EFFICIENT MARKETS: FICTIONS AND REALITY

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The arguments presented in this paper are extensively developed in our forthcoming book, tentatively entitled ***Illusions of Stability: Financial Markets, the State, and the Future of Capitalism***, which will be published by Princeton University Press in 2010.

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Eugene Fama, one of the founders of the so-called "Efficient Markets Hypothesis" (EMH), articulated early on the basic narrative that underpins it: "competition… among the many [rational] intelligent participants [would result in an] efficient market at any point in time [in which] the actual price of a security will be a good estimate of its intrinsic value" (Fama, 1965, p. 56).

In the aftermath of the 2007-2009 financial crisis, the "rationality of the market" began to be widely referred to as a "myth."[1] Too many market participants were supposedly "irrational" – that is, they behaved inconsistently with economists' standard of rationality. But the alternative mathematical "behavioral finance" models that have gained currency since the crisis imply that the "rational market" has not disappeared for good. After all, these models assume that if "irrational" individuals could somehow be barred from influencing market outcomes – by regulatory policy or other means – "rational" participants would re-gain the upper hand, thereby restoring the "rational market." [2]

However, the "rational market" *is* a myth – in the strictest sense of the word: it is a "widely held but false belief."[3] It cannot be turned into reality by any means, including regulatory policy, no matter how wise or efficacious. The reason is simple: assets' underlying values unfold over time in non-routine ways that no one can fully foresee. There is thus no "true" intrinsic value that "competition" among "intelligent participants" could possibly establish. The widely held idea that "competition among investors" can arbitrage away "discrepancies between actual prices and intrinsic values" [Fama, 1965, p. 56) simply has no meaning.

The rational market arose in an attempt to provide a scientific underpinning to EMH, which serves as the cornerstone of financial economics. According to the hypothesis, asset "prices always 'fully reflect' available information" (Fama, 1970, p. 383).

As it stands, EMH says very little about how prices unfold over time, or whether markets allocate capital well. There is an abundance of publicly available information about economic, political, and social factors and events that is quickly disseminated to individuals around the world. Participants make a selection from this flow of information in forming their forecasts of future prices and risk. These forecasts underpin their decisions to buy and sell, which the market aggregates in setting prices. In this way, prices fully reflect the information that participants deem relevant in forecasting.

If, by "available information," one means the particular information chosen by participants in thinking about the future, then EMH is merely a descriptive hypothesis about markets. To turn it into a theory of asset prices, economists have had to take a stand

[1] This notion has been popularized by the title ("The Myth of the Rational Market") used by Fox (2009).

[2] For a notable exception, see Soros (2008).

[3] *Oxford American Dictionary* (2009).

on what is meant by "all available information" and *how* it gets "fully reflected in asset prices."

By relying on REH in attempting to solve this formidable problem, EMH was transformed into a conjecture that markets allocate society's scarce capital almost perfectly by setting prices to fluctuate randomly around their "true" fundamental values. As a result, EMH also implies that using available information in an attempt to earn "excess returns" after taking risk into account is bound to fail. When these striking claims entered the public debate, the assumptions that underpin them were left behind in the academic literature.

In this paper, we discuss how financial economists over the past three decades have transformed the narrative account behind EMH into a theory of asset prices by imagining a world where all change is mechanical and individuals have given up searching for new ways to understand the past and future. As such, EMH lacks any connection to what real-world markets and their participants actually do.

Unfortunately, the post-crisis policy debate continues to be based on EMH's view of markets, which implies that, so long as market participants are "rational" and there are no market failures arising from asymmetries of information, lack of transparency, inadequate incentives, or weak competition, financial markets always set asset-prices at the nearly "true" underlying value of assets.

Many public officials, especially in the United States, actually came to believe this claim, which resulted in the massive deregulation of financial markets that we saw in the late 1990's and early 2000's. These decisions to deregulate made the crisis more likely, if not inevitable.

The belief that REH is the standard of rationality has also led to the view that swings in asset prices are "bubbles" that arise because market participants fall prey to irrationality, emotions, or herding instincts, or because they rely on technical rules. Moreover, market participants are supposed to ignore fundamental factors altogether. Bubble models thus lead to an extreme view of the role of swings in capitalist economies: they are unrelated to the movements of fundamentals and, as a result, serve no useful social function.

Thus, the belief in the adequacy of economists' standard of rationality gives rise to two extreme positions concerning the role of the state in asset markets. The state should either leave markets unimpeded, other than ensuring transparency and eliminating other market failures, or it should extinguish asset-price swings as soon as they arise, even if this requires massive intervention.

In this paper, we advance an intermediate view, which we call the *Contingent Markets Hypothesis* (CMH). This view recognizes that an overarching model of modern economies, which relates market outcomes to fundamental factors exactly up to a random error, is beyond the reach of economists or anyone else. Acknowledging that the process driving asset prices and fundamental factors undergoes change at times and in ways that cannot be fully specified in advance suggests that asset-price swings play an indispensible role in guiding society's allocation of capital to alternative projects. Although psychological factors and technical trading may play a role, markets undergo swings even if *all* market participants buy and sell decisions *solely* on the basis of fundamental factors. But, if price swings lie at the heart of what markets do, then eliminating them as soon as they appear, as the bubble models advise, is likely to dampen innovative activity.

Moreover, CMH recognizes that, although markets play an essential role in allocating society's scarce capital, they are not perfect. Market participants, like everyone else, must cope with imperfect knowledge about how to interpret fundamental factors in forecasting future returns. Elsewhere, we show that this implies that price swings can sometimes become excessive.[4] It is this possibility that provides an alternative rationale for policy intervention in asset markets. It also has important implications for how regulators should measure and manage systemic risk in the financial system.

The Market Metaphor

In financial markets, participants' trading decisions depend on their forecasts of future returns and the risk or chance that returns might be lower than predicted. In the equity market, for example, the return from buying shares in a company today depends on the future price at which they can be sold, any dividends that the company pays over the holding period, and the cost of capital. Risk might be proxied by standard statistical measures like the standard deviation of returns, or, as we have suggested, by relating it to the divergence of stock prices from historical benchmark values, such as those based on earnings or dividends.[5]

To forecast prices, dividends, and risk, participants must choose from a large set of potentially relevant factors, from company-specific variables like corporate earnings and industry trends to economy-wide variables like announcements by the central bank, inflation rates, and overall economic activity. Each participant formulates a forecasting strategy, which reflects her own knowledge and intuition about which factors are relevant and how each one should be interpreted in thinking about the future.

At each moment in time, participants' forecasts differ. As of this writing, overall economic activity in the US economy has increased over the past two quarters, suggesting that the two-year downturn that began at the end of 2007 may already have ended. Corporate earnings for many companies, overall employment, and exports have also been rising, while the Federal Reserve has announced that it plans to keep short-term interest rates at very low levels for some time to come. Such news is often interpreted bullishly for stocks, and may lead participants to forecast higher future prices and dividends.

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[4] Frydman and Goldberg (2007, 2008). For a related analysis of this point, which emphasizes the importance of "reflexivity" in prolonging excessive fluctuations, see Soros (1987, 2008).
[5] See Frydman and Goldberg (2007), chapter 12.

However, there is also much news pointing in the opposite direction. Much of the increase in overall economic activity so far has come from companies restocking their inventories. Spending by consumers and businesses expenditures on new plant and equipment has shown no real sign of rising from historic lows. The muddle over financial reform, health care, and the environment has created considerable uncertainty about how the legal and regulatory framework undergirding private enterprise might change. And the overall stock market has now risen above historical levels based on earnings and dividends – news that is often viewed as leading participants to forecast lower prices and dividends.

In characterizing how an individual makes her trading decisions, economists often assume that she compares her forecast of the return from holding a stock in one period to some minimum return – what economists call a "premium" – that depends on her forecast of the risk and the degree to which risk negatively affects her well being. If an individual's forecast of the return after accounting for the cost of capital exceeds her premium, she will want to hold the stock, whereas if the converse is true, she will either stay out of the market or take a short position.[6]

At each point in time, participants may revise their forecasts of the return and/or risk because of new information or new ways of thinking about the future. If an individual's forecast of the return rises relative to her premium, she buys stock, whereas if it falls, she sells. Prices then move to the value that represents the equilibrium between total supply and demand for a given stock, thereby reflecting an invisible weighting of bullish and bearish views about the future.

Indeed, when economists speak about the "market," they do so "metaphorically…[as] a convenient way of summarizing the decisions of individual investors and the way these decisions interact to determine prices" (Fama, 1976, p. 135). They typically suppose that the excess of total buying over total selling of a stock at each point in time is related to an average of participants' forecasts of return and an average of their premiums.[7] If those averages imply a market forecast greater than the market premium, total buying will exceed total selling. To balance total buying and selling, prices must move in such a way that they equate the market's forecast of return with its premium after accounting for the cost of capital.

