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Stock Prices and Social Dynamics

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 of 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[1]

INVESTING in speculative assets is a social activity. Investors 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 of 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 of those who buy and sell in speculative markets seem to take it for granted that social movements significantly influence the behavior of prices. Popular interpretations of the recurrent recessions that we observe often include ideas that the shifts in, say, consumer confidence

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1. Henry Fielding, *The True Patriot*, no. 1, 1745, in James P. Browne, ed., *The Works of Henry Fielding, Esq.*, vol. 8 (London: Bickers and Son, 1903), p. 69.

or optimism are also at work in other aspects of the business cycle, such as interest rates, inventories, and so on. Academic research on market psychology, however, appears to have more or less died out in the 1950s, at about the time the expected-utility revolution in economics was born. Those academics who write about 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 have been discredited as unscientific.[2] There is instead an enormous recent literature in finance that takes one of the various forms of the efficient markets hypothesis for motivation and a related literature in macroeconomics that is based on the assumption of rational expectations. In academic circles there has certainly been an interest in speculative bubbles, but pursued within the framework of rational expectations models with unchanging tastes.[3]

It is hard to find in the large literature on the efficient markets hypothesis any discussion of an alternative hypothesis involving social psychology in financial markets.[4] Yet the impression persists in the literature and in casual discussions that there are very powerful arguments against such social-psychological theories. Arguments 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 consider explicitly these arguments against a major role for mass psychology in financial markets.

Returns on speculative assets are nearly unforecastable; this fact is the basis of the most important argument in the oral tradition against a role for mass psychology in speculative markets. One form of this

2. 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.

3. For example, David Cass and Karl Shell refer to market psychology in motivating their discussion of extraneous uncertainty, but they 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 in this paper. See Cass and Shell, "Do Sunspots Matter?" *Journal of Political Economy*, vol. 91 (April 1983), pp. 193–227.

4. There are some casual arguments in the literature against such a role for mass psychology. The most-cited reference may be Eugene F. 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).

argument claims that because real returns are nearly unforecastable, the real price of stocks is close to the intrinsic value, that is, the present value with constant discount rate of optimally forecasted future real dividends. This argument for the efficient markets hypothesis represents one of the most remarkable errors in the history of economic thought. It is remarkable in the immediacy of its logical error and in the sweep and implications of its conclusion. I will discuss 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.

I have divided my discussion into four major sections: arguments from a social-psychological standpoint for the importance of fashions in financial markets, a critique of the argument for the efficient markets hypothesis, a proposed alternative model based on social psychology, and some exploratory data analysis suggested by the alternative model.

The first section discusses 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 (although I think it is of value in understanding the business cycle). Rather, I will be motivated here by the relatively narrow question of why speculative asset prices fluctuate as much as they do.

The second section sets forth and evaluates the efficient markets model and the presumed evidence against a role for social psychology in determining prices. The fundamental issue is the 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.

The third section offers a simple though rather incomplete alternative model of stock prices that admits the importance of social-psychological factors. This model involves "smart-money investors" and "ordinary investors" and is intended to demonstrate how models of financial markets might better accommodate the econometric evidence on the near unforecastability of returns, evidence that is widely interpreted as favoring the efficient markets model.

The fourth section uses U.S. stock market data to explore some relations suggested by the alternative model. Using Standard and Poor's composite stock price index, I examine various forecasting equations for real returns. I consider 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 present a time series model of the aggregate real dividend series associated with Standard and Poor's composite stock price index. I also propose a hypothetical scenario using the alternative model that shows for recent U.S. history what the smart-money investors may have been doing, the fraction of total trading volume that 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 *BPEA* might find themselves caught up in capricious fashion changes? Those of us involved in the current fashion of running for exercise may say that we do it because it is good for our health, but the health benefits of such exercise were known decades ago.[5] 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 twenty years ago? Why are we thinking about running these days and not about once-popular leisure activities now in decline, such as leading Boy Scout troops or watching western movies?[6]

Fashions in one country may often move in one direction while those

5. A few minutes spent with an index to periodical literature will confirm that the idea that regular exercise helps prevent heart disease was part of the conventional wisdom by the mid-1950s.

6. 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* (May 7, 1979), pp. 86–87. Those who think that people simply got tired of westerns will have to explain why it took a generation for them to do so.

in another country are moving in a different direction. In politics, for instance, we have seen in the last decade a drift toward 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 these countries. Is there any reason to think that social movements affect investments any less strongly than they do these other activities? We know that attitudes toward investments are very different across cultures. In West Germany today investors are notably cautious; it is hard to raise venture capital, and the stock market itself is very small. Isn't it plausible that attitudes that change across countries should also change within a country through time?

Some may argue that investing is less likely than other activities to be influenced by fashions because people make investment choices privately, based on their perception of the prospects for return, and usually not with any concern for what people will think. It is, however, plausible that these perceptions of return themselves represent changing fashions. The changing fashions in "physic" that Fielding noted are analogous. Sick people in Fielding's day 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 CONTROLS EQUITY INVESTMENTS?

It is important first to clarify the identity of investors in corporate stock. It is widely and mistakenly believed that (1) institutional investors hold most stocks, (2) most wealthy individuals have delegated authority to manage their investments, and (3) smart money dominates the market. By suggesting that the market is more professionalized than it is, these misconceptions lend spurious plausibility to the notion that markets are very efficient.

It is true that the importance of institutional investors has been growing 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 percent in 1955 to 35.4 percent in 1980.[7] Still, nearly 65 percent of all New York Stock Exchange stocks were held by individuals in 1980.

Most individually held corporate stock belongs to the wealthy. 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.[8] 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 to experts the authority over their investments.

A 1964 Brookings study interviewed 1,051 individuals with 1961 incomes of more than $10,000 (or about $34,000 in 1984 prices) concerning their investment habits, among other things. The 1961 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."[9] 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

7. See New York Stock Exchange, *New York Stock Exchange Fact Book 1983* (NYSE, 1983), p. 52. This source says that institutional investors accounted for 65 percent of all public volume on the New York Stock Exchange in the fourth quarter of 1980 (p. 54). Thus, institutional investors trade much more frequently than do individual investors. Data that 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 percent of all stock was held by institutions and foreigners in 1971, up from 17.9 percent in 1960 (p. 32).

8. See Marshall E. Blume, Jean Crockett, and Irwin Friend, "Stockownership in the United States: Characteristics and Trends," *Survey of Current Business*, vol. 54 (November 1974), pp. 16–40. In 1981, 7.2 percent of households had income above $50,000 (*Statistical Abstract of the United States, 1982–83*, p. 430).

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

advice when investing, while two out of three said they did 'occasionally.' "[10] Two-thirds of the investors said they tried to keep informed, and 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."[11]

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 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 investors as well. In assessing this probability, one must bear in mind that the class of smart-money investors does not correspond closely to the intelligent segment of the population. What is at work behind smart money is not just intelligence but also interest in investments and timeliness. Presumably the probability is fairly low that heirs are smart investors.[12]

There are several factors that serve to mitigate the effects of higher returns on the average wealth of smart-money investors. 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 persons, whose portfolios have had less time to accumulate, will figure more prominently in the aggregate of wealth. 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 speculative assets.

Roughly speaking, one can expect to live thirty years after receiving a bequest on the death of one's parents. A representative smart-money heir who earns and accumulates at a rate n greater than a representative ordinary investor in the middle of the thirty years will thus have on

10. Ibid., p. 68.

11. Ibid., p. 71. These findings were also confirmed in other surveys. See George Katona, *Psychological Economics* (Elsevier, 1975), p. 269.

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

average, if original bequests were equal, roughly $(1 + n)^{15}$ times as much wealth. If n is 2 percent per year, this is 1.3; if 5 percent per year, this is 2.1. As long as the percentage of smart investors 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; because we lack data on their savings patterns versus the savings patterns of ordinary investors, it is impossible to say anything concrete about how much money smart investors accumulate. If the smart investors behave like good trustees of the family estate and consume at exactly the rate that would preserve the real value of the family wealth, then smart money will not accumulate at all, regardless of the return it earns.

THE AMBIGUITY OF STOCK VALUE

Stock prices are likely to be among the prices that are relatively vulnerable to purely social movements because there is no accepted theory by which to understand the worth of stocks and 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. Do projections of large future deficits in the federal budget imply that the price of long-term bonds will go up or down? Does the election of a conservative U.S. president imply that earnings of General Motors will go up or down? Does a rise in the price of oil cause the price of IBM stock to go up or down? Ordinary investors have no objective way of knowing.

Ordinary investors are faced with what Frank Knight in 1921 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.[13]

13. Frank H. Knight, *Risk, Uncertainty and Profit* (Augustus M. Kelley, 1964), pp. 232–33.

Ordinary investors also cannot judge the competence of investment counselors in the way they can that of other professionals. It is very easy to learn whether a map company is producing correct maps; we can therefore take it for granted that others have done this and that any map that is sold will serve to guide us. It is much harder to evaluate investment advisers who counsel individual investors on the composition of their portfolios and who claim to help them make investments with high returns. Most investors lack data on past outcomes of a counselor's advice and on whether the current advice is based on the same approach that produced these outcomes. Moreover, most investors do not understand data analysis or risk correction, necessary knowledge for evaluating the data.

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, whereas 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 lack 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."[14] 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 would 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 individuals arrived, without any discussion, at consensuses (differing across groups)

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

on the amount of movement. Subjects, interviewed afterward, showed little awareness of the influence of the group on their individual decision.

