices. The fundamental issue is power of statistical tests in distinguishing the efficient markets model from the important alternatives. If statistical tests have little power, then we ought to use the sort of qualitative evidence discussed in the first section to evaluate the efficient markets model.

In the third section, a simple, though rather incomplete, alternative model of stock prices will be presented, an alternative which admits the importance of social psychological factors. This model, involving "smart money" and "ordinary

investors", is intended to demonstrate how one might better adapt financial markets models to the econometric evidence on the near unforecastability of returns which is widely interpreted as favoring the efficient markets model.

In the fourth section, some relations suggested by the alternative model are explored with U. S. stock market data. Various forecasting equations for real returns are examined using the Standard and Poor Composite Stock Price Index. I will examine whether stock price movements seem to follow simple patterns, as in an overreaction to dividends or earnings news, and whether this overreaction induces a sort of forecastability for returns. In doing this, I will present a time series model of the aggregate real dividend series associated with the Standard and Poor Composite Stock Price Index, and look at some indications of excess volatility of stock prices relative to the efficient markets model. In this section I will also propose a hypothetical scenario using the alternative model which shows, for recent U. S. history, what the smart money may have been doing, the fraction of total trading volume which might have been accounted for by smart money trades in and out of the market, and the extent to which ordinary investors may have influenced stock prices.

Evidence on Fashions and Financial Markets

Fashions in Everyday Life

Isn't it plausible that those who are so enlightened as to be readers of the Brookings Papers might find themselves caught up in capricious fashion changes? Those of us involved in the current fashion of running for exercise may say that they do it because it is good for their health, but the health benefits of such exercise were known decades ago.⁴ Talking with runners suggests that far more is at work in this movement than the logical reaction to a few papers in medical journals. Why wasn't the joy of running appreciated 20 years ago? Why are we thinking about running these days and not about leisure activities in decline (such as leading boy scout troops or watching western movies)?⁵

Fashions show different movements in different countries at the same time. In politics we have seen in the last decade a drift towards conservatism in some Western countries and a drift toward socialism in others. The objective evidence for or against socialism cannot have moved both ways. Something about the social environment, collective memories or leadership is

different, and changing through time differently, in the different countries.

Is there any reason to think that social movements affecting investments are any less important than these other social movements? We know that attitudes toward investments are very different across cultures. West Germany today is a country in which investors are notably cautious; it is hard to raise venture capital and the stock market itself is very small. Isn't it plausible that these differences we observe across countries in attitudes toward investments should also change within a country through time?

Some may argue that investing is less likely to be influenced by fashions than are other activities, since people make investment choices privately on their perception of the prospects for return and usually not with any other concerns about what people will think. It is however plausible that these perceptions for return themselves represent changing fashions. The changing fashions in physic that Fielding noted are analogous. People asked physicians to bleed them because they thought they would get well as a result, and not because they thought that they would impress other people by having it done. Therapeutic bleeding is an excellent example of a fashion because there has never been any scientific basis for it; the belief in its efficacy arose entirely from the social milieu.

Who Are In Control of Investments in Corporate
Stock?

It is important first to clarify who it is we are talking about when we speak of investors in corporate stock. There are some common misconceptions that exaggerate the importance of institutional investors, the extent to which stocks are held by wealthy stockowners who delegate authority to manage their investments, and the extent to which "smart money" may be expected to have taken over the market. These misconceptions lend spurious plausibility to the notion that markets are very efficient by suggesting that the market is more professionalized than it is.

It is true that institutional investors have been growing in importance in the postwar period. Institutional holdings of New York Stock Exchange Stocks as a percent of the total value of the stocks rose from 15.0% in 1955 to 35.4% in 1980.⁶ Still, nearly 65% of all New York Stock Exchange stocks were held by individuals in 1980.

Most individually held corporate stock is held by wealthy individuals. In 1971, the 1 percent of U. S. families (including single individuals) with the largest personal income accounted for 51 percent of the market value of stock owned by all families, while the 10 percent of families with the largest

income accounted for 74 percent of market value.⁷ Wealthy individuals are of course part of the same society as the rest of us. They read the same newspapers and watch the same television programs. They are different, however, in one important way. For them, information costs are quite low relative to the income from their investments. One might be inclined to think that they would in practice delegate authority over their investments to experts.

In a 1964 Brookings study, a sample of 1051 high income individuals, i. e. individuals with 1961 incomes over \$10,000 (or about \$34,000 in 1984 prices), was interviewed concerning their investment habits. The sample emphasized individuals with income substantially above \$10,000. The median income for the sample was about \$40,000 (or about \$135,000 in 1984 prices). "Only one-tenth reported delegating some or all authority over their investments, and this proportion reached one-fourth only for those with incomes over \$300,000. Only 2 percent of the entire high income group said they delegated 'all' authority."⁸ Instead of delegating authority, most made their own investment decisions with some advice: About three-fourths of the high income respondents who managed their own assets said that they got advice from others in making their investment decisions. One in three of those seeking advice said they 'always' sought advice when investing, while two out of three said they did 'occasionally.'⁹ Two thirds of the investors said they tried to keep informed, more than half said they made use of business

magazines, "but only one-tenth of those trying to keep informed said that they read the financial statements and other reports issued by the corporations in which they were considering an investment."¹⁰

What is really important for one's view of financial markets is not directly the extent to which institutional investors or wealthy individuals dominate the market, but the extent to which "smart money" dominates the market. One commonly expressed view is that intelligent individuals can be assumed to take control of the market by accumulating wealth through profitable trading. This argument overlooks the fact that individuals do consume their wealth and eventually also die.

When they die they bequeath it to others who have perhaps only a small probability of being smart money as well. In assessing this probability, one must bear in mind that "smart money" does not correspond closely to the intelligent segment of the population. What is at work is not just intelligence but also interest in investments and timeliness. Presumably the probability is fairly low.¹¹

There are several factors which serve to mitigate the effects of higher returns on steady-state wealth. One is that most people do not acquire most of their maximum wealth until fairly late in the life cycle, and thus do not have as much time to accumulate. Another factor is that in a growing population younger people, whose portfolios have had less time to accumulate due to investment opportunities, will figure more prominently in

aggregate wealth figures. Yet another factor is that saving early in the life cycle tends for institutional reasons to take the form of investing in a house, rather than in a menu of speculative assets.

Roughly speaking, one can expect to live something like 30 years after receiving a bequest on the death of one's parents. A representative "smart money" heir which earns and accumulates at a rate n over a representative ordinary investor in the middle of the thirty years will thus have on average, if original bequests were equal, something like $(1+n)^{15}$ times as much wealth. If n is 2% per year, this is 1.3, if 5% per year this is 2.1. As long as the percentage of people who are smart money is small, returns that are higher by this order of magnitude will not cause the smart money to take over the market.

Of course, it is unlikely that "smart money" investors are pure accumulators. Since we are lacking data on the behavior of the "smart money" savings patterns versus the savings patterns of ordinary investors, it is impossible to say anything concrete about how much the smart money accumulate. If, let us suppose, the smart money behave like good trustees of the family estate and consume at just the rate which would preserve the real value of the family wealth, then smart money will not accumulate at all, regardless of the return they earn.

The Ambiguity of Stock Value

The reason stock prices are likely to be among the prices which are relatively vulnerable to purely social movements is that there is no accepted theory by which to understand the worth of stocks, and there are no clearly predictable consequences to changing one's investments.

Ordinary investors have no model or at best a very incomplete model of the behavior of prices, dividends or earnings of speculative assets. Should large projected future federal deficits imply that the price of long-term bonds should go up or down? Should the election of a conservative U. S. president imply that earnings of General Motors should go up or down? Should a rise in the price of oil imposed by OPEC cause the price of stock in IBM to go up or down? They have no objective way of knowing.

Investors are faced with what Frank Knight called "uncertainty" rather than "risk:"

The practical difference between the two categories, risk and uncertainty, is that in the former the distribution of the outcome in a group of instances is known, either from calculation a priori or from statistics of past experience, while in the case of uncertainty this is not true, the reason being in general that it is impossible to form a group of instances, because the situation dealt with is in a high degree unique.... It is this true uncertainty which by preventing the theoretically perfect outworking of the tendencies of competition gives the characteristic form of "enterprise" to economic

organization as a whole and accounts for the peculiar income of the entrepreneur.¹²

Ordinary investors also cannot judge the competence of investment counselors as they can that of other professionals. It is very easy to learn whether a map company is producing city maps which place the streets right. We can therefore take it for granted that others have done this and that any map which is sold will serve to guide us around a city. It is much harder to evaluate investment advisors who counsel individual investors on the composition of their portfolios and who claim to help them make investments with high returns. Investors lack data on past outcomes of a counselor's advice, and on whether the current advice is based on the same theory which produced these outcomes. Anyway, investors do not understand such things as data analysis, or risk correction.

It is also much easier to change one's mind on one's investments than on one's consumption of commodities. The former has no apparent immediate effect on one's well-being. To change one's consumption of commodities, one must give up some habit or consume something one formerly did not enjoy.

Suggestibility and Group Pressure

Since investors are lacking any clear sense of objective evidence regarding prices of speculative assets, the process by which their opinions are derived may be especially social.

There is an extensive literature in social psychology on individual suggestibility and group pressure. Much of this literature seeks to quantify, by well-chosen experiments, how individual opinions are influenced by the opinions of others. A good example of such experiments is Muzafer Sherif's classic work using the "autokinetic effect".¹³ In this experiment, subjects were seated in a totally darkened room and asked to view at a distance of five meters a point of light seen through a small hole in a metal box. They were told that the point of light will begin to move and were asked to report to the experimenter the magnitude, in inches, of its movements. In fact, the point was not moving, and the viewer had no frame of reference, in the total darkness, to decide how it was moving. When placed in groups so that they could hear answers of others in the group, the groups arrived without any discussion at consensus (differing across groups) as to the amount of movement. Subjects, interviewed afterwards, showed little awareness of the influence of the group in their decision.

In another well-known experiment, Solomon Asch placed individuals in group situations in which they were to respond to questions (involving comparing lengths of line segments) whose answers were so obvious that the subjects could only be described as having clear objective evidence. Even then, if placed in a group in which all other members were coached to give the same wrong answers, subjects were also observed to give wrong answers.¹⁴ Even though the correct answer was completely

inoffensive, people were afraid to contradict the group.

The research shows evidence of flagrant decision errors under social pressure but not of abandonment of rational individual judgment. It does help provide some understanding of possible origins of swings in public opinion. The Asch experiment, for example, suggests that group pressures do serve at the very least to cause individuals to remain silent on what they perceive as deviant views and their silence will prevent the dissemination of relevant information which might establish the view more firmly.