Each participant's forecasting strategy connects the future price and dividend with current and past information about the variables that she thinks are relevant. In the aggregate, the market's forecasting strategy depends on an invisible weighting of the variables and interpretations that are used on the individual level.

As the market's forecast of prices and dividends moves, so do prices. But, whereas economists emphasize new information on the relevant causal variables as the reason for

[6] We have in mind a log-linear specification of the model. A short position in an asset produces a positive return when the asset price falls.
[7] Aggregation is a problem, but as the literature usually does, we disregard this issue.

such movements, participants' revisions of their forecasting strategies also impact the market's forecast. Over time, then, price movements result from new information on the causal variables and revisions of the market's forecasting strategy. Until an economist takes a stand on such changes, his "market metaphor" says very little about how stock prices will unfold over time.

Expecting Random Price Fluctuations Come Rain or Shine

Contemporary economists typically model economic outcomes and forecasting behavior with probabilistic formalism. This formalism supposes that the impact of change on economic outcomes can be captured with two components, one that is fully predetermined, conditional on available information, and another that is stochastic and uncorrelated with available information.

To see what this entails, consider the problem of modeling the future dividend stream of a company. The fully predetermined component of the specification would consist of a mechanical rule that attempts to capture all of the future change that can be anticipated on the basis of current and past information. This rule might relate future dividends to the values of other causal variables, such as industry trends and overall economic activity. But a particularly simple rule that is common in the literature would suppose that a company's dividend tends to grow at a constant rate, say 1% per year. So if this year's dividend is $1, next year's will be $1.01.

Economists understand that much change cannot be anticipated. No one can be sure about how the earnings prospects and dividends of a company will unfold over the next year, let alone over the next 10 or 20 years. The values of such outcomes will depend on many changes, including yet-to-be-invented technologies, new ways of organizing human and physical capital within organizations, and unforeseeable changes in institutions and economic policies worldwide.

Economists attempt to capture this unpredictable change by adding "stochastic shocks" (Koopmans, 1947, p. 171), or error terms, to their models. As Paul Samuelson put it,

> Just as Ehrenfest and other physicists had to add probability to the causal systems of physics in order to get around the time-irreversibility feature of classical mechanics that was so inconsistent with the second law of thermodynamics, so we must, in the interests of realism, add stochastic probability distributions to our economic and biological causal systems. (Samuelson, 1965a, p. 147)

An error term is described by a probability distribution: a prespecified set of possible values along with the probability for each possible value. Economists usually assume that the possible values and probabilities are such that the error term's realizations would average zero.

The presence of such an error term implies that the dividend in any period is itself stochastic: it depends on a fully predetermined change from the prior year and the realization of the error term in the current year. Next year's dividend is then described by a probability distribution conditional on its current value. If the same conditional probability distribution were to apply over time, the stochastic shocks would cancel each other out and dividends would on average follow their fully predetermined time path involving 1% annual growth. In this way, the model severely restricts unpredictable change to a random deviation from a fully predetermined path.

Economists use such conditional probability distributions to portray participants' forecasting strategies at each point in time. Using our example, a participant's forecast today of next year's dividend would be the mean average of the possible values, which, with a random error term, is just 1% higher than this year's dividend. Next year's dividend, of course, will differ from this year's forecast because of a stochastic shock. And because this shock can take on one of many values, the forecast error could be large or small. The possible variation of this error, which is often measured by its standard deviation, is commonly used to portray how participants measure risk.

In formalizing the market metaphor, economists must portray how the market, at every point in time, forecasts the price, dividend, cost of capital, and risk of speculating. To focus on the market's forecasting of price and dividends, economists often assume a constant interest rate and market premium, setting the latter equal to zero. They thus attribute to the market at each point in time a joint probability distribution for the next period's price and dividend, which implies some mean change for both variables, conditional on some information set.

Economists typically attribute the same conditional probability distribution to the market at every point in time. But, even if they allow for different distributions over time, the market model has a key feature: a stock's price is pushed to the value at which the market expects the next period's price to be unchanged from its current value, a property that economists call a "martingale." From the vantage point of the market, price is expected to fluctuate randomly.

To see this, suppose that in prior time periods the market's forecasting strategy for dividends is described by our example, and that today it undergoes a revision: the market's forecast of next year's annual dividend growth increases from 1% to 2%. The rise in expectation leads the market to bid the price up immediately. With the premium assumed to be zero, the market will push the price all the way up to the value at which it expects a zero return after accounting for the cost of capital.

This expectation of a zero return does not in general imply that the price is expected to fluctuate randomly. The expected return also depends on the cost of capital and the expected dividend. However, price changes tend to dominate these other effects. For this reason, economists typically refer to the stochastic market model as implying the martingale property for price with respect to the market's forecasting strategy and information set. We will also follow this convention.

Fama's (1970) original formulation of EMH appealed to this martingale property of the market model. By "available information," he meant the market's information, and by "fully reflects," he meant that information was interpreted using the market's forecasting strategy. He and others thought that, barring some "inefficiency," this property necessarily implied that prices in financial markets would fluctuate randomly, and that no individual could use available information to earn above-average returns.

However, the model merely assumes that a stock's price is set according to the market's expectation at every point in time. Consequently, when "viewed" through the lens of the market's forecasting strategy and information set, the next-period price is always expected to be unchanged from the current period. As LeRoy (1989) pointed out, Fama's (1970) formulation of EMH that "prices always fully reflect available information" was a tautology. It had no empirical implications for how asset prices unfold over time.

Manufacturing Random Price Fluctuations: Fully Predetermined Change and Truth

Samuelson (1965b) turned the martingale tautology into a statement that prices would fluctuate randomly by invoking additional assumptions about the process driving dividends and the other causal variables, and about how these processes are related to the market's forecasting strategy.

Price movements in the model depend on how the market's expectation of future prices and dividends *changes* over time. Suppose, for example, that today the market expects that next year's stock price and dividend will equal $100 and $1, respectively. The price that the market is willing to pay today for this expected future payoff depends on the value of this future payoff in today's dollars, or what economists call its "present discounted value." If we assume that the cost of capital is 1% per year, $101 received next year would be worth $100 today. In bidding for shares, then, participants in the aggregate would push today's stock price to $100. At this value, the expected dividend would just compensate the market for the cost of capital and the market would expect no change in price over the coming year.

Whether the price in one year is $100 or some other value depends on the market's expectation of price and dividend next year for the following year. To derive implications for actual price movements in the model, therefore, Samuelson had to characterize how the market's thinking about the future next year differs from its thinking this year.

Economists insist on fully predetermining their models and thus ignore any revisions that the market cannot foresee. Samuelson did so by assuming no change at all; he used exactly the same conditional probability distribution to characterize the market's forecasting at *every* point in time into the indefinite future. By doing so, he presumed that markets do not play any role in helping society cope with change: participants never look for change in the processes driving the market and economy and thus never alter the way they think about the future.

With the market's forecasting strategy for price and dividend assumed to be forever fixed, Samuelson could apply the market model in further iterations, implying that the market's expectation today of next year's price is equal to its expectation today of price and dividend in two years discounted back one year. Samuelson carried out this "forward iteration" into the indefinite future, showing that the market would push today's price to its estimate of what economists call the "collateralized or intrinsic" value: the present discounted value of all dividends that the market expects it will receive over all future periods.

For example, suppose that the market's forecasting behavior implies that a company's dividend grows by 1% per year. In this case, the market's estimate of the company's intrinsic value each year would be a fixed multiple of that year's dividend. If, say, the interest rate were 6% per year, this fixed multiple would be about 20.[8] With a stock's intrinsic value equal to a fixed multiple of the current dividend, the market would expect this value, and thus the stock's price, to grow at the same 1% annual rate at which dividends are expected to grow.

Whether price in the model tends to grow at 1% per year depends on how the dividends unfold over time. As with forecasting, Samuelson ignored all change and assumed that exactly the same conditional probability distribution characterized dividends at every point in time.

But, to derive his martingale result for stock prices, he needed more. He presumed that the market knows the truth about how dividends unfold over time, and thus set the market's forecasting strategy and the actual development of the dividend to be one and the same. With its forecasts of all future dividends correct on average, the market's estimate of a company's intrinsic value deviates from the true value only by a random forecast error that is uncorrelated with available information.