In another well-known experiment, Solomon Asch had individuals alone and in groups compare the lengths of line segments. The lengths were sufficiently different that, when responding alone, subjects gave very few wrong answers. Yet when placed in a group in which all other members were coached to give the same wrong answers, individual subjects also frequently gave wrong answers.[15] Through follow-up questions, Asch found that even though the subject was often aware of the correct answer, and the answer was completely inoffensive, the subject was 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 suggests that group pressures do serve at the very least to cause individuals to remain silent when their own views appear to deviate from the group's, and their silence will prevent the dissemination of relevant information that might establish the dissenters' views 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, and the basic mechanisms are well known. The ideas that 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 causes people to talk about related matters or slowed if a news event distracts their attention.

Social movements can take place in a matter of hours 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

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

diffusion. However, the general finding of research on persuasion is that "any impact that the mass media have on opinion change is less than that produced by informal face-to-face communication of the person with his primary groups, his family, friends, coworkers, and neighbors."[16] 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."[17] Thus, it is not surprising that in surveys in the 1950s and 1960s "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."[18]

Such diffusion processes for news or rumor have been modeled more formally by mathematical sociologists drawing on the mathematical theory of epidemics.[19] For example, in what has been referred to as the "general epidemic model,"[20] 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" τ. The first assumption is that of the familiar model which gives rise to the logistic curve, and the second assumption causes any epidemic or social movement eventually to come to an end. In this model a new infectious agent or an event interpreted as important news can have either of two basic consequences. 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.

16. William J. McGuire, "The Nature of Attitudes and Attitude Change," in Gardner Lindzey and Elliot Aronson, eds., *Handbook of Social Psychology* (Addison Wesley, 1969), p. 231.

17. See Katona, *Psychological Economics*, p. 203.

18. Ibid., p. 267.

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

20. See Norman T. Bailey, *The Mathematical Theory of Epidemics* (London: C. Griffin, 1957).

The removal rate and the infection rate may differ dramatically from one social movement to another depending on the characteristics of the sources, media, and receivers. One survey of the literature on removal rates after persuasive communications concluded that "the 'typical' persuasive communication has a half-life of six months" but that different experiments produced widely different half-lives.[21] Changes in the infection rate or removal rate may be what accounts for the sudden appearance of some 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 patterns in social movements: long-lasting "humps" that build slowly (low removal and infection rate) or that rise and fall quickly (high removal and infection rate); news events with a subsequent monotonic decline of infectives (zero infection rate) or followed by a monotonically increasing number of infectives (zero removal rate). Of course, such patterns may not be seen directly in prices of speculative assets, as the "alternative model" I present later in the paper will show.

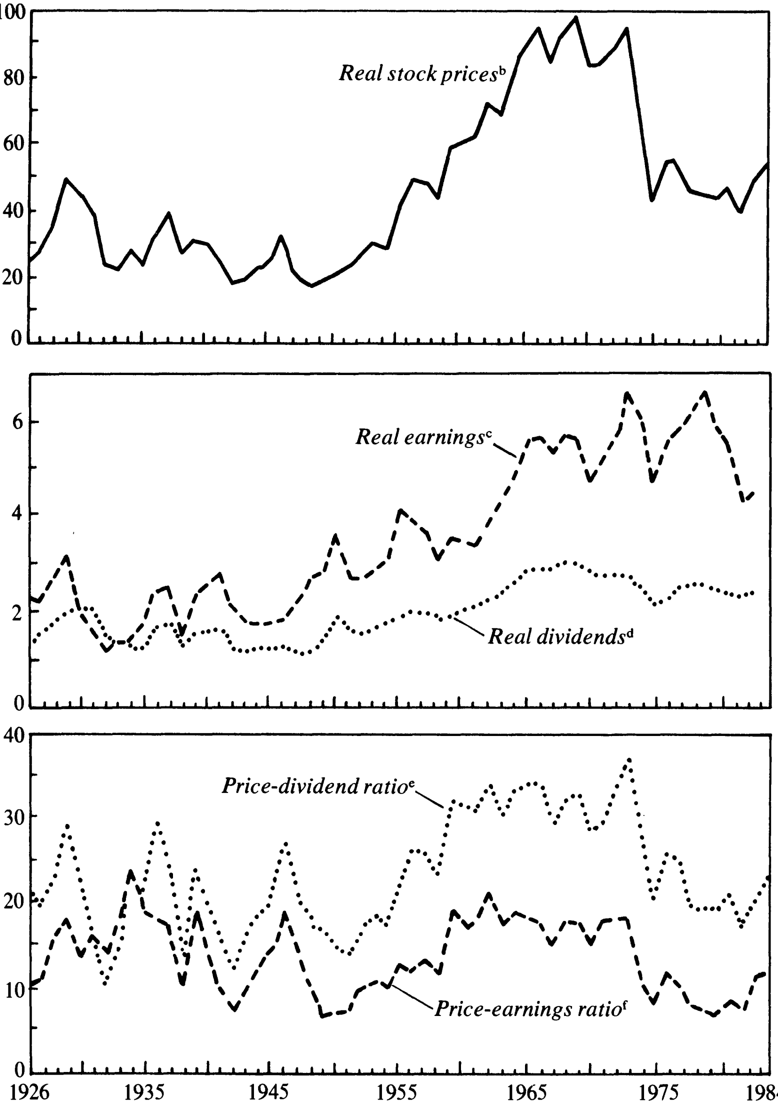
SOCIAL MOVEMENTS AND THE POSTWAR STOCK MARKET

The real price of corporate stocks, as measured by a deflated Standard and Poor's composite stock price index (figure 1), shows what appears to be a pronounced uptrend between the late 1940s and the late 1960s and since then a downtrend (or, more accurately, a single major drop between 1973 and 1975). The postwar uptrend period, the last great bull market, has often been characterized as one 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 1960s?

Such evidence will not take the form of proof 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 that the

21. McGuire, "The Nature of Attitudes," pp. 253–54. 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. See Bartholomew, *Stochastic Models*, for a discussion of empirical work on the infection rate.

Figure 1. Standard and Poor's Stock Price Data, 1926–84[a]



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

a. Annual data, fifty-nine observations from 1926 to 1984. The stock price index is Standard and Poor's composite stock price index.

b. Stock price index for January (1941–43 = 100) divided by the January producer price index, all items, times 100.

c. Four-quarter total for the fourth quarter of Standard and Poor's earnings per share adjusted to the stock price index, divided by the January producer price index, times 100.

d. Four-quarter total for the fourth quarter of Standard and Poor's dividends per share adjusted to the stock price index, divided by the January producer price index, times 100.

e. Computed by dividing the stock price series by the dividends series for the preceding year (in nominal terms).

f. Computed as for the price-dividend ratio, with earnings in place of dividends.

growth should be expected to continue was an idea backed by plausible reasons, such as:

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 bull market will come instead from other sources. The evidence will be the growing numbers of individuals who participated in, were interested in, or knew about the market; the changes in relations between investor and agent; and the changes in attitudes that might plausibly affect the valuation of stocks. The evidence is not intended to provide a tight theory of the movements of stock prices but to show that large social movements appear to have occurred that might plausibly have had a great impact on stock prices. In fact, there is 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 quantity of stocks held by institutional investors. The most important component of this increase was pension funds. The rise of employer pension funds in the postwar period might even be considered a social movement that probably caused an increased demand for shares. Individuals may, by saving less themselves, offset the saving done on their behalf by firms; but because 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 fewer shares. Such changes in demand by 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]

22. George Shea, *Wall Street Journal*, October 12, 1955, reprinted in *Forty Years on Wall Street* (Princeton, N.J.: Dow Jones, 1968), pp. 42–43.

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

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 percent in 1952 to 7 percent in 1959 to a peak of 15 percent in 1970.[24] The corresponding numbers for 1975, 1980, and 1981 varied from 11 percent to 12 percent.[25]

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, was motivated by the question, Why is it that "4 out of 5 doctors, lawyers, major and minor executives, engineers and salesmen *do not own* stock in publicly owned corporations?"[26] 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 percent of the adult population knew enough to define corporate stock as "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 functions of the Exchange" rose nearly 20 percent. 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.[27]

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

24. New York Stock Exchange, *Share-ownership 1952* through *1970* (NYSE, 1953 through 1971). The rise before 1970 of shareownership involved a trend toward somewhat more egalitarian distribution of stock. In 1958, 83.2 percent of stock value was owned by individuals with the top 10 percent of income. By 1970, this had fallen to 75.4 percent. See Friend, Blume, and Crockett, "Stockownership," p. 27.

