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STOCK PRICES AND SOCIAL DYNAMICS

Robert J. Shiller

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> Fashion is the great governor of this world; it
> presides not only in matters of dress and amusement,
> but in law, physic, politics, religion, and all other
> things of the gravest kind; indeed, the wisest men
> would be puzzled to give any better reason why
> particular forms in all these have been at certain
> times universally received, and at others universally
> rejected, than that they were in or out of fashion.
>
> Henry Fielding,
> The True Patriot #1, 1745

Investing in speculative assets is a social activity.
People who invest spend a a substantial part of their leisure
time discussing investments, reading about investments, or
gossiping about others' successes or failures in investing. It
is thus plausible that investors' behavior (and hence prices of
speculative assets) would be influenced by social movements.
Attitudes or fashions seem to fluctuate in many other popular
topics for conversation, such as food, clothing, health or

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politics. These fluctuations in attitude often occur widely in

the population and often appear without any apparent logical

reason. It is plausible that attitudes or fashions regarding

investments would also change spontaneously or in arbitrary

social reaction to some widely-noted events.

Most practitioners who actually deal in speculative markets

seem to take it for granted that such social movements are of

great importance for the behavior of prices. Popular

interpretations of the recurrent recessions that we observe often

include ideas that the same sorts of swings in attitudes (say, of

consumer confidence or optimism) are at work in other aspects of

the business cycle. Academic research on market psychology,

however, appears to have more or less died out at about the time

the expected utility revolution in economics was born, or in the

1950's. Those academics who write on financial markets today are

usually very careful to dissociate themselves from any suggestion

that market psychology might be important, as if notions of

market psychology had been discredited as unscientific.[2] There

is instead an enormous recent literature in finance which takes

one of the various forms of the efficient markets model for

motivation, and a related literature in macroeconomics which is

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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. The Journal of Economic Psychology, now
three years old, has not published a single article on financial
markets.

based on the assumption of rational expectations. There has

certainly been an interest in academic circles in speculative

bubbles, but this interest has been pursued within the framework

of rational expectations models with unchanging tastes.[3]

Despite the large literature on the efficient markets

hypothesis, it is hard to find in the literature a careful

argument specifically against a major role for 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. Any

arguments which are confined to an oral tradition, tacitly

accepted by all parties and not discussed in the scholarly

literature, are particularly vulnerable to error. It is thus

important to bring these arguments against a major role for mass

psychology in financial markets into explicit consideration.

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3. For example, David Cass and Karl Shell refer to market
psychology in motivating their discussion of extraneous
uncertainty, but then assume economic agents are expected utility
maximizers with unchanging tastes. Perhaps though there is a
sense in which they and others are wrestling with some of the
same issues that are of concern below in this paper. See David
Cass and Karl Shell, "Do Sunspots Matter?," Journal of Political
Economy, vol. 91 (April 1983), pp. 193-227.

4. There are some casual arguments in the literature against such
a role for mass psychology. The most-cited reference may be
Eugene Fama, "The Behavior of Stock Market Prices," Journal of
Business vol. 38, (January 1965) pp. 34-105. The argument
consists of no more than a few paragraphs pointing out that
"sophisticated traders" might eliminate profit opportunities
thereby tending to make "actual prices closer to intrinsic
values." p. 38

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

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

This paper is divided into four major sections: a section which argues from a social-psychological standpoint for the importance of fashions in financial markets, a section which examines the argument for the efficient markets model, a section which proposes an alternative social-psychological model, and a section which reports some exploratory data analysis suggested by the alternative model.

In the first section, I wish to offer some qualitative evidence that such social movements are quite important for stock

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prices and to review what we know about the nature of such social movements. [5] This will not be direct evidence that people are not expected utility mazimizers, nor is the evidence of great value in judging how far we should carry the assumption of rationality in other areas of economics. (I do like to think that this evidence is of value in understanding the business cycle.) Rather, I will be concerned here with the relatively narrow question as to why speculative asset prices fluctuate as much as they do. The evidence will be about changing fashions in areas other than investments and the likely generality of such phenomena, about the relative unimportance of professionals in financial markets, about the ambiguity of intrinsic value of stocks, about the literature in social psychology on suggestibility and group pressure, and about the literature in mathematical sociology on the diffusion of opinions. This section will conclude with a brief history of the postwar U. S. stock market, of the varying themes which dominated public discussion of the market over this period, and evidence for social movements then which plausibly affected stock prices.

In the second section, I will evaluate the efficient markets model and the presumed evidence against a role for social

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5. Since much of the evidence that I will interpret as favoring the view that mass psychology is important in financial markets will be qualitative and even anecdotal, some of the sources for such evidence are therefore those who write for the trade market. Of these, the best and closest to our discussion here appears to be David N. Dreman, Psychology and the Stock Market, (AMACOM, 1977), and its sequels.

psychology in determining prices. The fundamental issue is power
of statistical tests in distinguishing the efficient markets
model from the important alternatives. If statistical tests have
little power, then we ought to use the sort of qualitative
evidence discussed in the first section to evaluate the efficient
markets model.

In the third section, a simple, though rather incomplete,
alternative model of stock prices will be presented, an
alternative which admits the importance of social psychological
factors. This model is intended to demonstrate how one might
better adapt financial markets models to the econometric evidence
on the near unforecastability of returns which is widely
interpreted as favoring the efficient markets model. Any robust
model of financial markets will have to assume the existence of
some "smart money" but one need not go to the extreme of assuming
that only smart money influences markets. This model
incorporates both "smart money" and "ordinary investors." The
behavior of the latter is exogenous to the model. The model will
then make prices the present discounted value not only of
dividends but also of future demands by ordinary investors.

In the fourth section, some relations suggested by the
alternative model are explored with U. S. stock market data.
Various forecasting equations for real returns are examined using
the Standard and Poor Composite Stock Price Index. I will
examine whether stock price movements seem to follow simple

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patterns, as in an overreaction to dividend or earnings news, and whether this overreaction induces a sort of forecastability for returns. In doing this, I will present a time series model of the aggregate real dividend series associated with the Standard and Poor Composite Stock Price Index. I will also review the evidence from some of my earlier papers that stock prices are too volatile to accord with simple efficient markets models. Some of the evidence will be recast using a different method of detrending. In this section I will also go out on a limb a little and propose a hypothetical scenario using the alternative model which shows, for recent U. S. history, what the smart money may have been doing, the fraction of total trading volume which might have been accounted for by smart money trades in and out of the market, and the extent to which ordinary investors may have influenced stock prices.

Evidence on Fashions and Financial Markets

Fashions in Everyday Life

It is impossible to quantify how important are socially-induced capricious fashion changes in our everyday behavior. One must rely largely on the reader's sense, from

everyday experience, of the importance of such changes.

In most cases we are never quite sure whether there might indeed be some logical reason why many people are adopting an attitude or fashion. We usually feel confident that an observed fashion is truly capricious only if it is observed among persons whose judgment we do not respect at all: lower class teenagers, religious fanatics, etc. But if fashions do change spontaneously in such groups, it is plausible by extension that spontaneous attitude changes also afflict groups (such as most investors in speculative assets) whose judgment may operate on a somewhat higher level.

Isn't it plausible that those who are so enlightened as to be at this Panel meeting might find themselves caught up in capricious fashion changes? It certainly won't be possible to prove this to the satisfaction of all readers. Those of us involved in the current fashion of running for exercise may say that they do it because it is good for their health, but the health benefits of such exercise were known decades ago.[6] Talking with runners suggests that far more is at work in this movement than the logical reaction to a few papers in medical journals. Why wasn't the joy of running appreciated 20 years ago? Why are we thinking about running these days and not about

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

leisure activities in decline (such as leading boy scout troops or watching western movies)?[7]

Fashions show different movements in different countries at the same time. In countries that do not communicate much with each other (e. g., Iran and the United States) we see widely divergent trends. Even among Western countries in close communication there are noticeable differences in social movements. In politics we have seen in the last decade a drift towards conservatism in some Western countries and a drift toward socialism in others. The objective evidence for or against socialism cannot have moved both ways. Something about the social environment, collective memories or leadership is different, and changing through time differently, in the different countries.

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

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

plausible that these differences we observe across countries in attitudes toward investments should also change within a country through time? Shouldn't there be changing fashions regarding investing in railroad stocks or airlines stocks or regarding investing in stocks at all? Shouldn't these changing fashions cause changes in the demand for stocks and thus changes in the price of stocks?

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

Who Are In Control of Investments in Corporate Stock?

It is important first to clarify who it is we are talking

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

It is true that institutional investors have been growing in
importance in the postwar period. Institutional holdings of New
York Stock Exchange Stocks as a percent of the total value of the
stocks rose from 15.0% in 1955 to 35.4% in 1980.[8] Still, nearly
65% of all New York Stock Exchange stocks were held by
individuals in 1980. This figure, moreover, probably understates
the percent of the aggregate stock market which is subject to the
control of individuals. Included among institutional investors
are mutual funds which usually specialize in their investments
and ultimately leave it to the individual to decide whether to

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

invest in stocks.

Most individually held corporate stock is held by wealthy individuals. In 1971, the 1 percent of U. S. families (including single individuals) with the largest personal income accounted for 51 percent of the market value of stock owned by all families, while the 10 percent of families with the largest income accounted for 74 percent of market value.[9] Wealthy individuals are of course part of the same society as the rest of us. They read the same newspapers and watch the same television programs. They are different, however, in one important way. For them, information costs are quite low relative to the income from their investments. One might be inclined to think that they would in practice delegate authority over their investments to experts.

In a 1964 Brookings study, a sample of 1051 high income individuals, i. e. individuals with 1961 incomes over $10,000 (or about $34,000 in 1984 prices), was interviewed concerning their investment habits. The sample emphasized individuals with income substantially above $10,000. The median income for the sample was about $40,000 (or about $135,000 in 1984 prices). "Only one-tenth reported delegating some or all authority over

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

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."[10] Instead of delegating authority, most made their own investment decisions with some advice: About three-fourths of the high income respondents who managed their own assets said that they got advice from others in making their investment decisions. One in three of those seeking advice said they 'always' sought advice when investing, while two out of three said they did 'occasionally.'"[11] Two thirds of the investors said they tried to keep informed, more than half said they made use of business magazines, "but only one-tenth of those trying to keep informed said that they read the financial statements and other reports issued by the corporations in which they were considering an investment."[12]

These findings were later confirmed by studies by the Survey Research Center of the Institute for Social Research at the University of Michigan:

> ...the proportion of stockholders who said that they
> devoted much time to such studies [research about
> economic trends or propects of individual companies]
> was very small even among those with substantial
> holdings.....Do people under these circumstances
> transfer responsibility for their investments to

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

11. Ibid., p. 68.

12. Ibid., p. 71.

professional management? Purchases of mutual funds
point in this direction, but when buyers were asked
about their reasons for buying mutual fund shares,
interest in diversification was found to be a far more
important consideration. Most stockholders and even
most holders of mutual funds said that they wanted to
participate in the management of their investments.[13]

What is really important for one's view of financial markets

is not directly the extent to which institutional investors or

wealthy individuals dominate the market, but the extent to which

"smart money" dominates the market. One commonly expressed view

is that intelligent individuals can be assumed to take control of

the market by accumulating wealth through profitable trading.

