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# The Fallibility of the Efficient Market Theory: A New Paradigm

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*The efficient market theory has failed to explain the market behavior and asset pricing of recent years. A new model that incorporates the principal-agent problem and addresses the dilemma of asymmetric information explains what has previously been unexplainable.*

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**M**ost branches of science have special and limiting cases. In physics, there is zero gravity and a perfect vacuum; in engineering, zero friction. These cases provide benchmarks from which to judge what happens when these conditions are relaxed. But it would be useless to build machines or set up experiments by relying on an understanding of what happens only in these special states. The richness and value of a scientific theory depend on the knowledge of how outcomes change as assumptions and conditions vary. Finance theory should be no different.

Financial economics has its own special and limiting case in the form of the efficient market hypothesis (EMH) and the asset pricing model constructed from it (capital asset pricing model, or CAPM). Rational investors invest directly in securities in the absence of frictions or limits to arbitrage. The EMH predicts that prices are efficient, markets self-stabilizing, and excess returns impossible to earn. It is an important starting point and a necessary benchmark for understanding what occurs when these assumptions are changed or relaxed. But a theory that predicts perfection cannot be expected to explain what happens or how to act in conditions of imperfection, which is the interesting part.

The EMH has been modified and qualified over the years, which has been helpful. But academic finance still struggles to offer a coherent explanation for the biggest puzzles, such as momentum, the value effect, short-termism, and the beta anomaly.

What is needed is a general asset pricing model that can predict mispricing, not as an exceptional outcome or aberration but as an embedded and

self-perpetuating feature of securities markets. There may be various ways of achieving this goal, but I want to talk about the avenue that my colleagues at the London School of Economics and I have been exploring these past few years.

One of the core assumptions of standard theory is that households do their own investing, but the bulk of investors now delegate this responsibility to financial intermediaries. Delegation raises the prospect of principal-agent problems, which is not new to economists in corporate finance or banking, but the implications of these problems for asset pricing have not been widely explored.

Delegation creates information asymmetry. Agents have better information and different objectives, and principals cannot be certain of the competence and diligence of these agents. Our model incorporates delegation and is conducted in a rational framework, with principals and agents acting optimally to maximize their risk-adjusted returns. The basic model is able to explain many of the common examples of systematic mispricing that have proved difficult to align with the EMH.

## Rational Behavior amid Chaotic Markets

A painful experience from my days as an asset manager first caused me to think along these lines. Recounting it also gives a nice introduction to how the new model works. In the late 1980s, I had started the London side of the Boston-based asset management firm GMO. We enjoyed an uninterrupted decade of good performance from our “value” strategy. Then along came the technology bubble to disturb the calm. By the peak of the bubble in March 2000, we had underperformed the benchmark S&P 500 Index and FTSE indices by around 20

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percentage points, despite holding a precautionary 30% of every portfolio in a momentum strategy to protect against just such eventualities.

Clients withdrew 40% of their assets under management, with most doing so close to the peak of the bubble. We stuck to our strategy and were rewarded by value's resurgence over the next five years, and we ultimately outperformed the indices by two and a half times the earlier losses. Clients returned in droves but only after we had recovered from the initial shortfall.

These events resemble a laboratory experiment in how securities markets work and taught me two basic lessons. We, as agents, had been acting rationally and in line with our contracts as value managers. For their part, the clients had deduced from two years of underperformance that we were no longer competent; they were acting rationally to fire us. Our experience was a microcosm of what was happening across the asset management industry. So, the first lesson was that rational behavior by all parties is consistent with mayhem in markets.

Second, the episode demonstrated that fund flows are a big factor in asset price formation. Client withdrawals from value managers and corresponding transfers to recently successful momentum and growth managers helped push tech stocks beyond their fundamental value. Fund flows across markets, it seemed, were as influential in determining stock prices as the projected cash flows of securities.

## A Model of Asset Pricing with Intermediaries

My first step was to develop with an academic colleague a model that explains momentum and reversal in a rational framework.<sup>1</sup> This model conceptualizes the mechanism I just described, incorporating investors choosing managers and managers building portfolios from a pool of securities. The analysis can be conducted with a three-period version to observe the basic mechanism or with a continuous-time version for a more complete set of interactions.

Investors learn about the ability of managers from the returns the managers generate over time. Following sustained underperformance, investors switch their assets to a more successful manager. The transfer requires the sale of the securities from the underperforming fund, which causes an amplification of the initial price drop, and vice versa for the new appointment.

<sup>1</sup>Dimitri Vayanos and Paul Woolley, "An Institutional Theory of Momentum and Reversal," *Review of Financial Studies*, vol. 26, no. 5 (May 2013):1087–1145.

The decline is gradual; investors are slow to respond because of the learning process and inertia but also because of the "bird in the hand" effect.<sup>2</sup> Despite predicted future outflows and the probability of the lower prices they would bring, some investors prefer to buy cheaply now rather than wait for a real bargain that may or may not materialize. The fall in price is muted by these purchases but also extended, thereby creating momentum. As the price falls, the expected return on the security rises, fund outflows cease, and reversal begins.

Our model shows that asset prices are determined as much by investor fund flows as by the expected cash flows of the assets. It explains several other features of markets that are inconsistent with the paradigm of efficient pricing—notably, the value effect. Value stocks are those that have become cheap based on the ratio of price to discounted future cash flows, or simply price in relation to current assets or earnings, often as the result of an earnings shock. Explaining momentum is tantamount to explaining value and growth because momentum creates the conditions for under- and overvaluation to arise. The length of momentum cycles is related to the persistence with which stocks stay in each category. The model also helps to show why value stocks offer higher future returns despite declining earnings.

