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The Efficient Market Theory and Evidence: Implications for Active Investment Management

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Abstract

The Efficient Market Hypothesis (EMH) asserts that, at all times, the price of a security reflects all available information about its fundamental value. The implication of the EMH for investors is that, to the extent that speculative trading is costly, speculation must be a loser's game. Hence, under the EMH, a passive strategy is bound eventually to beat a strategy that uses active management, where active management is characterized as trading that seeks to exploit mispriced assets relative to a risk-adjusted benchmark. The EMH has been refined over the past several decades to reflect the realism of the marketplace, including costly information, transactions costs, financing, agency costs, and other real-world frictions. The most recent expressions of the EMH thus allow a role for arbitrageurs in the market

who may profit from their comparative advantages. These advantages may include specialized knowledge, lower trading costs, low management fees or agency costs, and a financing structure that allows the arbitrageur to undertake trades with long verification periods. The actions of these arbitrageurs cause liquid securities markets to be generally fairly efficient with respect to information, despite some notable anomalies.

Contents

All modern investors are faced with the fundamental decision to use a passive management strategy, an active management strategy, or a combination of the two approaches. A passive management strategy is also known as indexing. Indexed assets are invested according to a pre-determined set of rules that seek to replicate the performance of an index of pooled securities whose positive historical performance and risk characteristics have been studied, and are known to match the goals of the investor. Passive indexation started in the late 1970s and grew very popular in the 1980s because of a theory prevalent in financial economics through most of the second half of the twentieth century — the Efficient Market Hypothesis [EMH].

In simple terms, the efficient market theory asserts that, at all times, the price of a security reflects all available information about its fundamental value. A consequence of the theory is that, if true, it is impossible for an investment manager — and hence the clients of the manager — to consistently beat the market. The underlying principle driving the EMH is elegant and intuitive. In a large, active marketplace for publicly traded securities, vigorous competition among scores of investors will drive speculative profits to zero. The implication of the EMH for investors is that, to the extent that speculative trading is costly, speculation must be a loser's game. Hence, an indexing strategy is bound to eventually beat a strategy that uses active management; where active management is characterized as trading that seeks to exploit mispriced assets. In the world of the EMH, there are no mispriced assets because the invisible hand of the marketplace moves faster than any single agent.

We review the extensive theoretical and empirical literature on the EMH. The academic literature on the EMH is vast. While a complete history of its theoretical development is intellectually interesting, we base our review on the implications of the EMH for the practice of active investment management. We begin with a brief discussion of current efficient market theory. Following this theoretical foundation we discuss the recent empirical evidence on efficiency as it pertains to a range of different markets — not simply the large, liquid public securities markets but also the private capital markets.

Our review of the empirical tests of the EMH is divided into two parts: tests on prices and tests on investment managers and institutions. Tests of the theory using past price behavior in the stock and bond markets have occasionally produced evidence contrary to the null hypothesis of efficiency, suggesting that the EMH may not hold for all markets and all times. The logical foundation for these tests is a pricing model that represents the "fair" price of a security in terms of its exposure to a set of common risk factors. The simplest of these models is the Capital Asset Pricing Model [CAPM], and the most commonly used in recent times is a multi-factor model derived from the Arbitrage Pricing Theory [APT]. The APT holds that the investor will be compensated by higher returns for accepting the risk implied by exposure to these factors.

Both the CAPM and the APT stress the important role that risk factors play in determining the expected future return of investment in an asset. Tests of the EMH in this framework are implicitly joint tests of the pricing model and market efficiency, however. Much recent debate has focused on whether such violations should be interpreted as inefficiency, or simply the inability of researchers to correctly identify and specify the risk factors relevant to the market.

If the benchmark is solely a market-weighted portfolio consisting of all traded securities, then active management (defined as deviations from these market weights) may be useful in accessing factor risk premiums which are not captured by market exposure. In the context of the APT this could also be interpreted as passive exposure to additional risk factors. Theory and empirical evidence suggests that investors are compensated for taking systematic risks — such as investing in "value" stocks vs. "growth" stocks and volatility risk — over the long term. In the presence of these multiple systematic risk factors, empirical tests overwhelmingly reject that the market portfolio is efficient and other static or time-varying combinations of assets result in higher reward-to-risk ratios.

The back-tests of trading strategies seeking pure alpha have suggested a wide array of potentially profitable investments. However, for a number of reasons these provide limited guidance to investors. They represent simulated (not actual) returns and do not account for

actual transactions costs, fees, and price impact. They also suffer from potential data-mining biases. Changing market conditions, including time-varying arbitrage activity, make it difficult to extrapolate future performance. Finally, many anomalies are not scalable and cannot be implemented in large position sizes.