This argument overlooks the fact that individuals do consume

their wealth and eventually also die.

We can in fact, in a life cycle framework, conceive of a

steady state amount of wealth held by the smart money as a

function of the return they earn. Even if the smart money are

accumulators and do not consume their wealth, when they die they

bequeath it to others who have perhaps only a small probability

of being smart money as well. In assessing this probability, one

must bear in mind that "smart money" does not correspond closely

to the intelligent segment of the population. What is at work is

not just intelligence but also interest in investments and

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13. See Katona, Psychological Economics, p. 269. It should be
noted that mutual funds represent only a small part of all
stocks. Open and closed end investment companies held 3.5
percent of all New York Stock Exchange stocks in 1980, as
reported in the 1983 New York Stock Exchange Fact Book p. 52.

timeliness. Presumably the probability is fairly low.[14]

How then does such a steady state amount of wealth depend on
the return earned by the smart money? There are several factors
which serve to mitigate the effects of higher returns on
steady-state wealth. One is that most people do not acquire most
of their maximum wealth until fairly late in the life cycle, and
thus do not have as much time to accumulate. Another factor is
that in a growing population younger people, whose portfolios
have had less time to accumulate due to investment opportunities,
will figure more prominently in aggregate wealth figures. Yet
another factor is that saving early in the life cycle tends for
institutional reasons to take the form of investing in a house,
rather than speculative assets. A factor of perhaps less
importance is that estate taxes may not be entirely avoided.

Let us discuss the "representative" household in which all
persons live exactly the number of years corresponding to the
national average. Mortality tables show that the average age at
death for white males who have attained the age of 40 is 74
years, for white females the corresponding figure is 80 years.
Let us suppose that the average wife is two years younger than
her husband, so that she will outlive him by 8 years . Let us
also suppose that the average mother is 30 years of age at the

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

birth of her representative child, so that under the assumption that children have the same mortality rates as parents, each household receives two bequests, one 30 years before the wife's death (or 22 years before the husband's death) and the other 32 years before the wife's death (or 24 years before the husband's death). The representative bequest is thus in the hands of a married couple for 23 years and in the hands of the surviving wife for 8 more years.[15]

Let us imagine that the relatively wealthy segment of the population which holds stocks are just pure inheritors and accumulators who plow back all returns on their inheritances into further investments. At any point of time the representative inheritance is in the middle of its 30 or so years in the hands of one household. A representative "smart money" household which earns at a rate n over a representative ordinary household will thus have on average, if original bequests were equal, something like $(1+n)^{15}$ times as much wealth. If n is 2% per year, this is 1.3, if 5% per year this is 2.1. As long as the percentage of people who are smart money is small, returns that are higher by this order of magnitude will not cause the smart money in any sense to take over the market.

Of course, it is unlikely that "smart money" investors are pure accumulators. Since we are lacking data on the behavior of

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15. Generation-skipping trusts may not alter this timetable as far as control over assets is concerned.

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

The Ambiguity of Stock Value

The reason stock prices are likely to be among the prices
which are relatively vulnerable to purely social movements is
that there is no accepted theory by which to understand the worth
of stocks. Ordinary investors have no model or at best a very
·incomplete model of the behavior of prices, dividends or earnings
of speculative assets. They are not aware of any objective
received doctrine as to how to forecast these variables. Should
large projected future federal deficits imply that the price of
long-term bonds should go up or down? Should the election of a
conservative U. S. president imply that earnings of General
Motors should go up or down? Should a rise in the price of oil
imposed by OPEC cause the price of stock in IBM to go up or
down? They have no objective way of knowing.

Ordinary investors find it very difficult to make
probability assessments of returns on investments because they

tend to regard investment opportunities at a particular time or
in a particular firm as one-of-a-kind events. They are thus
faced with judgments for which statistical theory is of no help.
Investors are faced with what Frank Knight called "uncertainty"
rather than "risk:"

> The practical difference between the two categories,
> risk and uncertainty, is that in the former the
> distribution of the outcome in a group of instances is
> known, either from calculation a priori or from
> statistics of past experience, while in the case of
> uncertainty this is not true, the reason being in
> general that it is impossible to form a group of
> instances, because the situation dealt with is in a
> high degree unique.... It is this true uncertainty
> which by preventing the theoretically perfect
> outworking of the tendencies of competition gives the
> characteristic form of "enterprise" to economic
> organization as a whole and accounts for the peculiar
> income of the entrepreneur.[16]

Ordinary investors also have no good way of judging the
competence of professionals who may claim to be guided by
models. One can judge the competence of certain other
professionals much better than one can judge the competence of
investment advisors. It is very easy to learn whether a map
company is producing city maps which place the streets right. We
can therefore take it for granted that others have done this and
that any map which is sold will serve to guide us around a city.

It is much harder to evaluate investment advisors who
counsel individual investors on the composition of their

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

portfolios and who claim to help them make investments with high
returns. There is no objective way for ordinary investors to
evaluate their performance. If an advisor's prediction proves
wrong, one does not know whether the error was due to chance.
One cannot evaluate the abilities of the advisor without a
substantial number of observations. The ordinary investor does
not have these data except for a short list of his or her own
observations and does not have such data regarding alternative
advisors. Even if he had these data, he does not know that the
advisors are doing the same thing thing now that they were doing
when the data were generated. Even if he had these data and were
sure that the analysts themselves had not changed their methods,
he just does not know how to test statistical hypotheses.
Ordinary investors are apparently not sufficiently cognizant of
the power of statistics that they show much interest in the few
published tests of the forecasting records of investment advisory
services. Even if he then made it through all these obstacles,
the investor must then decide how to correct for risk, a matter
on which there is no agreement even in the finance profession
today.

Suggestibility and Group Pressure

Since investors are lacking any clear sense of objective
evidence regarding prices of speculative assets, the process by

which their opinions are derived may be especially social.
According to social psychologist Leon Festinger: "When the
dependence on physical reality is low, the dependence on social
reality is correspondingly high. An opinion, attitude or belief
is 'correct, valid and proper' to the extent that it is anchored
in the group of people with similar beliefs, opinions and
attitudes."[17]

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".[18] In this experiment, subjects
were seated in a totally darkened room and asked to view at a
distance of five meters a point of light seen through a small
hole in a metal box. They were told that the point of light will
begin to move and were asked to report to the experimenter the
magnitude, in inches, of its movements. In fact, the point was
not moving, and the viewer had no frame of reference, in the
total darkness, to decide how it was moving. Not only did
individuals see movements, but each individual also arrived at a

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17. Leon Festinger, "A Theory of Social Comparison Processes,"
Human Relations, vol 7. pp. 117-40, (1954).

18. See Muzafer Sherif, "An Experimental Approach to the Study of
Attitudes," Sociometry, vol 1, (1937), pp. 90-98, reprinted in
Eleanor Maccoby, editor, Readings in Social Psychology, 3rd
edition, (Holt, 1958).

decision as to the typical amount of movement. The distribution

across individuals of mean decisions was fairly wide. Some

subjects, studied individually, typically reported movements

around 2 inches, while other subjects typically reported

movements around 10 inches.

    Sherif's famous result was observed when a group of people

viewed the light simultaneously and heard each others responses:

The typical size of the reported movements converged for each

group to a number which differed across groups. Moreover, the

majority of the subjects, when questioned after the experiment

was over about their thoughts during the experiment "reported not

only that their minds were made up as to the judgment they were

going to give before the others spoke, but that they were not

influenced by the others in the group." Thus, most subjects were

unaware of the process by which a group consensus was reached.

    Sherif's experiment launched a number of similar and highly

publicized experiments where people were shown to adapt their

opinions to the perceived opinions of others. Probably, many of

these results were oversold, at least in popular

characterizations. The problem with all of the experiments is

that they were not completely convincing in ruling out the

possibility that individuals' responses were actually quite

rational. People may well have learned to respect the opinions

of others as revealing others' information and thus they

incorporate (perhaps as a result of past experience with the

practice and without conscious thought) the opinions of others in

forming their own judgments:

> ....the description of socialization in terms of blind
> adoption of beliefs and practices is both schematic and
> misleading. Generally practices are adopted on the
> basis of reasons that have the appearance of
> validity.[19]

Solomon Asch recognized this issue and tried to correct the

weakness of the Sherif experiment. In one of the most famous

experiments in the field of social psychology, Asch asked

subjects to make judgments on a question for which they ought

full well to know the answer. In each trial, the subject was

shown a line segment and was asked to match its length with one

of three line segments of unequal length. The three line

segments were in each trial sufficiently different in length that

when subjects were questioned in isolation there were very few

errors in answering. When individual subjects were placed (near

the end in answering sequence) in a group of 6 to 8 others who

had been previously coached all to give the same wrong answers on

seven of the twelve trials, Asch found that only about a quarter

of the individual subjects answered correctly on all trials.

Most subjects tended to vacillate between the group opinion and

the correct opinion.

Asch found that whether or not the subjects relented under

social pressure, the experiment produced substantial anxiety in

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19. Solomon E. Asch, <u>Social Psychology</u> (Prentice Hall, 1952).

the subjects, fears (as the subjects described them afterwards) that they might appear "strange and absurd to the majority." It is significant that he did not find that subjects completely lost sight of their private opinions under social pressure. When questioned afterwards, subjects who gave wrong answers said such things as "I felt they were probably wrong but I wasn't absolutely sure," or "I tried to make myself see it as [they did]." Asch's experiment shifted the discussion to an issue less clearly related to group influence on opinion towards individuals' fears of seeming different.

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

The judgments subjects made in these experiments, involving moving lights or line segments, do not have the same emotional significance as do the judgments investors make. The experiments do not capture the "enthusiasm," "panic," or "hysteria" that some observers attribute to investors. For those phenomena, we are

obliged to observe investors in their natural habitat.

The Diffusion of Opinions

The dynamic process by which social movements take place is
the subject of an extensive literature by social psychologists
and sociologists. The basic mechanisms are well known. The
mechanisms involve a sort of diffusion process whose speed may be
very variable. Social movements may begin when ideas which seem
plausible based on some interpretation of news or events may
enter individuals' minds. The ideas may remain uncommunicated to
others for a long time. An idea may not become a matter of
conviction until the individual hears the idea from several
friends or from public authorities. This process takes time.
The process may be helped along if some vivid news event appears
which causes people to talk about related matters. Or the
process may be slowed if another news event distracts their
attention from the matter.

Social movements can take place in a matter of hours, as
after so vivid an event as the onset of a war. Or changes in
attitudes can take decades to diffuse through the population, as
evidenced by the fact that many fashion changes in dress seem to
happen very slowly. The communications media may, if attention
is given to some event, speed the rate of diffusion. However,
"the general finding of research on persuasion is that

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face-to-face communication with peers is more important than formal mass communication in changing attitude behavior."[20] 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."[21] Thus, it is not surprising that in surveys in the 1950's and 1960's "the answers to the two questions 'Do you own any stocks' and 'Do you have any friends or colleagues who own any stocks' were practically identical."[22]

Such diffusion processes for news or rumor have been modelled more formally by mathematical sociologists[23] drawing on the mathematical theory of epidemics. For example, in what has been referred to as the "general epidemic model"[24] it is assumed first that new carriers of news (as of a disease) are created at

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

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

22. ibid., p. 267.