25. New York Stock Exchange, *Share-ownership 1975, 1980,* and *1981* (NYSE, 1976, 1981, and 1982).

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

27. See New York Stock Exchange, *The Investors of Tomorrow,* title page and p. 6 (NYSE, 1960).

dividends was at work in producing the bull market. Any model that 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 between 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 percent of the adult population said they would turn first to a broker for investment advice; by 1959 this figure had risen to 38 percent. During this five-year period, stockbrokers replaced bankers as the first source of investment advice. An estimated 9 million adults said they were contacted by brokers in 1959, compared with fewer than 5 million in 1954.[28]

The New York Stock Exchange initiated an investors' education program as part of a broader shareownership program. Begun in 1954, the program by 1959 had a list of 2,500 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."[29]

By 1959 the program had conducted 4,500 lecture courses reaching 525,000 persons or about 4 percent of the total number of shareholders in 1959. The investor education program used all the media, including advertisements in newspapers and magazines and on radio. As early as 1954, when the program was only six months old, 5 percent 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."[30]

In contrast the 1970s was 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, the exchange in 1977 severely cut back the

28. New York Stock Exchange, *Investors of Tomorrow*, pp. 9, 14.
29. See *New York Times*, September 20, 1959.
30. New York Stock Exchange, *The Public Speaks*, p. 10.

investors' education program and dropped the adult education program. Lack of public enthusiasm for the program was also offered as a reason for the cutback. The same factors that caused the New York Stock Exchange to suspend its investors' education program may have also had the effect of decreasing the efforts of individual brokers to promote corporate stocks. Such factors as competitive commissions, which reduce the profits in conventional brokerages, have "tended to shrink the numbers of people who are out there trying to encourage individual investors into this market place."[31]

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 indication of how much stocks were talked about and how much people enjoyed investing. The number of clubs in the National Association of Investment Clubs rose from 923 in 1954 to a peak of 14,102 in 1970 and then fell to 3,642 in 1980.[32] The total number of individuals directly involved in investment clubs and their aggregate wealth is of course small. However, the investment club movement is plausible evidence of a national movement that is not reflected in the membership rolls.

There is in the postwar period evidence of substantial changes in behavior big enough to have a major impact on the market. For example, the percentage of people who said that religion is "very important" in their lives fell from 75 percent in 1952 to 52 percent in 1978.[33] The birth rate hovered around 2.5 percent throughout the 1950s and then began a gradual decline to around 1.5 percent in the 1970s. These changes may reflect changing attitudes toward 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 of mistrust in our national institutions. . . . Trust in government declined dramatically from almost 80% in the late 1950s to about 33% in 1976. Confidence in business fell from approximately a 70% level in the late 60s to about 15% today. Confidence in other institutions—the press, the

31. Robert M. Gardiner, chairman of Reynolds Securities, Inc., as quoted in New York Stock Exchange, *Share-ownership 1975* (NYSE, 1976), p. 21.

32. Data from the National Association of Investment Clubs.

33. See "Religion in America," *The Gallup Report*, no. 222 (March 1984).

military, the professions—doctors and lawyers—sharply declined from the mid-60s to the mid-70s.[34]

To Yankelovich's list we may add stockbrokers. One of the findings of the New York Stock Exchange 1977–78 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."[35] By their very pervasiveness, the negative attitudes toward institutions suggest a prejudice rather than an informed judgment.

The Efficient Markets Model

The observation that stock returns are not very forecastable is widely thought to mean that investor psychology could not be an important factor in financial markets. Why is it thought so? 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, because 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 $E_tR_t = \delta$, 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 δ 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 that can be solved, subject to a stability

34. From a speech, April 1977, quoted in Seymour Martin Lipset and William Schneider, *The Confidence Gap: Business, Labor and Government in the Public Mind* (Free Press, 1983), p. 15. The Gallup Poll also documents a fairly steady decline in confidence in all major institutions over the years 1973–83. See *Gallup Report*, no. 217 (October 1983).

35. See New York Stock Exchange, *Public Attitudes Toward Investing: Marketing Implications* (NYSE, 1979), p. 5.

terminal condition, by recursive substitution.[36] Out of the negative result that we cannot seem to forecast returns we thus get the powerful efficient markets model:[37]

$$P_t = \sum_{k=0}^{\infty} \frac{E_t D_{t+k}}{(1 + \delta)^{k+1}}. \tag{1}$$

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

There is a fundamental error in this argument for the efficient markets model: it overlooks the fact that the statistical tests have not shown that returns are not forecastable; they have shown 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 model against importantly different alternatives. Consider an alternative model in which the true (theoretical) R^2 in a regression of aggregate returns of corporate stocks on some set of information variables is 0.1. Given that the standard deviation of the real annual returns on the aggregate stock market is about 18 percent, such an R^2 implies that the standard deviation of the predictable component of returns is about 5.7 percent per year. Thus, under this alternative

36. One rearranges the equation to read $P_t = bE_tD_t + bE_tP_{t+1}$, where $b = 1/(1 + \delta)$, and then uses the fact that $E_tE_{t+k} = E_t$ if $k > 0$. One substitutes in the above rational expectations model for P_{t+1}, yielding $P_t = bE_tD_t + b^2E_tD_{t+1} + b^2E_tP_{t+2}$. 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, $b^nE_tP_{t+n}$, goes to zero as n goes to infinity.

37. Paul Samuelson explains the relationship of this model to the random walk model in his "Proof that properly discounted present values of assets vibrate randomly," in Hiroaki Nagatani and Kate Crowley, eds., *The Collected Scientific Papers of Paul A. Samuelson,* vol. 4 (MIT Press, 1977), pp. 465–70. It should be emphasized of course that there is no agreement on the precise definition of the term "efficient markets model" or 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 F. Fama, "Efficient Capital Markets: A Review of Theory and Empirical Work," *Journal of Finance*, vol. 25 (May 1970), pp. 383–417.

model we might well predict real returns of 14 percent in one year and 2 percent in another (these are one-standard-deviation departures from mean return). In an unusual year we might predict a real return of 19 percent or -3 percent (these are two-standard-deviation departures from the mean return). Yet if the alternative model is true with thirty observations (thirty years of data) and one forecasting variable, the probability of rejecting market efficiency in a conventional F-test at the 0.05 level 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.[38] As I have argued in a paper with Pierre Perron, increasing the number of observations by sampling more frequently while leaving the span in years of data unchanged may not increase the power of tests very much and may even reduce it.[39]

Someone may well wonder if there is not also some direct evidence that stock prices really do anticipate future dividends in the manner represented in equation 1. There is anecdotal evidence that the prices of some firms whose dividends can be forecasted to fall to zero (bankruptcy) or soar to new levels (breakthrough) do anticipate these movements. But these anecdotes do not show that there is not another component of the volatility of prices, a component that might dominate price movements in the stocks whose dividends 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.[40]

Some may argue that the constancy of discount rates in equation 1 may not be an appropriate feature for a general model of market efficiency. There are, of course, many variations on this model, such as the recent "consumption beta" models.[41] It is not possible to address all

38. These power computations are based on the usual assumption of normal residuals; as a result the conventional F-statistic is, under the alternative hypothesis, distributed as noncentral 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.

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

40. 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.

41. 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," in

these alternatives here. Equation 1 is chosen as 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. Moreover, 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 postulate the existence of smart-money investors who, subject to their wealth limitations, respond quickly and appropriately to publicly available information. Consider a story that tells 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, with which it is to be compared.

Smart-money investors in this model respond to rationally expected returns but to an extent limited by their wealth. Suppose that their 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:

$$Q_t = \frac{(E_tR_t - \rho)}{\varphi}. \tag{2}$$

Here, Q_t is the demand for shares by smart money at time t expressed as a portion of the total shares outstanding, and E_tR_t is the expected return starting at time t, defined as it is above. The symbols ρ and φ represent constants. Thus, ρ 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 $\rho + \varphi$; that is, φ is the risk premium that would induce smart money to hold all the shares. The terms ρ and φ 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

Karl Brunner and Allan H. Meltzer, eds., *Economic Policy in a World of Change*, Carnegie Rochester Conference Series in Public Policy, vol. 17 (Amsterdam: North-Holland, 1982), pp. 203–38.

their behavior at all, but merely define Y_t as the total value of stock demanded per share by these investors.[42] 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 equation 1 gives us the model

$$(3) \qquad P_t = \sum_{k=0}^{\infty} \frac{E_t D_{t+k} + \varphi E_t Y_{t+k}}{(1 + \rho + \varphi)^{k+1}},$$

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

Equation 3 and the efficient markets model (equation 1) could be equally consistent with the usual finding in the event-studies literature that announcements have their effect on returns as soon as the information becomes public and have little predictable effect thereafter. Equation 3 has, however, a very different interpretation for the jump in price that 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. Equation 3 implies that the price effect of changes in the outlook for future dividends will be governed by equation 1 if Y_t is not also affected by these changes. However, if Y_t is always positive, the discount rate $\rho + \varphi$ 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 $\rho + \varphi$ 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 (that is, 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.

42. 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.

I argued above that models of the diffusion of opinions suggest a number of possible patterns of response, among them a hump-shaped 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 $\rho + \varphi$. 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. 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 that 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 the 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 as Y_t approaches its peak (not so fast as to cause higher than normal returns after the lower dividend-price ratio is taken into account); the price will peak somewhat before Y does and then 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 (equation 1) price would always be constant. Suppose also that $Y_t = U_{t-1} + U_{t-2} + \ldots + U_{t-n}$, where U_t is white noise, that is, 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^2 in a regression of $P_{t+1} - P_t$ on P_t is only 0.015 for the case

$n = 20$ years, $\rho = 0$, and $\varphi = 0.2$. If one included all information (the current and twenty lagged U values) in the regression, the theoretical R^2 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 0.5 (so that the mean dividend price ratio is 4 percent) then the theoretical R^2 (as estimated in a Monte Carlo experiment) 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 responds to dividends.

The first extreme view is that Y_t 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 (say, the president suffering a heart attack) but not to any time-series data that we observe. It is reasonable also to suppose that Y_t is a stationary stochastic process in 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. 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. In the next section this correlation will be examined with data.

The second extreme view is that Y_t responds to past returns, that is, Y_t is a function of R_{t-1}, R_{t-2}, and so on. Together with equation 2 this gives a simple rational expectations model whose only exogenous variable is the dividend D_t. If we were to specify the function relating Y_t to past returns and specify the stochastic properties of D_t, we would be left with a model that makes P_t driven exclusively by D_t. Depending on the nature of the function and the stochastic properties of D_t, price may overreact to dividends relative to equation 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}, and so on. 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 equation 1. Such an overreaction (to dividends as well as to earnings) will be studied econometrically below.