The Diffusion of Opinions

The dynamic process by which social movements take place is the subject of an extensive literature by social psychologists and sociologists. The basic mechanisms are well-known. The ideas which represent a movement may be latent in people's minds long before the movement begins. An idea may not become a matter of conviction or active thought until the individual hears the idea from several friends or from public authorities. This process takes time. The process may be helped along if some vivid news event appears which causes people to talk about related matters. Or the process may be slowed if another news event distracts their attention from the matter.

Social movements can take place in a matter of hours, as

after so vivid an event as the onset of a war. Or changes in attitudes can take decades to diffuse through the population, as evidenced by the fact that many fashion changes in dress seem to happen very slowly. The communications media may, if attention is given to some event, speed the rate of diffusion. However, "the general finding of research on persuasion is that face-to-face communication with peers is more important than formal mass communication in changing attitude behavior."¹⁵ This fact is recognized by television advertisers, who, in promoting their products, often try to create with actors the illusion of such communication. Katona has used the term "social learning" to refer to the slow process of "mutual reinforcement through exchange of information among peer groups by word of mouth, a major condition for the emergence of a uniform response to new stimuli by very many people."¹⁶ Thus, it is not surprising that in surveys in the 1950's and 1960's "the answers to the two questions 'Do you own any stocks' and 'Do you have any friends or colleagues who own any stocks' were practically identical."¹⁷

Such diffusion processes for news or rumor have been modelled more formally by mathematical sociologists¹⁸ drawing on the mathematical theory of epidemics. For example, in what has been referred to as the "general epidemic model"¹⁹ it is assumed first that new carriers of news (as of a disease) are created at a rate equal to an "infection rate" β times the number of carriers times the number of susceptibles and second that carriers cease being carriers at a "removal rate" r . The first

assumption is that of the familiar model which gives rise to the logistic curve, but the second assumption causes any epidemic or social movement eventually to come to an end. In this model, the consequence of a new event which is interpreted as important news (or of a new infectious agent) can have either of two basic forms. If the infection rate is less than a threshold equal to the removal rate divided by the number of susceptibles, the number of carriers will decline monotonically. If the infection rate is above the threshold, the number of carriers will have a hump shaped pattern, rising at first and then declining.

The removal rate and the infection rate may differ dramatically from one social movement to another, depending on a number of factors. According to one survey of the literature on removal rates after persuasive communications, it was concluded that "the 'typical' persuasive communication has a half-life of six months," but that different experiments produced widely different half-lives. Research on the differences in half-lives found that a number of factors were important: source factors (e. g., positive versus negative source), message factors (e. g. clear versus subtle) or receiver factors (actively participating versus passive).²⁰ The infection rate may depend on the vividness of the event and the participation of media in the dissemination of the news, as well as the "generation" of the carrier of the news.²¹

Changes in the infection rate or removal rate may be what accounts for sudden appearance of social movements. A rise in

the infection rate, for example, may cause an attitude long latent in people's minds to snowball into a movement.

We might expect then to see a variety of social movement patterns: long lasting humps which build slowly (low removal and infection rate) or humps whose buildup is of short duration (high removal and infection rate) or impact-type news events with subsequent monotonic decline of infectives (zero infection rate) or events followed by monotonically increasing number of infectives (zero removal rate). Of course, such patterns may not be seen directly in prices of speculative assets, as will be discussed below.

Social Movements and the Postwar Stock Market

The real price of corporate stocks, as measured by a deflated Standard and Poor Composite Stock Price Index, showed what appears to be a pronounced uptrend between the late 1940's and the late 1960's and since then a downtrend (or more accurately, a single major drop between 1973 and 1975). (See figure 1). The postwar period of the uptrend, the last great "bull market", has often been characterized as a period of contagious and increasingly excessive optimism. Is there any evidence of such a social movement then? Is there evidence that such a social movement came to an end after the late 1960's?

It should be clear from the outset that such evidence will

not take the form of proving that people should have known better than to price stocks as they did. The postwar period was one of rapidly growing real earnings and real dividends, and plausible sounding reasons were offered to suggest that the growth should be expected to continue:

These include the constant speed-up in business research in order to cut costs and bring out ever newer and more competitive products; the extension of business expansion planning farther and farther into the future, which means that such plans are carried forward regardless of any jiggles in the trend of business; the improvement in business techniques that offset the effects of seasonal fluctuations; the advance in methods of monetary management by the Federal Reserve Board; and the similar advance in general understanding of the effects of the Government's tax and other economic policies.²²

How was anyone to know whether these reasons were right or not?

The evidence for a social movement driving the stock market during the "bull market" will come instead from other sources. The evidence will concern the growing numbers of individuals who participated in, were interested in, or knew about the market, evidence of changing relations among investors and their agents, and evidence of changes in attitudes which took place then which might plausibly affect their valuation of stocks. The evidence is intended to show that large social movements are appear to have occurred which might plausibly have had great impact on stock prices, but not to provide a tight theory of the movements of stock prices. In fact, there are a superabundance of plausible reasons for the movements of the market.

Evidence for the growing numbers of individuals who

participated in the market can of course be found most directly in the rising quantities of stocks held by institutional investors, as noted above. The most important component of this increase took the form of pension funds. The rise of employer pension funds in the postwar period might even be considered a social movement which probably caused an increased demand for shares. Even if individuals offset the saving done on their behalf by firms by saving less themselves, since most people do not hold any stocks it is not possible for them (without short sales) to offset the institutional demand for stocks by holding less shares. Such changes in demand for institutions are likely to be important in determining asset prices but are not my main concern here. Others have studied such changes using "flow of funds" methodology.²³

The period of rising stock prices also corresponds roughly with a period of a dramatic increase in the number of people who participated directly (not through institutions) in the stock market. The New York Stock Exchange Shareownership Surveys showed that the total number of individual shareowners as a percent of the U. S. population rose from 4% in 1952 to 7% in 1959 to a peak of 15% in 1970.²⁴ Since 1970 there has been a decline in shareownership. The 1975, 1980 and 1981 surveys showed shareowner percents of 12%, 11% and 12% respectively.

The increase in individual stockownership appears to correspond to an increase in knowledge about and interest in the market. The 1954 New York Stock Exchange investor attitude

survey, consisting of interviews of several thousand individuals, sought information why more people weren't owning stock. They wanted to learn why "On the average 4 out of 5 doctors, lawyers, major and minor executives, engineers and salesmen do not own stock in publicly held corporations?"²⁵ What came out of the survey was a sense of lack of information or interest in the stock market, and vague senses of prejudice against the stock market. Only 23% of the adult population even knew what corporate stock was enough to give a definition like "a share in profit," "bought and sold by public, anyone can buy," or "not preferred or a bond."

By 1959 there appeared a "much better understanding of the functions of the Stock Exchange as the nation's marketplace." The number of Americans who could "explain the role of the exchange itself" rose nearly 20%. The number who "knew that companies must meet certain standards before the exchange will permit their stocks to be listed for trading" increased 36 percent in the same five year period.²⁶

The growth of numbers of people who knew about or were involved at all in the stock market is important evidence that something other than a reevaluation of optimal forecasts of the long run path of future dividends was at work in producing the bull market. Any model which attributes the increase in stock prices to a Bayesian learning process will not stand up to the observation that most of the investors at the peak of the bull market were not involved or interested in the market at all at

the beginning of the increase.

Evidence about changing relations among individual investors and their agents takes two forms: evidence regarding the rise of stockbrokers and of publicity campaigns from them and evidence regarding the investment club movement.

Between 1954 and 1959 stockbrokers were growing in reputation. In the 1954 New York Stock Exchange survey 30% of the adult population said they would turn first to a broker for investment advice; by 1959 this figure had risen to 38%. Over this five year period, stockbrokers replaced bankers as the first source of investment advice. An estimated nine million adults said they were contacted by brokers in 1959, compared with less than five million in 1954.²⁷

The New York Stock Exchange initiated an investors' education program as part of a broader shareownership program. Begun in 1954, by 1959 the program had a list of 2500 lecturers in 85 cities. Lectures were held in local high schools as part of adult education programs by lecturers "bent on carrying the investing gospel wherever there were ears to hear."²⁸ By 1959, the program had conducted 4,500 lecture courses reaching 525,000 persons or about 4% of the total number of shareholders in 1959. The investor education program used all the media, including advertisements in newspapers, magazines and radio. As early as 1954 when the program was only six months old, 5% of the adult population in the United States could identify the New York Stock Exchange as the source of the slogan "Own Your Share of American

Business."²⁹

In contrast, the 1970's were a period of low profits for the New York Stock Exchange and advertising in newspapers and magazines was suspended. In 1975 competitive commissions were established and amendments to the Securities Act threatened the viability of the New York Stock Exchange. Prices of seats on the exchange dropped. In response to the problems, in 1977 the investors' education program was severely cut back and the adult-education program dropped altogether. Lack of public enthusiasm for the program was also offered as a reason for the cutback.

The same factors which caused the New York Stock Exchange to suspend its investors' education program may have also had the effect of decreasing the promotion offered by individual brokers for corporate stocks. Such factors as competitive commissions which reduce the profits in conventional brokerage have "tended to shrink the numbers of people who are out there trying to encourage individual investors into this market place."³⁰

Investment clubs are social clubs in which small groups of people pursue together a hobby of investing. Interest in such clubs might well give some index at least as to how much stocks were talked about, and how much people enjoyed investing. The number of investment clubs in the National Association of Investment Clubs rose from 923 in 1954 to a peak of 14,102 in 1970, and fell to 3,642 clubs in 1980.³¹ The total number of individuals directly involved in investment clubs and their aggregate wealth are of course small. However, the investment

club movement is plausible evidence of a national movement which is not reflected in the membership roles.

There is in the postwar period evidence of substantial changes in attitudes that suggest changes in behavior big enough to have a major impact on the market. For example, the percentage of people who say that religion is 'very important' in their lives fell from 75% in 1952 to 52% in 1978.³² The birth rate hovered around 2.5 percent throughout the 1950's and then began a gradual decline to around 1.5 percent in the 1970's. These changes may reflect changing attitudes as to the importance of family, of heirs, or of individual responsibility for others.

Of all such changes, the one with perhaps the most striking importance for demand for shares in the postwar period is the pervasive decline in confidence in society's institutions after the bull market period. According to poll analyst Daniel Yankelovich:

We have seen a steady rise in mistrust of our national institutions..... Trust in government declined dramatically from almost 80% in the late 1950's to about 33% in 1976. Confidence in business fell from approximately a 70% level in the late 60's to about 15% today. Confidence in other institutions, the universities, the unions, the press, the military, the professions -- doctors and lawyers³³ -- sharply declined from the mid-60's to the mid-70's.