The martingale result that the actual price fluctuates randomly around its fully predetermined time path, and that available information cannot be used to earn a positive return consistently over time, follows immediately. Each year, the market pushes a stock's price to its estimate of the company's intrinsic value. This estimate takes into account all available information (the current dividend) and all fully predetermined change that it "knows" will occur (the tendency for dividends and price to grow at 1% per year). At this price, the market expects that the growth in price and dividend will just cover the cost of capital, and that the expected return will be zero.

The actual change in price each period will differ from the market's expectation of a 1% annual growth rate only because new information – a stochastic shock – arrives and impacts dividends. These shocks are assumed to be random and thus uncorrelated with prior information. As time passes, then, prices fluctuate randomly around their fully predetermined time path, based on 1% annual growth. As such, returns are on average

[8] The constant multiple of dividends in this case equals the ratio of one plus the dividend growth rate and the difference between the interest rate and the dividend growth rate.

zero, and there is no possibility of using available information to earn a higher return consistently over time.

Samuelson's martingale result had a seminal impact on financial economics. It provided a theoretical connection between the assumption that the market, given available information, pushes prices to values at which it expects randomness and the claim that prices would in fact be random and approximate intrinsic values. As Fama would later put it, "it gives testable content to the term 'fully reflect'" (Fama, 1976, p. 134).

Samuelson's Doubts

Samuelson himself was quite dubious of the relevance of his analysis for modeling real-world markets, publishing it more than 10 years after its development. In that publication, he "confess[ed] to having oscillated over the years…between regarding it as trivially obvious (and almost trivially vacuous) and regarding it as remarkably sweeping." He pointed out that "the applicability of the empirical model to economic reality must be kept distinct from the *logical* problem of what is the model's implied content" (Samuelson, 1965b, p. 45, emphasis added). He cautioned his readers against attaching too much importance to his result, emphasizing that

> [i]t does not prove that actual competitive markets work well…or that speculation is a good thing or that randomness of price changes would be a good thing…or that anyone who makes money in speculation…has accomplished something good for society or for anyone but himself. All or none of these may be true, but that would require a different investigation. (Samuelson, 1965b, p. 48)

Samuelson's doubts anticipated many of the difficulties inherent in characterizing economic outcomes with an overarching model. His list of qualms begins with the observation that he has "not here discussed where the basic probability distributions are supposed to come from" (Samuelson, 1965b, p. 48). In obtaining those distributions, Samuelson fully prespecified all change in his model by assuming no change at all: supposedly, participants *never* change the ways that they think about the future, and companies' earnings prospects unfold in strictly routine ways.

It might be reasonable in some time periods to suppose that over the short term, market participants' forecasting strategies, at least in the aggregate, and the process underpinning the causal variables, do not change very much. But, sooner or later, profit-seeking individuals revise their forecasting strategies, and the causal variables move in ways that are not mechanical – and thus cannot be fully prespecified. Despite the presence of random error terms, a single conditional probability distribution is simply unable to capture such change.

Suppose, for example, that a conditional probability distribution relating in a particular way a company's stock price to, say, its earnings in the previous year and the current interest rate did adequately describe the market's forecasting strategy over the recent past. If a sizable number of market participants today decided that the economy's inflation rate was also relevant for forecasting future prices, the original stochastic specification would cease to provide an adequate characterization of the market's forecasting strategy.

One conditional probability distribution is simply unable to capture adequately the forecasting behavior of the market or its participants at every point in time. The problem is that no participant, let alone an economist, can fully foresee how she might revise her forecasting strategy in one year, let alone at longer time horizons. As Karl Popper put it, "no society [or group of people like market participants] can predict scientifically its own future states of knowledge" (Popper, 1957, p. xii).

Although economic models need to allow for different characterizations of forecasting at different points in time, it makes little sense to prespecify fully transitions across specifications to obtain an overarching model of outcomes. Samuelson showed that doing so delivers strong conclusions. But such an approach has no connection to what individuals and markets really do.

Samuelson also questions the market metaphor itself:

> [A]re [the basic probability distributions]… supposed to belong to the market as a whole? And what does that mean? Are they supposed to belong to the "representative individual," and who is he? Are they some defensible or necessitous compromise of divergent expectation patterns? (Samuelson, 1965b, p. 48)

The answer, which Friedrich Hayek (1945) so clearly understood, is that they are in no one's mind. Participants in financial markets can simply not afford to adhere to one forecasting strategy endlessly. Change, and the imperfect knowledge that it both generates and reflects, leads to diversity among participants about how they think about the future. As Hayek put it,

> …the fact [is] that knowledge of the circumstances of which we must make use never exists in concentrated or integrated form but solely as the dispersed bits of incomplete and frequently contradictory knowledge which all the separate individuals possess. (Hayek, 1945, p. 519)

In deriving his martingale result, Samuelson assumed that the market "knows" the truth about how dividends unfold over time. Participants, of course, do not have this knowledge and Samuelson wondered "in whose minds [the basic probability distributions] are *ex ante*" and whether there is "any *ex post* validation" (Samuelson, 1965b, p. 48) of their forecasting strategies.

However, once the assumption that the market is omniscient is dropped, the model no longer implies the martingale property for prices and returns. Consider a simple case:

suppose that the market expects dividends to grow every period by 1%, while the actual growth rate is 2%. Each period, the market would push the stock's price to the value at which, after accounting for a 1% growth rate in dividends, it expected a zero return over the coming period. However, each period, dividends would tend to be higher than expected. Estimates of intrinsic values, and thus prices, would also tend to rise faster than expected. But, with prices and dividends rising faster on average, the stock's return would tend to be positive over time and thus not embody the martingale property. The stock's price would also deviate systematically from the supposed actual intrinsic values.

Of course, if there really was no change, participants would eventually discover the tendency of returns to be positive and attempt to exploit this systematic behavior. However, spotting systematic behavior in prices and returns is much more difficult than suggested by our simple example. The process underpinning a company's earnings prospects and dividends undergoes unforeseen change. The variation in stock prices and returns also depends on how participants revise their forecasting strategies in their efforts to find profitable opportunities. Until such change is modeled, the market model says little about how prices and returns in financial markets unfold over time.

Samuelson himself did not attempt to "pronounce on these interesting questions," either in his first 1965 publication or in his follow-up article on the stock market (Samuelson, 1973). However, Fama and other financial economists thought that they had found the right answers in REH.

Stability, Perfection, and Randomness

Financial economists embraced REH in order not only to model the forecasting of rational individuals, but to do so exactly. The hypothesis seemed to offer the missing justification for the assumptions behind Samuelson's martingale result. By tying EMH to REH, financial economists transformed the statement that asset "prices always 'fully reflect' available information" from a descriptive hypothesis about markets into a theory of asset markets with a central implication: markets are stable in that they set prices to fluctuate randomly around true intrinsic values. Such stability, in turn, implies that markets are near-perfect allocators of society's scarce capital, and that all attempts to use available information to earn above-average returns consistently over time are doomed to failure.

In "rational markets," individuals know the true processes driving dividends and all other causal variables, and thus forecast them correctly on average. If change occurs in these processes, they can fully specify it ahead of time up to a random error. They also know the overarching model that connects future prices to the causal variables, and thus never have to revise their forecasting strategy. And, because they know the truth, they can forecast prices correctly on average, too.

With all of these fanciful assumptions, price movements in the model occur only because of new information. When new information becomes available on the causal variables, all "rational" investors properly interpret it in estimating a stock's intrinsic value. For an instant, if investors' estimate of this value were to rise, for example, they would all wager large amounts of capital on the expectation that the stock's price would rise to equal its new estimated intrinsic value. Investors' attempts to speculate would immediately push up the stock's price to the new estimate of its intrinsic value.

New information arrives in random fashion. Over time, then, the REH-based market model predicts that stock prices (and other asset prices) fluctuate randomly around their true intrinsic values.

The stability of rational markets has two implications. First, prices on average are correctly connected to companies' short- and long-term earnings capacity. They reveal, therefore, which companies have the best chance of using society's capital productively. As a company's future prospects improve, its stock price rises and enables it to raise greater capital through issuance of new shares. In REH World, then, the price signals generated in financial markets enable society to allocate capital nearly perfectly.

Second, the stability of rational markets implies that available information is always properly reflected in prices. Returns, then, unfold randomly over time, so that available information cannot be used to earn above-average returns consistently.

Fama recognized that tying EMH to REH does not provide "a completely accurate view of the world…but formal tests require formal models" (Fama, 1976, p. 167). By the late 1970's, the hypothesis that markets are efficient had become synonymous with the conjecture that "asset prices [were] being determined by the interaction of rational agents." (LeRoy, 1989, p. 1584).

As with the confusion between REH and how profit-seeking individuals actually forecast in financial markets, the implication that "rational markets" set prices to fluctuate randomly around true intrinsic values has been conflated with the claim that real-world markets are stable, allocate capital nearly perfectly, and thus cannot be "beaten" consistently.