My suggestions about the possible behavior of Y_t are perhaps too extreme and special to provide the basis for serious econometric modeling now. However, these possibilities and equation 3 provide the motivation for some exploratory data analysis.

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's composite stock price index P and the corresponding annual real dividend series D between 1926 and 1983 is 0.91 (figure 1).[43] This correlation is partly due to the common trend between the two series, but the trend is 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 is only 0.60.[44] 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 in this way is that most of the data series cover a smaller time interval (years rather than the decades shown in the figure) and sample the data more frequently (monthly, say, rather than the annual rate shown in the figure). The correlation coefficient between real price and real dividends might be much lower with data from the smaller, more frequently sampled time interval or might appear to be more dominated by trend.

The correlation between real price P and the real earnings series E for 1926 to 1983 is 0.75. This number is closer to the correlation of P with a linear time trend. Although 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 1926–83 sample period, the coefficient of D is 38.0 and the constant term is -0.28. The average price-dividend ratio P/D in this sample is 22.4. The real

43. 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's composite stock price index: Alfred Cowles and Associates, *Common-Stock Indexes, 1871–1937* (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.

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

price moves proportionally more than the real dividend, and as a result P/D tends to move with real prices. The correlation in this sample of P/D with P (0.83) and with D (0.67) is strong enough that it can be seen 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 be low when real dividends are high (relative to trend or relative to the dividends' average value in recent history) and high when real dividends are low. One would also 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, if 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 may be consistent with some psychological models. Psychologists have shown in experiments that individuals may continually overreact to superficially plausible evidence even when there is no statistical basis for their reaction.[45] Such an overreaction hypothesis does not necessarily imply that the ultimate source of stock price movements should be thought of as dividends or the earnings of firms. Dividends are under the discretion of managers.[46] 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.[47] In doing this, managers, like the public, are forecasting earnings and may become overly optimistic or pessimistic. In reality, the divi-

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

46. Marsh and Merton claimed that dividends are determined by management'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 1475–83 (Massachusetts Institute of Technology, Alfred P. Sloan School of Management, September 1983).

47. See John Lintner, "Distribution of Incomes of Corporations among Dividends, Retained Earnings, and Taxes," *American Economic Review*, vol. 46 (May 1956, *Papers and Proceedings, 1955*), pp. 97–113.

dends and stock prices may both be driven by the same social optimism or pessimism, and the "overreaction" may simply reflect a greater response to the fads in price than in dividends. The apparent response of price to earnings could also 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 the change in 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.[48] An individual firm is substantially constrained in its accounting practices, but the accounting profession's concept of conventional accounting methods may be influenced by notions of what is the proper level of aggregate earnings, and these notions may be influenced by 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, that is, a regression that predicts P as a weighted moving average of current and lagged D. One sees from rows one and two of table 1 that when the real price is regressed with a thirty-year distributed lag on current and lagged real dividends, the current real dividend has a coefficient 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 price-dividend 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.

Rows 5 and 6 of table 1 show 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). Compared with dividends, earnings show more short-run variability; therefore these results do not contradict a notion that prices overreact to earnings as well as to dividends. The lower $\overline{R}^2$ 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.[49] The $\overline{R}^2$ is high enough that some major movements in stock prices are explained by this regression. For example, the decline

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

49. Ibid.

Table 1. Distributed Lag Regressions for Real Stock Prices or Returns on Real Dividends or Earnings, Selected Periods, 1900–83[a]

						Sample statistic				
Sample period	*Dependent variable*[b]	*Constant*	*Coefficient of current independent variable*	*Sum of coefficients of lagged independent variable*[c]	*Coefficient of lagged error*	*F*	*Signifi-cance level of F*	$\bar{R}^2$	*Durbin-Watson*	*Standard error*
				Independent variable is real dividends[d]						
1900–83	*P*	−0.08 (−2.95)	34.64 (14.16)	−11.79 (−4.34)	. . .	257.3	0.00	0.90	0.82	0.07
1900–83[e]	*P*	−0.07 (−1.20)	28.25 (9.13)	−5.37 (−1.14)	0.66 (7.89)	44.49	0.00	0.68	1.86	0.06
1900–82	$R(t + 1)$	0.09 (1.21)	−6.57 (−1.03)	9.62 (1.40)	. . .	2.72	0.05	0.06	2.06	0.19
1926–82	$R(t + 1)$	0.17 (1.33)	−7.62 (−0.94)	5.17 (0.57)	. . .	1.52	0.22	0.03	2.05	0.20
				Independent variable is real earnings[f]						
1900–83	*P*	0.10 (2.61)	11.73 (5.61)	−5.83 (−2.29)	. . .	57.59	0.00	0.67	0.27	0.13
1900–83[e]	*P*	0.17 (1.07)	7.98 (6.52)	−2.58 (−0.48)	0.90 (18.35)	10.74	0.00	0.32	1.61	0.06
1900–82	$R(t + 1)$	0.09 (1.51)	−5.77 (−1.90)	7.45 (1.91)	. . .	2.19	0.09	0.04	1.97	0.19

a. Numbers in parentheses are *t*-statistics. Distributed lags based on second-degree thirty-year polynomial with far endpoint tied to zero were used throughout. The regression method is ordinary least squares except where noted otherwise. The stock price index throughout is the Standard and Poor's composite stock price index.

b. Dependent variable *P* is the stock price index for January divided by the January producer price index. 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 stock price index and Standard and Poor's composite dividend series.

c. The sums are for the twenty-nine lagged values and do not include the coefficient of the current independent variable, which is shown separately.

d. Standard and Poor's dividends per share adjusted to the stock price index, total for four quarters, divided by the January producer price index.

e. Method is Cochrane-Orcutt serial correlation correction and sample statistics are for transformed regression.

f. Standard and Poor's earnings per share adjusted to the stock price index, total for four quarters, divided by the January producer price index.

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 an overreaction) to earnings.

It is important to investigate whether the pattern of coefficients in rows 1 or 2 (or 5 or 6) of table 1 might be optimal given equation 1. The easiest test of 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 of equation 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 row 3 of table 1. 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.[50] A similar pattern of coefficients found when E replaced D in the regression (row 7) suggests a similar overreaction for earnings, but the result is significant only at the 9 percent level.

By looking at the time-series properties of real dividends, one can better see why the pattern of reaction of prices to dividends causes returns to be forecastable. The class of models by Box and Jenkins that employ autoregressive integrated moving averages (ARIMA) has been very popular, and it would be instructive to see how the real dividend series could be represented by a model in this class.[51] Unfortunately, time-series modeling methods are partly judgmental and do not lead all researchers to the same model. In applying such methods one must decide whether to detrend the data prior to data analysis. In previous work I estimated a first order autoregressive model for the log of

50. 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.

51. George E. P. Box and Gwylim M. Jenkins, *Time Series Analysis, Forecasting and Control* (Oakland, Calif.: Holden-Day, 1977).

dividends around a deterministic linear trend. In this model, with the same annual real dividend series used here, the coefficient of lagged log dividends for 1872–1978 was 0.807, which implies that dividends always would be predicted to return half the way to the trend in about three years.[52] This result does not appear sensitive to the choice of price deflator used to deflate dividends. Taking account of the downward bias of the least squares estimate of the autoregressive coefficient, one can reject by a Dickey-Fuller test at the 5 percent 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 models with a deterministic trend unappealing and prefer models that make dividends nonstationary. With a model of nonstationary dividends one can handle the apparent trend by first-differencing the data. The following model was estimated with the real annual 1926–83 Standard and Poor's dividend data.

$$
\begin{aligned}
\Delta D_t &= \underset{(1.498)}{3.285 \times 10^{-3}} + \underset{(11.753)}{0.850}\Delta D_{t-1} + u_t \\
u_t &= a_t \underset{(-69.434)}{-0.981}a_{t-1},
\end{aligned}
\tag{4}
$$

where a_t is a serially uncorrelated zero mean random variable. This is what Box and Jenkins called an ARIMA (1,1,1) model. It merely asserts that the change in real dividend is a linear function of its lagged value plus an error term, u_t, that is a moving average of a_t. The t-statistics, 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. However, this model will suffice to tell how it might be plausible, given the past behavior of dividends, to forecast future dividends. This model cannot be rejected at usual significance levels with the usual Ljung-Box Q-test. It is noteworthy that when the same model was estimated with the sample period 1871–1925, almost the same parameter values emerged: the coefficient of ΔD_{t-1} was 0.840 and the coefficient of a_{t-1} was -0.973.

This estimated model is one that exhibits near parameter redundancy: the coefficient of a_{t-1} is so close to -1 that the moving average on a_t

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

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 0.850. It is more accurate to describe this model as a first order autoregressive model around a moving mean that 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:

$$(5) \qquad E_tD_{t+1} = 0.869D_t + 0.131M_t + 0.173$$

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

where M_t is a moving average of dividends with exponentially declining weights that sum to one. Since 0.981 is so close to 1.00, the moving average that defines M_t is extremely long (0.981 even to the twenty-fifth power is 0.619), and thus the term M_t does not vary much over this sample. Thus, for one-step-ahead forecasts this model is very similar to a first order autoregressive model on detrended dividends.

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

$$(6) \qquad P_t = 5.380D_t + 7.120M_t + 11.628.$$

Note that the distant past has relatively more weight 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 one need look only at the recent past, but to forecast into the distant future one need look into the distant past. Equation 6 implies that P_t, just as D_t, is an ARIMA (1,1,1) process.[53] If I had modeled 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.