To Yankelovich's list we may add stock brokers. One of the findings of the New York Stock Exchange 1977-8 survey was that "a negative image of brokers and firms permeates all subgroups and even top quality clients have an unfavorable impression of the industry."³⁴

By its very pervasiveness, the negative attitudes toward institutions suggest a prejudice rather than an informed judgment.

The Efficient Markets Model

Apparently the evidence that is widely interpreted as against a psychological factor in financial markets comes from the observation that stock returns are not very forecastable. An extensive literature in finance journals has been interpreted as showing that returns cannot be forecasted very well at all.

Why is it thought to follow from the evidence on the forecastability of returns that investor psychology could not be an important factor in financial markets? If investor fads influenced stock prices, the argument goes, then it would seem that these fads would cause stock price movements to be somewhat predictable. Moreover, since dividends themselves are somewhat forecastable (firms in fact announce changes in their dividends from time to time) and in spite of this we are unable to forecast well any change in returns, it must be true that stock prices in some sense are determined in anticipation of dividends paid. Thus, stock prices should be determined by optimal forecasts of dividends.

The above argument can be formalized by representing the

unforecastability of returns by $E_t R_t = i$ where E_t denotes mathematical expectation conditional on all publicly available information at time t , R_t is the real (corrected for inflation) rate of return (including both dividends and capital gain) on a stock between time t and time $t+1$ and i is a constant. Here, R_t equals $(P_{t+1} - P_t + D_t)/P_t$ where P_t is the real price of the share at time t and D_t any real dividend which might be paid in the time period. This is a first order rational expectations model of the kind familiar in the literature which can be solved, subject to a stability terminal condition, by recursive substitution.³⁵ Out of the negative result that we cannot seem to forecast returns we thus get the powerful efficient markets model:³⁶

$$(1) \quad P_t = \sum_{k=0}^{\infty} E_t D_{t+k} / (1+i)^{k+1}$$

Equation 1 asserts then that real price is the present discounted value of expected future dividends and in this sense price anticipates optimally, i. e. takes into account all publicly available information, the stream of future dividends that the stock will pay in the future.

The error in this argument for the efficient markets model is just that it overlooks the fact that the statistical tests have not shown that returns are not forecastable, only that returns are not very forecastable. The word very is crucial here, since alternative models that have price determined

primarily by fads (such as will be discussed below) also imply that returns are not very forecastable.

We can get some idea at this point of the power of the regression tests of the efficient markets hypothesis against importantly different alternatives. Consider an alternative hypothesis in which the true (theoretical) R squared in a regression of aggregate returns of corporate stocks on some set of information variables is 0.1. Such an R squared implies, given that the standard deviation of the real annual returns on the aggregate stock market is about 18% , that the standard deviation of the predictable component of returns is about 5.7% per year. Thus under this alternative hypothesis we might well predict real returns of 14% in one year, and returns of 2% in another year (these are one-standard-deviation departures from mean return). In an unusual year we might predict a real return of 19% or -3% (these are two-standard-deviation departures from the mean return). Yet the probability of rejecting market efficiency in a conventional F-test at the .05 level if the alternative hypothesis is true with 30 observations (30 years data) and one forecasting variable is only 0.42. With two forecasting variables, the probability of rejecting is 0.32, and the probability becomes negligible as the number of explanatory variables is increased further.³⁷ As I have argued in a paper with Pierre Perron, increasing the number of observations by sampling more frequently, leaving the span in years of data unchanged, may not increase power of tests very much and may even

reduce it.³⁸

Someone may well wonder if there isn't also some direct evidence that stock prices really do anticipate future dividends as represented in equation 1. Anecdotal evidence is available which shows that prices of some firms whose dividends can be forecasted to fall to zero (bankruptcy) or soar to new levels (breakthrough) do show some evidence of anticipating these movements. But these anecdotes do not show that there is not another component of the volatility of prices, a component which might dominate price movements in the stocks whose returns are not so forecastable. For the aggregate stock market, there is no evidence at all that stock price movements have been followed by corresponding dividend movements.³⁹

Some may argue that the constancy of discount rates in equation 1 may not be what we really want to embody as a representation of the general notion of market efficiency. There are, of course, many variations on this model, such as the recent "consumption beta" models⁴⁰. It is not possible in this paper to address all these alternatives. Equation 1 is chosen as representative of the most commonplace version of the efficient markets theory, and a version that seems to have figured most prominently in the arguments against market psychology. Arguments about the power of tests of equation 1 may well extend to some of the other variants of the efficient markets hypothesis.

An Alternative Model

Let us tell a story which postulates the existence of some investors, the "smart money," who respond quickly and appropriately to publicly available information and shows how they might alter the response of the market to the behavior of ordinary investors. This story is no doubt oversimplified and restrictive but then so is the simple efficient markets model, against which it is to be compared.

The smart money in this model are responsive to rationally expected returns. Let us suppose that the demand for stock is linear in the expected return on the market (or if the model is applied to an individual firm, the expected return on a share of that firm) over the next time period:

$$(2) \quad Q_t = (E_t R_t - r)/v$$

Here, Q_t is the demand at time t by smart money for shares, expressed as a portion of the total shares outstanding, and $E_t R_t$, the expected return starting at time t , is as defined above. The symbols v and r represent constants. Thus, r is the expected real return such that there is no demand for shares by the smart money. The real return at which $Q_t = 1$ is $r + v$; that is, v is

the risk premium which would induce smart money to hold all the shares. The terms r and v reflect the risk aversion of the smart money as well as the total real wealth of those smart money investors who have evaluated the stock, the riskiness of the stock, and characteristics of alternative investments.

Ordinary investors include everyone who does not respond to expected returns optimally forecasted. Let us suppose that they overreact to news or are vulnerable to fads. We will not make assumptions about their behavior at all, but merely define Y_t as the total value of stock demanded per share by these investors.⁴¹ Equilibrium in this market requires that $Q_t + Y_t/P_t = 1$. Solving the resulting rational expectations model just as we did to derive the efficient markets model in the introduction gives us the model:

$$(3) \quad P_t = \sum_{k=0}^{\infty} (1+r+v)^{-(k+1)} (E_t D_{t+k} + v E_t Y_{t+k})$$

so that real price is the present value, discounted at rate $r+v$, of both the expected future dividend payments and v times the expected future demand by ordinary investors. The limit of this expression as v goes to zero (i. e. as smart money becomes more and more influential) is the ordinary efficient markets model which makes price the present value of expected dividends. The limit of this expression as v goes to infinity (i. e. as smart money becomes less and less influential) is the model $P_t = Y_t$ so

that ordinary investors determine the price.

The model 3 could be as consistent as the efficient markets model 1 with the usual finding in the event studies literature that announcements have their effect on returns as soon as the information becomes public and little predictable effect thereafter. The model 3 has, however, a very different interpretation for the jump in price which coincides with the announcement. The jump does not represent only what the smart money thinks the announcement means for future dividends. It also represents what the smart money thinks the announcement means for the demand for stock by ordinary investors.

The model 3 implies that factors which affect the outlook for future dividends will have, if Y_t is not also affected by these factors, the effect on price that is predicted by a model of the form of equation 1. However, if Y_t is always positive the discount rate $r+v$ in equation 3 is necessarily greater than or equal to the expected return on the market, which is the discount factor in equation 1. If $r+v$ is high, then factors affecting expectations of distant dividends will have relatively little effect on price today.

The more persistent is the behavior of the variable Y_t through time (i. e. the less we can expect changes in Y_t to be offset by subsequent changes in the opposite direction) the less the moving average in expression 3 will reduce its variance and the more, in general, will be its influence on P_t . Fads that can be predicted to come and go quickly will have little effect on

price. Fads which are predicted to be long-lived will have full impact on prices.

It was argued above that models of the diffusion of opinions suggest a number of possible patterns of response, among them a hump-shaped response pattern in which Y_t would rise for a while, level off, and then return to its normal level. The implication for real price P_t of such a hump shaped response of Y_t to a piece of news depends on the time frame of the response relative to the discount rate $r+v$. Suppose the hump can be predicted to build up very quickly and dissipate, say, in a matter of weeks. Then equation 3 implies that there will be very little impact on price at all. The relatively long moving average in equation 3 will smooth over the hump in Y_t so that it is observed, if at all, only in a very attenuated form. The demand for shares by ordinary investors will show the hump shaped pattern, as smart money sells shares to them at virtually unchanged prices only to buy the shares back after the ordinary investors have lost interest.

If the hump-shaped pattern takes longer to evolve, the effect on price will be bigger. Then as soon as the news which gives rise to the hump shaped pattern becomes known to the smart money the price of the stock will jump discontinuously. This jump will be instantaneous, taking effect as soon as the smart money realizes that price will be higher in the future. After the initial jump, the effect of the news will be to cause the price of the stock to rise gradually (not so fast as to cause

higher than normal returns after the lower dividend price ratio is taken into account) as Y_t approaches its peak, to peak somewhat before Y peaks, and then to decline. Returns however, will tend to be low during the period of price rise.

A more explicit yet simple example along these lines will illustrate why tests of market efficiency may have low power even if the market is driven entirely by fashions or fads. Suppose that the dividend D_t is constant through time so that by the efficient markets model 1 price would always be constant. Suppose $Y_t = U_{t-1} + U_{t-2} + \dots + U_{t-n}$ where U_t is white noise, i. e., U_t is uncorrelated with U_{t-k} for all k not equal to zero. Suppose current and lagged values for U are in the information set of the smart money. Here, Y responds to an observed shock in U with a rising then falling (or square hump) pattern. Under these assumptions, $Y_{t+1} - Y_t$ is perfectly forecastable based on information at time t . However, $P_{t+1} - P_t$ will be hardly forecastable from information at time t . It follows from equation 3 that P_t will equal a constant plus a moving average of U with substantial weight on U_t . The theoretical R squared in a regression of $P_{t+1} - P_t$ on P_t is, for the case $n=20$ years, $r = 0$ and $v = .2$, only 0.015. If one included all information (the current and twenty lagged U values) in the regression, the theoretical R squared would rise, but only to 0.151. If the U_t are for each t uniformly distributed from 0 to 1 and if the constant dividend is .5 (so that the mean dividend price ratio is 4 percent) then the R squared in a

regression of the return R_t on D_t/P_t is only 0.079.

Let us now consider three alternative extreme views of the behavior of Y_t : that it responds to exogenous fads whose origin is unrelated to relevant economic data, that it responds to lagged returns and that it reacts to dividends.