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

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

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

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

participating versus passive).[25] A great deal of research has

also been done on the importance of repetition on the removal

rate. The infection rate may depend on the vividness of the

event and the participation of media in the dissemination of the

news, as well as the "generation" of the carrier of the news.[26]

We might expect then to see a variety of response patterns:

long lasting humps which build slowly (low removal and infection

rate) or humps whose buildup is of short duration (high removal

and infection rate) or impact-type news events with subsequent

monotonic decline of infectives (zero infection rate) or events

followed by monotonically increasing number of infectives (zero

removal rate). Of course, such patterns may not be seen directly

in prices of speculative assets, as will be discussed below.

Social Movements and the Postwar Stock Market

The real price of corporate stocks, as measured by a

deflated Standard and Poor Composite Stock Price Index, showed

what appears to be a pronounced uptrend between the late 1940's

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

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

and the late 1960's and since then a downtrend (or more accurately, a single major drop between 1973 and 1975). (See figure 1). The postwar period of the uptrend, the last great "bull market", has often been characterized as a period of contagious and increasingly excessive optimism. Is there any evidence of such a social movement then? Is there evidence that such a social movement come to an end after the late 1960's?

It should be clear from the outset that such evidence will not take the form of proving that people should have known better than to price stocks as they did. On the contrary since, as claimed above, we have such a poorly developed theory of the stochastic properties of stock prices, dividends or earnings, no really convincing case could be made that stocks were either over- or under-priced.

Consider a date near the end of the bull market, say in the mid 1960's. This was a time of very high price-earnings or price-dividend ratios. We shall see below that such ratios historically do provide weak evidence for low subsequent returns. Even so, it was not obvious that the market was overpriced.

It was often pointed out then that aggregate price-earnings ratios (or, for that matter, price-dividend ratios) were high but not far outside of the range that had been experienced before. The ordinary investor could not be expected to know that periods of high aggregate price-dividend ratios (and to some extent high

price-earnings ratios) have historically been associated with low subsequent returns on investments in stocks, given the weakness of the relation.

The postwar period was one of rapidly growing real earnings and real dividends. If we look at the prewar behavior of these series, we might well conclude that the likely outlook was for a reversion to past levels rather than a continued growth of earnings or dividends. But it is easy to see why an investor then might not have reached such a conclusion. The stochastic properties of such series are not easily ascertained. Even if people knew the stochastic properties of past earnings series, ample reasons were offered that the stochastic properties of these series ought to have changed, and the ordinary investor had no way of evaluating these reasons.

A "growth theme" became apparent in the media starting in 1954, and the term "growth stock" became popular round then.[27] Perhaps expectations of growth seemed superficially plausible because of the quiescent behavior and growth of aggregate GNP over this period. Some of the reasons given to expect growth in corporate earnings were:

> These include the constant speed-up in business
> research in order to cut costs and bring out ever newer
> and more competitive products; the extension of
> business expansion planning farther and farther into
> the future, which means that such plans are carried
> forward regardless of any jiggles in the trend of

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27. See Robert Sobel, The Last Bull Market (W. W. Norton, 1980).

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.[28]

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

As suggested earlier, the growth in dividends or earnings may themselves be, at least to some extent, products of of the same popular theory that growth should be expected. Dividends were set by management with their knowledge of the expectations of stockholders. The switch (for tax purposes) from FIFO to LIFO accounting in a period of secular inflation was long delayed, according to a common explanation offered by management, because of the effect it would have on earnings[29]. Firms interested in maintaining growth in accounting earnings per share may have altered other real activities. In the mid-1960's there arose public concern that acquisition by high price-earnings ratio firms of low price-earnings ratio firms was done to boost earnings per share, and the accounting practice of pooling of earnings was criticized. However, I cannot make the case that

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

29. Management's concern with LIFO's impact on earnings for its effect on the price of shares in the firm may be justified. One study concluded (though with the disclaimer that more research is needed) that "LIFO adopters suffered negative abnormal return performance during the period surrounding their annual earnings announcements" (usually the same date at which the changeover to LIFO was announced). See William E. Ricks, "The Market's Response to the 1974 LIFO Adoptions," Journal of Accounting Research, vol. 20 (Autumn 1982), pp. 367-87.

earnings growth was not for the most part genuine over this period. It is going to be very hard to argue that people should have known better than to expect more genuine earnings growth.

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

Evidence for the growing numbers of individuals who participated in the market can of course be found most directly in the rising quantities of stocks held by institutional investors, as noted above. The most important component of this increase took the form of pension funds. The rise of employer pension funds in the postwar period might even be considered a social movement which probably caused an increased demand for shares. Even if individuals offset the saving done on their behalf by firms by saving less themselves, since most people do not hold any stocks it is not possible for them (without short sales) to offset the institutional demand for stocks by holding

less shares. Such changes in demand for institutions are likely to be important in determining asset prices but are not my main concern here. Others have studied such changes using "flow of funds" methodology.[30]

The period of rising stock prices also corresponds roughly with a period of a dramatic increase in the number of people who participated directly (not through institutions) in the stock market. The New York Stock Exchange Shareownership Surveys showed that the total number of individual shareowners as a percent of the U. S. population rose from 4% in 1952 to 7% in 1959 to a peak of 15% in 1970.[31]) Since 1970 there has been a decline in shareownership. The 1975, 1980 and 1981 surveys showed shareowner percents of 12%, 11% and 12% respectively.

The increase in individual stockownership appears to correspond to an increase in knowledge about and interest in the market. The 1954 New York Stock Exchange investor attitude survey, consisting of interviews of several thousand individuals, sought information why more people weren't owning stock. They

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

31. New York Stock Exchange Shareownership Surveys. The rise before 1970 of shareownership involved a trend toward somewhat more egalitarian distribution of stock. In 1958, 83.2% of stock value was owned by individuals with the top 10% of income. By 1970, this percent had fallen to 75.4%. See Irwin Friend, Marshall E. Blume and Jean Crockett, "Stockownership in the United States: Characteristic and Trends," Survey of Current Business, (November 1974), pp. 16-40.

wanted to learn why "On the average 4 out of 5 doctors, lawyers, major and minor executives, engineers and salesmen do not own stock in publicly held corporations?"[32] What came out of the survey was a sense of lack of information or interest in the stock market, and vague senses of prejudice against the stock market. Only 23% of the adult population even knew what corporate stock was enough to give a definition like "a share in profit," "bought and sold by public, anyone can buy," or "not preferred or a bond." Of the attitudes of medical doctors in the upper-income survey, the interviewers commented, "risky, low level of information about the market, little interest, priority of other investments." The typical non-shareowner minor executive in the survey showed "moderately favorable attitude toward stock investment but is deterred from investing by fear of risk and small amount of investment capital; distrusts the market; not very informed about stock investment."

The next investor attitude survey by the New York Stock Exchange took place in late 1959.[33] The survey was unfortunately not well designed to be compared with the 1954 survey. However, the surveyors did note that between 1954 and 1959 there appeared a "much better understanding of the functions of the Stock Exchange as the nation's marketplace." The number of Americans

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

33. This is summarized in the NYSE The Investors of Tomorrow (NYSE, 1960). No details of the sample are offered.

who could "explain the role of the exchange itself" rose nearly 20%. The number who "knew that companies must meet certain standards before the exchange will permit their stocks to be listed for trading" increased 36 percent in the same five year period.

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

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

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

than five million in 1954.[34]

Not only were there more brokers as time went on, but also the New York Stock Exchange initiated an investors' education program as part of a broader shareownership program. Begun in 1954, by 1959 the program had a list of 2500 lecturers in 85 cities. Lectures were held in local high schools as part of adult education programs by lecturers "bent on carrying the investing gospel wherever there were ears to hear."[35] By 1959, the program had conducted 4,500 lecture courses reaching 525,000 persons or about 4% of the total number of shareholders in 1959. The investor education program used all the media, including advertisements in newspapers, magazines and radio. As early as 1954 when the program was only six months old, 5% of the Adult population in the United States could identify the New York Stock Exchange as the source of the slogan "Own Your Share of American Business."[36])

In contrast, the 1970's were a period of low profits for the New York Stock Exchange and advertising in newspapers and magazines was suspended. In 1975 competitive commissions were established and amendments to the Securities Act threatened the viability of the New York Stock Exchange. Prices of seats on the

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

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

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

exchange dropped. In response to the problems, in 1977 the investors' education program was severely cut back and the adult education program dropped altogether. Lack of public enthusiasm for the program was also offered as a reason for the cutback.

The same factors which caused the New York Stock Exchange to suspend its investors' education program may have also had the effect of decreasing the promotion offered by individual brokers for corporate stocks. Such factors as competitive commissions which reduce the profits in conventional brokerage have "tended to shrink the numbers of people who are out there trying to encourage individual investors into this market place."[37]

Investment clubs are social clubs in which small groups of people pursue together a hobby of investing. Interest in such clubs might well give some index at least as to how much stocks were talked about, and how much people enjoyed investing. The 1950's and 1960's were a period of soaring interest in investment clubs. The number of investment clubs in the National Association of Investment Clubs rose from 923 in 1954 to a peak of 14,102 in 1970. According to a study by the New York Stock Exchange, the number of investment clubs in the United States rose 150% between June 1957 and November 1959 alone.[38] Clearly,

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

38. See "20,000 Investment Clubs," The Exchange, vol. 21 (1960), pp. 12-13.

a social movement was underway at that time. The total number of individuals directly involved in investment clubs and their aggregate wealth are of course small. However, the investment club movement is plausible evidence of a national movement which is not reflected in the membership roles.

The end of the bull market corresponds roughly to the beginning of the decline of the investment club movement. According to the National Association of Investment Clubs, the total number of clubs in the United States reached a record high of 14,102 in May 1970 (or shortly after the peak in the market) and declined from then until 1980 when there were 3,642 clubs. (There has been a slight pickup since 1980; the 1983 total was 5,409 clubs)[39] In the 1970's and 1980's there is little news about investment clubs. Instead, we hear of "barter clubs" of individuals who are interested in swapping goods and services to avoid using money.

Evidence of changes in attitudes which might plausibly be related to changes in investment preferences can be found in many sources. There were in the postwar period substantial changes in other activities which suggest changes in tastes or preferences which might be big enough to have a major impact on the market. For example, the 1950's was a time when church attendance was rising. Church members as a percent of the U. S. population rose

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

from 57 percent in 1950 to 64 percent in 1960, held steady at 64
percent until 1965 and then started a gradual decline to 59
percent in 1980.[40] The changing church attendance represents
change in certain fundamental attitudes, attitudes that one can
easily see as influencing demand for investments. For another
example, recall that during the bull market the baby boom was
underway, The birth rate hovered around 2.5 percent throughout
the 1950's and then began a gradual decline to around 1.5 percent
in the 1970's.[41] Perhaps the changing birth rate reflects
fundamentally changing attitudes as to the importance of family,
of heirs, or of individual responsibility for others.