A House of Cards

Proponents of the efficient markets hypothesis often view it simply as implying that profit-seeking participants will quickly spot systematic behavior in prices. In attempting to exploit such behavior, they will cause prices to fluctuate randomly around intrinsic values.

Prior to the REH revolution, economists argued informally for this claim. Milton Friedman, for example, believed that speculation in currency markets would work to stabilize prices around fundamental values, because otherwise "speculators [would] lose money…on the average [and] sell when the currency is low in price and buy when it is high" (Friedman, 1953, p. 175).

Fama believed that in an efficient market "the actual price of a security will be a good estimate of its intrinsic value" He did point out that

> intrinsic values can themselves change across time…[because of] such things as the success of a current research and development project, a change in management, a tariff imposed on the industry's product by a foreign country, an increase in individual production or any other *actual or anticipated* change in a factor which is likely to affect a company's prospects. (Fama, 1965, p. 56).

Consequently, Fama acknowledged that "in an uncertain world the intrinsic value of a security can never be determined exactly." Indeed, even if one could estimate with a reasonable degree of confidence a company's earnings in the near term, coming up with estimates, let alone a probability distribution, that would adequately describe these prospects 10 or 20 years out is beyond the reach of anyone. Once one acknowledges change and imperfect knowledge,

> there is always room for disagreement among market participants concerning just what the intrinsic value of an individual security is, and such disagreement will give rise to discrepancies between actual prices and intrinsic values. (Fama, 1965, 56).

Nonetheless, Fama believed that if such discrepancies were "systematic rather than random, participants…[would] attempt to take advantage of this knowledge…[and] neutralize [it] in price series" (Fama, 1965, p. 56).

By Fama's own account, there is no "true" intrinsic value that "competition" among "intelligent participants" could establish. Thus, even if all participants base their trading decisions on estimates of intrinsic values, the market price will reflect some weighted average of these estimates. Participants do indeed speculate based on their own thinking and views, but no one can "determine intrinsic values exactly." The idea that individuals act as if they can arbitrage away "discrepancies between actual prices and intrinsic values," simply has no meaning.

Acknowledging change and ever-imperfect knowledge, as Fama does, implies that financial markets are imperfect assessors of asset values. As such, EMH's claim that markets are stable and get prices right on average does not have any rationale. And, without such stability, EMH itself becomes unsustainable, because there is no longer any basis for asserting that markets are near-perfect allocators of capital and that it is impossible to use available information to earn above-average returns consistently.

These strong claims about markets stand and fall with REH as well. Financial economists understand that "strictly speaking," these claims require that "all the individual participants in the market (a) have the same information and (b) agree on its implications for the joint distribution of future prices…[and they] must in turn make [correct] assessments about the likelihoods of different states of the world" (Fama, 1976, p. 168).

But, with no one possessing an overarching view of intrinsic values, and with REH having no connection to the decision-making of profit-seeking market participants, financial economists are left exactly where they were prior to the REH revolution: clinging to informal arguments without any rationale, let alone scientific underpinning, for EMH's strong claims about markets' stability and perfection.

Fama argues that "what we really have in mind…is a market where there is disagreement among investors but where the force of common judgments is sufficient to produce an orderly adjustment of prices to new information" (Fama, 1976, p. 168). But what, exactly, "common judgments" and "orderly adjustment" are supposed to mean, and how such phenomena might lead to stability around mythical intrinsic values, is left unanswered.

Best-Tested Hypothesis in All the Social Sciences?

Although financial economists recognize that REH-based EMH is not "a completely accurate view of the world," they point to an enormous amount of statistical research that they believe provides strong empirical support for EMH's main claims about asset prices and markets. The primary focus of this research is to test the prediction that price movements are random, in the sense that they are uncorrelated with – i.e., unrelated to – available information. Under REH, such randomness would imply that prices are, on average, equal to true intrinsic values.[9] Consequently, much of the empirical research involves searching for correlations between future prices and current and past prices or values of fundamental variables, such as price-earnings ratios, inflation, and interest rates. [10]

The Semblance of Short-Term Randomness

When researchers first started to examine short-term – daily, weekly, or monthly – price movements, they usually reported no discernable correlations in the data. Later studies, which rely on more powerful test procedures, find evidence of non-randomness. However, the correlations generally seem to be weak, suggesting that traders could not use them to beat the market consistently.[11] Studies that examine the profitability of mechanical trading rules based on past price trends support this view on the whole: the rules are generally unable to generate profits systematically. Researchers also find that

[9] REH presumes that, over time, the market's estimates of intrinsic values differ from actual prices by a random error.

[10] For a review articles, see Fama (1970, 1991).

[11] Exceptions include Jegadeesh and Titman (1993) and Lo and MacKinlay (1999). Because of change in the process driving prices, we would expect that the correlations found in these studies to be temporally unstable, indicating that they could not be used reliably to earn excess returns on average.

professional managers of mutual funds are consistently unable as a group to generate returns higher than those of passive funds based on a broad index.

Many financial economists conclude from this evidence that "there is no other proposition in economics which has more solid empirical evidence supporting it than the Efficient Markets Hypothesis" (Jensen, 1978, p. ??). Indeed, the University of Chicago's John Cochrane has recently claimed that EMH is "probably the best-tested proposition in all the social sciences" (Cochrane, 2009, p. 3).

Almost all of the empirical evidence, however, presumes that any correlations that might be found in the data are stable over time. Consequently, researchers estimate models with unchanging parameters over long stretches of time, in some cases involving centuries.

But new technologies and other non-routine activities, as well as revisions in participants' forecasting strategies, lead to shifts in the processes driving dividends and prices that, as we saw, cannot be captured with one probability distribution. This implies that the probability models that empirical researchers fit to the data are unstable over time. Correlations that might have been found in the data over some past stretch of time eventually change or disappear and are replaced with new relationships between price changes and informational variables.

Looking for stable correlations between asset prices and variables in any information set, therefore, merely draws data from different subsamples of the data, each involving distinct correlations. Doing so is likely to mask any correlations that might exist in the data during the stretches of time that occur between significant shifts in the causal process.

Nowhere is this more apparent than in currency markets. International macroeconomists routinely estimate one unchanging exchange-rate relationship in samples that run longer than two or three decades. Their results suggest that "exchange rates are moved largely by factors other than the obvious, observable, macroeconomic fundamentals" (Dornbusch and Frankel, 1988, p.16). However, once we allow for a changing relationship, we find not only that fundamental variables matter for currency movements, but that they matter in different ways during different time periods (Frydman and Goldberg, 2007).[12]

Temporal instability is not difficult to find in other asset markets. For example, Fama and MacBeth (1973) and others report favorable estimates of the Capital Asset Pricing Model (CAPM), which is widely used in academia and industry, over a sample that runs until 1965. However, when the sample was updated to include the 1970's and 1980's, and additional variables were added to the analysis, the results implied that the CAPM was "atrocious as an empirical model" (Fama, 1992, p. D1). In commenting on the temporal instability of correlations in asset-price data in an interview with *Institutional Investor*, William Sharpe quipped that "[i]t's almost true that if you don't like an empirical result,

[12] See also Goldberg and Frydman (1996, 2001) and Rogoff and Stavrakeva (2008), which also report clear evidence of a temporally unstable exchange-rate relationship.

if you can wait until somebody uses a different [time] period…you'll get a different answer" (Wallace, 1980, p. 24).

EMH's claim that asset prices fluctuate randomly, leaving no room for anyone to use available information to earn above-average returns consistently, is difficult to reconcile with the many participants who *do* comb over company and other data, and with the huge information and stock-analysis industry that has developed to help them. For proponents of EMH, such fundamental analysis is a waste of time and resources; individuals should instead invest in a well-diversified portfolio. They readily admit that some participants who do engage in fundamental analysis have been able to earn above-average returns consistently – Warren Buffet and George Soros immediately come to mind – but claim that such success is due to sheer luck. As one leading EMH proponent put it, "if I survey a field of untalented analysts all of whom are…flipping coins, I expect to see some…who have tossed ten heads in a row" (Jensen, 1995, p. 317).

Of course, using data in any fixed way – for example, by mechanically relying on trading rules that extrapolate past prices trends – is, as researchers have found, doomed to failure. But, as the process driving prices and dividends undergoes non-routine change, it alters the correlations in the data, which for a time opens up new profit opportunities. Those who do the painstaking research and have the skill and flexibility to revise their thinking in ways that enable them to spot the profit opportunities reap enormous gains.