The first extreme view of Y_t is represented by the hypothesis that it is independent of current and lagged dividends - it is exogenous noise - caused by capricious fashions or fads. In this view, Y_t may respond systematically to vivid news events (e. g. the President's heart attack) but not to any time series data which we observe. It is reasonable also to suppose that Y_t is a stationary stochastic process - that it tends to return to a mean. Thus, if demand by ordinary investors is high relative to the mean of Y_t it can be expected eventually to decline. Since the return R_t equals $r + v_t - vY_t/P_t$ plus noise uncorrelated with information at time t , the covariance of return with any variable known at time t is the same as the covariance of the variable with $-vY_t/P_t$. If dividends vary relatively little through time, an argument can then be made that would suggest that return is positively correlated with the dividend-price ratio D_t/P_t . This correlation will be examined with data below.

The second extreme view of Y_t is that it responds to past returns, that is, Y_t is a function of R_{t-1} , R_{t-2} , This in connection with equation 2 gives a simple rational expectations model whose only exogenous variable is the dividend D_t . If we specified the function relating Y_t to past returns and

specified the stochastic properties of D_t we would be left with a model which makes F_t exclusively driven by D_t . Depending on the nature of the function and the stochastic properties of D_t , price may overreact to dividends, relative to the model 1.

The third extreme view is that Y_t responds directly to current and lagged dividends, that is Y_t is directly a function of $D_t, D_{t-1}, D_{t-2}, \dots$. For example, dividend growth may engender expectations of future real dividend growth that are unwarranted given the actual stochastic properties of D_t . Such expectations might also cause price to overreact to dividends relative to the model 1. Such an overreaction (to dividends as well as to earnings) will be studied econometrically below.

The suggestions I have made about the possible behavior of Y_t are perhaps too extreme and special to provide the basis for serious econometric modelling at the present time. However, these possibilities and the model 3 may provide the motivation for some exploratory data analysis, which follows.

An Exploratory Data Analysis

Stock Prices Appear to Overreact to Dividends

Aggregate real stock prices are fairly highly correlated over time with aggregate real dividends. The simple correlation coefficient between the annual (January) real Standard and Poor Composite stock price index P and the corresponding annual real dividend series D between 1926 and 1983 was 0.91.⁴² The correlation is readily apparent by visual inspection of figure one. This correlation was partly due to the common trend between the series, but the trend was by no means the whole story. The correlation coefficient between the real stock price index P and a linear time trend over the same sample was only 0.60.⁴³

Thus, the price of the aggregate stock market is importantly linked to its dividends, and much of the movements of the stock market that we often regard as inexplicable can be traced to movements in dividends. One reason that most of us are not accustomed to thinking of the stock market as being this closely related to dividends is that most of the data series that we look at cover a smaller time interval (years rather than the decades shown in the figure) and sample the data more frequently (monthly, say, rather than annually as in the figure.) The correlation coefficient between real price and real dividends might be much lower with such data, or might look more trend-dominated.

The correlation between real price P and the real earnings series E for 1926 to 1983 was 0.75. This figure is closer to the correlation of P with a linear time trend.

While the correlation coefficient between P and D is fairly high, the real price is substantially more volatile than the real dividend. If P is regressed on D with a constant term in the 1926 - 1983 sample period, the coefficient of D is 38.0 and the constant term -0.28. The average price-dividend ratio P/D in this sample was 22.4. Real price moves proportionally more than the real dividend. As a result, the price-dividend ratio tends to move with real prices. The correlation in this sample of P/D with P is 0.83 and with D is 0.67. This correlation is strong enough that it can be seen visually in the figure. The volatility of stock prices relative to dividends is another reason why we tend not to view the stock market as driven so closely by dividends.

One would think that if the efficient markets model equation 1 is true the price-dividend ratio should tend to be low when the real dividend is high (relative to trend or relative to its average value in recent history) and high when real dividends are low. One would think that the real price, which represents according to equation 1 the long-run outlook for real dividends, would be sluggish relative to the real dividend. Therefore, short-run movements in the real dividend would correspond to short-run movements in the opposite direction in the price-dividend ratio.

The observed perverse behavior of the price-dividend ratio might be described as an overreaction of stock prices to dividends, assuming that it is correct to suppose that dividends tend to return to trend or return to the average of recent history. This behavior of stock prices might be construed as consistent with some psychological models. Psychologists have shown in experiments that people may continually overreact to superficially plausible evidence even when there is no statistical basis for their reaction.⁴⁴

Such an overreaction hypothesis does not necessarily imply that the ultimate source of stock price movements should be thought of as dividends, or of the earnings of firms. Dividends are under the discretion of managers.⁴⁵ John Lintner, after a survey of dividend setting behavior of individual firms, concluded that firms have a target payout ratio from earnings but also feel that they should try to keep dividends fairly constant through time.⁴⁶ In doing this, managers like the public, are forecasting earnings and may become overly optimistic or pessimistic. In reality, the dividends and stock prices may both be driven by the same social optimism or pessimism, and the "overreaction" may reflect just a greater response to the fads in price than in dividends. The apparent response of price to earnings could even be attributed to the same sort of effect, to the extent that reported earnings themselves are subject to the discretion of accountants. Fisher Black has claimed that changing accounting practices through time might be described as

striving to make earnings an indicator of the value of the firm rather than the cash flow.⁴⁷ While an individual firm is substantially constrained in its accounting practices, the choices that are made over time as to conventional accounting methods may be influenced by a sense as to what is a proper level of aggregate earnings, and this sense may be influenced by the social optimism or pessimism.

The relation between real price and real dividend can be described perhaps more satisfactorily from a distributed lag regression of P on D, i. e., a regression which predicts P as a weighted moving average of current and lagged D. One sees from row 1 of table 1 (row 2 with a serial correlation correction) that when the real price is regressed with a 30 year distributed lag on current and lagged real dividends (first coefficient free, remaining coefficients on a second degree polynomial with far endpoint tied to zero) the current real dividend has a coefficient which is greater than the average price dividend ratio (22.6 for this sample) and the sum of the coefficients of the lagged real dividends is negative. The sum of all coefficients of real dividends, current and lagged, is about the average dividend price ratio. Thus, this equation implies that the price tends to be unusually high when real dividends are high relative to a weighted average of real dividends over the past thirty years and low when dividends are low relative to this weighted average.

Table 1 row five (row six with a serial correlation

correction) shows the same regression but with real earnings as the independent variable. The coefficient of current earnings is less than the average price earnings ratio (13.0 for this sample). Because earnings show more short-run variability than do dividends, these results do not contradict a notion that prices overreact to earnings as well as to dividends. The lower R^2 in this regression might be regarded as a reflection of the fact that dividends are not really well-described by the Lintner model which made dividends a simple distributed lag on earnings.⁴⁸ The R^2 is high enough that some major movements in stock prices are explained by this regression. For example, the decline in earnings between 1929 and 1933 explains more or less the decline in P over that period (the regression had positive residuals in all these years). While the reasons for the market decline on particular days in 1929 may forever be a mystery, the overall market decline in the depression is explained fairly well as a reaction (or overreaction) to earnings.

It is important of course to investigate whether the pattern of coefficients in rows one or two (or five or six) of table 1 might be optimal given the model 1. The easiest test of the model equation 1 suggested by the pattern of reaction of real prices to real dividends documented here is to regress future returns on current and lagged dividends. The efficient markets model 1 implies that returns are unforecastable and the overreaction alternative suggests that D can be used to forecast returns. Such a distributed lag appears in Table 1 row 3. The coefficient

of the current dividend is negative and the sum of the coefficients of the remaining lagged dividends is positive. Indeed, as our overreaction story would suggest, when dividends are high relative to a weighted average of lagged dividends (so that stocks are by this interpretation overpriced) there is a tendency for low subsequent returns. An F-test on all coefficients but the constant shows significance at the 5 percent level.⁴⁹ A similar pattern of coefficients was found when E replaced D in the regression (Table 1 row 7) suggesting a similar overreaction for earnings, but the result is significant only at the 9 percent level.

We can get a better idea why the pattern of reaction of prices to dividends causes returns to be forecastable by looking at the time series properties of real dividends.

The ARIMA class of models by Box and Jenkins⁵⁰ has been very popular among applied workers, and it would be instructive to see how the real dividend series could be represented by a model in this class. Unfortunately, time series modelling methods are partly judgmental and do not lead all researchers to the same model. One judgment that one has to make in applying such methods is whether to detrend the data prior to data analysis. In my own previous work I estimated a first-order autoregressive model for the log of dividends around a deterministic linear trend. In this model, with the same annual real dividend series used here, the coefficient for 1872-1978 of lagged log dividends was 0.807 implying that dividends always would be predicted to

return half way back to the trend in about three years.⁵¹ This result does not appear sensitive to the choice of price deflator used to deflate dividends. One can reject (taking account of the downward bias of the least squares estimate of the autoregressive coefficient) by a Dickey-Fuller test at the 5% level the null hypothesis of a random walk for log dividends in favor of the first-order autoregressive model around a trend. Some, however, find the model with a deterministic trend unappealing and prefer a model which makes dividends nonstationary. One can deal with the apparent trend in terms of a model of nonstationary dividends by first-differencing the data. The following model was estimated with the real annual Standard and Poor dividend data for 1926 to 1983:

$$(4) \quad dD_t = \frac{3.285 \times 10^{-3}}{(1.498)} + 0.850 \frac{dD_{t-1}}{(11.753)} + u_t$$

$$u_t = a_t - 0.981 \frac{a_{t-1}}{(69.434)}$$

where $dD_t = D_t - D_{t-1}$ and a_t is a serially uncorrelated zero mean random variable (t statistics in parentheses). This is what Box and Jenkins called an ARIMA(1,1,1) model. It merely asserts the change in real dividend is a linear function of its lagged value plus an error term u_t which is a moving average of a_t . The Standard errors, in parentheses, are misleading in that the likelihood function for this model has other modes with almost the same likelihood but very different parameter estimates. For

the purpose of telling a story about how it might be plausible, given the past behavior of dividends, to forecast future dividends, this model will suffice. This model cannot be rejected at usual significance levels with the usual Ljung-Box Q-test. It's noteworthy that when the same model was estimated with the sample period 1871 to 1925 almost the same parameter values emerged: the coefficient of dD_{t-1} was 0.840 and the coefficient of a_{t-1} was -0.973.