Equation 6 is very different from the estimated relation between P and D. The coefficient of D_t in equation 6 is 5.380, which is far below the

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

estimated value in rows 1 or 2 of table 1. The coefficients of the lagged dividends sum to a positive number, not a negative number.

In summary, 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 departure of dividends from such a transformation. It is as if the optimism of investors is too volatile, influenced by departures from trends rather than by the trends themselves.

FORECASTING REGRESSIONS THAT EMPLOY DIVIDEND-PRICE AND EARNINGS-PRICE RATIOS

The most natural test of 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 only 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 come to an end, then we would expect a high dividend-price or earnings-price ratio 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 or earnings and sell when it is high, pays off.

However, it is not easy to carry out such simple tests. 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, and I will not attempt here to deal rigorously with them. It is, however, worthwhile to note that high dividend-price or earnings-price ratios do seem to be correlated with high returns.

Whether stocks with a high earnings-price ratio will have a relatively high return has been the subject of much discussion in the literature. It was confirmed that there is a simple correlation across firms between such ratios and returns.[54] The question then arose, Can such a phenomenon 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 does firm size, which correlates with the ratio, affect expected returns? Recently, Sanjoy Basu concluded that risk-adjusted returns are positively correlated with the earnings-price ratio even after controlling for firm size.[55] 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 the variables chosen for forecasting were such things as the inflation rate,[56] the spread between low-grade and high-grade bonds,[57] or the spread between long-term and short-term bonds.[58]

Table 2 shows that a high dividend-price ratio (total Standard and Poor's dividends for the preceding year divided by the Standard and Poor's composite index for July of the preceding year) is indeed an indicator of high subsequent returns.[59] 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, equation 1 would predict that a high current yield should correspond to an expected capital loss

54. See for example Francis Nicholson, "Price Ratios in Relation to Investment Results," *Financial Analysts Journal*, vol. 24 (January–February 1968), pp. 105–09.

55. 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. 129–56.

56. See Eugene F. Fama and G. William Schwert, "Asset Returns and Inflation," *Journal of Financial Economics*, vol. 5 (November 1977), pp. 115–46.

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

58. See John Y. Campbell, "Stock Returns and the Term Structure" (Princeton University, 1984).

59. 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.

Table 2. Forecasting Returns Based on the Dividend-Price Ratio, Selected Periods, 1872–1983[a]

Sample period	Constant	Coefficient of dividend-price ratio	Sample statistic: $\bar{R}^2$	Sample statistic: Durbin-Watson	Sample statistic: Standard error
1872–1983[b]	−0.10 (−1.52)	3.59 (2.85)	0.06	1.85	0.17
1872–1908[b]	−0.02 (−0.20)	2.26 (0.96)	0.00	2.05	0.14
1909–45[b]	−0.14 (−0.88)	3.89 (1.42)	0.03	1.46	0.21
1946–83[b]	−0.16 (−1.70)	5.23 (2.62)	0.14	1.80	0.17
1889–1982[c]	−0.13 (−1.94)	4.26 (3.15)	0.09	1.85	0.17
1926–82[d]	−0.17 (−1.73)	5.26 (2.71)	0.10	2.01	0.21

a. Numbers in parentheses are t-statistics. The stock price index throughout is the Standard and Poor's composite stock price index. The dependent variable is the real return on the stock price index from January of the year to January of the following year (average for the month) except where otherwise noted. The return is the sum of the change in the stock price index plus Standard and Poor's four-quarter total of the composite dividends per share as adjusted to the stock price index, all divided by the stock price index. The independent variable is total dividends in the preceding year (which is Standard and Poor's four-quarter total of the composite dividends as adjusted to the stock price index) divided by the stock price index for July of the preceding year.

b. Price deflator is the producer price index.

c. Price deflator is the consumption deflator for nondurables and services.

d. Nominal returns were cumulated for the end of January until the end of January of the following year from monthly data in "Common Stocks Total Returns," Roger Ibbotson and Associates; the price deflator is the January producer price index.

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.[60]

In table 3, rows 1 through 5 show analogous regressions with the earnings-price ratio (total Standard and Poor's earnings for the preceding year divided by the Standard and Poor's 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.[61]

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

61. The lower significance appears to be due to the relatively noisy behavior of the annual earnings series. If the earnings-price ratio is computed as the average annual Standard and Poor's earnings for the preceding thirty years divided by the Standard and

Table 3. Forecasting Returns Based on the Earnings-Price Ratio, Selected Periods, 1872–1983[a]

Sample period	Constant	Coefficient of earnings-price ratio	Sample statistic $\bar{R}^2$	Sample statistic Durbin-Watson	Sample statistic Standard error
1872–1983	0.01 (0.24)	0.85 (1.41)	0.01	1.90	0.18
1872–1908	0.00 (0.02)	1.28 (0.63)	−0.02	2.16	0.15
1909–45	0.08 (0.72)	0.03 (0.02)	−0.03	1.59	0.21
1946–83	−0.09 (−1.09)	1.86 (2.13)	0.09	1.71	0.17
1889–1982	0.01 (0.19)	0.78 (1.24)	0.01	1.96	0.18
1901–83[b]	−0.04 (−0.68)	1.57[c] (2.38)	0.05	1.81	0.19

a. Numbers in parentheses are t-statistics. Dependent and independent variables and price deflators are as in table 2, with earnings in place of dividends.

b. Price deflator is the producer price index.

c. Earnings-price ratio is computed by forming the average real earnings for the previous thirty years (not counting the current year) and then dividing by the real stock price index for January of the current year.

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.[62] The most important criticism of the excess volatility claim centers on the claim's assumption that stock prices are stationary around a trend of the dividend series.[63] Here I discuss the volatility tests in light of this criticism and present

Poor's composite index for January of the current year (row six of table 3), then the relation between returns and the earnings-price ratio looks more impressive.

62. 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 Implied Variance Bounds," *Econometrica,* vol. 49 (March 1981), pp. 555–74, and by me 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 in "Do Stock Prices Move too Much."

63. In the case of LeRoy and Porter, the earnings series, instead of the dividend series, was assumed to be stationary.

tests in a slightly different form that deals better with the issue of nonstationarity.

I showed that if the dividend D_t is a stationary stochastic process, then the efficient markets model (equation 1) implies the variance inequality

$$\sigma(P - P_{-1}) \leq \frac{\sigma(D)}{(2\delta)^{0.5}}, \qquad (7)$$

that is, 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.[64] 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 δ 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; in an earlier paper, I handled the problem by multiplying prices and dividends by an exponential decay factor as a way to detrend them. 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 that is not removed by such detrending.[65] Thus, violating inequality 7 in these tests should not be regarded by itself as definitive evidence against equation 1. Most of the criticism of the variance-bounds inequality has centered on this point.[66] 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

64. Shiller, "Do Stock Prices Move Too Much."

65. Shiller, "The Volatility of Long-Term Interest Rates."

66. 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" (Stanford University, Graduate School of Business, 1983); and Terry A. Marsh and Robert C. Merton, "Dividend Variability and Variance Bounds Tests for the Rationality of Stock Market Prices," Working Paper 1584-84 (Massachusetts Institute of Technology, Alfred P. Sloan School of Management, August 1984).

Table 4. Sample Statistics for Detrended Price and Dividend Series, Selected Periods, 1871–1984[a]

Sample period	*Left-hand side of inequality*	*Right-hand side of inequality*
1877–1984	$\sigma(P5 - P5_{-1}) = 2.83$	$\sigma(D5)/(2\delta)^{0.5} = 3.52$
1887–1984	$\sigma(P15 - P15_{-1}) = 2.93$	$\sigma(D15)/(2\delta)^{0.5} = 1.64$
1902–1984	$\sigma(P30 - P30_{-1}) = 3.39$	$\sigma(D30)/(2\delta)^{0.5} = 1.38$

Source: Equations 7–10.

a. The variables *P*5, *P*15, and *P*30 are the real stock price index detrended by dividing by the 5-year, 15-year, and 30-year geometric average of lagged real earnings respectively; σ denotes sample standard deviation. The variables *D*5, *D*15, and *D*30 are the corresponding dividend series as defined in the text. The constant δ equals 0.08, the average real return on the Standard and Poor's composite stock price index over the entire period 1871–1983.

hold; and this fact can be included among other factors in judging the plausibility of the efficient markets model.

Table 4 displays the elements of the above inequality but with the data detrended in a different and perhaps more satisfactory manner that depends only on past information. Let us define detrended price series *P*5, *P*15, and *P*30 and corresponding dividend series *D*5, *D*15, and *D*30 by

$$Pk_t = \frac{P_t}{Nk_t} \qquad k = 5, 15, 30 \tag{8}$$

and

$$Dk_t = \frac{D_t}{Nk_t} + P_{t-1}\left(\frac{1}{Nk_t} - \frac{1}{Nk_{t+1}}\right) \qquad k = 5, 15, 30, \tag{9}$$

where

$$Nk_t = \prod_{j=1}^{k} E_{t-j}^{1/k} \qquad k = 5, 15, 30. \tag{10}$$

The detrended price and dividend series have the following property: returns calculated with 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, and 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 share in a mutual fund that 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. The variable Nk_t is a geometric moving average of lagged real earnings. 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, shows no apparent trend and does not look unstationary. If, for example, the natural log of E is a Gaussian random walk and is thus nonstationary, and if $D_t = E_t$, then Pk_t will be a stationary lognormal process, and Dk_t will be the sum of stationary lognormal processes.[67] We see from table 4 that inequality 7 is not violated for $k = 5$ but is violated for $k = 15$ and $k = 30$. The detrending factor Nk_t gets smoother as k increases.