Warren Buffet rejected the coin-flipping story as an explanation of his success. As he put it, "if 225 million orangutans had engaged in [stock picking]…the results would be much the same [as flipping a coin]," but too many of the successful orangutans, "came from the 'same zoo'" (Lowenstein, 1995, p.317). Indeed, there is something odd about a theory that is based on the idea that individuals are profit-seeking, but supposes that the masses of participants who rely on fundamental analysis are merely wasting their time.

To be sure, Buffet would not claim that the mere fact of using fundamental analysis necessarily implies an ability to beat the market. A company's prospects evolve over time in ways that become more difficult to assess as one looks farther into the future. Movements of short-term fundamentals – earnings, industry trends, or overall economic activity – as well as longer-term factors such as news about "a current research and development project," provide clues to potential changes in these prospects. As investors alter their understandings and assessments about the future, they influence the process driving prices. Correctly anticipating such change is no easy task.

Ultimately, good forecasting is much like good entrepreneurship: it involves one's own "personal" knowledge, intuition, and hard work to spot profit opportunities. The insight that such endeavors cannot be preprogrammed lay behind Hayek's argument that central planning is impossible *in principle*. We would thus not expect that all or even most mutual fund managers would be able to anticipate correctly future changes in the market or economy consistently over time, which is exactly what the literature has found. But the fact that it is possible, and that some individuals do succeed, provides powerful incentives to look for and attempt to speculate on change.

Changing Patterns at Longer Time Horizons

Empirical researchers have uncovered evidence of a greater prevalence of non-random fluctuations in asset prices at longer time horizons. Here, too, the observed patterns in the data are sensitive to the time period studied.

Fama and French (1988) report that industry and market stock portfolios with positive returns over the preceding 3-5 years tend to produce negative returns over the following 3-5 years, and *vice versa*.[13] Campbell and Shiller (1988) find that returns on the *Standard and Poors* (S&P) *500* basket of stocks over horizons of 3-10 years are related to standard valuation measures, such as the price-dividend and price-earnings ratios: when stock prices relative to earnings or dividends are high compared to historical averages, real returns tend to be below average over the subsequent 3-10 years.[14]

These empirical results suggest that longer-term returns are correlated with available information, thus providing evidence against EMH's claim that "prices always fully reflect available information." However, one should not conclude that making money in the stock market is as easy as buying portfolios with below-average returns or low valuation ratios. As with short-term fluctuations, the observed patterns in longer-term data are not stable over time. Fama and French (1988) find that when they delete the first part of their sample in the analysis, the negative relationship in returns data becomes much weaker; they cannot reject the hypothesis that it disappears altogether.

Campbell and Shiller's (1988) results are more stable, but they also do not provide a sure recipe for beating the market.[15] For example, the price-earnings ratio on the S&P 500 basket of stocks in January 1997 stood at a record-high 28. Campbell and Shiller (1998) report that at this level, their analysis implied the prediction of a -40% real return on holding the S&P 500 stocks over the next 10 years. Although stock prices fell considerably from 2000-2003, they were back up by January 2007: over the 10-year period an investor would have earned a real annual return of 4.6%. Watching P/E ratios may be useful, but timing when to buy and sell is essential. As with short time horizons, one must rely on one's own understanding and flexibility to spot profit opportunities.

Although the patterns in longer-term data cannot be used in mechanical ways, they are a reflection of the tendency for asset prices to undergo persistent swings of unpredictable duration and magnitude away from and toward estimates of commonly used benchmark levels. EMH's claim that financial markets get prices right is difficult to reconcile with this long-swings behavior.

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[13] De Bondt and Thaler (1985) showed much the same result.

[14] Fama and French (1988) also find similar results.

[15] Shiller (1984) finds the negative relationship between high valuation ratios and subsequent returns across different subperiods of the data.

Does Risk or Irrationality Account for Asset-Price Swings?

The tendency to undergo persistent swings away from and toward estimates of benchmark levels is arguably the most striking feature of asset prices that are determined freely by the forces of supply and demand. Figures 1 and 2 provide just two examples. They plot the price of the S&P 500 relative to a trailing 10-year average of earnings and the British pound-US dollar exchange rate, respectively, along with estimates of a typical benchmark level.[16]

The findings that longer-term returns in asset markets are negatively related to departures from common benchmark values indicate that these values act as anchors of sorts for asset-price swings. Eventually, price swings away from benchmark levels are followed by sustained movements back toward those levels.

But how long a price swing in either direction will last is very difficult to predict. The swings in figures 1 and 3 are of uneven in duration and magnitude. For example, in the case of the pound-dollar exchange rate, the upswing above the benchmark in the mid-1970's lasted a year and a half, and involved an overvaluation of roughly 30%, whereas the upswing in the first half of the 1980's lasted nearly four years and involved an overvaluation of almost 60%.

Is it Risk?

Many financial economists would regard figures 1 and 2 as indicating stability in asset markets: prices fluctuate randomly around intrinsic values, which themselves undergo long swings. According to this view, swings in intrinsic values occur because of participants' changing attitudes toward risk.

According to the REH-based market model, a stock's price today equals the market's estimate of its intrinsic value – the expectation of all future dividends discounted back to today. As individuals lower their estimates of the riskiness of holding stock over different time horizons, they discount future values less, and so raise their estimates of intrinsic values. In effect, they are more willing to hold stocks relative to safer assets, such as government securities, given their forecasts of future returns. Economists refer to such behavior as a fall in the market's risk premium. As the risk premium falls and estimates of intrinsic values rise, market participants bid up prices. And of course, prices would fall if the market's premium were to rise.

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[16] The monthly P/E ratio in figure 1 is based on a 10-year trailing average of earnings and makes use of data from Shiller (2000), which is updated on his website. The horizontal line in the figure is the historical average of the P/E ratio over the 129 years of the sample, which equals 16.4. The monthly pound-dollar rate in figure 2 is plotted along with its purchasing power parity (PPP) value, which implies that a dollar spent in either New York or London will have the same purchasing power. PPP exchange rates are widely used in academia and by policy makers and market participants as a simple way to determine whether exchange rates are overvalued or undervalued. There is much research showing that exchange-rate swings revolve around PPP levels in many currency markets. For more details on how the PPP exchange rate is calculated in figure 2, see Frydman and Goldberg (2007, chapter 7).

In attempting to account for the price swings in figure 1 with the market's risk premium, financial economists appeal to empirical studies that examine the co-movements of the premium and P/E ratio with overall economic activity. These studies suggest that when the economy expands, risk premia fall and stock prices rise relative to dividends. Such behavior can be rationalized in the context of an REH-based model with risk-averse individuals: as the economy improves and individuals' incomes rise, they become more willing to bear risk.[17]

However, since Mehra and Prescott (1985), economists have found that REH-based risk-premium models are grossly inconsistent with the time-series behavior of the market's premium. Even if cyclical variation in attitudes toward risk is incorporated into these models, they simply are unable to account for the basic features of the data in equity and other asset markets. As two leading financial economists put it, "the traditional [rational] framework is appealingly simple…[but] after years of effort, it has become clear that basic facts about the aggregate stock market, the cross-section of average returns and individual trading behavior are not easily understood in this framework" (Barberis and Thaler, 2003, p. 1053).

Another problem with the risk-premium explanation of asset-price swings is that it is based on estimating models that presume stable patterns in the data over samples of up to six decades. Over such long stretches of time, however, the relationships describing how participants forecast risk are bound to change. As with the empirical studies examining shorter- and longer-term returns, imposing stability on a statistical model merely mixes data from different time periods with different relationships and is likely to mask the underlying patterns in the data.

Zheng (2009) provides empirical evidence suggesting that this is the case. She finds instability in the relationship driving the premium in the stock market using monthly data. Once she allows for this instability, she obtains results that differ markedly from those of earlier studies. Figure 3 is taken from her study, which focuses on the period from mid-1997 to late 2008. The figure suggests that the estimated market premium tends to rise and fall along with the gap between the P/E ratio and its historical average.[18]

A positive relationship involving the market premium and the gap between the asset price and estimates of its benchmark level is also found in Frydman and Goldberg (2003, 2007), Cavusoglu, Frydman and Goldberg (2009), and Stillwagon (2010), which together examine 14 different currency markets for both developed and developing countries. Figure 4 is taken from Frydman and Goldberg (2007), which plots the monthly market

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[17] See Campbell (2000) and references therein.