This estimated model is one which exhibits near parameter redundancy. That is, the coefficient of a_{t-1} is so close to minus one that the moving average on a_t almost cancels against the first difference operator. In other words, this model looks almost like a simple first-order autoregressive model for dividends with coefficient on the lagged dividend of .850. It's more accurate to describe this model as being a first-order autoregressive model around a moving mean which is itself a moving average of past dividends. One can write the one-step-ahead optimal forecast of D_t implied by equation 4 in the following form:

$$(5) \quad E_t D_{t+1} = 0.869 * D_t + 0.131 * M_t + 0.173$$

$$M_t \equiv (1-0.981) * \sum_{k=0}^{\infty} 0.981^k * D_{t-k-1}$$

Where M_t is a moving average of dividends with exponentially declining weights which sum to one. Since 0.981 is so close to

1.00, the moving average which defines M_t is extremely long (even 0.981 to the 25th power is 0.619) and thus the term M_t does not vary a lot over this sample. Thus, for one-step-ahead forecasts this model in our sample is very similar to a first-order autoregressive model on detrended dividends.

If real dividends are forecasted in accordance with equation 5 then the model 1 (with discount rate $i = 0.080$) would imply (using the chain principle of forecasting) that that stock prices should be a moving average of dividends given by:

$$(6) \quad P_t = 5.380 * D_t + 7.120 * M_t + 11.628$$

Note that the distant past has much more weight relative to the weight on the current real dividend in determining the price today (a weighted average of expected dividends into the infinite future) than it does in determining the dividend next period. This model thus accords with the intuitive notion that to forecast into the near future you need look only at the recent past but to forecast into the distant future you need to look into the distant past. Equation 6 implies that P_t , just as D_t , is an ARIMA(1,1,1) process.⁵² If we had modelled the real dividend series as a first-order autoregressive model around a trend then P_t would be a weighted average of D_t (with about the same weight as in equation 6) and a trend.

The coefficient of D_t in equation 6 is 5.380, which is far below the estimated value in row one or two of table 1. The

coefficients of the lagged dividends sum to a positive number, not a negative number.

In conclusion, it appears that stock prices do not act, as they should, like a smoothed transformation of dividends over the past few decades. Instead dividends look like an amplification of the difference of dividends from such a transformation. It is as if people's optimism is too volatile, influenced by departures from trends rather than by the trends themselves.

Excess Volatility of Stock Prices

Regression tests of the efficient markets model may not fully characterize the way in which the model fails. A simpler and perhaps more appealing way to see the failure of the model represented by equation 1 follows by observing that stock prices seem to show far too much volatility to be in accordance with the simple model.⁵³

The most important criticism of these claims of excess volatility of speculative asset prices centered on the assumed stationarity around a trend of the dividend series.⁵⁴ In this section the volatility tests will be discussed in light of this criticism and presented again in a slightly different form (which might deal better with the nonstationarity issue).

I showed that if the dividend D_t is a stationary stochastic process then the efficient markets model 1 implies that:⁵⁵

$$(7) \quad \sigma(P - P_{-1}) < \sigma(D) / (2i)^{.5}$$

i. e. that the standard deviation of the change in price $P - P_{-1}$ is less than or equal to the standard deviation of the dividend D divided by the square root of twice the discount factor. If we know the standard deviation of D , then there is a limit to how much $P - P_{-1}$ can vary if equation 1 is to hold at all times. If the market is efficient then price movements representing changes in forecasts of dividends cannot be very large unless dividends actually do move a lot. The discount factor i is equal to the expected return $E(R_t)$, which can be estimated by taking the average return. Before we can use this inequality to test the efficient markets model, we must somehow deal with the fact that dividends appear to have a trend, and the problem was dealt with before by detrending price and dividend by multiplying by an exponential decay factor. This method of detrending has become a source of controversy. Indeed, as I noted in the original paper, the trend in dividends may be spurious and dividends may have another sort of nonstationarity which such detrending does not remove.⁵⁶ Thus, this violation should not be regarded by itself as definitive evidence against the equation 1. Most of the criticism of the variance bounds inequalities has centered on this point.⁵⁷ On the other hand, the violation of the variance inequality does show that dividend volatility must be potentially much greater than actually observed historically (around a trend or around the historical mean) if the efficient markets model is

to hold, and this fact can be entered in to a weighing among other factors in judging the plausibility of the efficient markets model.

In table 4 the elements of the above inequality are displayed where the data are detrended in a different, and perhaps more satisfactory, manner, which depends only on past information. Let us define detrended price series P5, P15 and P30 and corresponding dividend series D5, D15 and D30 by:

$$(8) \quad Pk_t = P_t / Nk_t \quad k = 5, 15, 30$$

$$(9) \quad Dk_t = D_t / Nk_t + P_{t+1} (1/Nk_t - 1/Nk_{t+1}) \quad k = 5, 15, 30$$

where

$$(10) \quad Nk_t = \prod_{j=0}^{k-1} D_{t-j}^{1/k}$$

The detrended price and dividend series have the property that returns calculated using Pk and Dk in place of P and D in the formula for return R_t are the same as if P and D had been used. Thus, if equation 1 holds for P_t and D_t then equation 1 holds where Pk_t and Dk_t replace P_t and D_t . Thus, the same variance inequality 7 should hold for Pk and Dk. One can think of Pk and Dk as the price and dividend respectively of a mutual fund which holds the same fixed portfolio (whose price is P_t and whose dividend is D_t) but buys back or sells its own shares so that it always has Nk_t shares outstanding. Nk_t is a geometric moving

average of lagged real dividends. This may cause the dividend of the mutual fund to be stationary even if the dividend D_t is not. A plot of D30, for example, looks very much like a detrended dividend series and does not look unstationary. If, for example, the log of D is a Gaussian random walk and is thus nonstationary then Pk_t will be a stationary lognormal process and Dk_t will be the sum of stationary lognormal processes.⁵⁸ We see from table 4 that the inequality 7 is violated for data detrended in this way, the extent of the violation is higher the higher the k, i. e., the more smoothing involved in the averaging.

Forecasting Regressions Using Dividend-Price and Earnings-Price Ratios

The most natural test of the model equation 1 is to regress return R_t on information available to the public at time t. Analogous tests of related models might regress excess returns on information at time t, or regress risk-corrected returns on information at time t. If the F-statistic for the regression (that is, for the null hypothesis that all coefficients save the constant term are zero) is significant, then we will have rejected the model. The simplest such tests use just price itself (scaled, say, by dividing it into earnings or dividends) as an explanatory variable, and use the conventional t statistic to test the model. If "fads" cause stocks to be at times

overpriced, at times underpriced, and if these fads tend to come to an end, then we would expect a high dividend-price ratio or earnings-price ratio to tend to predict high returns and a low dividend-price or earnings-price ratio to predict low returns. This would mean that the most naive investment strategy: buy when price is low relative to dividends, sell when it is high, pays off.

When one tries to carry out such simple tests, one discovers that matters are not so simple. One confronts a number of econometric problems: the independent variable is not "nonstochastic" so that ordinary t statistics are not strictly valid, the error term appears nonnormal or at least conditionally heteroskedastic, and risk correction if it is employed is not a simple matter. There is no agreed-upon way to deal with such problems. I will not attempt here to deal rigorously with such econometric problems. It is however worthwhile pointing out that high dividend-price ratios or earnings-price ratios do seem to be correlated with high returns.

Whether stocks with high earnings price ratios will have relatively high returns has been the subject of much discussion in the literature. It has been confirmed that there is a simple correlation across firms between such ratios and returns.⁵⁹ The issue that then attracted attention was whether such a phenomenon could be explained within the framework of the capital asset pricing model if there happens to be a positive correlation between the ratio and the beta of the stocks, or whether the

ratio is proxying for a "small-firm effect", i. e., whether firm size, which correlates with the ratio, affects expected return. Recently, Sanjoy Basu concluded that risk adjusted returns are positively correlated with earnings price ratio even after controlling for firm size.⁶⁰ As Basu notes, however, his tests depend on the risk measurement assumed.

It is apparently accepted today in the finance profession that expected returns fluctuate through time as well as across stocks. These results are interpreted as describing the time variation in the "risk premium." The dividend-price ratio or earnings-price ratio has not figured prominently in this literature. Instead forecasting variables were such things as the inflation rate⁶¹, the spread between low-grade and high-grade bonds⁶², or the spread between long-term and short-term bonds⁶³

In table 2 we see that a high dividend-price ratio (total S&P dividends for the preceding year divided by the S&P Composite Index for July of the preceding year) is indeed an indicator of high subsequent returns.⁶⁴ Thus, for example, the equation in row 1 asserts that when the dividend price ratio (or "current yield") is one percentage point above its mean the expected return on the stock is 3.588 percentage points above its mean. Thus, the high current yield is augmented by an expected capital gain that is two and a half times as dramatic as the high current yield. In contrast, the model 1 would predict that a high current yield should correspond to an expected capital loss to offset the current yield. The efficient markets hypothesis thus appears

dramatically wrong from this regression: stock prices move in a direction opposite to that forecasted by the dividend price ratio. This is true in every subperiod examined.⁶⁵

In table 3 are shown analogous regressions with the earnings price ratio (total S&P earnings for the preceding year divided by the S&P composite index for July of the preceding year) in place of the dividend price ratio. These forecasting regressions work in the same direction (price low relative to earnings implies high returns) but are less significant.⁶⁶

Implications of the Forecasting Equations in Connection With the Model

If we choose hypothetical values for r and v in equation 2 then we can use one of the equations forecasting R_t produced in tables 1 through 3 to estimate the paths through time of Q_t and Y_t . Such an estimate will be admittedly pretty arbitrary, and of course the forecasting regressions here are not *prima facie* evidence that it would be "smart" to behave as will be supposed here. Considering such an estimate may nonetheless give some insights into the plausibility of the sort of model here. We learn immediately in doing this that v must be very large if swings in Q_t , the proportion of share held by smart money, are not to be extraordinarily large. This problem arises because stock prices are actually quite forecastable, that is, the

standard deviation of the expected return implied in many of the forecasting equations is so large that unless v in equation 2 is large, Q_t will often move far out of the zero to one range.

Figure 2 shows a hypothetical example: estimated values of Y_t and Q_t implied by equation 2 and the forecasting equation based on the dividend-price ratio in Table 2 row one for $r = 0\%$ and $v = 50\%$. Also shown is the real price P_t . For these values of r and v , Q_t is always positive and thus Y_t is always less than P_t . The demand for shares by ordinary investors is Y_t looks on the whole fairly similar to the price P_t itself. This arises because the forecasting equation is related to the dividend price ratio and because dividends are fairly sluggish, so that Q_t itself resembles the reciprocal of P_t . Y_t is somewhat more volatile than P_t , showing a tendency to be lower proportionally at lows and higher proportionally at highs. The overreaction to dividends is more pronounced in Y_t than in P_t . The presence of smart money thus serves to mitigate the overreaction of ordinary investors. The year 1933 stands out for a very large proportion of smart money and low proportion of ordinary investors. This was the year when the dividend-price ratio reached an extreme high and when the highest returns were forecasted. The late 50's and early 60's were times of low demand by smart money: the dividend-price ratio was low then and so they were "smart" ex ante to get out of the market though of course ex post they would have liked to stay in the market. The demand by smart money is currently neither high nor low, since the dividend price ratio is

not far from its historical average. The weighted average return ($\sum Q_t R_t / \sum Q_t$) over 1926 to 1983 was 12.9% in contrast to the average return (mean of R_t) over this period of 8.2%.