Katona thought that a decline in confidence in the
government might itself be a significant part of the explanation
for the decline in the stock market:

> At various times in the early 1950s the Survey Research
> Center asked the following question of representative
> samples of American families:"Do you think that
> something like the depression of the 1930's is likely
> to happen again during the next five years or so?"
> That in those years very many people would consider the
> recurrence of a severe depression improbable was
> expected. But the researchers were still surprised by
> the answers they received. Close to 60 percent of all
> respondents, and an even higher percentage among those
> in the upper-income brackets, said flatly that nothing
> like the depression of the 1930's could happen
> again.....the conviction was found to be widespread
> that the government had learned that there were means
> with which to fight a depression and never again would

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40. See the Statistical Abstract of the United States, 1982-3,
p. 56.

41. See U. S. Public Health Service, Vital Statistics of the
United States, passim.

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it fail to use those means....Following the recession
of 1970-71 a new factor entered the picture. Trust in
the government's ability to manage the economy was
severely diminished.[42]

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. People lost confidence, according to

some who analyze public opinion polls, not only in business and

government but also all major institutions after the mid 1960's:

> As it happened, the early 1960's, however, turned out
> to be a high-water mark in the public's attitudes
> toward their social, political and economic
> structures.The explosion of protest against the U. S.
> participation in the Vietnam War as well as other
> conflicts stemming from the rise of militant social
> movements concerned with the status of women and
> various minority groups - blacks, Hispanics and
> American Indians - apparently changed the prevailing
> perceptions Americans had of their country ."[43]

According to poll analyst Daniel Yankelovich:

> We have seen a steady rise in mistrust of our national
> institutions...... Trust in government declined
> dramatically from almost 80% in the late 1950's to
> about 33% in 1976. Confidence in business fell from
> approximately a 70% level in the late 60's to about 15%
> today. Confidence in other institutions, the
> universities, the unions, the press, the military, the
> professions -- doctors and lawyers -- sharply declined
> from the mid-60's to the mid-70's.[44]

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42. Katona, Psychological Economics, pp. 164-6.

43. Seymour Martin Lipset and William Schneider, The Confidence
Gap: Business, Labor and Government in the Public Mind, (The Free
Press, 1983).

44. From a speech, April 1977, quoted in Lipset and Schneider,
The Confidence Gap. The Gallup Poll also documents a fairly
steady decline in confidence in all major institutions over the

To Yankelovich's list we may add stock brokers. One of the

findings of the New York Stock Exchange 1977-8 survey was that "a

negative image of brokers and firms permeates all subgroups and

even top quality clients have an unfavorable impression of the

industry."[45]

By its very pervasiveness, the negative attitudes toward

institutions suggest a prejudice rather than an informed

judgment.

The Efficient Markets Model

Apparently the evidence that is widely interpreted as

against a psychological factor in financial markets comes from

the observation that stock returns are not very forecastable. An

extensive literature in finance journals has been interpreted as

showing that returns cannot be forecasted very well at all.

Why is it thought to follow from the evidence on the

forecastability of returns that investor psychology could not be

an important factor in financial markets? It is important for

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years 1973-83. See "Confidence in America's Institutions," Gallup
Report No. 217 (October, 1983).

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

our purposes to take careful note of the common argument. It is

thought that it follows from the unforecastability of returns

that stock prices themselves must make good sense on fundamental

grounds. If investor fads influenced stock prices, then it would

seem that these fads would cause stock price movements to be

somewhat predictable. Fads, one might think, build up for a

while, peak, and then fade away, but the general impression in

the profession is that no tendency for such patterns for stock

prices seems to have been identified in scholarly work.

Moreover, since dividends themselves are somewhat forecastable

(firms in fact announce changes in their dividends from time to

time) and in spite of this we are unable to forecast well any

change in returns, it must be true that stock prices in some

sense are determined in anticipation of dividends paid. Thus,

stock prices should be determined by optimal forecasts of

dividends.

There is a more formal version of the above argument against

a role for mass psychology in markets.[46] Suppose we represent

the unforecastability of returns by writing $E_t R_t = i$ where E_t

denotes mathematical expectation conditional on all publicly

available information at time t, R_t is the real (corrected for

inflation) rate of return (including both dividends and capital

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46. See also Paul A. Samuelson, "Proof that Properly Discounted
Present Values of Assets Vibrate Randomly," in Hiroaki Nagatini
and Kate Crowley, editors, The Collected Scientific Papers of
Paul A. Samuelson, the M. I. T Press, 1977, pp. 465-88.

gain) on a stock between time t and time t+1 and i is a

constant. The constancy of $E_t R_t$ means that there is no good time

or bad time to buy a stock; we never know that a stock price is

low or high. Here, R_t equals $(P_{t+1} - P_t + D_t)/P_t$ where P_t is the

real price of the share at time t and D_t any real dividend which

might be paid in the time period. This is a first order rational

expectations model of the kind familiar in the literature which

can be solved, subject to a stability terminal condition, by

recursive substitution.[47] Out of the negative result that we

cannot seem to forecast returns we thus get the powerful

efficient markets model:[48]

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

Equation 1 asserts then that real price is the present discounted

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

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

value of expected future dividends and in this sense price anticipates optimally the stream of future dividends that the stock will pay in the future. Price does not respond to anything other than information about dividends. Changes in price can always be interpreted as adjustments to optimal forecasts of the future dividends, and nothing else.

The error in this argument for the efficient markets model is just that it overlooks the fact that the statistical tests have not shown that returns are not forecastable, only that returns are not very forecastable. The word very is crucial here, since alternative models which are far more plausible than the efficient markets model (such as will be discussed below) also imply that returns are not very forecastable. These alternatives may even have the property that stock prices are driven entirely by fads and not at all by information about future dividends. The evidence on the forecastability of returns in the efficient markets literature is thus irrelevant to distinguishing the models. We must use evidence other than the forecasting regressions in the efficient markets literature to decide between the models.[49]

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49. Failure to take account of the weakness of statistical tests against important alternatives is a common methodological error. See Arnold Zellner, "Statistical Analysis of Hypotheses in Economics and Econometrics," Proceedings of the Business and Economics Section, American Statistical Association, Washington D. C., [1980], pp. 199-203. and and Amos Tversky and Daniel Kahneman, "Belief in the Law of Small Numbers," Psychological Bulletin, Vol. 2, (1971), pp.105-10.

We can get some idea at this point of the power of the regression tests of the efficient markets hypothesis against importantly different alternatives. Consider an alternative hypothesis in which the true (theoretical) R squared in a regression of aggregate returns of corporate stocks on some set of information variables is 0.1. Such an R squared implies, given that the standard deviation of the real annual returns on the aggregate stock market is about 18% , that the standard deviation of the predictable component of returns is about 5.7% per year.[50] Thus under this alternative hypothesis we might well predict real returns of 14% in one year, and returns of 2% in another year (these are one-standard-deviation departures from mean return). In an unusual year we might predict a real return of 19% or -3% (these are two-standard-deviation departures from the mean return). Yet the probability of rejecting market efficiency in a conventional F-test at the .05 level if the alternative hypothesis is true with 30 observations (30 years data) and one forecasting variable is only 0.42. With two forecasting variables, the probability of rejecting is 0.32, and the probability becomes negligible as the number of explanatory variables is increased further.[51] As I have argued in a paper

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50. The R squared is defined as the variance of the predicted value divided by the variance of the dependent variable. Thus, the standard deviation of the predicted value equals $\sqrt{(R^2)}$ times the standard deviation of the dependent variable.

51. These power computations are based on the usual assumption of normal residuals, so that the conventional F statistic is, under the alternative hypothesis, distributed as non-central F with k-1

with Pierre Perron, increasing the number of observations by

sampling more frequently, leaving the span in years of data

unchanged, may not increase power of tests very much and may even

reduce it.[52]   Most researchers use even less than 30 years data,

so the probability of rejecting would be even lower.   In this

paper, somewhat greater power will be achieved by increasing the

number of observations by using long historical data series.

Someone may well wonder if there is not something more to

the argument for equation 1 than was given above.   Isn't there

some direct evidence that stock prices really do anticipate

future dividends as represented in equation 1?   There is some

such evidence for some individual stocks.   Anecdotal evidence is

available which shows that prices of some firms whose dividends

can be forecasted to fall to zero (bankruptcy) or soar to new

levels (breakthrough) do show some evidence of anticipating these

movements.   But these anecdotes show only that if expected

dividend movements are sufficiently dramatic prices will

respond.   They do not show that there is not another component of

the volatility of prices, a component which might dominate price

movements in the stocks whose returns are not so forecastable.

For the aggregate stock market, there is no evidence at all that

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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.

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

stock price movements have been followed by corresponding

dividend movements.[53]

What might strike someone who looks at expression 1 is that
the significant restriction in this equation is that the discount
rates (at which future dividends are discounted to today's price)
are constant through time, and that this may not be what we
really want to embody in our representation of the notion of
market efficiency. However, econometric evidence against the
notion that mass psychology has an effect on financial markets
must take the form of evidence for some model of rational
behavior. If we allowed discount rates to vary without any
restriction then we would have no model. The basic idea behind
equation 1 is that real rates of discount do not vary enough to
account for much of the enormous variation in stock prices.
Sanford Grossman and I discussed whether discount rates may
indeed vary enough, in the framework of the intertemporal capital
asset pricing model (ICAPM), to account for most of the price
variation.[54] The ICAPM has, however, been rejected for stock
prices in formal tests.[55] Moreover, other assets, long-term

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53. 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.

54. See Sanford Grossman and Robert J. Shiller, "Determinants of
the Variability of Stock Market Prices,American Economic Review,
vol. 71 (May 1981) pp. 222-7.

55. See for example 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

bonds, land and housing do not have the sort of comovements with

the stock market that that theory would suggest.[56] The ICAPM

will not be considered further here simply because it has not

figured importantly in previous arguments against the importance

of market psychology in determining prices. The present paper

should not be interpreted as denying that the ICAPM model offers

important insights into the functioning of real-world markets.

In fact, certainly if we drop the rational expectations

assumption from the ICAPM model and allow social movements to

influence expectations, then we have a very nice story, but

perhaps not one that lends itself to econometric evidence.

An Alternative Model

        Let us tell a story which postulates the existence of some

investors who respond quickly and appropriately to publicly

available information and shows how they might alter the response

of the market to the behavior of ordinary investors. Should the

result always be that ordinary investors have no effect at all on

market prices? That would be a remarkable result if one could

show it! In this story the result is instead that ordinary

1983), pp. 249-65.

56. See Robert J. Shiller, "Consumption, Asset Markets and
Macroeconomic Fluctuations," Carnegie Rochester Series in Public
Policy vol. 17 (1982), pp. 203-38.