[18] The market premium is proxied by regressing actual future excess returns on interest rates and Shiller's (2001) smoothed P/E ratio. The gap variable is based on deviations of this P/E ratio from its historical average of 16.4.

premium along with the gap between the pound-dollar exchange rate and PPP. The tendency for the currency premium to rise and fall with the gap from PPP is striking.[19]

Figure 1
Premium and the Gap: 1997-2007

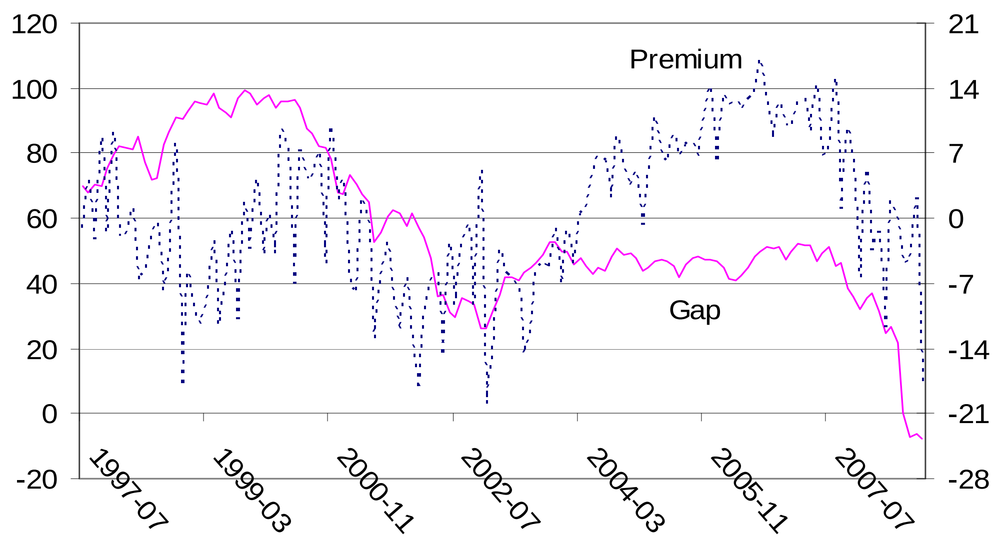
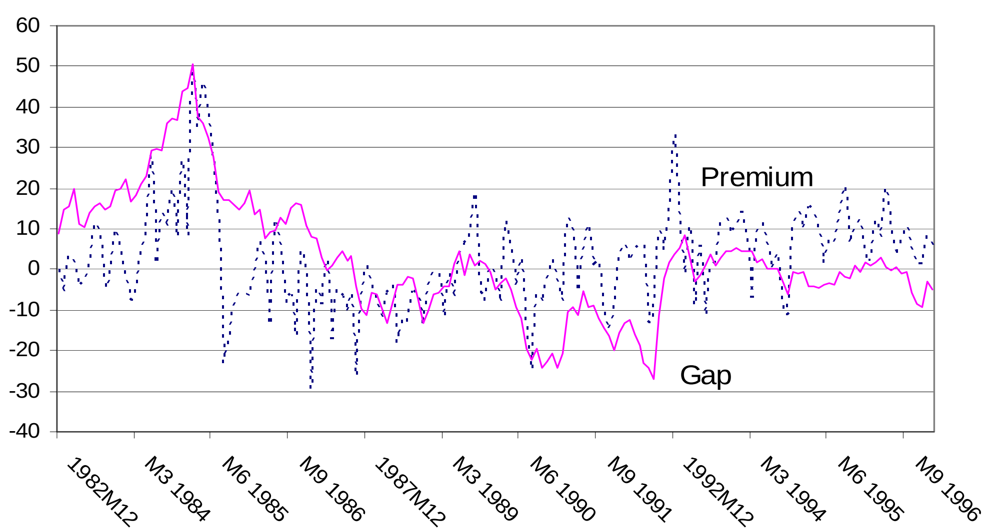


Figure 2
Excess Returns and the Gap: The BP/$ Market



[19] The proxy for the market premium is based on survey data from Money Market Services International, which conducted weekly surveys of market participants' one-month-ahead exchange-rate forecasts. For more details, see Frydman and Goldberg (2007, chapter 12).

Imperfect Knowledge and Risk

These empirical results underpin an alternative way of characterizing how participants assess the riskiness of speculative positions, one that builds on Keynes' (1936) insight that perceptions of benchmark levels serve as anchors for asset-price swings and thus for forecasting market outcomes. In discussing the forecasting problem involved in holding bonds over money, he emphasized that

> what matters is not the absolute level of [the interest rate] but the degree of its divergence from what is considered a fairly safe level…Unless reasons are believed to exist why future experience will be very different from past experience, a…rate of interest [much lower than the safe rate], leaves more to fear than to hope and offers, at the same time, a running yield which is only sufficient to offset a very small measure of fear [of capital loss] (Keynes, 1936, pp. 201-202).

Keynes's discussion of the importance of benchmark levels suggests that what is important in assessing the riskiness of speculative positions are not standard measures of volatility, but the gap between an asset price and perceptions of its benchmark level. Goldberg and Frydman (2007) model this idea with "Imperfect Knowledge Economics" (IKE) to portray forecasting behavior, and with "endogenous prospect theory" to characterize individuals' preferences.[20] According to the model, asset-price swings lead bulls and bears to revise their premia in opposite directions. For example, as an asset price rises farther above perceptions of the benchmark, bulls become more concerned about an eventual reversal in price and so raise their forecasts of the potential losses and the premia they need to take long positions. Bears, for their part, become more confident about a reversal, lowering their forecasts of the potential losses from short positions and thus their premia. In the aggregate, the premium moves positively with the gap between the asset price and perceptions of the benchmark level.

Beyond accounting for the empirical evidence, the model implies a role for the market's premium that is totally different from the one used in defense of EMH. Instead of producing price swings, movements of the market premium limit their duration and magnitude. As trends in fundamental variables and revisions of forecasting strategies lead bulls, say, to increase their forecasts of the next period's price and to bid up prices, it also leads them to raise their assessments of the riskiness of holding long positions. The perceptions of increased risk, as captured by the higher premiums, dampen bulls' willingness to increase their long positions, thereby limiting the rise in the asset price. Such behavior opens up a new channel and set of measures by which policy makers can counter excessive price swings.

[20] Endogenous prospect theory provides a way to represent the experimental findings of Kahneman and Tversky (1979) and others in a world of imperfect knowledge.

Is it Irrationality?

The inability of REH models to account for asset-price swings and risk has not eroded REH's special role as the cornerstone of rationality in finance and macroeconomics, and the belief that unimpeded markets composed of "rational" individuals would set prices to fluctuate randomly around "true" intrinsic values. This belief has led to the view that the asset-price swings in figures 1 and 2 are "bubbles" that arise *only* because market participants fall prey to irrationalities, herding instincts, or reliance on technical rules.

According to one important class of bubble models, market participants who join a bubble are typically assumed to forecast according to prespecified "chartist rules" that merely extrapolate past price trends into the future. To capture reversals of swings, the models rely on an external shock, or a predetermined rule, that eventually leads market participants to begin abandoning the chartist rules in favor of the "fundamental rule."

Such "irrational" bubbles are unrelated to fundamentals and serve no useful social purpose. If policy officials could eliminate bubbles, the market would return to setting asset prices nearly perfectly. The bubble model suggests a relatively straightforward way for policy officials to accomplish this. All they need do is start a short-term price trend back toward the "true" fundamental value. This would lead both chartists and fundamentalists to respond mechanically to the new trend and bid the price back to this value. But this implication is contradicted by experience and research.[21]
One well-known example of the difficulty that policy officials face in engendering sustained counter-movements in asset prices is given by former Fed chairman Alan Greenspan's attempt to warn US stock markets on December 5, 1996, of "irrational exuberance." Initially, this pronouncement led to a sharp drop in equity prices. But if the bubble models really captured the mechanism driving equity values, this change in trend would have been more than sufficient to trigger a sustained reversal. Instead, US stock prices resumed their long upward climb, which lasted another four years.

Contingent Market Hypothesis

By ignoring non-routine change and presuming that REH provides *the* standard of rationality, contemporary economic theory implies two extreme views of markets. They either are dominated by the decisions of "rational" or "irrational" participants, and thus are nearly perfect at setting asset prices at their intrinsic values, or they allocate resources on the basis of prices that have nearly no connection to the prospects of projects and companies.

[21] For example, research on the efficacy of official intervention in currency markets also shows that policy officials face difficulty in influencing asset prices in any sustained way. Researchers generally find that although official intervention is effective in the near term at moving exchange rates in the desired direction, it is usually not capable of generating a sustained counter-movement. See, for example, Dominguez and Frankel (1993) and Fatum and Hutchison (2003, 2006).

However, the reason that markets play an essential role in modern economies is precisely that change is "contingent" – it is "affected by unforeseen causes or conditions"[22] – and knowledge is imperfect, giving rise to diverse views about the future. Jettisoning fully predetermined models and REH leads to an intermediate view of the relative roles of markets and the state.