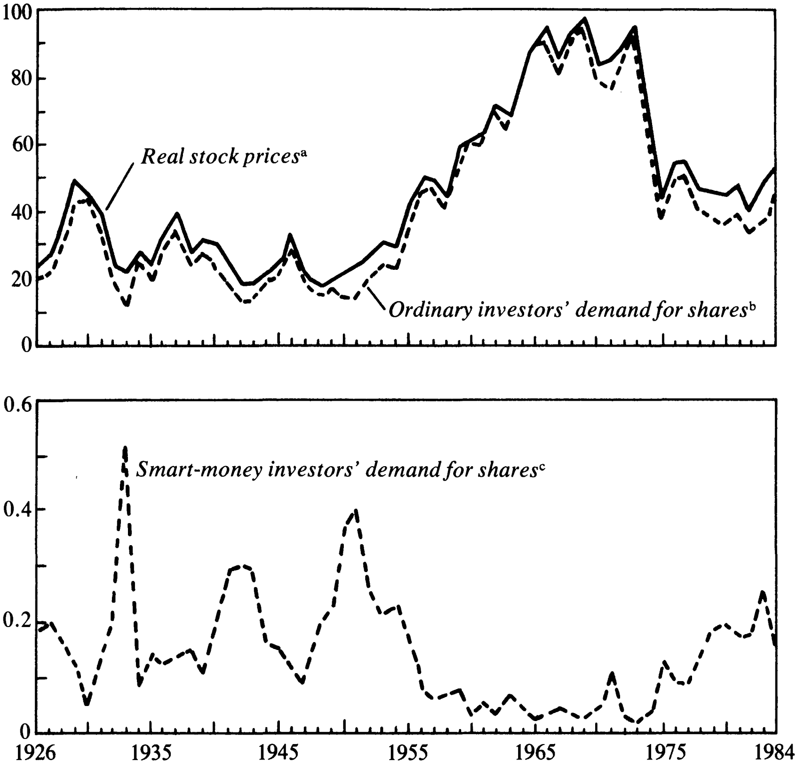
IMPLICATIONS OF THE FORECASTING EQUATIONS IN CONNECTION WITH THE MODEL

If we choose hypothetical values for ρ and φ in equation 2, we can use one of the equations forecasting R_t and produced in tables 1 through 3 to estimate the paths through time of Q_t and Y_t. Such an estimate will be admittedly quite arbitrary, and of course these forecasting regressions 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 alternative model. We learn immediately in doing this that φ must be very large if swings in Q_t, the proportion of shares held by smart-money investors, are not to be extraordinarily large. This problem arises because stock prices are actually quite forecastable: the standard deviation of the expected return implied in many of the forecasting equations is so large that unless φ in equation 2 is large, Q_t will often move far out of the zero-to-one range.

Figure 2 shows a hypothetical example with estimated values of Y_t and Q_t implied by equation 2 and the forecasting equation based on the dividend-price ratio in row 1 of table 2 for $\rho = 0$ and $\varphi = 0.5$. Also shown is the real price P_t. For these values of ρ and φ, Q_t is always positive and thus Y_t is always less than P_t. The demand for shares by ordinary investors, 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. However, Y_t is somewhat more volatile than P_t, showing a tendency to be lower proportionally at lows

67. 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 $g = 1/(1+\delta)$, 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 will provide the stationarity result for Pk and Dk noted in the text.

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



a. Real stock price index (P_t), as described in figure 1, notes a and b.
b. The hypothetical demand for shares by ordinary investors, equal to $P_t(1 - Q_t)$, where Q_t is the hypothetical demand for shares by smart-money investors.
c. The variable Q_t from equation 2 with $\rho = 0$ and $\varphi = 0.5$ and based on the forecasting equation for returns in row 1 of table 2.

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 investors and a 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 1950s and early 1960s were times of low demand by smart-money investors: 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 have stayed in the market. The demand by smart money is currently neither high nor low because the dividend-price ratio is not far from its historical average. The weighted average return ($\Sigma Q_t R_t / \Sigma Q_t$) for 1926 to 1983 was 12.9 percent, in contrast to the average return (mean of R_t) for this period of 8.2 percent.

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 measure for the sample shown in figure 2 is 0.055. In this sample, the New York Stock Exchange turnover rate (reported annual share volume divided by average of shares listed) was between 9 percent (1942) and 42 percent (1982), except for the early depression years, when turnover was extremely high.[68] Thus, the story told in figure 2 is not one of an implausibly high volume of trade. Because corporate stock constitutes less than one-third of all wealth, we are also not talking about implausibly large wealth movements on the part of smart money.[69] 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 percent in 1948 to 136.2 percent in 1968.[70]

The results shown in figure 2 are 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 ρ and φ. If an equation that forecasts with the earnings/price ratio (row six 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 1950s and early 1960s. The weighted average return for smart money over this period would be 11.4 percent.

A discount rate $\rho + \varphi$ of 50 percent in equation 3 may or may not

68. New York Stock Exchange, *Fact Book 1983*, p. 68.

69. 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 percent in 1948 to 31.8 percent in 1968. See Board of Governors of the Federal Reserve System, *Balance Sheets for U.S. Economy* (Washington, D.C., April 1981), table 700, "Consolidated Domestic Net Assets with Tangibles at Current Cost, 1945–1980."

70. Ibid.

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 percent per year amounts to about 0.1 percent per day (compared to the standard deviation of daily return of about 1 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 φ and hence a smaller discount rate.

Summary and Conclusion

Much of this paper relies on the reader's good judgment. A great deal of evidence is presented here that suggests 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 is unimpeachable.

The most important reason for expecting that stock prices are heavily influenced by social dynamics comes from observations of participants in the market and of human nature as presented in the literature on social psychology, sociology, and marketing. A study of the history of the U.S. stock market in the postwar period suggests that various social movements were under way during this period that might plausibly have major effects on the aggregate demand for shares. Must we rely on such evidence to make the case against market efficiency? Yes; there is no alternative to human judgment in understanding human behavior.

The reason that the random-walk behavior of stock prices holds up as well as it does may be two-fold. First, the aggregate demand of ordinary investors may itself not be entirely unlike a random walk. Fashions are perhaps inherently rather unpredictable, and ordinary investors may overreact to news of earnings or dividends, which behavior may also make their demand relatively unpredictable.

Second, and on the other hand, as shown by the model in equation 3 the ordinary investors' predictable patterns of behavior are prevented from causing big short-run profit opportunities by the limited amount of smart money in the economy, so that returns may be nearly unpredictable, and tests of market efficiency may have little power. However, 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.

Data on stock prices show evidence of overreaction to dividends, and the forecasting equations for returns are consistent with such overreaction. 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 also other possible interpretations of this correlation; that is why I presented the data analysis as merely confirming that notions of overreaction suggested by qualitative evidence are consistent with the data.

It should also be emphasized that the model in equation 3 involves a present value of expected dividends and that it shares some properties of the efficient markets model. Despite all the inadequacies of the notion of market efficiency, modern theoretical finance does offer many insights into actual market behavior. The robustness of the models to variations like those here is a matter deserving more attention.

Comments and Discussion

Stanley Fischer: In an important and controversial series of papers published since 1979, Robert Shiller has brought sophisticated empirical evidence to support the view that the stock market fluctuates excessively. Shiller's contribution has been extraordinarily impressive: he has chosen a topic of central importance to both the economy and economics; he has formulated the hypothesis of excess volatility of stock prices in a testable fashion; and he has examined evidence on the volatility of interest rates, of stock prices, and on the co-movements of consumption and stock prices, all of which appear to support his viewpoint. He has understandably had the field of finance on the defensive ever since he first mounted his empirical challenge to the hypothesis of stock market efficiency, which many earlier studies in finance had appeared to support. Among these earlier studies were those of the responses of stock prices to dividend and earning changes, of the effects of changes in accounting measures of earnings on stock prices, and of the ability of individuals or institutions to outperform the market.

Before turning to the present paper, I will set the background by describing Shiller's early test of stock market efficiency and the related literature. The striking early Shiller finding of excess volatility of stock prices was based on a simple model of rational stock price determination in which the price is the present discounted value of expected future dividends.[1] Omitting some technical details, we can understand Shiller's finding that the market fluctuates excessively if we recognize that dividends fluctuate relatively little, and their present discounted value

1. Stephen F. LeRoy and Richard D. Porter, "The Present-Value Relation: Tests Based on Implied Variance Bounds," *Econometrica*, vol. 49 (May 1981), pp. 555–74, obtained similar results.

accordingly fluctuates even less, so that stock prices should be smoother than dividends. But they are not.

For some time, the Shiller result successfully withstood all attacks. During that period other evidence of excess volatility or apparent irrationality, including exchange rate behavior, consumption behavior, the covariation of consumption and stock returns, and interest rates, as well as the payment of dividends, seemed to reinforce his findings. Backing up that empirical evidence was the development, by Shiller among others, of the theory of speculative bubbles, providing a reason that prices could fluctuate excessively without smart investors being able to expect to profit from knowing they were living in a bubble.