The under- and overreactions of stock prices to earnings and other announcements have been widely studied. The data are traditionally thought to show an initial underreaction to news, followed by a secondary overreaction, and to finally culminate in a reversal. The momentum model suggests another interpretation: Prices rise in an immediate and accurate response to news, overreact because of momentum, and eventually revert to fundamental value. The model addresses other observed price effects that are inconsistent with the EMH:

- *Co-movement.* Empirical studies show that after redemptions from some mutual funds, all assets held by the funds decline in price.
- *Lead-lag effects.* There is evidence of cross-asset predictability. That is, a price change in one group of assets (e.g., momentum stocks rising) leads to lagged price effects in another group of assets (e.g., value stocks rising later).
- *Idiosyncratic risk.* Momentum, reversal, and co-movement are larger for assets with high idiosyncratic risk. Trading against mispricings in these assets exposes fund managers to a high risk of underperforming their benchmarks.

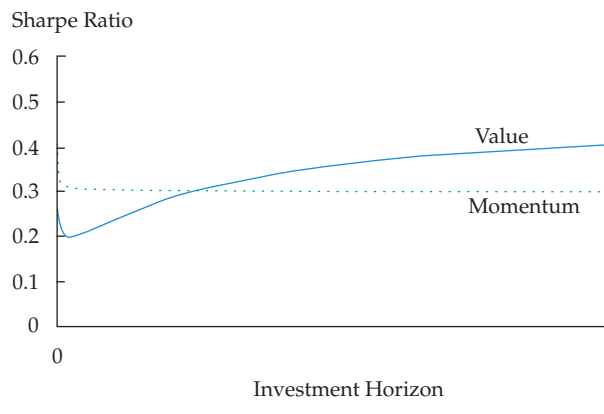
<sup>2</sup>The proverb "A bird in the hand is worth two in the bush" suggests that it is better to have a lesser but certain advantage than to pursue a greater but uncertain advantage.

## Horizon Returns to Momentum and Value

Until now, the only way to show returns from investment strategies has been to review past data. But such exercises are fraught with sampling problems—particularly, the choice of time period. Our model provides a way to examine the returns. The model can be calibrated to show the raw and risk-adjusted returns over selected horizons for any mix or implementation of strategy. Having a conceptual framework against which to compare the data-driven analysis is a major advance.

Figure 1 shows the Sharpe ratios for a given formulation of momentum and value over a full investment horizon—short, medium, and long term. Momentum returns are based on optimum formation and holding periods, as is the practice in data-driven studies. It is quite flattering to momentum because the periodicity of momentum cycles may vary and the penalties for bad timing can be severe.

**Figure 1. Annualized Sharpe Ratios of Momentum and Fair Value over a Full Investment Horizon**



The returns to value assume knowledge of future cash flows but are little compromised by using a simple ratio of price to current earnings instead. Value is more forgiving because it is valuation based; momentum is not.

The Sharpe ratios for momentum are constant over medium- and long-term horizons, consistent with the strategy representing a succession of independent bets. The Sharpe ratio of value is lower than that of momentum in the early years but rises to intersect and then overtake it. The intuition is that momentum investors trade stocks regardless of value, whereas value investors retain, or add to, losing stocks if they remain cheap. Value investors, therefore, benefit from the mean reversion of value,

which makes the long-run risk of the value strategy less than the sum of its short-run risks.

My colleagues and I are studying the issue of horizon returns for value and momentum; we are finding that, with the vector autoregression technique, the empirical results for US stocks over 70 years are a close match to the theoretical predictions. The headline policy implications are that

- short-horizon investors (such as hedge funds with impatient investors to satisfy) should adopt a momentum approach, which they generally do.
- long-horizon investors (such as pension funds) should adopt a predominantly value approach, which they generally do not because of the agency problem.

## Asset Management Contracts and Equilibrium Prices

Our model has another use: It demonstrates how the design of asset management contracts can affect asset prices.

The terms under which asset owners delegate to managers are spelled out in contracts specifying the benchmark, target outperformance, and risk parameters. Contracts are generally designed to limit agency friction—that is, the possibility that the manager is incompetent or will take on excessive risk (moral hazard). Accordingly, the benchmark is often a securities index with fairly tight tracking error.

The model shows that such terms have a distorting effect on asset pricing. High-beta and more volatile stocks become overpriced, whereas low-beta and less volatile stocks become cheaper. The first effect is stronger than the second, implying that the overall market becomes overvalued. The explanation lies in the manager's attempts to satisfy the tracking error constraint, obliging him or her to hold a higher weight in high-beta and more volatile stocks and a lower weight in low-risk stocks. The effect is stronger for stocks that increase because they account for a larger fraction of market movements. Using an index of peer group performance as a benchmark has the same effect because it is also based on market capitalization.

Following the logic to its conclusion, we find that the model explains both the beta anomaly and the volatility anomaly: High-beta stocks have lower returns than low-beta stocks. Similarly, more volatile stocks have lower returns than less volatile ones. These findings are consistent with empirical evidence and are directly contrary to the core prediction of the CAPM.

## Conclusion

Our new model is a work in progress, but early indications show the merit of introducing delegation and asymmetric information to achieve a better

understanding of how finance works, how finance fails, and what can be done about it.

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