Participants use available information, ranging from news about earnings to central bank announcements, about a wide range of fundamental factors in forecasting the prospects of innovative projects and companies and other economic outcomes. Financial markets translate individuals' myriad distinct bundles of knowledge and intuitions about how to interpret this information into prices of equities and other financial claims. Participants revise their thinking about the future in ways that they themselves cannot fully foresee as they look for non-routine changes in technology, institutions, economic policies, and other facets of the social context. Such contingencies alter the process driving prices. Price changes reflect myriad views about the impact of contingencies, and provide a better assessment of the changing values of alternative investment projects than estimates of those values that any individual could produce on her own.

This alternative view of markets leads us to propose the Contingent Market Hypothesis (CMH):

- The causal process underpinning price movements depends on available information, which includes observations concerning fundamental factors specific to each market.
- This process cannot be adequately characterized (according to whatever criteria are considered acceptable) by an overarching model, defined as a rule that exactly relates these outcomes to available information up to a fully predetermined random error at all time periods, past, present, and future.

In the context of asset markets, CMH has four implications. First, given that there is no overarching model, significant changes in the process driving asset prices occur at moments and in ways that cannot be fully foreseen. Such contingent change implies that statistical estimates of fully predetermined models of asset prices vary in significant ways as the time period examined is changed. We have already seen such instability in the context of the CAPM and exchange-rate models.

Second, because no overarching model of asset prices is adequate, a fixed trading rule that generates excess returns on average over some stretch of time, net of the cost of capital and compensation for risk, will eventually cease to do so. [23] The evidence for this claim is overwhelming.

Third, without an overarching rule, there are no objective criteria to pinpoint the time or predict the way in which the process driving market outcomes change. This creates profit

[22] *Webster's Unabridged Dictionary* (20??).
[23] "Excess return" is defined as a return greater than what could be earned by buying and holding the market.

opportunities for those who possess the skill and intuition to gather and use available information to spot or anticipate shorter- or longer-term change – and explains the enormous time and resources that market participants and companies devote to collecting information and interpreting how it might affect future outcomes. It also explains why so many market participants ignore EMH's strong implication that *everyone* should passively invest in index funds, which hold diversified portfolios.

Finally, given non-routine change and the imperfect knowledge that it engenders, the normal state of financial markets is one in which prices undergo swings of uneven duration and magnitude away from and toward estimates of commonly used benchmark levels. Our IKE model of asset prices implies that price swings may occur even if *all* market participants forecast future prospects *solely* on the basis of fundamental factors. Indeed, the inherent imperfection of knowledge that Knight, Keynes, and Hayek so clearly recognized is crucial to understanding that financial markets are hard-wired to undergo price swings.

Financial Markets and the State

Economists and policy makers generally agree that excessive price swings in asset values can be costly, for they can lead to misallocation of financial capital and painful shifts in consumption patterns, trigger or prolong real economic downturns, and expose consumers and businesses to greater financial risks. Many have pointed to excessive upswings in house and equity prices as key factors behind the current financial crisis and its devastating effects on the real economy.

For proponents of EMH, such fluctuations represent movements in intrinsic values. Aside from ensuring transparency and mitigating problems such as distorted incentives (for example, on the part of ratings agencies) and weak competition, the state should leave financial markets unfettered.

By contrast, bubble models imply that price swings in financial markets are unrelated to the movements of fundamentals and, as a result, serve no useful social function. Accordingly, these models place no limits on the scope and intrusiveness of state intervention in financial markets, which may go well beyond ensuring transparency, adequate competition, and appropriate incentives. Even if very strong measures were required to extinguish asset-price swings, the bubble models imply that implementing them as quickly as possible would unambiguously improve long-term capital allocation.

For various reasons, officials have not adopted such extreme policies. However, the belief that stability is the most important goal of policy, and that the state should thus respond to fluctuations as soon as they arise, has guided countercyclical policies of all kinds for decades, and continues to shape the policy debate.

Fully predetermined models seem to provide a scientific underpinning for such thinking. But these models ignore the possibility that swings in asset prices are *an inherent* part of how markets function in allocating capital. Although some individuals may fall prey to emotions or rely on technical rules, swings arise from market participants' necessarily imperfect knowledge about how asset prices will unfold over time.

Our IKE model of asset prices suggests that efforts by the state to counter fluctuations as soon as they arise are likely to dampen the volume of innovative activities, thereby reducing society's dynamism and growth potential.

To illustrate this point, consider the so-called "statistical provisioning scheme" introduced by the Bank of Spain in July 2000 to gear the capital requirements of banks to some average, presumably stable level. Because such schemes aim to reduce the volume of bank loans throughout the expansion, they are likely to reduce the volume of loans issued in the early part of the expansion, which is driven, at least in part, by the introduction of new products and processes.

Clearly, fully predetermined models cannot shed light on the question of how to reconcile regulatory reform of the financial system with the key feature of capitalist economies – their superior ability to spur innovation and growth. By contrast, if economists were to acknowledge their own and market participants' ever-imperfect knowledge, we would no longer be stuck with two polar extremes concerning the relative roles of the market and the state.

Imperfect knowledge economics suggests such an intermediate position, which would replace countercyclical policies with a variety of excess-dampening measures. So long as asset-price swings remain within reasonable bounds, the state should limit its involvement to setting the rules of the game and enforcing simple, fixed capital requirements, ensuring transparency, and eliminating other market failures.

But, price swings sometimes become excessive. Even acknowledging that policy officials must cope with ever-imperfect knowledge, they can implement measures – such as guidance ranges for asset prices and changes in capital and margin requirements that depend on whether prices are too high or too low – to dampen excessive swings.

Although these excess-dampening measures are likely to be necessary to avoid excessive swings and crisis, they have been overlooked in policy discussions. One of the reasons might be that the vast majority of contemporary macroeconomic models imply one overarching forecasting strategy and therefore are unsuitable for crafting policies that target bulls and bears differently. For example, if one wanted to dampen an excessive upswing, one could not use these models to formulate measures that discourage the bulls and encourage the bears,

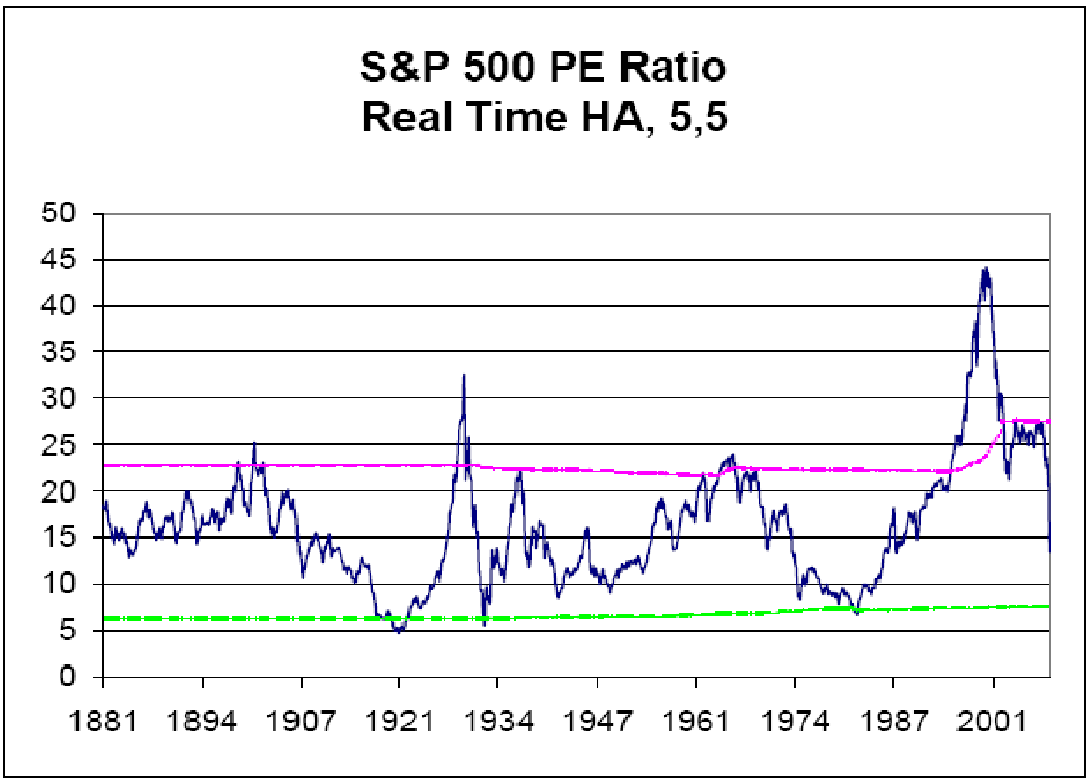
A general lesson here is that widely discussed measures, such a Tobin tax on all financial transactions and wholesale restrictions on short-selling, that do not differentiate between bulls and bears and whether the long swing is excessive from above or below, could actually lead to greater instability, not less.