The second part of the review on empirical tests of the EMH focuses on returns generated by active managers and institutions. Recent theory and empirical evidence suggests that some fund managers may have talent and out-perform market benchmarks before fees. However, the evidence does not support the conclusion that superior ability filters predictably through to the ultimate investors in those funds. In the mutual fund industry, after-fee returns and alphas are, on average, zero or negative. While the average mutual fund typically underperforms a passive portfolio on an after-fee risk-adjusted basis, there is evidence that under certain conditions better managers can be identified.

Turning to the non-retail sector, there is some evidence of positive post-fee risk-adjusted returns in hedge funds where highly paid managers actively trade marketable securities. One caveat is that the quality and duration of these data, as well as the changing institutional marketplace for hedge fund services, make it difficult to extrapolate such conclusions to future performance. By contrast, there is little convincing evidence of superior risk-adjusted returns to private equity and venture capital. Although some studies suggest skill persistence, the current data are not conclusive on this point. In the real estate sector there is simply not enough information to evaluate whether managers have added value on a risk-adjusted basis.

In other institutional investment sectors, such as large-scale endowments, pension funds and sovereign funds, there is even less evidence about the capability of active management to generate positive risk-adjusted returns. Some U.S. endowments performed exceedingly well prior to the recent crisis using alternative investments as the basis for their strategy. It is often noted that a long-horizon perspective allowed these endowments to focus on alternative asset classes. Most research suggests that pension fund managers are not able to identify top managers *ex ante* and the managers who serve the pension fund sector show little evidence of skill on a risk-adjusted basis. Finally, the few studies

of sovereign fund trades in public securities provide evidence that, while stock prices respond positively when a sovereign fund invests, the long-term performance of these investments is not particularly good.

In summary, the EMH has been refined over the past several decades to reflect information, transactions, financing and agency costs. Tests of the theory on prices have produced violations suggestive of the potential for active management to add value to a multi-asset portfolio, but finding consistent out-performing active managers is difficult. Since the most recent versions of the EMH emphasize the comparative advantages of specialized arbitrageurs due to better information, skill, lower trading costs, and better access to financing, the balance between indexation and active management is a choice variable for which the optimum depends on general beliefs about the existence and potential of manager skill, the pricing opportunities afforded within a given market, the time preferences and risk aversion of the investor, and the expertise and incentive contract of the specific manager.

1

Theory

1.1 Early Theoretical Foundations

The early theoretical articulations of the EMH focused on arguments that future changes in security prices should be unpredictable. The earliest clearly articulated proposition of the random walk hypothesis was by French stock broker Regnault (1863), which included the proposition that the market of a publicly traded asset aggregates all value-relevant information. Regnault constructed an empirical test of the random walk using French government bond data which was roughly equivalent to a variance-ratio test.[1] In the twentieth century, the seminal paper by Cowles (1933) tested whether professional market forecasters could beat random stock selection. His follow-up paper, Cowles and Jones (1937) developed a theory of the random walk of stock prices. Among the first to develop the random walk theory rigorously was the iconoclastic mathematician and father of fractal geometry, Mandelbrot (1963) who showed that, even in a very general framework allowing for discontinuities and extreme events, changes in security prices should be unpredictable. Two years later at the University of

[1] Cf. Jovanovic and Le Gall (2001).

Chicago, Fama (1965) formalized and extended the argument using the law of iterated expectations, arguing that security prices should follow a random walk. The same year, Nobel laureate Paul Samuelson published a famous paper, "A Proof that Properly Anticipated Prices Fluctuate Randomly." In it, he refined the random walk model using the framework of futures prices, showing that spot market prices need not wander randomly, nor should the sequence of daily changes in prices even be uncorrelated with each other. Rather, the EMH implies only that, "The market quotation ... already contains in itself all that can be known about the future and in that sense has discounted future contingencies as much as humanly possible..." In short, futures prices should be unbiased, and that speculation should be a "fair game" with an expected reward of zero or, more generally, an amount that reflects a normal risk premium.

These early theories about market efficiency motivated a number of empirical studies of prices in various asset markets chiefly focused on whether security returns were serially uncorrelated — i.e., whether past price changes could predict future price changes. Although we will not go into these in any detail, the evidence resulting from these "random walk" tests was mixed. Empirical evidence of predictability frequently cropped up in market data, but it was generally dismissed as weak or unexploitable by a speculator due to transactions costs. To some extent, the theoretical logic of the EMH articulated by Regnault, Cowles, Fama, Samuelson, and Mandelbrot was so compelling and ultimately so useful as a tool for the development of asset pricing models that it became the dominant intellectual paradigm for a generation of scholars.