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investors may dominate price movements and yet that conventional

tests of market efficiency might not show dramatic evidence of

the influence of these investors. This story is no doubt

oversimplified and restrictive but then so is the simple

efficient markets model. The model below is presented with the

idea that we need some concrete, very simple alternative to the

efficient markets model.[57]

Our simple model defines two classes of investors: the

"smart money" and the "ordinary investors". Of course, "smarts"

is not an all-or-nothing thing, and it would be better to model a

continuum of investor savvy. Any single person, moreover, may

alternate between the smart money and ordinary investor groups

depending on his or her free time, interest, and information

resources. However, for the purpose of simplicity we shall make

the strong assumption that investors are cleanly divided into

only two discrete classes.

The first class, the smart money, is responsive to

rationally expected returns. For this class, let us suppose that

the demand for stock is linear in the expected return on the

market (or if the model is applied to an individual firm, the

expected return on a share of that firm) over the next time

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57. The closest parallel in the literature to this model may be
the noisy rational expectations models, as for example Martin F.
Hellwig, "On the Aggregation of Information in Competitive
Markets," Journal of Economic Theory, vol. 22 (June 1980), pp.
477-98. But these models have a different motivation.

period:

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

Here, Q_t is the demand at time t by smart money for shares,
expressed as a portion of the total shares outstanding, and $E_t R_t$.
the expected return starting at time t, is as defined above. The
symbols v and r represent constants. Thus, r is the expected
real return such that there is no demand for shares by the smart
money. The real return at which Q_t = 1 is r + v; that is, v is
the risk premium which would induce smart money to hold all the
shares. The linear form for the demand schedule is introduced
here for convenience in this model, however such a demand
schedule is not implausible. The terms v and r 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. It would have been better if, instead of equation
2, it were hypothesized that smart money investors are expected
utility maximizers, but this would get us into more complexities
than are useful here. If it were assumed, as is customary today
in the intertemporal capital asset pricing model, that
individuals maximize the present value of expected utility of
future consumption, then we would suffer from the problem that
the consumption of smart money is not measured. One might think
of equation 2 as embodying the assumption that consumption of

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smart money is approximately a random walk and that risk

perceptions do not change through time.[58]

Ordinary investors, our second type, include everyone who
does not respond to expected returns optimally forecasted. Let
us suppose that they overreact to news or are vulnerable to
fads. We will not make assumptions about their behavior at all,
but merely define Y_t as the total value of stock demanded per
share by these investors.[59] Equilibrium in this market requires
that $Q_t + Y_t/P_t = 1$. Solving the resulting rational expectations
model just as we did to derive the efficient markets model in the

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58. A conventional capital asset pricing model would predict a
linear relation between Q_t and expected returns if the objective
function of investors were a linear combination of mean and
variance. Q_t would also depend on expected returns on competing
assets unless the variance matrix of returns were diagonal. In
the diagonal case, the coefficient v would be directly
proportional to variance of stocks and inversely proportional to
total wealth of smart money investors. Disregarding the effect
of expected returns on competing assets in this expression might
be best justified when the model is applied to a single stock for
which there is a big fad, so that we can disregard the effects,
in general equilibrium, of the fad on expected returns on
competing assets.

59. 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.

introduction gives us the model:

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

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

According to expression 3, price may be regarded as responding to information regarding future demand by ordinary investors as much as to information regarding future dividends. Thus, for example dividends could be very stable and Y_t very unstable in which case price changes might reflect information primarily about the behavior of ordinary investors. Since Y_t enters the model in the same way as D_t does in equation 1, there is no reason to think that the importance of psychological factors makes it any less likely that we should see an approximate random walk behavior for price.

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

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

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

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

It was argued above that models of the diffusion of opinions suggest a number of possible patterns of response, among them a hump-shaped response pattern in which Y_t would rise for a while, level off, and then return to its normal level. The implication for real price P_t of such a hump shaped response of Y_t to a piece of news depends on the time frame of the response relative to the discount rate r+v. Let us discuss the impact of such a hump shaped response in Y_t as if nothing else were happening, though in fact much other noise would disguise the patterns we describe in stock prices. Suppose the hump can be predicted to build up very quickly and dissipate, say, in a matter of weeks. Then equation 3 implies that there will be very little impact on price at all. The relatively long moving average in equation 3 will smooth over the hump in Y_t so that it is observed, if at all, only in a very attenuated form. The demand for shares by ordinary investors will show the hump shaped pattern, as smart money sells shares to them at virtually unchanged prices only to buy the shares back after the ordinary investors have lost interest.

Suppose instead that the hump pattern of effect on Y_t takes place over an extremely slow time frame. Let us suppose that the build up of effect takes many years and the decline takes many years. In this case, the moving average in equation 3 is very

short relative to the hump pattern, and will not smooth out the effect of Y_t on P. In this case, the hump pattern is passed with little modification from Y_t to P. There will be a "bull market" in this stock for a period of years and then a "bear market".

Suppose finally that the hump pattern has an intermediate time frame, between the extremely short and extremely long time frames alluded to above. The model then implies a rather different sort of hump pattern. Then as soon as the news which gives rise to the hump shaped pattern becomes known to the smart money the price of the stock will jump discontinuously. This jump will be instantaneous, taking effect as soon as the smart money realizes that price will be higher in the future. After the initial jump, the effect of the news will be to cause the price of the stock to rise gradually (not so fast as to cause higher than normal returns after the lower dividend price ratio is taken into account) as Y_t approaches its peak, to peak somewhat before Y peaks, and then to decline. Returns however, will tend to be low during the period of price rise.

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

The first extreme view of Y_t is represented by the hypothesis that it is independent of current and lagged dividends - it is exogenous noise - caused by capricious fashions or fads.

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

The second extreme view of Y_t is that it responds to past
returns, that is, Y_t is a function of R_{t-1}, R_{t-2}, ...
This in connection with equation 2 gives a simple rational
expectations model whose only exogenous variable is the dividend
D_t. If we specified the function relating Y_t to past returns and
specified the stochastic properties of D_t we would be left with a
model which makes P_t exclusively driven by D_t. Depending on the
nature of the function and the stochastic properties of D_t, price
may overreact to dividends, relative to the model 1.

The third extreme view is that Y_t responds directly to
current and lagged dividends, that is Y_t is directly a function
of D_t, D_{t-1}, D_{t-2}, ... For example, dividend growth may

engender expectations of future real dividend growth that are unwarranted given the actual stochastic properties of D_t. Such expectations might also cause price to overreact to dividends relative to the model 1. Such an overreaction (to dividends as well as to earnings) will be studied econometrically below.

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

An Exploratory Data Analysis

Stock Prices Appear to Overreact to Dividends

Aggregate real stock prices are fairly highly correlated over time with aggregate real dividends. The simple correlation coefficient between the annual (January) real Standard and Poor Composite stock price index P and the corresponding annual real dividend series D between 1926 and 1983 was 0.91.[60] The

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60. 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

correlation is readily apparent by visual inspection of figure

one. This correlation was partly due to the common trend between

the series, but the trend was by no means the whole story. The

correlation coefficient between the real stock price index P and

a linear time trend over the same sample was only 0.60.[61]

Thus, the price of the aggregate stock market is importantly

linked to its dividends, and much of the movements of the stock

market that we often regard as inexplicable can be traced to

movements in dividends. One reason that most of us are not

accustomed to thinking of the stock market as being this closely

related to dividends is that most of the data series that we look

at cover a smaller time interval (years rather than the decades

shown in the figure) and sample the data more frequently

(monthly, say, rather than annually as in the figure.) The

correlation coefficient between real price and real dividends

might be much lower with such data, or might look more

trend-dominated.

The correlation between real price P and the real earnings

series E for 1926 to 1983 was 0.75. This figure is closer to the

correlation of P with a linear time trend.

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and Poor Composite Stock Price Index: Alfred Cowles and
Associates, Common Stock Indexes, Principia Press, 1938, series
Da-1 and Ea-1. All series are deflated by the producer price
index (January starting 1900, annual series before 1900) where
1967 = 100.

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

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

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

The observed perverse behavior of the price-dividend ratio might be described as an overreaction of stock prices to

dividends, assuming that it is correct to suppose that dividends

tend to return to trend or return to the average of recent

history. This behavior of stock prices might be construed as

consistent with some psychological models. Psychologists have

shown in experiments that people may continually overreact to

superficially plausible evidence even when there is no

statistical basis for their reaction.[62]

    Such an overreaction hypothesis does not necessarily imply

that the ultimate source of stock price movements should be

thought of as dividends, or of the earnings of firms. Dividends

are under the discretion of managers.[63] 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.[64]. In doing this, managers like the public, are

forecasting earnings and may become overly optimistic or

pessimistic. In reality, the dividends and stock prices may both

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

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

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

be driven by the same social optimism or pessimism, and the "overreaction" may reflect just a greater response to the fads in price than in dividends. The apparent response of price to earnings could even be attributed to the same sort of effect, to the extent that reported earnings themselves are subject to the discretion of accountants. Fisher Black has claimed that changing accounting practices through time might be described as striving to make earnings an indicator of the value of the firm rather than the cash flow.[65] While an individual firm is substantially constrained in its accounting practices, the choices that are made over time as to conventional accounting methods may be influenced by a sense as to what is a proper level of aggregate earnings, and this sense may be influenced by the social optimism or pessimism.

The relation between real price and real dividend can be described perhaps more satisfactorily from a distributed lag regression of P on D, i. e., a regression which predicts P as a weighted moving average of current and lagged D. One sees from row 1 of table 1 (row 2 with a serial correlation correction) that when the real price is regressed with a 30 year distributed lag on current and lagged real dividends (first coefficient free, remaining coefficients on a second degree polynomial with far endpoint tied to zero) the current real dividend has a

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

coefficient which is greater than the average price dividend

ratio (22.6 for this sample) and the sum of the coefficients of

the lagged real dividends is negative. The sum of all

coefficients of real dividends, current and lagged, is about the

average dividend price ratio. Thus, this equation implies that

the price tends to be unusually high when real dividends are high

relative to a weighted average of real dividends over the past

thirty years and low when dividends are low relative to this

weighted average.

Table 1 row five (row six with a serial correlation

correction) shows the same regression but with real earnings as

the independent variable. The coefficient of current earnings is

less than the average price earnings ratio (13.0 for this

sample). Because earnings show more short-run variability than

.do dividends, these results do not contradict a notion that

prices overreact to earnings as well as to dividends. The lower

R^2 in this regression might be regarded as a reflection of the

fact that dividends are not really well-described by the Lintner

model which made dividends a simple distributed lag on

earnings.[66] The R^2 is high enough that some major movements in

stock prices are explained by this regression. For example, the

decline in earnings between 1929 and 1933 explains more or less

the decline in P over that period (the regression had positive

residuals in all these years). While the reasons for the market

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66. Ibid.

decline on particular days in 1929 may forever be a mystery, the

overall market decline in the depression is explained fairly well

as a reaction (or overreaction) to earnings.