The volume of trade implied by the movements in and out of shares by smart money between t and $t+1$ is $|Q_{t+1} - Q_t|$. The average value of this over the sample shown in figure 2 is 0.055. The New York Stock Exchange turnover rate (reported annual share volume divided by average of shares listed) in this sample was, except for the early depression years when turnover was extremely high, between 9% (1942) and 42% (1982).⁶⁷ Thus, the story told in figure 2 is not one of implausibly high volume of trade. Since corporate stock constitutes less than a third of all wealth (between 1945 and 1980 corporate shares held by households and private financial institutions as a proportion of household net worth including tangibles and government debt ranged from 12.6% in 1948 to 31.8% in 1968)⁶⁸ we are also not talking about implausibly large wealth movements on the part of smart money. Of course, not all household wealth is very liquid. The ratio of the market value of corporate equities to deposits and credit market instruments held by households ranged from 47.7% in 1948 to 136.2% in 1968.⁶⁹

The results shown in figure 2 are, of course, not insensitive to the choice of forecasting equation, though as long as the forecasting equation is a simple regression on the dividend price ratio (as in Table 2) changing the equation has no more effect than changing r and v . If an earnings-price ratio

forecasting equation (row 6 of table 3) is used to compute $E_t R_t$, the pattern through time of Q is somewhat different. Q is still high (though not as high in figure 2) in 1933 and low in the late 1950's and early 60's. The weighted average return for smart money over this period would be 11.4%.

A discount rate $r+v$ of 50% in equation 3 may or may not imply very forecastable returns, depending on the stochastic properties of Y_t . In the hypothetical example, the behavior of Y_t is sufficiently dominated by long (low frequency) components that returns are not more forecastable than would be implied by the forecasting regression in table 2. A discount rate of 50% per year amounts to about a tenth of a percent per day (compared to the standard deviation of daily return of about one percentage point), so that for event studies involving daily stock price data the discount rate is still very small. If equation 3 were to be applied to individual stocks, we might choose a smaller value of v and hence a smaller discount rate.

Summary

Much of this paper relies on the reader's good judgment. A lot of evidence was presented here that suggested that social movements, fashions or fads, are likely to be important or even the dominant cause of speculative asset price movements but no

single piece of evidence was unimpeachable. The most important reason for expecting that stock prices are heavily influenced by social dynamics came from our observations as to who participates in the market and as to human nature. We were aided by the literature on social psychology, sociology, and marketing. A study of the history of the U. S. stock market in the postwar period suggested that various social movements were underway over this period which might plausibly have major effects on the aggregate demand for shares. I hope that all things considered a convincing case was made. Why must we rely on such evidence to make the case against market efficiency? There is just no alternative to human judgment in understanding human behavior.

The reason why the random walk behavior of stock prices holds up as well as it does may have two origins. First, the aggregate demand of ordinary investors may itself not be entirely unlike a random walk. Fashions are perhaps inherently rather unpredictable. Ordinary investors may overreact to news of returns, earnings or dividends, and such behavior may also make their demand relatively unpredictable. Second, as shown by the model in equation 3 here, the limited amount of smart money in the economy ought to have the effect of preventing what predictable patterns of behavior ordinary investors do show from causing big short run profit opportunities, so that returns may be nearly unpredictable and tests of market efficiency may have little power. It was emphasized that in preventing large profit opportunities the smart money may not be preventing the ordinary

investors from causing major swings in the market and even being the source of volatility in the market.

Stock price data show evidence of overreaction to dividends. The forecasting equations for returns are consistent with such an overreaction story. However, an alternative interpretation for the correlation of prices to dividends might be that firms that set dividends are influenced by the same social dynamics that influence the rest of society. There are other possible interpretations of this correlation. That is why the data analysis was presented as merely confirming the consistency with the data of notions of overreaction suggested by casual observation. Since our understanding of the behavior of financial markets is so poor, advocates of the basic notion of market efficiency are likely to be able to think of some reason why any observed correlation is consistent with rational optimizing behavior.

Despite all the inadequacies of the notion of market efficiency, modern theoretical finance does offer many insights into actual market behavior. Progress would be best served by pursuing these insights which in many cases do not require the notion of market efficiency.

Figure 1. Real Standard and Poor Stock Price Data, 1926 to 1984^a

Source: Author's calculations from data from Standard and Poor Statistical Service and the U. S. Bureau of Labor Statistics.

a. Annual data: 59 observations from 1926 to 1984. P - Standard and Poor Composite Stock Price Index for January divided by the producer price index, all items, for January, times 100. E - Earnings per share adjusted to index, composite, four quarter total, fourth quarter, divided by the producer price index for January, times 100. D - Dividends per share adjusted to index, composite, four quarter total, fourth quarter, divided by the producer price index for January. Ratios (bottom panel) computed by dividing P by D or E for the preceding year.

Figure 2. Hypothetical Demands for Shares by Smart Money and Ordinary Investors

Source: Authors Calculations

P_t - Real Standard and Poor Composite Stock Price Index

Q_t - Hypothetical proportion of shares demanded by "smart money" according to equation 9 with $r = 0$ and $v = .5$ based on forecasting equation for returns in Table 2 row 1.

Y_t - Hypothetical demand for shares by ordinary investors, equal to $P_t * (1 - Q_t)$.

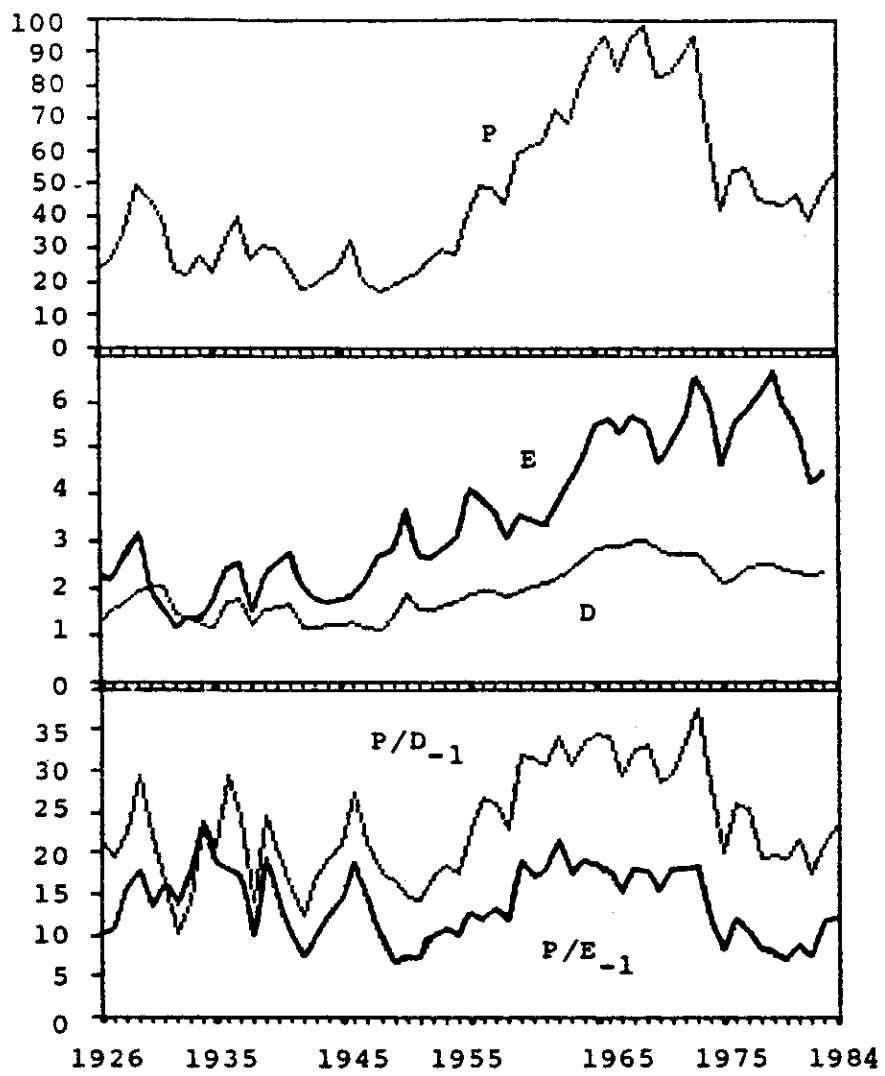
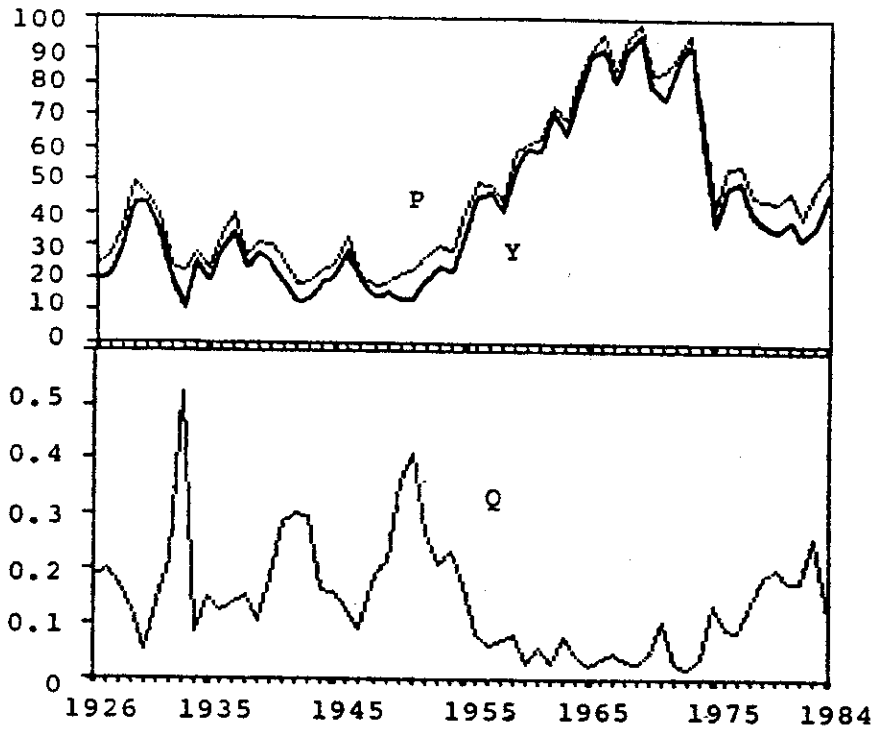