Surprisingly, Shiller dismisses the speculative bubble literature, which is one explanation for excess volatility of the market and which has produced increasingly sophisticated empirical work. Apparently he objects both to the rational expectations assumptions in the speculative bubble approach and to the implication that there are no excess returns expected even when the bubble is full blown. Instead Shiller tries in this paper to make the case that excess variability is a result of fads in stock market investing. In a remarkable example of the perfect foresight of stock market investors, Shiller's explanation was anticipated by Bernard Baruch in his 1932 introduction to a reprint of the 1841 classic by Charles Mackay, *Extraordinary Popular Delusions and the Madness of Crowds*. Baruch says "I never see a brilliant economic thesis expounding, as though they were geometrical theorems, the mathematics of price movements, that I do not recall Schiller's dictum: 'Anyone taken as an individual, is tolerably sensible and reasonable—as a member of a crowd, he at once becomes a blockhead.' "[2]

Shiller claims and argues at some length that "mass psychology may well be the dominant cause of movements in the price of the aggregate stock market." That is, he argues the blockheads play a major role in the stock market. No one who has met more than a few stock market investors can fail to have some sympathy with this viewpoint. Nonetheless the paper does not bring much direct evidence to bear on the issue and leaves the links between social fads and excess volatility vague.

In the first section of the paper, Shiller takes us through some social

2. Charles Mackay, *Extraordinary Popular Delusions and the Madness of Crowds* (Farrar, Straus and Giroux, 1932); foreword by Bernard M. Baruch, p. xiii.

psychology literature to persuade us of the importance of fashions. This is interesting material, some of it quite relevant to the stock market, but all it can do is soften us up for the more hard-boiled parts of the paper that follow. The difficulty with the first part of the paper is that I would be equally persuaded after reading it that the propensity to consume fluctuates wildly—which it does not—as that stock prices fluctuate wildly—which they do.

Shiller's dismissal of the efficient markets model is mild after his earlier characterization of the standard argument for the model—that stock returns are unforecastable—as "one of the most remarkable errors in the history of economic thought." The error actually is not that remarkable. Under the conditions Samuelson posited in his classic article, stock prices should fluctuate randomly.[3] This is a necessary condition—under Samuelson's assumptions—for stock market efficiency. It is not, however, sufficient, as the work on speculative bubbles tells us. But the failure to reject the random walk prediction in early tests was surely not evidence against stock market rationality. Of course Samuelson's assumptions were extremely strong, especially constancy of the discount rate. Stock market models imply that the discount rate should be a function of both the risk-free rate, which certainly varies, and the riskiness of stock returns, which also varies. So it is entirely to be expected that the discount rate should vary.

For that reason the more convincing arguments against efficient stock pricing result from tests that allow the discount rate to vary, for instance those of Grossman and Shiller or Hansen and Singleton that implicitly or explicitly use consumption-based measures of rates of discount.[4] We should be clear, as Shiller is, that forecastability of stock returns is not inconsistent with efficient stock pricing, because there may be entirely predictable movements in the discount factor. Tests for efficiency can then be based on comparison of the behavior of rates of return on different assets. In this connection, Shiller's equation 1 is suspect, because it not infrequently predicts stock returns will be below Treasury

3. Paul A. Samuelson, "Proof that Properly Anticipated Prices Fluctuate Randomly," *Industrial Management Review*, vol. 6 (Spring 1965), pp. 41–49.

4. Stanford J. Grossman and Robert J. Shiller, "The Determinants of the Variability of Stock Market Prices," *American Economic Review*, vol. 71 (May 1981, *Papers and Proceedings, 1980)*, pp. 222–27; Lars Peter Hansen and Kenneth J. Singleton, "Stochastic Consumption, Risk Aversion, and the Temporal Behavior of Asset Returns," *Journal of Political Economy*, vol. 91 (April 1983), pp. 249–65.

bill returns. It would be far better to estimate stock and bill returns jointly, constraining the former to exceed the latter, for instance by estimating the premium for stocks over bills.

Shiller's model of pricing when some investors are irrational is an important positive contribution. Models of irrationality are not easy to create and test; perhaps the best-known earlier example is Modigliani and Cohn's hypothesis that stock market investors use nominal instead of real interest rates to discount expected earnings. In Shiller's model a group of blockheads owns a given value of shares in each period, which value is determined possibly irrationally, for instance being held constant. Another group, smart-money investors, worries about expected returns. The market equilibrium obtains when supply equals demand, with the smart-money investors looking ahead to try to predict both dividends and the value of shares the blockheads will be holding in the future. Changes in expectations of the holdings of blockheads, as well as changes in expected dividends, will change the price—which Shiller argues will therefore fluctuate excessively relative to a dividends-only pricing model if there are swings in fashion in holding stocks.

It is not quite clear what the appropriate benchmark for the Shiller model is. Suppose, to start with, that the blockheads own half the market and then become smart by acquiring exactly the same demand function as the smart money. The resultant equilibrium could show more variability of stock prices than in Shiller's "irrational" equilibrium. The irrational equilibrium could also produce excessively smooth stock prices, if, for instance, the irrationality takes the form of slow adjustment of expectations of dividends to dividend innovations. Thus the model speaks more to the nonrationality of prices—because there is an extra Y term in the valuation formula—than to the volatility issue. But the model is sufficiently flexible that the irrational component of demand can vary enough for the market to fluctuate excessively relative to any benchmark.

At this stage Shiller has produced a model that could account for excess fluctuations in the stock market. This might seem to be a good place to stop, since his earlier work established that the market fluctuates excessively. Why go through the evidence again? There are three reasons. First, Shiller wants to show that dividends help predict stock returns: in particular, when the dividend-price ratio is high, expected returns are high—in other words, buy low and sell high is a good strategy. This contradicts the simple stock-pricing model of constant expected returns, but as Shiller himself notes, it does not contradict a version of the model in which the discount factor changes over time—as it surely does.

The second reason for re-examining the empirical evidence is that Shiller wants to address critics, for example Kleidon and Marsh and Merton, who have pointed to the fact that the excess variability test is crucially dependent on the assumption of stationarity of the dividend series.[5] Shiller's test is basically that stock prices should fluctuate less than dividends. Marsh and Merton point out that dividends are themselves chosen by managers, and that the micro evidence is that managers smooth dividends. If managers smooth dividends, then there is no necessity that stock prices, which are estimates of the present value of future dividends, be smoother than dividends. To understand the role of nonstationarity, consider the following example from my colleague Julio Rotenberg. Suppose managers smooth dividends by not paying them out at all, planning to do so only at some remote future date. Then in the sample of data, dividends will be entirely smooth but stock prices, the present value of what will eventually be paid out, fluctuate. Nonstationarity is critical because dividend behavior is not stationary when the managers plan to change their payout practices at some future date.

Shiller concedes this point to the critics and proposes an alternative method of detrending the data that he believes permits the excess variability tests to be applied to the detrended data—and which once again results in a rejection of efficiency.

Since the issue is not the stationarity of the detrended data but rather of the underlying series, it is not obvious that the alternative procedure handles the nonstationarity problem. An alternative approach has been taken in very recent papers by Ken West, who has tests for the presence of speculative bubbles that are valid even if dividends do not follow a stationary process.[6] West's tests accept the presence of bubbles and

5. Allan Kleidon, "Variance Bounds Tests and Stock Price Valuation Models" (Stanford University, Graduate School of Business, 1983), and Terry A. Marsh and Robert C. Merton, "Dividend Variability and Variance Bound Tests for the Rationality of Stock Market Prices," Working Paper 1584-84 (Massachusetts Institute of Technology, Alfred P. Sloan School of Management, 1984).

6. Kenneth D. West, "Speculative Bubbles and Stock Price Volatility," and "A Specification Test for Speculative Bubbles" (Princeton University, Department of Economics, 1984). Similar tests were proposed in Olivier J. Blanchard and Mark W. Watson, "Bubbles, Rational Expectations, and Financial Markets," in Paul Wachtel, ed., *Crises in the Economic and Financial Structure* (Lexington, Mass.: Lexington Books, 1982), pp. 295–315.

accord them a major role in stock pricing, but he does not permit the discount rate to vary.

The third reason Shiller turns to the data is to examine, mainly in figure 2, implications of his particular model of irrationality. The volume of trading implied by the model is reasonable, but the risk aversion that has to be assumed for smart money and the very small holdings of stocks by the smart money from 1955 to 1969 are not. Thus the model has to be regarded as interesting but as yet in a preliminary stage.

Where does all this leave us? Much as the stock market fluctuates, the balance of the argument for excess variability is now weaker than it was a few years ago. The nonstationarity issue has for the moment deflected the early Shiller attack. The new detrending method in this paper and West's tests look like a new round in the econometric battle.

And despite Shiller's appeal for the use of qualitative evidence when statistical tests are weak, the outcome will turn on statistical tests. The reason is that there is no way of knowing how important are the fashions and fads described in the first section without quantitative evidence on the extent of departures from market efficiency. With the evidence of the last few years on varying real interest rates, the new tests will have to allow for changing discount rates on stocks. They will also in all likelihood be more closely related to the speculative bubble literature than to the fads literature—if indeed those approaches are ultimately different.

Benjamin M. Friedman: It is hardly unusual, in many fields of scientific inquiry, for a basic tenet of professional research to be the out-of-hand dismissal of a view popularly held by interested persons outside the field. In most such cases (one hopes), this rejection of popular belief rests on researchers' awareness of an overwhelming accumulation of evidence that is too technical, or somehow too inaccessible in other ways, to have made much impression on all but the best-informed laymen. In some cases, however, professional researchers' near unanimous dismissal of a view held by most men and women of common sense rests on evidence that is either scant or weak or both. In such cases there is reason to believe that other factors, ranging from the social values typical of educated groups to various forms of outright self interest, play a large part in molding and maintaining the solidity of professional opinion.