It is important of course to investigate whether the pattern

of coefficients in rows one or two (or five or six) of table 1

might be optimal given the model 1. The easiest test of the model

equation 1 suggested by the pattern of reaction of real prices to

real dividends documented here is to regress future returns on

current and lagged dividends. The efficient markets model 1

implies that returns are unforecastable and the overreaction

alternative suggests that D can be used to forecast returns.

Such a distributed lag appears in Table 1 row 3. The coefficient

of the current dividend is negative and the sum of the

coefficients of the remaining lagged dividends is positive.

Indeed, as our overreaction story would suggest, when dividends

are high relative to a weighted average of lagged dividends (so

that stocks are by this interpretation overpriced) there is a

tendency for low subsequent returns. An F-test on all

coefficients but the constant shows significance at the 5 percent

level.[67] A similar pattern of coefficients was found when E

replaced D in the regression (Table 1 row 7) suggesting a similar

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67. 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.

overreaction for earnings, but the result is significant only at the 9 percent level.

When the same regression was run with a shorter sample period, 1926 to 1982, we see roughly similar coefficients. The R^2 is slightly lower due to the lower volatility of dividends. Because of this and the shorter sample period, the shorter sample does not offer enough power to reject the efficient markets hypothesis even if it is false along lines we have described. The results are no longer significant at conventional significance levels. This sample, however, is very long in years relative to the samples used by most researchers in finance.

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

The ARIMA class of models by Box and Jenkins[68] has been very popular among applied workers, and it would be instructive to see how the real dividend series could be represented by a model in this class. Unfortunately, time series modelling methods are partly judgmental and do not lead all researchers to the same model. One judgment that one has to make in applying such methods is whether to detrend the data prior to data analysis. In my own previous work I estimated a first-order

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

autoregressive model for the log of dividends around a
deterministic linear trend. In this model, with the same annual
real dividend series used here, the coefficient for 1872-1978 of
lagged log dividends was 0.807 implying that dividends always
would be predicted to return half way back to the trend in about
three years.[69] This result does not appear sensitive to the
choice of price deflator used to deflate dividends. One can
reject (taking account of the downward bias of the least squares
estimate of the autoregressive coefficient) by a Dickey-Fuller
test at the 5% level the null hypothesis of a random walk for log
dividends in favor of the first-order autoregressive model around
a trend. Some, however, find the model with a deterministic
trend unappealing and prefer a model which makes dividends
nonstationary. One can deal with the apparent trend in terms of
a model of nonstationary dividends by first-differencing the
data. The following model was estimated with the real annual
Standard and Poor dividend data for 1926 to 1983:

$$(4) \qquad dD_t = \underset{(1.498)}{3.285 \ast 10^{-3}} + \underset{(11.753)}{0.850 \ast dD_{t-1}} + u_t$$

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

where $dD_t = D_t - D_{t-1}$ and a_t is a serially uncorrelated zero mean

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

random variable (t statistics in parentheses). This is what Box and Jenkins called an ARIMA(1,1,1) model. It merely asserts the change in real dividend is a linear function of its lagged value plus an error term u_t which is a moving average of a_t. The Standard errors, in parentheses, are misleading in that the likelihood function for this model has other modes with almost the same likelihood but very different parameter estimates. For the purpose of telling a story about how it might be plausible, given the past behavior of dividends, to forecast future dividends, this model will suffice. This model cannot be rejected at usual significance levels with the usual Ljung-Box Q-test. It's noteworthy that when the same model was estimated with the sample period 1871 to 1925 almost the same parameter values emerged: the coefficient of dD_{t-1} was 0.840 and the coefficient of a_{t-1} was -0.973.

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

the following form:

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

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

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

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

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

Note that the distant past has much more weight relative to the weight on the current real dividend in determining the price today (a weighted average of expected dividends into the infinite future) than it does in determining the dividend next period. This model thus accords with the intuitive notion that to forecast into the near future you need look only at the recent

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past but to forecast into the distant future you need to look into the distant past. Equation 6 implies that P_t, just as D_t, is an ARIMA(1,1,1) process.[70] If we had modelled the real dividend series as a first-order autoregressive model around a trend then P_t would be a weighted average of D_t (with about the same weight as in equation 6) and a trend.

The coefficient of D_t in equation 6 is 5.380, which is far below the estimated value in row one or two of table 1. The coefficients of the lagged dividends sum to a positive number, not a negative number. This forecasting equation would indeed imply that the real stock price index would behave much more stably than it has.

Hypotheses Regarding Overreaction in the Term Structure

Some recent papers on the term structure of interest rates have also investigated certain overreaction hypotheses. The rational expectations theory of the term structure of interest rates is analogous to the efficient markets model equation 1. If we considered D_t the one-period interest rate at time t and $i*P_t$ the yield to maturity on a perpetuity then equation 1 becomes a

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

linearized version of the expectations theory of the term

structure where i is the interest rate around which the

linearization is made.

Mankiw and Summers[71] defined "overreaction" as that the

long-term interest rate behaves in accordance with the

expectations model but for a bond of shorter duration. In other

words, overreaction meant that long bonds' yields behave as

somewhat shorter bonds should behave if the rational expectations

hypothesis were correct. They did not find evidence of such

overreaction. The analogous concept of overreaction in the

present context would be that equation 1 holds when $S*D_{t+k}$ $S>1$

replaces D_{t+k}. In other words, stock prices behave as the

present value discounted at a rate higher than the average return

on stock of a magnified dividend. This notion of overreaction is

not supported by the stock data either, for it would imply a

negative relation between returns and the dividend price ratio,

not the positive relation that we observed in the preceding

section.

The concept of overreaction defined here is instead

analogous to that in a paper I wrote with John Campbell[72]

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71. See N. Gregory Mankiw and Lawrence H. Summers, "Do Long-Term
Interest Rates Overreact to Short-Term Interest Rates?"
'Brookings Papers on Economic Activity, 1984

72. See John Y. Campbell and Robert J. Shiller, "A Simple Account
of the Behavior of Long-Term Interest Rates," American Economic
Review, vol. 74 (May 1984), pp. 44-8.

Although the concept was defined there, we did not find evidence

for it in the postwar U. S. term structure data. Long-term

interest rates did behave somewhat more sluggishly than do

short-term interest rates, so that the ratio or spread between

short rates and long rates was high, not low, when short rates

were high relative to recent experience. We should not consider

it as evidence against any fundamental psychological theories

that some markets at some times do not show such overreaction.

The apparent change after the second world war in the stochastic

properties of short interest rates (which did not return to their

former usual level but trended generally upward) may have meant

that it was an anomalous period.

Forecasting Regressions Using Dividend-Price and Earnings-Price Ratios

The most natural test of the model equation 1 is to regress

return R_t on information available to the public at time t.

Analogous tests of related models might regress excess returns on

information at time t, or regress risk-corrected returns on

information at time t. If the F-statistic for the regression

(that is, for the null hypothesis that all coefficients save the

constant term are zero) is significant, then we will have

rejected the model. The simplest such tests use just price

itself (scaled, say, by dividing it into earnings or dividends)

as an explanatory variable, and use the conventional t statistic
to test the model. If "fads" cause stocks to be at times
overpriced, at times underpriced, and if these fads tend to come
to an end, then we would expect a high dividend-price ratio or
earnings-price ratio to tend to predict high returns and a low
dividend-price or earnings-price ratio to predict low returns.
This would mean that the most naive investment strategy: buy when
price is low, sell when it is high, pays off.

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

Whether stocks with high earnings price ratios will have
relatively high returns has been the subject of much discussion
in the literature. It has been confirmed that there is a simple
correlation across firms between such ratios and returns.[73]. The

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73. See for example Francis Nicholson, "Price Ratios in Relation
to Investment Results," _Financial Analysts Journal_ vol. 24

issue that then attracted attention was whether such a phenomenon

could be explained within the framework of the capital asset

pricing model if there happens to be a positive correlation

between the ratio and the beta of the stocks, or whether the

ratio is proxying for a "small-firm effect", i. e., whether firm

size, which correlates with the ratio, affects expected return.

Recently, Sanjoy Basu concluded that risk adjusted returns are

positively correlated with earnings price ratio even after

controlling for firm size.[74] As Basu notes, however, his tests

depend on the risk measurement assumed.

It is apparently accepted today in the finance profession

that expected returns fluctuate through time as well as across

stocks. These results are interpreted as describing the time

variation in the "risk premium." The dividend-price ratio or

earnings-price ratio has not figured prominently in this

literature. Instead forecasting variables were such things as

the inflation rate[75], the spread between low-grade and high-grade

bonds[76], or the spread between long-term and short-term bonds[77]

(January-February, 1968), p.   105-9.

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

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

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

In table 2 we see that a high dividend-price ratio (total

S&P dividends for the preceding year divided by the S&P Composite

Index for July of the preceding year) is indeed an indicator of

high subsequent returns. 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 3.529 percentage points above its mean. Thus, the high

current yield is augmented by an expected capital gain that is

two and a half times as dramatic as the high current yield. In

contrast, the model 1 would predict that a high current yield

should correspond to an expected capital loss to offset the

current yield. The efficient markets hypothesis thus appears

dramatically wrong from this regression: stock prices move in a

direction opposite to that forecasted by the dividend price

ratio. This is true in every subperiod examined.[78]

In table 3 are shown analogous regressions with the earnings

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

78. The fifth row of table 2 repeats the same regressions but with data deflated by the consumption deflator for nondurables and services rather than by the producer price index. The different price index makes little difference to the results. The last row of table 2 checks against the possibility that the results are due to the fact that total dividends paid and the producer price index were not in the public information set for all of January. Here, the dependent variable is the real return from the end of January until the end of January of the following year, using the "Common stock total return" series of Ibbotson and Associates. See Roger Ibbotson and Associates, Stocks, Bonds, Bills, and Inflation, 1984 Yearbook (February 1984), page 28. Again the results are essentially unchanged.

price ratio (total S&P earnings for the preceding year divided by the S&P composite index for July of the preceding year) in place of the dividend price ratio. These forecasting regressions work in the same direction (price low relative to earnings imply high returns) but are less significant.[79]

In table 4, we substitute nominal returns for real returns as the dependent variable (thereby eliminating any potential problems from the price index which was used to deflate nominal series) and add as an additional independent variable a short term nominal interest rate. The regressions thus make some allowance for a time varying interest rate. We might expect that the coefficient of the interest rate should be 1.00 and the coefficient of the dividend price ratio or the earning price ratio should be zero. Instead, the coefficient of the interest rate has uniformly the wrong sign and the ratio variables are generally significant.[80]

There is evidence that the strategy of holding stocks with high dividend-price ratios has actually paid off for those

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

80. That stock returns show negative correlation with the short-term interest rate with U.S. data 1953-71 was pointed out by Eugene F. Fama and G. William Schwert, "Asset Returns and Inflation," _Journal of Financial Economics_, vol. 5, (November 1977), pp. 115-46.

investors who followed it. In a study conducted by Lewellen,

Lease and Schlarbaum, trading records on individuals who had

accounts with a major national retail brokerage house were

obtained and questionnaires were sent to the individuals to

obtain information on their characteristics and strategies.[81]

They found statistically significant negative correlations

between investment performance and both education and income, and

few significant correlations with "strategy" variables.[82] This

hardly seems to suggest that smart money can do better. They did

say though:

> We can, nonetheless, report indications of as least one
> intriguing--though not totally startling--investment
> strategy dimension which was related to performance
> differences in all four of the derived rate-of-return
> tableaus: the percentage of the investor's portfolio
> which he or she regarded as comprised of securities
> designed chiefly to produce dividend income.....In
> effect, a relatively large commitment to high-dividend
> yield stocks generally assured a respectable, but not
> outstanding, investment outcome over the calendar
> interval examined.[83]

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81. 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.