Fig. 1



P, Y, Q

Table 1. Distributed Lag Regressions on Real Dividends or Earnings

Row	Sample period	Dependent variable	Const.	Coef. of current indep. variable	Sum of coef's of lagged indep. variable	Rho	Sample statistics		
							F	R ²	Durbin Watson
						Prob>F	R ²	SER	
A. Independent variable is real dividends:									
1900-	P		-0.081	34.64	-11.79		257.3	0.906	0.818
1983	Ols		(-2.947)	(14.16)	(-4.344)		0.000	0.903	0.072
1900-	P		-0.073	28.25	-5.373	0.655	44.49	0.695	1.863
1983	Corc		(-1.202)	(9.130)	(-1.143)	(7.888)	0.000	0.680	0.057
1900-	R(t+1)		0.089	-6.571	9.623		2.716	0.094	2.059
1982	Ols		(1.205)	(-1.026)	(1.395)		0.049	0.059	0.187
1926-	R(t+1)		0.173	-7.618	5.168		1.523	0.079	2.053
1982	Ols		(1.326)	(-0.935)	(0.570)		0.219	0.027	0.201
B. Independent variable is real earnings:									
1900-	P		0.103	11.73	-5.829		57.59	0.684	0.270
1983	Ols		(2.611)	(5.612)	(-2.293)		0.000	0.672	0.131
1900-	P		0.168	7.979	-2.576	0.896	10.74	0.355	1.613
1983	Corc		(1.074)	(6.521)	(-0.484)	(18.35)	0.000	0.322	0.063
1900-	R(t+1)		0.088	-5.765	7.451		2.190	0.077	1.971
1982	Ols		(1.512)	(-1.901)	(1.907)		0.094	0.042	0.189

Source: Author's calculations. T-statistics are in parentheses below coefficient estimates. Ols denotes ordinary least squares. Corc denotes Cochrane-Orcutt serial correlation correction

(a) Dependent variable P is the real (i. e. divided by the Producer Price Index for January) Standard and Poor Composite Stock Price Index for January. Dependent variable R(t+1) is the real return from January of the following year to January of two years hence (deflated by the producer price index) based on the Standard and Poor Composite Stock Price Index and dividend series.

Table 2. Forecasting Returns Based on Dividend Price Ratio (a)

Row	Dependent Variable	Sample Period	Constant	Coefficient of Dividend Price Ratio	Sample Statistics	
					R ²	Durbin Watson
					\bar{R}^2	SER
1	R (b)	1872-1983	-0.097 (-1.515)	3.588 (2.850)	0.069 0.060	1.848 0.171
2	R (b)	1872-1908	-0.023 (-0.201)	2.259 (0.962)	0.026 -0.002	2.054 0.143
3	R (b)	1909-1945	-0.135 (-0.875)	3.886 (1.415)	0.054 0.027	1.463 0.206
4	R (b)	1946-1983	-0.156 (-1.700)	5.226 (2.616)	0.159 0.136	1.803 0.165
5	R (c)	1889-1982	-0.130 (-1.943)	4.255 (3.154)	0.098 0.088	1.848 0.171
6	R (d)	1926-1982	-0.165 (-1.729)	5.264 (2.710)	0.118 0.102	2.008 0.209

Source: Author's calculations

(a) Dependent variable is the real return on the Standard and Poor Composite Stock Price Index from January of the year to January of the following year. The return is calculated as the sum of the change in index plus S&P Composite Dividends per Share Adjusted to Index, Four Quarter Total, divided by the index. Independent variable is total Dividends in the preceding year (S&P Composite Dividends Adjusted to Index, Four Quarter Total) divided by the S&P Composite Index for July of the Preceding Year. T-statistics are in parentheses.

(b) Price deflator used to convert nominal magnitudes to real magnitudes is the producer price index.

(c) Price deflator used to convert nominal magnitudes to real magnitudes is the consumption deflator for nondurables and services.

(d) Dependent variable is the real return from the end of January end of January of the following year. Nominal returns were cumulated from monthly data "Common stocks total returns" from Roger Ibbotson & Associates, Inc. These were converted to real returns using the January producer price index.

(c) The independent variable in part A above is the real dividend D (Standard and Poor Dividends per Share adjusted to index, Composite, total for four quarters). The independent variable in part B above is real earnings E (Earnings per Share adjusted to index, composite, total for four quarters). Second degree 30 year polynomial distributed lags with far endpoint tied to zero were used throughout. The sum of lagged coefficients shown is for the 29 lagged values and does not include the coefficient of the current independent variable which is shown separately.

Table 3. Forecasting Returns Based on Earnings Price Ratio. (a)

Row	Dependent Variable	Sample Period	Constant	Coefficient of Earnings Price Ratio	Sample Statistics	
					R ²	Durbin Watson
					\bar{R}^2	SER
1	R (b)	1872-1983	0.012 (0.243)	0.851 (1.410)	0.018 0.009	1.898 0.176
2	R (b)	1872-1908	0.002 (0.018)	1.282 (0.630)	0.011 -0.017	2.159 0.145
3	R (b)	1909-1945	0.076 (0.720)	0.026 (0.022)	0.000 -0.028	1.594 0.211
4	R (b)	1946-1983	-0.088 (-1.092)	1.860 (2.132)	0.112 0.087	1.714 0.170
5	R (c)	1889-1982	0.010 (0.193)	0.784 (1.241)	0.016 0.006	1.957 0.179
6	R (b)	1901-1983	-0.035 (-0.680)	1.573 (d) (2.378)	0.065 0.054	1.805 0.188

Source: Author's calculations

(a) Dependent variable is the real return on the Standard and Poor Composite Stock Price Index from January of the year to January of the following year. The return is calculated as the sum of the change in index plus S&P Composite Dividends per Share Adjusted to Index, Four Quarter Total, divided by the index. Independent variable is total earnings in the preceding year (S&P Composite Earnings Adjusted to Index, Four Quarter Total) divided by the S&P Composite Index for July of the Preceding Year. T-statistics are in parentheses.

(b) Price deflator used to convert nominal magnitudes to real magnitudes is the producer price index.

(c) Price deflator used to convert nominal magnitudes to real magnitudes is the consumption deflator for nondurables and services.

(d) Earnings price ratio is the average real S&P earnings (deflated by the producer price index) for the preceding 30 years (not including current year) divided by the real S&P Composite index for January (deflated by the producer price index).

Table 4. Sample Statistics for Price and Dividend Series (a)

Sample Period	Left-Hand Side of Inequality	Right-Hand Side of Inequality
1877-1984	$\sigma(P5-P5_{-1})=4.163$	$A*\sigma(D5)=3.675$
1887-1984	$\sigma(P15-P15_{-1})=4.640$	$A*\sigma(D15)=2.152$
1902-1984	$\sigma(P30-P30_{-1})=5.447$	$A*\sigma(D30)=1.795$

Source: Author's Calculations

a. The variables P5, P15, and P30 are the real stock price index which was detrended by dividing by the 5, 15 and 30 year geometric average of lagged real dividends respectively, and σ denotes sample standard deviation. The variables D5, D15 and D30 are the corresponding dividend series as defined in the text. The constant A equals $1/(2*0.079)^{.5}$ where 0.079 is the average real return on the Standard and Poor index over the entire sample period, 1871-1983.

Footnotes

*John Pound provided research assistance. This research was supported by the National Science Foundation and the Sloan Foundation.

1. The recent literature on behavioral economics associated with survey research has apparently not touched substantially on speculative markets. Some of their findings are relevant and will be cited below.
2. For example, David Cass and Karl Shell refer to market psychology in motivating their discussion of extraneous uncertainty, but then assume economic agents are expected utility maximizers with unchanging tastes. There is however a sense in which they and others are wrestling with some of the same issues that are of concern below in this paper. See David Cass and Karl Shell, "Do Sunspots Matter?," Journal of Political Economy, vol. 91 (April 1983), pp. 193-227.
3. There are some casual arguments in the literature against such a role for mass psychology. The most-cited reference may be Eugene Fama, "The Behavior of Stock Market Prices," Journal of Business vol. 38, (January 1965) pp. 34-105. The argument consists of no more than a few paragraphs pointing out that

"sophisticated traders" might eliminate profit opportunities thereby tending to make "actual prices closer to intrinsic values." p. 38

4. A few minutes spent with a periodical index will confirm that the idea that regular exercise (walking, cycling, running, etc.) helps prevent heart disease was part of the conventional wisdom by the mid-1950's.

5. There seems to be the same superabundance of theories to explain the decline of boy scouting since 1973 as for the decline in the stock market over the same period. See "Whatever Happened to... Boy Scouts - Trying to Make a Comeback," U. S. News and World Report vol. 86 (May 7, 1979) pp. 86-7. Those who think that people just got tired of westerns will have to explain why it took a generation for them to get tired.

6. See the 1983 New York Stock Exchange Fact Book, page 52. According to this source, institutional investors accounted for 65% of all public volume on the New York Stock Exchange in the fourth quarter of 1980 (page 54). Thus, institutional investors trade much more frequently than do individual investors. Data which are probably more accurate on institutional holdings are in Irwin Friend and Marshall Blume, The Changing Role of the Institutional Investor (Wiley, 1978). They estimated that 24.9% of all stock was held by institutions and foreigners in 1971, up from 17.9% in 1960.

7. See Marshall E. Blume, Jean Crockett and Irwin Friend, "Stockownership in the United States: Characteristics and Trends," Survey of Current Business, (November 1974) pp. 16-40. In 1981, 7.2 percent of households had income above \$50,000. (Statistical Abstract of the United States, 1982-3, p. 430.)

8. Robin Barlow, Harvey E. Brazer and James N. Morgan, Economic Behavior of the Affluent (Brookings, 1966), p. 26.

9. Ibid., p. 68.

10. Ibid., p. 71. These findings were also confirmed in other surveys. See Katona, Psychological Economics, p. 269.

11. The median correlation (from 12 studies) between IQ's of natural parents and of their children is 0.50. See Eysenck, H. J. and Leon Kamin, The Intelligence Controversy (Wiley, 1980), p. 50.