Reliance on excess-dampening measures promises to avoid the dampening effects of countercyclical policies on innovation and growth, and yet reduce the economic and social costs of excessive swings. But their merits and implementation ultimately depend on whether policy officials can ascertain, with some degree of confidence, that levels of asset prices and/or real activity have become excessively high or low.

Of course, at any point in time, no one knows the exact longer-term prospects of projects and companies. This implies that the range of non-excessive values must be wide. Moreover, any excess-dampening measures that are triggered when asset prices begin trending beyond the policymakers' guidance range should be introduced only gradually.

Historical experience is a good place to start to assess the guidance ranges for asset classes. To provide one example of how this could be done, consider the US stock market. As Figure 3 shows, in the normal course of the market's functioning, equity prices undergo long swings, which sometimes become excessive.

FIGURE 3: GUIDANCE RANGE, 5% THRESHOLD HISTORICAL VALUES AT EACH POINT IN TIME



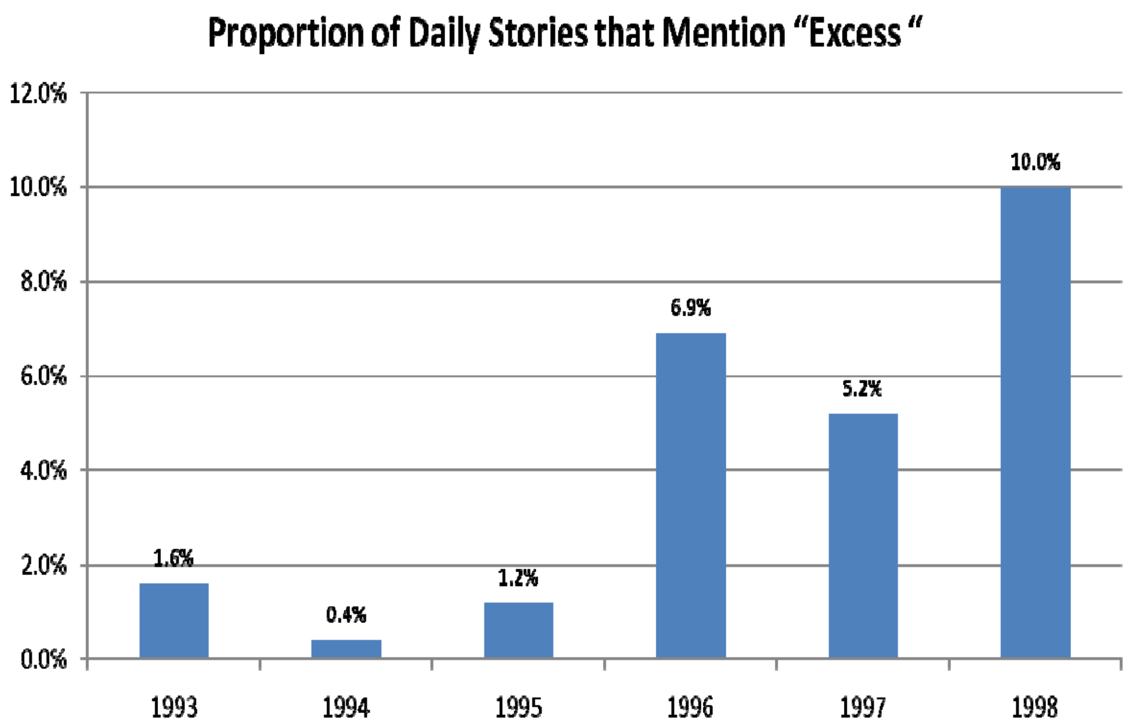
Initialization of the computation of the guidance range: the average PE ratio (monthly data) based on the first 50 years (1881-1931). Starting with year 51 (1932), the upper and lower points of range are selected as the top and bottom 5% PE ratios in "real-time," respectively, leaving the 90% "guidance range" of non-excessive values.

The graph shows that when equity prices rise far above or fall well below historical benchmark levels, the market itself judges them excessive and eventually self-corrects.

But this can happen so late as to lead to a sharp reversal that imposes enormous costs to the financial system and the real economy.

For example, by the end of 1996, the PE ratio had reached levels that the market had seen only 5% of the time during the previous 100 years. The reporting contained in Bloomberg Inc. end-of-day news stories reveals that market participants and policymakers began to wonder whether the upswing in equity prices had entered an excessive phase. Figure 4 is taken from Mangee (2010) and shows that statements of concern about excessive fluctuations, like "many investors are uncomfortable with the market's price-to-earnings ration which is near the high end of its historical range" (Bloomberg Inc, July 7, 1997), were mentioned with greater frequency as the upswing in stock prices proceeded.

FIGURE 4: MARKET PARTICIPANTS' RECOGNITION THAT THE UPSWING IN EQUITY PRICES HAD BECOME EXCESSIVE IN 1996



SOURCE: Daily market-wrap stories reported by Bloomberg, inc.

To be sure, the market did self-correct, but only four years later, in 2000. Had there been a policy framework that put officials on guard for excess and equipped them with tools to dampen it, the excessive swing likely would have ended much earlier.

Of course, historically based guidance ranges are only a rough guide. The future does not unfold from the past in a mechanical way. Modern economies change in new ways all the time, and there are occasional periods in which change is particularly comprehensive. As a result, policymakers need some discretion to adjust the range, though they should be required to explain such adjustments publicly.

Aiming to dampen excessive swings is quite different from the attempts of central banks to confine asset prices to a pre-specified target zone. Given the enormous size of daily volumes in asset markets, such attempts almost always fail. Instead, changes in capital requirements and central banks' regular announcements of a range of benchmark values aim to increase the risk of capital losses from betting on greater departures into the excessive range.

From a broader perspective, the regulatory policies proposed in Frydman and Goldberg (2009, 2010) acknowledge that, within limits, markets are far superior than the state in allocating capital. However, by arguing that active, but gradual state intervention is necessary to guard against the social and economic costs of occasionally excessive swings, IKE's excess-dampening approach aims to restore a much-needed balance between what should largely be left to the markets and what only the state and collective action can accomplish.

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The Efficient Markets Hypothesis is an investment theory primarily derived from concepts attributed to Eugene Fama's research work as detailed in his 1970.Â Efficient Markets Hypothesis. "It is not possible to outperform the market by skill alone". Home â€º Resources â€º Knowledge â€º Trading & Investing â€º Efficient Markets Hypothesis. What is the Efficient Markets Hypothesis? The Efficient Markets Hypothesis (EMH) is an investment theory primarily derived from concepts attributed to Eugene Famaâ€™s research as detailed in his 1970 book, â€œEfficient Capital Markets: A Review of Theory and Empirical Work.â€ Efficient Market Hypothesis. Market efficiency is defined for the foreign exchange market, meaning that spot and forward exchange rates quickly adjust to any new information. From: International Money and Finance (Ninth Edition), 2017. Related termsÂ If the capital markets are weak form efficient, the prices fully reflect all historical information about the stock. In that case by the time the information is public, the price adjustment would have already take place and technical trading systems based on past trading data would have no value at all.Â However, in reality it has been observed that investors may exhibit apparently irrational and predictable biases mainly attributable to psychological factors (Odean, 1998; Barber and Odean, 2000). The efficient markets hypothesis (EMH) states that all information should be incorporated into prices, such that any return predictability has to be about risk premia. Nowhere does the EMH state that all firms should have the same price or the same price multiple, such as B/P. In fact, the use of profitability to enhance value strategies can be consistent with an efficient or inefficient markets view of the world. By cleaning up valuation ratios, that is identifying which firms have low (high) B/P because they are more (less) profitable rather than less (more) risky, profitability helps identi A. the markets cannot be allocationally efficient. B. systematic risk does not matter. C. no type of analysis can be used to generate abnormal returns. D. returns must follow a random walk. A. the markets cannot be allocationally efficient. Which of the following beliefs would not preclude charting as a method of portfolio management? A. The market is strong-form efficient. B. The market is semistrong-form efficient. C. The market is weak-form efficient.Â The semistrong form of the efficient market hypothesis asserts that stock prices: a. Fully reflect all historical price information b. Fully reflect all publicly available information. c. Fully reflect all relevant information including insider information. d. May be predictable. b. Fully reflect all publicly available information.