82. Other studies have sought evidence that income class is
correlated with investment outcome, but encountered important
methodological problems in attempting this. See Shlomo Yitzhaki,
"Are High Income Individuals Better Stock Market Investors?"
mimeographed, National Bureau of Economic Research, 1984.

83. Ibid., p. 52.

Excess Volatility of Stock Prices

We have seen in the preceding sections that the efficient
markets model 1 can be rejected at conventional significance
levels based on some simple regression tests if long time series
data are used. Such tests may not be convincing because it is
hard for the reader to judge how much data mining has gone into
the production of the regressions and because the reader may be
concerned about the accuracy of the data, particularly the price
deflator to convert nominal returns into real returns. Moreover,
such regression may not fully characterize the way in which the
model 1 fails. A simpler and perhaps more appealing way to see
the failure of the model equation 1 follows by observing that, as
has been shown elsewhere, stock prices show far too much
volatility to be in accordance with the simple model 1.[84]

The most important criticism of these claims of excess
volatility of speculative asset prices centered on the assumed

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84. The arguments for excess volatility in financial markets were
put forth independently by Stephen F. LeRoy and Richard D.
Porter, "The Present Value Relation: Tests Based on Variance
Bounds," Econometrica, vol. 49 (March 1981), pp. 555-74 and by
myself in several papers beginning with "The Volatility of
Long-Term Interest Rates and Expectations Models of the Term
Structure," Journal of Political Economy, vol. 87 (December
1979), pp. 1190-1219 and with "Do Stock Prices Move too Much to
be Justified by Subsequent Changes in Dividends," American
Economic Review, vol. 71 (June 1981), pp. 421-36.

stationarity around a trend of the dividend series.[85]. In this section the volatility tests will be discussed in light of this criticism and presented again in a slightly different form (which might deal better with the nonstationarity issue).

I showed that if the dividend D_t is a stationary stochastic process then the efficient markets model 1 implies that:[86]

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

i. e. that the standard deviation of the change in price $P-P_{-1}$ is less than or equal to the standard deviation of the dividend D divided by the square root of twice the discount factor. If we know the standard deviation of D, then there is a limit to how much $P - P_{-1}$ can vary if equation 1 is to hold at all times. Intuitively, if the market is efficient then price movements representing changes in forecasts of dividends cannot be very large unless dividends actually move a lot. The discount factor i is equal to the expected return $E(R_t)$, which can be estimated by taking the average return. Before we can use this inequality to test the efficient markets model, we must somehow deal with the fact that dividends appear to have a trend, and the problem was dealt with before by detrending price and dividend by

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

86. Shiller, "Do Stock Prices..."

multiplying by an exponential decay factor.[87] This method of

detrending has become a source of controversy. Indeed, the trend

in dividends may be spurious and dividends may have another sort

of nonstationarity which such detrending does not remove. Thus,

this violation should not be regarded as definitive evidence

against the equation 1. Most of the criticism of the variance

bounds inequalities has centered on this point.[88] On the other

hand, the violation of the variance inequality does show that

dividend volatility must be potentially much greater than

actually observed historically (around a trend or around the

historical mean) if the efficient markets model is to hold, and

this fact can be entered in to a weighing among other factors in

judging the plausibility of the efficient markets model.

In table 1 the elements of the above inequality are

displayed where the data are detrended in a different, and

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87. Ibid.

88. For example, see Philip Dybvig and Jonathan Ingersoll, Jr.,
"Stock Prices are not too Variable,: A Theoretical and Empirical
Analysis," mimeographed, Yale University (1984), Marjorie A.
Flavin, "Excess Volatility in the Financial Markets: A
Reassessment of the Empirical Evidence," Journal of Political
Economy vol. 91 (December 1983), pp. 929-56., Allan W. Kleidon,
"Variance Bounds Tests and Stock Price Valuation Models,"
mimeographed, Graduate School of Business, Stanford University,
(1983), and Terry A. Marsh and Robert C. Merton, "Dividend
Variability and Variance Bounds Tests for the Rationality of
Stock Market Prices," working paper No. 1584-84, Sloan School of
Management, (August 1984). The substance of most of this
criticism was actually anticipated in my first paper on the
subject, Robert J. Shiller, "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.

perhaps more satisfactory, manner, which depends only on past information. Let us define detrended price series P5, P15 and P30 and corresponding dividend series D5, D15 and D30 by:

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

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

where

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

The detrended price and dividend series have the property that returns calculated using Pk and Dk in place of P and D in the formula for return R_t are the same as if P and D had been used. Thus, if equation 1 holds for P_t and D_t then equation 1 holds where Pk_t and Dk_t replace P_t and D_t. Thus, the same variance inequality 7 should hold for Pk and Dk. One can think of Pk and Dk as the price and dividend respectively of a mutual fund which holds the same fixed portfolio (whose price is P_t and whose dividend is D_t) but buys back or sells its own shares so that it always has Nk_t shares outstanding. Nk_t is a geometric moving average of lagged real dividends. This may cause the dividend of the mutual fund to be stationary even if the dividend D_t is not. A plot of D30, for example, looks very much like a detrended dividend series and does not look unstationary. If, for example, the log of D is a Gaussian random walk and is thus nonstationary

then Pk_t will be a stationary lognormal process and Dk_t will be

the sum of stationary lognormal processes.[89] We see from table 1

that the inequality 7 is violated for data detrended in this way,

the extent of the violation is higher the higher the k, i. e.,

the more smoothing involved in the averaging.

Implications of the Forecasting Equations in Connection With the Model

If we choose hypothetical values for r and v in equation 2

then we can use one of the equations forecasting R_t produced in

tables 1 through 4 to estimate the paths through time of Q_t and

Y_t. While such an estimate will be admittedly pretty arbitrary,

considering it may give some insights into the plausibility of

the sort of model here. We learn immediately in doing this that

v must be very large if swings in Q_t are not to be

extraordinarily large. This problem arises because stock prices

are _too_ forecastable, that is, the standard deviation of the

fitted value implied by the R^2 corrected for degrees of freedom

in many of the forecasting equations is so large that it must be

scaled down by a large v in equation 2. Large values of v might

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

be proxying for some skepticism by smart money regarding the forecasting equation.

Figure 2 shows a hypothetical example: estimated values of Y_t and Q_t implied by equation 2 and the forecasting equation based on the dividend-price ratio in Table 2 row one for r = 0% and v = 50%. Also shown is the real price P_t. For these values of r and v, Q_t is always positive and thus Y_t is always less than P_t. The demand for shares by ordinary investors is somewhat more volatile than P, showing a tendency to be lower proportionally at lows and higher proportionally at highs. The overreaction to dividends is more pronounced in Y_t than in P_t. The presence of smart money thus serves to mitigate the overreaction of ordinary investors. The year 1933 stands out for a very large proportion of smart money and low proportion of ordinary investors. This was the year when the dividend-price ratio reached an extreme high and when the highest returns were forecasted. Except for its somewhat greater volatility, the overall pattern of Y looks basically similar to that of the real price P. This is because for the most part the expected return on the market has behaved fairly smoothly, not so irregularly as to cause smart money to offset the noisy pattern of demand by ordinary investors.

The volume of trade implied by the movements in and out of shares by smart money between t and t+1 is $|Q_{t+1} - Q_t|$. The average value of this over the sample shown in figure 2 is 0.055. The New York Stock Exchange turnover rate (reported annual share

volume divided by average of shares listed) in this sample was, except for the early depression years when turnover was extremely high, between 9% (1942) and 42% (1982).[90] Thus, the story told in figure 2 is not one of implausibly high volume of trade. Since corporate stock constitutes less than a third of all wealth (between 1945 and 1980 Corporate shares held by households and private financial institutions as a proportion of household net worth (with tangibles and government debt) ranged from 12.6% in 1948 to 31.8% in 1968)[91] we are also not talking about implausibly large wealth movements on the part of smart money. Of course, not all household wealth is very liquid. The ratio of the market value of corporate equities to deposits and credit market instruments held by households ranged from 47.7% in 1948 to 136.2% in 1968.[92]

A discount rate r+v of 50% in equation 3 may or may not imply very forecastable returns, depending on the stochastic properties of Y_t. In our hypothetical example, the behavior of Y_t is sufficiently dominated by long (low frequency) components that returns are not more forecastable than would be implied by the forecasting regression in table 2. A discount rate of 50% per

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

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

92. Ibid.

year amounts to about a tenth of a percent per day (compared to the standard deviation of daily return of about one percentage point), so that for event studies involving daily stock price data the discount rate is still very small. If equation 3 were to be applied to individual stocks, we might choose a smaller value of v and hence a smaller discount rate.

Summary

The most important reason for expecting that stock prices are heavily influenced by social dynamics comes from our observations as to who participates in the market and as to human nature. We are aided by the literature on social psychology, sociology, and marketing. A study of the history of the U. S. stock market in the postwar period suggests that various social movements were underway which might plausibly have major effects on the aggregate demand for shares. Econometric evidence against the efficient markets hypothesis could never be as convincing as such qualitative evidence about the people who make up markets.

The reason why the random walk behavior of stock prices holds up as well as it does may have two origins. First, the aggregate demand of ordinary investors may itself not be entirely unlike a random walk. Fashions are perhaps inherently rather unpredictable. Second, the limited amount of smart money in the

economy ought to have the effect of preventing what predictable patterns of behavior ordinary investors do show from causing big short run profit opportunities. It was emphasized that in preventing this the smart money may not be preventing the ordinary investors from causing major swings in the market and even dominating the behavior of the market. The alternative model of stock market behavior suggested as reasonable here made stock prices the present value of both optimally forecasted future dividends and optimally forecasted future demands by ordinary investors.

Stock prices appear to overreact to dividends. Prices are exceptionally high when dividends are high relative to recent experience and are exceptionally low when dividends are low relative to recent experience. Time series modelling of the dividend process suggests that dividends tend to revert back to the levels of the recent past, which would suggest that prices should behave more sluggishly than they do. The forecasting equations for returns and the modified variance bounds tests shown here are consistent with such an overreaction story. It might be better, though, to describe the correlation of prices to dividends as due to the fact that firms who set dividends are influenced by the same social dynamics which influence the rest of society.

The stock market boom of the 1950's and early 60's was a period of rising dividends and earnings, and so the boom might be

described as largely a simple overreaction of the market to

these. There is reason to suspect however that a general sense

of optimism in our institutions was growing over that period, and

that this and other social factors as well as institutional

changes may have pulled dividends up along with stock prices.