Robert Shiller's paper does the economics profession a significant service by calling attention to the insubstantial evidence and even the weak logical structure underlying the almost unanimous rejection by economic researchers of a view of speculative investment markets held by large numbers of men and women who are apparently perfectly sensible in all ways except—or in this instance is it including?—that they are not economists. The typical investor of course believes that the willingness of investors to buy securities, and hence the price of securities set in the market, depends on perceptions of the objective values underlying those securities. But the investor also believes that fads, fashions, and changing societal attitudes affect those perceptions, and hence also affect securities prices, in ways that sometimes bear no relation to the underlying objective values in question. The unanimity—indeed, often the religiosity—with which professional researchers in economics and finance dismiss such a possibility is truly astounding; Shiller's frank analysis of the arguments on which it rests makes it all the more so.

Because Shiller's paper focuses somewhat narrowly on the arguments and evidence for the "efficient markets" credo, it is important to pause to remind ourselves of why the issue he addresses is such an important one. Reflecting on these matters is valuable for the usual reason of keeping in focus the ultimate objectives motivating any specific line of research, but it is also valuable in this case because asking why it matters whether these markets are "efficient" helps to understand the origins and merits of the key linchpin that Shiller rejects from the argument for market efficiency—in this context the identification of "efficiency" with nonforecastability.

Why, then, do we care if markets are efficient? There are at least two different senses in which securities markets may be efficient: one private and one public. From a private perspective, the central issue is the prospect for investors to earn above-average returns, systematically, over sustained periods of time. Here the connection between efficiency and nonforecastability is entirely appropriate. The presence of what Shiller calls fads in no way implies the prospect of making money in the market unless an investor has the ability to forecast whether today's fad is on the way in or out, and what will be tomorrow's. It is no coincidence that the research Shiller cites on the efficient markets theory, and especially on the identification of efficiency with nonforecastability, has emerged almost entirely from the nation's business schools. From the perspective of the private-interest orientation of these institutions, this identification is both understandable and appropriate.

From a public perspective, however, and indeed from the perspective in which economists have traditionally addressed questions of efficiency, the central question is whether the signals and incentives provided by prices set in securities markets are doing the best possible job of allocating the economy's scarce resources. At the level of analysis at which Shiller's paper deals, the issue is whether the equity market as a whole is correctly steering economywide outcomes for such financial matters as corporate retentions and such nonfinancial matters as investment in plant and equipment. (The nonfinancial corporate business sector typically accounts for some three-fourths of all nonresidential fixed investment in the United States.) The same issues also apply at less aggregate levels, of course. Are the signals and incentives provided by securities prices efficiently guiding the allocation of scarce resources among different industries and among competing firms within the same industry? Research analogous to Shiller's but focused on industry-specific stock price indexes or even on the prices of individual stocks would be straightforward to implement. Findings from such further, less aggregative research would be interesting in just the same way.

It is in this second, public sense of market efficiency that Shiller's objection to the identification of efficiency with nonforecastability is both apt and potentially of the utmost importance. As an example, just to make Shiller's point trivially obvious in this context, suppose that all New York Stock Exchange prices were secretly set not by market trading but by the daily run of a computer located in the basement of 11 Wall Street and programmed to generate random numbers. The resulting securities prices, and the returns to holding securities, would be completely nonforecastable. But no one would argue that these prices led to an efficient allocation of economic resources. Shiller's point is that equally nonforecastable elements, originating not from a hidden computer but from social interactions among real human beings, are significant determinants of actual securities prices. The immediate corollary to Shiller's point, given the important role of the capital markets in an economy like that of the United States, is that the resulting resource allocations are not efficient either.

What are the implications of these conclusions for public policy?

Here substantial caution is necessary, and Shiller exercises the ultimate in caution by not even mentioning the possibility of such implications. From a policy perspective, the relevant question is not whether the economic allocations induced by the securities markets are efficient in the sense of freedom from distortions due to Shilleresque fads, but instead whether the corresponding allocations produced by any alternative process would be superior. In the absence of a clear statement of what such an alternative process would be, it is impossible even to begin to answer this question. Judging from the most prominently proposed alternatives, however, I am skeptical of the ability of governmental intervention to improve resource allocations except in cases of obvious externalities which securities markets are not expected to internalize anyway.

In sum, Shiller has given us a paper both persuasive in its content and potentially important in its implications. Before concluding these remarks, however, I want to challenge one aspect of Shiller's analysis that I find not persuasive. Interestingly enough, at least in this one respect Shiller's fault lies in attributing to the market too much efficiency rather than too little.

In particular, Shiller follows recent literature in assuming the existence of what he calls "smart-money investors," and informally identifies the smart money with institutional investors. This assumption and identification may be appropriate in some contexts, but not in Shiller's. It is certainly true, for reasons of differential costs of gathering and processing information, in addition simply to differing attitudes and inclinations, that some investors do a more thorough job than others of assessing the objective underpinnings of security values. It is also plausible in most cases to assume that institutional investors have advantages in this regard. Shiller's concern, however, is not whether these objective considerations play *any* role in setting securities prices—he shows that they do—but whether they play the *only* role. In the context of Shiller's argument, therefore, smart money ought to refer not to an advantage in assessing objective considerations but rather to the freedom, at least in comparison with other investors, from being subject to socially determined fads and fashions.

There is simply no reason to believe that institutional investors are less subject to such social influences on opinion than other investors, and there are substantial grounds for thinking that they may be even more so. To begin, apart from a few lonely Warren Buffetts, institutional investors exist in a community that is exceptionally closely knit by constant communication and mutual exposure. The familiar extent to which economists talk shop with one another, look at the same aspects of the world they study, read the same research, and congregate at meetings like this one, simply pales in comparison to the day-to-day activity of the typical institutional investor.

Second, competitive success or failure among institutional investors depends on relatives, not absolutes. Any investor who is delighted when his portfolio loses 30 percent of its value if the market is off by 32 percent and who bewails a gain of 40 percent if the market is up by 42 percent is not especially likely to be immune to socially formed opinions. Moreover, the standard that money managers seek to meet is in many cases not the performance of the market index but the index of performance of other managers.

Together with the well-known asymmetry of incentives to overperform versus disincentives to underperform, this orientation often enhances the "herd" aspect of institutional investors' opinions and decisions. Major project financings in the United States, for example, can often attract investments either from all of the major institutions or from none. In addition, when all of the major institutions do participate in a project financing, they often do so in rough proportion to their respective sizes. The reason is clear. If the project succeeds, no manager wants to stand out as having failed to participate. If the project fails, the loss to any one manager's portfolio is no greater than that to any other, and hence to the average of all.

Finally, as Shiller's own analysis implies, if fads and fashions do influence securities prices, is it really so smart not to pay attention? Not long ago a senior managing director of one of New York's leading securities firms confided that, within the not too distant future, he expected all major firms—including his own—to employ astrologers. He did not believe in astrology, to be sure, but he argued that some investors did. If they were to invest in large enough volume, then anything that influenced their actions could in principle affect securities prices. At that point, astrology too would enter the universe of factors that other, presumably more rational, investors would want to take into account. Who can yet say he will be wrong?

General Discussion

Christopher Sims pointed out more than one interpretation of Shiller's statistical rejection of the efficient market hypothesis. One interpretation is that people have mistaken expectations about the state of the economy and future returns so that stock price fluctuations contain little information about future returns. If true, private markets are likely to make bad decisions, and this might be a justification for countercyclical policy or for overruling market valuations in evaluating long-term structural projects. Another interpretation is that Shiller's fads represent real mass fluctuations in taste between present and future consumption and these are reflected in mass fluctuations in discount rates. Finally, it could be that the arbitrage implicit in relating current asset prices to expected future returns is simply not operative. Sims noted that Shiller does not attempt to distinguish among these three sources of failure of efficient markets, though they have importantly different implications.

Lawrence Summers suggested that the acceptance of the efficient markets hypothesis has itself represented a fad in the economics profession. He noted that empirical evidence against it was even stronger than Shiller suggested. In markets such as those for short-term financial instruments and foreign exchange, where futures prices must converge to actual prices within a relatively short time, tests are sharper and conclusively reject the efficient markets model. This adds to the plausibility that the model is not a good description of the stock market.

Summers added that the idea that fads can rationally influence stock decisions is consistent with a broad view of how information becomes available and is acted upon by agents. He also noted that the large volume of trading after takeover announcements is at odds with the efficient markets hypothesis. The theory would have predicted minimal trading: outsiders who know that they are at an information disadvantage would refuse to trade, and insiders could not trade with each other since they would all wish to hold the same position.

Martin Baily argued that the alternative hypothesis proposed by Shiller needed to be formulated more convincingly. As the paper does not define what a fad is, identification of fads is arbitrary. Although a fad will produce "swimming-with-the-tide" type of behavior, this may be the optimal investment strategy. Investors with limited information might be well advised to follow the smart money. Shiller's model does not explain how fads are formed and why they subsequently disappear, nor does it suggest any propagation mechanism that would explain why the stock market boom in the 1960s was a worldwide phenomenon.

Gardner Ackley endorsed Shiller's attempt to bring social factors into modeling markets. But if the stock market is a sociopsychological process, perhaps it needs to be studied using the concepts and methods of social psychology. Thomas Juster suggested that social processes are important in the stock market even for professional money managers. They are rewarded on the basis of relatively short-term results measured against the average performance of other professional managers, so there is a strong incentive to be near the crowd.