Fama (1970) reviewed the empirical evidence on the Efficient Market Theory using a taxonomy for levels of efficiency proposed by Roberts (1967). Weak form efficiency implies that past returns cannot predict future excess returns. Semi-strong form implies that public information cannot be used to predict future excess returns. Strong form implies that no information (even direct personal knowledge of a merger, for example) can be used to predict future excess returns. Fama concluded that the empirical evidence up to 1970 supported weak-form and semi-strong form market efficiency.

1.2 Market Realism

More recent theory about the EMH has focused on making the theory more realistic. As the above quote of Samuelson points out, information is an essential feature of the theory. In effect the market price "impounds" all available value-relevant information about the future. This feature is common to all of the early theories. However, none of them explore either how the information is generated or the mechanism that causes the information to be reflected in prices. Nor do they provide a motive for information to be generated by the market. Why should a speculator do any research to evaluate the prospects for a company if trading on information is unprofitable? And, if no speculators actually collect information how can it be that prices nonetheless reflect all available information? Wouldn't this lead to a complete market failure and disequilibrium?

In the real economy, research is costly but potentially valuable if a speculator knows something no-one else knows. Indeed, empirical evidence on the gains to insider trading make it clear that illegally obtained private information can generate excess profits — which Fama (1970) would have classified as a violation of strong-form efficiency. This has led to regulations preventing such activity in most U.S. markets. However, this argument extends to publicly available information since if publicly information is already impounded into prices, who would spend time and effort to collect and process this information allowing prices to be efficient? Grossman and Stiglitz (1976) address this paradox through a model of a market with costly information acquisition. In their model traders who invest in research are rewarded through speculative profits so that they at least recoup the cost of their investment. Their trading activity, in turn, pushes prices toward fair economic value. In effect, they become the first mover of the "invisible hand." The Grossman–Stiglitz model portrays a "near efficient" economy in a constant state of controlled disequilibrium, but always moving toward equilibrium, driven by informed, active research and speculation. In the Grossman–Stigliz world, markets are by-and-large efficient but there are small pockets of inefficiency which are exploited by active managers with superior skills and resources.

This realistic picture of the investment market was mirrored by the contemporaneous development of the Arbitrage Pricing Theory [APT] by Ross (1976), who argued that the activity of arbitrageurs would naturally drive the expected return of assets toward a value consistent with an equilibrium trade-off between risk and return. The EMH was preserved by these developments, but it no longer narrowly hinged upon costless provision of information by the market, and no longer ignored the role of arbitrageurs or speculators. Although the Grossman, Stiglitz, and Ross theories about asset prices portrayed a more realistic view of the asset markets, allowing for potential deviations from equilibrium prices and active arbitrage to correct these deviations, they also relied upon some basic assumptions about arbitrageurs. In particular, the arbitrageurs in Ross's APT need to finance their purchases of undervalued stocks by borrowing cash. In order to exploit over-priced stocks, they need to borrow shares they do not have. What if these operations became difficult?

In 1997, Shleifer and Vishny explored the implications of these assumptions in a paper entitled "Limits of Arbitrage." Their paper was based on the old adage that the market can stay irrational longer than you can stay solvent. They constructed a model in which financing risk forced arbitrageurs to be cautious about exploiting mispricing. The implication of their model is that security prices might diverge from economic value for a long time if financing risk is high. The paper was particularly prescient: Long-Term Capital Management [LTCM], a very large, highly levered hedge fund collapsed in 1998. Among their major speculative positions was a bet on the convergence of U.S. vs. European and Japanese bond yields following the Asian currency crisis. This convergence eventually occurred, but in the short run the divergence between the bond yields increased and LTCM was forced to liquidate. The key implication of the Shleifer–Vishny paper for the EMH is that certain agents do not value assets according to rational asset pricing models and are instead driven by sentiment. This sentiment can significantly slow the diffusion of value-relevant information into security prices, and thus both the capital structure and institutional framework for arbitrage matter. Such constraints do not need to arise from behavioral sources; financing constraints or leverage constraints in economies

with rational agents can give rise to the same effects, as shown by later researchers.