The market decline since then might be understood in terms in

terms of a complex of vivid events which brought the sense of

optimism regarding future returns to an end.

Table 1. Distributed Lag Regressions on Real Dividends or Earnings

Row	Sample period	Depen-dent vari able / Method	Const.	Coef. of current indep. variable	Sum of coef's of lagged indep. variable	Rho	F / Prob>F	R² / R̄²	Durbi Watsc / SER
					A. Independent variable is real dividends:				
1	1900-1983	P Ols	-0.081 (-2.947)	34.64 (14.16)	-11.79 (-4.344)		257.3 0.000	0.906 0.903	0.81 0.07
2	1900-1983	P Corc	-0.073 (-1.202)	28.25 (9.130)	-5.373 (-1.143)	0.655 (7.888)	44.49 0.000	0.695 0.680	1.86 0.05
3	1900-1982	R(t+1) Ols	0.089 (1.205)	-6.571 (-1.026)	9.623 (1.395)		2.716 0.049	0.094 0.059	2.05 0.18
4	1926-1982	R(t+1) Ols	0.173 (1.326)	-7.618 (-0.935)	5.168 (0.570)		1.523 0.219	0.079 0.027	2.05 0.20
					B. Independent variable is real earnings:				
5	1900-1983	P Ols	0.103 (2.611)	11.73 (5.612)	-5.829 (-2.293)		57.59 0.000	0.684 0.672	0.27 0.13
6	1900-1983	P Corc	0.168 (1.074)	7.979 (6.521)	-2.576 (-0.484)	0.896 (18.35)	10.74 0.000	0.355 0.322	1.61 0.06
7	1900-1981	R(t+1) Ols	0.088 (1.512)	-5.765 (-1.901)	7.451 (1.907)		2.190 0.094	0.077 0.042	1.97 0.18

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

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

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

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

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

Source: Author's calculations

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

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

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

(d) Dependent variable is the real return from the end of January end of January of the following year. Nominal returns were cumulated from monthly data "Common stocks total returns" from Roger Ibbotson &

Associates, Inc. These were converted to real returns using the
January producer price index.

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

Row	Dependent Variable	Sample Period	Constant	Coefficient of Earnings Price Ratio	R^2	Durbin Watson
					$\bar{R}^2$	SER
1	R (b)	1872– 1983	0.012 (0.243)	0.851 (1.410)	0.018 0.009	1.898 0.176
2	R (b)	1872– 1908	0.002 (0.018)	1.282 (0.630)	0.011 −0.017	2.159 0.145
3	R (b)	1909– 1945	0.076 (0.720)	0.026 (0.022)	0.000 −0.028	1.594 0.211
4	R (b)	1946– 1983	−0.086 (−1.052)	1.823 (2.041)	0.106 0.081	1.710 0.172
5	R (c)	1889– 1982	0.010 (0.193)	0.784 (1.241)	0.016 0.006	1.957 0.179
6	R (b)	1901– 1983	−0.035 (−0.680)	1.573 (d) (2.378)	0.065 0.054	1.805 0.188

Source: Author's calculations

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

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

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

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

Table 4. Regressing Nominal Returns on Ratios and Nominal Interest Rate (a)

Row	Sample Period	Constant	Coefficient of Ratio	Coefficient of Interest Rate	Sample Statistics		
					F	R²	Durbii Watsoi
					Prob>F	R̄²	SER
1	1890–1983	−0.124 (−1.520)	4.887 (b) (3.445)	−0.002 (−0.246)	6.357 0.028	0.123 0.103	1.87 0.17i
2	1909–1945	−0.252 (−1.516)	7.404 (b) (2.634)	−0.017 (−1.106)	3.868 0.031	0.185 0.137	1.52 0.21
3	1946–1983	−0.107 (−1.214)	5.255 (b) (3.037)	−0.002 (−0.227)	4.717 0.015	0.212 0.167	2.26 0.14
4	1890–1983	0.018 (0.307)	1.465 (c) (2.238)	−0.008 (−1.120)	2.900 0.059	0.060 0.039	2.04 0.18
5	1909–1945	0.079 (0.645)	0.933 (c) (0.708)	−0.018 (−0.935)	0.587 0.562	0.033 −0.023	1.81 0.22
6	1946–1983	−0.040 (−0.559)	2.222 (c) (2.938)	−0.008 (−1.093)	4.420 0.019	0.201 0.156	2.21 0.14

Source: Author's calculations

(a) Dependent variable is the nominal return on the Standard and Poor Composite Stock Price Index from January of the year to January of the following year. The return is calculated as the sum of the change in index plus S&P Composite Dividends per Share Adjusted to Index, Four Quarter Total, divided by the index. The interest rate is the 4-6 month (6 month starting 1980) prime commercial paper rate for January. T-statistics are in parentheses.

(b) The independent variable denoted "Ratio" is total dividends in the preceding year (S&P Composite Dividends Adjusted to Index, Four Quarter Total) divided by the S&P Composite Index for July of the Preceding Year.

(c) The independent variable denoted "Ratio" is total earnings in the preceding year (S&P Composite Earnings Adjusted to Index, Four Quarter Total) divided by the S&P Composite Index for July of the Preceding Year.

Table 5. Sample Statistics for Price and Dividend Series (a)

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

Source: Author's Calculations

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

Fig.
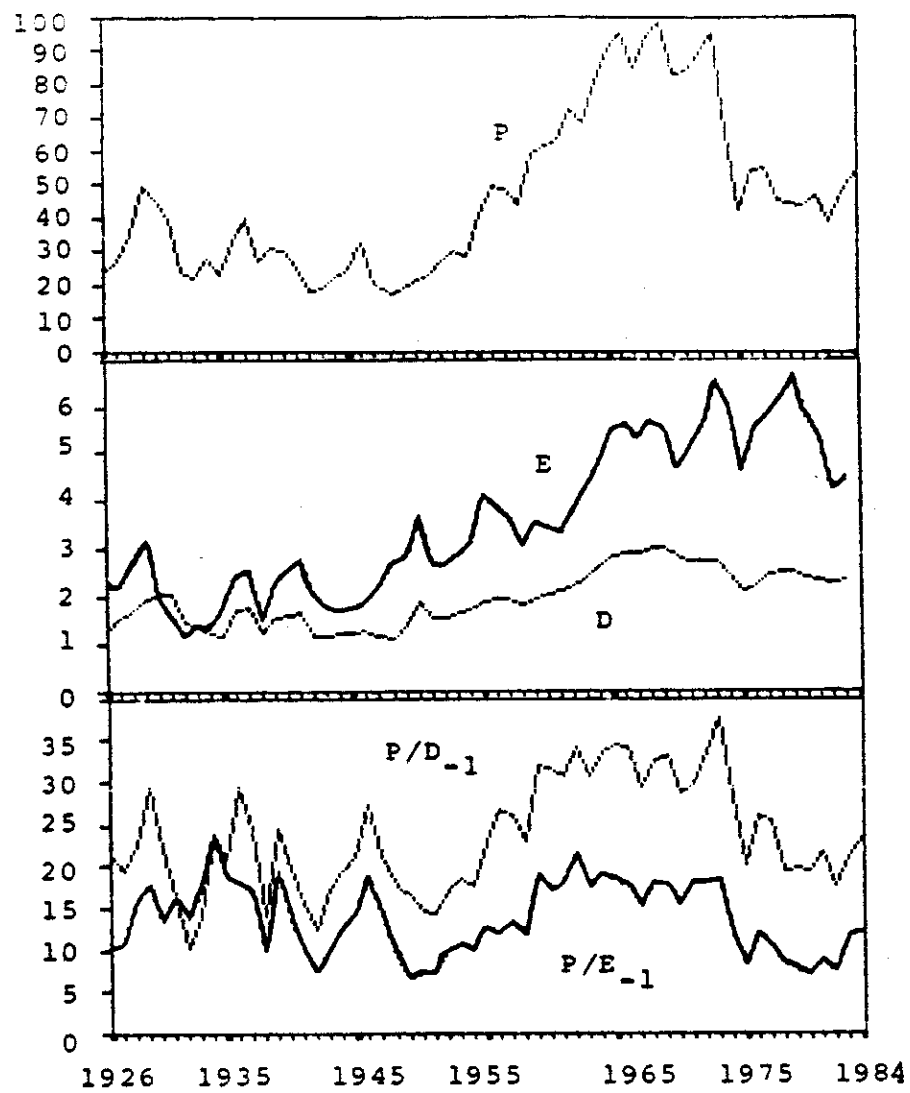
Figure 1. Real Standard and Poor Stock Price Data, 1926 to 1984[a]

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

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

Fig. 8
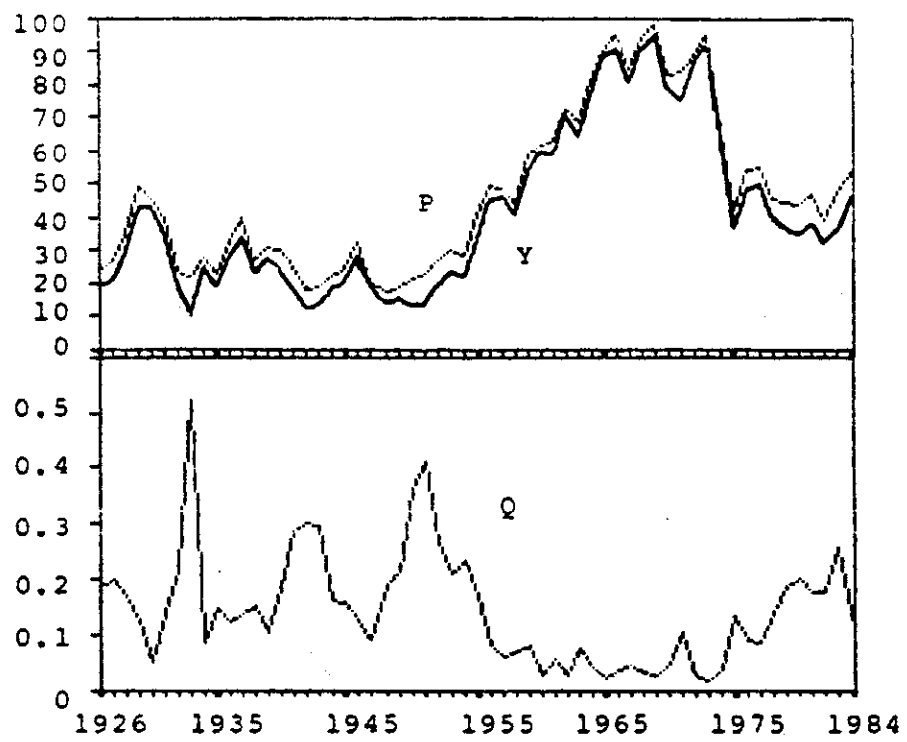
<u>Figure 2. Hypothetical Demands for Shares by Smart</u>

<u>Money and Ordinary Investors</u>

Source: Authors Calculations

P_t - Real Standard and Poor Composite Stock Price Index

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

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