12. Frank H. Knight, Risk, Uncertainty and Profit (Augustus M. Kelley, 1964, first printed 1921), pp. 232-3.

13. See Muzafer Sherif, "An Experimental Approach to the Study of Attitudes," Sociometry, vol 1, (1937), pp. 90-98.

14. See Solomon E. Asch, Social Psychology (Prentice Hall, 1952)

15. William J. McGuire, "The Nature of Attitudes and Attitude Change," in Gardner Lindzey and Elliot Aronson, editors, Handbook of Social Psychology (Addison Wesley, 1969).

16. See George Katona, Psychological Economics (Elsevier, 1975) p. 203.

17. *ibid.*, p. 267.

18. See for example David J. Bartholomew, Stochastic Models for Social Processes, (Wiley, 1967).

19. See Norman T. Bailey, The mathematical Theory of Epidemics (C. Griffin, 1957).

20. McGuire, "The Nature of Attitudes," pp 253,4. A description of recent research in marketing journals on the removal rate is in Richard P Bagozzi and Alvin J. Silk, "Recall, Recognition, and the Measurement of Memory for Print Advertisements," Marketing Science, vol. 2, (Spring 1983) , pp. 95-134

21. See Bartholomew, Stochastic Models ... for a discussion of empirical work on the infection rate.

22. George Shea, The Wall Street Journal, October 12, 1955

23. See, for a recent example, Benjamin M. Friedman, "Effects of Shifting Saving Patterns on Interest Rates and Economic Activity," Journal of Finance, vol. 37 (March 1982), pp. 37-62.

24. New York Stock Exchange Shareownership Surveys. The rise before 1970 of shareownership involved a trend toward somewhat more egalitarian distribution of stock. In 1958, 83.2% of stock value was owned by individuals with the top 10% of income. By

1970, this percent had fallen to 75.4%. See Irwin Friend, Marshall E. Blume and Jean Crockett, "Stockownership in the United States: Characteristic and Trends," Survey of Current Business, (November 1974), pp. 16-40.

25. New York Stock Exchange, The Public Speaks to the Exchange Community, (NYSE, 1955), p. 54.

26. See the NYSE The Investors of Tomorrow (NYSE, 1960).

27. NYSE, "The Public Speaks....," and "Investors of Tomorrow."

28. See the New York Times, S 20 III 1:7, 1959.

29. NYSE, "The Public Speaks...." p. 10.

30. Robert M. Gardiner, chairman of Reynolds Securities, Inc., as quoted in New York Stock Exchange, Share Ownership Survey, 1975, (NYSE, 1976), p. 21.

31. Unpublished data courtesy the National Association of Investment Clubs.

32. See The Gallup Report (March 1984).

33. From a speech, April 1977, quoted in Lipset and Schneider, The Confidence Gap, (The Free Press, 1980). The Gallup Poll also documents a fairly steady decline in confidence in all major institutions over the years 1973-83. See "Confidence in America's Institutions," Gallup Report No. 217 (October, 1983).

34. See New York Stock Exchange, Public Attitudes Toward Investing -- Marketing Implications (NYSE, 1979), p. 5.

35. One rearranges the equation to read $P_t = bE_t D_t + bE_t P_{t+1}$ where $b = 1/(1+i)$ and then uses the fact that $E_t E_{t+k} = E_t$ if $k > 0$. One substitutes in the above rational expectations model for P_{t+1} yielding $P_t = bE_t D_t + b^2 E_t D_{t+1} + b^2 E_t P_{t+2}$. One repeats this process, successively substituting for the price terms on the right hand side. The terminal condition assumption in the text is that the price term, $b^n E_t P_{t+n}$ goes to zero as n goes to infinity.

36. It should be emphasized of course that there is no agreement on the precise definition of the term "efficient markets model" and whether it corresponds to equation 1. For example, in his well-known survey, Eugene Fama says only that "A market in which prices always 'fully reflect' available information is called 'efficient.'" The empirical work he discusses, however, tests the hypothesis that price changes or returns are unforecastable. See Eugene Fama, "Efficient Capital Markets: A Review of Theory and Empirical Work," Journal of Finance, vol. 25 (May 1970), pp. 383-417.

37. These power computations are based on the usual assumption of normal residuals, so that the conventional F statistic is, under the alternative hypothesis, distributed as non-central F with $k-1$ and $n-1$ degrees of freedom and noncentrality parameter $(n/2) * R^2 / (1-R^2)$ where R^2 is the theoretical coefficient of

determination under the alternative hypothesis.

38. See Robert J. Shiller and Pierre Perron, "Testing the Random Walk Hypothesis: Power vs. Frequency of Observation," mimeographed, Yale University, 1984.

39. See Robert J. Shiller, "Do Stock Prices Move too Much to be Justified by Subsequent Changes in Dividends?", American Economic Review, vol. 71 (June 1981) pp. 421-36.

40. My own discussion of these and their plausibility in light of data may be found in Robert J. Shiller, "Consumption, Asset Markets and Macroeconomic Fluctuations," Carnegie-Rochester Series in Public Policy vol. 17 (1982), pp. 203-38.

41. That is, Y_t is the total shares demanded at current price times current price divided by number of shares outstanding. If we assume that demand elasticity by ordinary investors is unitary, we might regard Y_t as exogenous to this model.

42. The correlation of P with D for the years 1871-1925 was 0.84. In this paper, dividend and earnings series before 1926 are from the book which originated what is now called the Standard and Poor Composite Stock Price Index: Alfred Cowles and Associates, Common Stock Indexes, Principia Press, 1938, series Da-1 and Ea-1. All series are deflated by the producer price index (January starting 1900, annual series before 1900) where 1967 = 100.

43. The correlation of P with time for 1871 to 1925 was 0.43.

44. See for example Amos Tversky and Daniel Kahneman, "Judgment under Uncertainty: Heuristics and Biases," Science, vol. 185 (September 1974), pp.1124-31.

45. Marsh and Merton claimed that dividends represent managements's optimal forecast of long-run earnings. See Terry A. Marsh and Robert C. Merton, "Aggregate Dividend Behavior and its Implications for Tests of Stock Market Rationality," Working Paper No. 1475-83, Alfred P. Sloan School of Management, M. I. T., September 1983.

46. See John Lintner, "Distribution of Incomes of Corporations among Dividends, Retained Earnings, and Taxes," American Economic Review Papers and Proceedings, Vol. 66 (May 1956) pp. 97-113.

47. See Fisher Black, "The Magic in Earnings: Economic Earnings versus Accounting Earnings," Financial Analysts' Journal, (November-December 1980), pp. 19-24.

48. Ibid.

49. Tests for heteroskedasticity as proposed by Glejser were run using D, time, and a cubic polynomial in time as explanatory variables. Heteroskedasticity appeared remarkably absent in this regression. See H. Glejser, "A New Test for Heteroskedasticity," Journal of the American Statistical Association, vol. 64 (March 1969), pp.316-23.

50. George E. P. Box and Gwylim M. Jenkins, Time Series Analysis Forecasting and Control (Holden-Day, 1977).

51. See Robert J. Shiller, "The Use of Volatility Measures in Assessing Market Efficiency," Journal of Finance, vol. 36 (May 1981), pp. 291-304.

52. For this result in a more general form, see John Y. Campbell, Asset Duration and Time-Varying Risk Premia, unpublished Ph.D. Thesis, Yale University, (1984)

53. The arguments for excess volatility in financial markets were put forth independently by Stephen F. LeRoy and Richard D. Porter, "The Present Value Relation: Tests Based on Variance Bounds," Econometrica, vol. 49 (March 1981), pp. 555-74 and by myself in several papers beginning with "The Volatility of Long-Term Interest Rates and Expectations Models of the Term Structure," Journal of Political Economy, vol. 87 (December 1979), pp. 1190-1219 and with "Do Stock Prices..."

54. In the case of LeRoy and Porter, the earnings series, rather than the dividend series, was assumed stationary

55. Shiller, "Do Stock Prices..."

56. Shiller, "The Volatility of..."

57. For example, see Marjorie A. Flavin, "Excess Volatility in the Financial Markets: A Reassessment of the Empirical Evidence," Journal of Political Economy vol. 91 (December 1983), pp.

929-56., Allan W. Kleidon, "Variance Bounds Tests and Stock Price Valuation Models," mimeographed, Graduate School of Business, Stanford University, (1983), and Terry A. Marsh and Robert C. Merton, "Dividend Variability and Variance Bounds Tests for the Rationality of Stock Market Prices," working paper No. 1584-84, Sloan School of Management, (August 1984).

58. If $\log D_t - \log D_{t-1} = u_t$ where u is serially uncorrelated and normal with zero mean and variance s^2 then $E_t D_{t+k} = D_t h^k$ where $h = \exp(s^2/2)$. Calling $g = 1/(1+i)$ then if $hg < 1$ it follows from equation 1 that $P_t = gD_t/(1-hg)$. Substituting this into equation 8 and using equation 10 provides the stationarity result for P_k and D_k noted in the text.

59. See for example Francis Nicholson, "Price Ratios in Relation to Investment Results," Financial Analysts Journal vol. 24 (January-February, 1968), p. 105-9.

60. See Sanjoy Basu, "The Relationship between Earnings' Yield, market value and return for NYSE Common Stocks: Further Evidence," Journal of Financial Economics, vol. 12 (June 1983), pp. 129-156.

61. See Fama and Schwert, "Asset Returns and Inflation," Journal of Financial Economics, vol. 5 (November 1977), pp. 115-46

62. See Donald B. Keim and Robert F. Stambaugh, "Predicting Returns in the Stock and Bond Markets," mimeographed, University of Pennsylvania, 1984.

63. See John Y. Campbell, "Stock Returns and the Term Structure," mimeographed, Princeton University, 1984

64. There is evidence that the strategy of holding stocks with high dividend-price ratios has actually paid off for those investors who followed it. See Wilbur G. Lewellen, Ronald C. Lease, and Gary C. Schlarbaum, "Investment Performance and Investor Behavior," Journal of Financial and Quantitative Analysis, vol. 14 (March 1979), pp. 29-57.

65. The same regressions were run using a different price deflator (row 5 of table 2) and a different measure of return (row 6 of table 2) with little change in results.

66. The lower significance appears to be due to the relatively noisy behavior of the annual earnings series. If (row 6 table 3) the earnings price ratio is computed as the average annual S&P earnings for the preceding 30 years divided by the S&P composite index for January of the current year, then the relation between returns and earnings price ratio looks more impressive.

67. Source: 1983 New York Stock Exchange Fact Book, p. 68.

68. See Table 700, "Consolidated Domestic Net Assets with Tangibles at Current Cost, 1945-1980", Balance Sheets for U.S. Economy, mimeographed, Board of Governors of the Federal Reserve System, Washington, April 1981.

69. Ibid.