1.3 Theory of Active Delegated Management

Thus far, the discussion of the theory about the EMH has focused on the potential for security prices to deviate from fundamental economic value, and the potential of an active manager to profit from this deviation. An equally important question from the perspective of an investor is whether a profitable delegated investment structure is possible. In other words, even if markets were not perfectly efficient, could a non-expert investor take advantage of the inefficiency? This theoretical question is often referred to as the fundamental question of agency introduced by Ross (1973): a principal (the investor) retains an agent (the manager) and compensates the agent for generating a profit. Is there some combination of auditing and incentives that will result in the principal sharing significantly in the agent's gains, or will the price the agent charges for his/her service exactly equal the benefits generated? Put simply, suppose you hire a manager with a track record of generating positive risk-adjusted returns, can you expect to beat the market after fees?

The most influential recent theory about this problem is Berk and Green's (2004) model of delegation. In their model, investors fail to earn positive risk-adjusted returns, even though they rationally invest with past successful managers. Their model allows some managers to be better than others and have talent on average, it rewards managers for information production, managers earn their fees, but the investment technology has diminishing returns to scale: fund flows push successful managers beyond optimal scale. Hence, in the Berk and Green's model, prices may not be efficient, but the market for management services is. While there are gains for active management, these gains do not flow to principals (investors), but are captured entirely by agents (fund managers).

Another important recent theory about delegated investment management does not directly address the issue of price efficiency, but instead explains delegation as a response to changing market conditions. Mamaysky and Spiegel (2001) argue that the benefit of delegated

management rests on the degree to which it is dynamic. Indexing provides only a very limited set of potential payoffs to investors. This range is grossly inadequate for most investor needs, which can only be met by dynamic adjustment of portfolio weights, and monitoring of the macro-economy. Mamaysky and Spiegel argue that managers are compensated for this active process. By the same token, investors who use only passive indexes give up the possibility of optimizing their investments with respect to their possibly complex goals.

These two recent theories are of course not mutually exclusive. It is useful to think of them as describing two different management capabilities: security selection and dynamic portfolio management. Since both are defined relative to a benchmark, this points to an important issue inherent in how active versus passive management is defined: there may exist skill in capturing returns beyond market-weighted passive indices. Moreover, the market-weighted benchmarks themselves may poorly capture the desired risk-return trade-offs of investors.

1.4 The Swensen Approach

One additional conceptual framework for delegated investment management is worth including in this survey, despite it being a non-academic theory. David Swensen, the Chief Investment Officer for the Yale University Endowment published a highly influential book on institutional investing entitled "Pioneering Portfolio Management" in 2000. This book has since become the bible for many U.S.-based endowment funds and has been credited with the broad-based trend toward alternative investing. Swensen posits major differences in efficiency across various asset classes. In highly liquid markets such as fixed income, he argues that the potential for making positive excess returns is limited due to competition and consequently in those markets there is little scope for fundamental research. By contrast, other markets such as venture capital and private equity have large potential payoffs to superior research and management skill. The gains in such markets are not competed away because of the Shleifer–Vishny problem — most managers have limited investment horizons. Swensen argues that perpetually lived institutions such as college endowments can afford to

play in these markets because their horizons are longer than those of their "competitors" for investment management services.

As empirical support for this theory, Swensen notes that the cross-sectional dispersion in manager performance for some markets is much higher than that for others. Few fixed income managers differ from benchmarks by more than a few basis points, while hedge fund managers' track records vary widely. He thus counsels institutional investors with long horizons and sufficient resources to seek superior performance by careful selection of managers in the alternative space, and, if necessary for diversification, use indices for highly liquid asset classes. With the exception of 2008, the excellent track record of the Yale and other large University endowments over the past 15 years has provided some empirical support for his theory. Although the Swensen approach incorporates many of the subtleties of recent academic research, it leaves open a few questions. Among these are whether agency problems can be addressed through contracting and also what the role of dynamic asset management and allocation should be. Another issue is the limited tenure of endowment monitors. The horizon of the institution might be infinite but the horizon of its caretakers might not. Shorter term goals of university managers might induce risk aversion against short-term loss. Despite these caveats the Swensen perspective is a very useful foundation for considering the benefits of active management for the institutional investor.

Although our review of the theoretical development of the EMH is necessarily brief, the high points manifest an evolution from a relatively abstract model of rational expectations to a framework incorporating financing, information, agency, and active management as crucial factors. While the original intuition of the EMH remains robust, i.e., that it is extremely difficult to earn excess returns in a competitive market, current academic theories no longer deny the existence of mispricing. They elaborate instead on the institutional framework for exploiting such mispricings, and conjecture a wider role for active management beyond beating the market.

In the next section we review the key empirical studies that test various implications of the efficient market hypothesis, concentrating on the results relevant to investment management.

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