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# The Efficient Market Hypothesis, the *Financial Analysts Journal*, and the Professional Status of Investment Management

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Prior to Eugene Fama's 1965 contribution to the *Financial Analysts Journal*, making money on Wall Street was considered to be easy. The practical implication of the efficient market hypothesis (EMH) changed that presumption. Despite challenges to the hypothesis, small investors—those who are not professionals and have limited capital and limited access to special information—may as well assume that the EMH is true. Persistent outperformance requires skill and a professional status for security analysis—Benjamin Graham's argument in 1945 for the establishment of the *Financial Analysts Journal*. Not surprisingly, the *Journal* has extensively covered discussions of the EMH and its practical and intellectual implications.

It has been 55 years since the publication of Eugene Fama's paper "Random Walks in Stock Market Prices" (Fama 1965b) in the pages of the *Financial Analysts Journal (Journal)*.<sup>1</sup> The profound impact of his work is still being felt today. Up to that publication, making money on Wall Street had been considered easy. Yes, investment management involved some measure of skill, but the necessary skill was minimal and easy to acquire. The efficient market hypothesis (EMH) that developed from Fama's work (Fama 1970) for the first time challenged that presumption. Fama's results reported in 1965 were entirely empirical in nature, but the coincident work by Samuelson (1965) provided a strong theoretical basis for this hypothesis.

The term "efficient market hypothesis" means many things to many people; Fama in his classic paper (Fama 1970) and other financial economists who have built on his work are clear on what is meant by the term. It is nothing more than the statement that security prices fully reflect all available information. If this hypothesis is true, or nearly true, the burden is on asset managers to show that they can add value.

In a world of nearly efficient capital markets, one can no longer assume that making money by trading securities is easy. Moreover, the rapid growth of financial technology and access to large and ever-growing sources of data make this proposition more true today than it was when Fama's work was originally published. The rise of hedge funds, private equity, and both plain vanilla and exotic exchange-traded funds (ETFs) since 1965 have only increased the competitive pressure on public investment funds. What is the role of the investment manager in this new world? On average, outperforming a benchmark

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that represents the average manager is difficult, particularly after all fees and expenses are accounted for. But this understanding does not deny the reality that skilled managers can outperform. Successful asset management is, therefore, a skill that must be demonstrated. In the conclusion of Fama (1965b), the author wrote, “The analyst cannot merely protest that he thinks the securities he selects do better than randomly selected securities; he must demonstrate that this is in fact the case.” (p. 59). Fama’s paper was, in fact, a call for the professionalization of investment management, and its publication marked a point of change in the history of the *Journal*.

## The Practical Implications of the EMH

The *Financial Analysts Journal* (or the *Analysts Journal*, as it was then) was first published in 1945 by the New York Society of Security Analysts. At the time, whether particular skills were required for security analysis and asset management was in question. Benjamin Graham, in the first issue of the *Journal*, argued that its publication was, in itself, an assertion of professional status for security analysis (Graham 1945). Irving Kahn, a member of the first editorial board of the *Journal*, explained that financial analysis was a very new profession, and in the rapidly growing post-World War II world, everyone who worked on the *Journal* was motivated to make security analysis a serious profession (Kahn 2005).

In the years following the publication of Fama (1965b), practitioners could easily dismiss the EMH as irrelevant. As Kahn (2005) explained, at its founding, the *Journal* was interested in hands-on, fundamental analysis of actual companies and actual industries and in giving how-to advice in the day-to-day practice of analyzing company, industry, and national statistics and facts. Academic authors attracted to the *Journal* pursued the theoretical side. As a consequence, as Charles Ellis has explained (Ellis 2015), practitioners easily dismissed the academics, with their arcane null hypotheses, statistical inferences, and long equations littered with Greek letters. But then, as he explained, came systematic performance reporting and all kinds of odious comparisons that challenged whether active management could, indeed, add value.

In an interesting interchange on the EMH, Michael Jensen argued that, in the end, given the large amount of data that was only at that time becoming available, conclusions about the EMH were an

empirical issue (Jensen 1967). His study published the following year (Jensen 1968) was shocking. It showed that mutual funds for which data were then available did not outperform the market on an appropriate risk-adjusted basis. Although recent research challenges the view that active management cannot add value,<sup>2</sup> outperformance remains elusive and requires skill. In my view, at least, it is not accidental that in the same issue of the *Journal* in which Jensen (1967) appeared, there was a significant discussion about the need to establish and reaffirm the professional status of security analysis (Ketchum 1967). **Skill cannot be assumed. It must be demonstrated and shown.**

A review of past issues of the *Journal* since its inception in 1945 shows a broad concern for all issues related to wealth management and the funds management business. The search for alpha is a perennial theme in the pages of the *Journal*, however, and much of the history of the *Journal* subsequent to 1965 has been devoted to a discussion of the existential challenge of the EMH to the business model of funds management.

Those in the profession began to understand that for active managers to outperform passive benchmarks was difficult. As William Sharpe explained in his brutal “Arithmetic of Active Management,” for the average manager to outperform a passive benchmark that, in fact, represented the performance of the average manager is hard (Sharpe 1991).<sup>3</sup> And this difficulty occurs *before* costs. Jack Bogle, in his “cost matters” hypothesis, argued for a similar “arithmetic” to explain that the gross return in the financial markets minus the costs of financial intermediation equals the net return actually delivered to investors (Bogle 2005). Gross return, in his view, is unpredictable and fleeting, whereas the costs of financial intermediation are large and highly predictable. As Ellis (1975) explained, the fact that 85% of professionally managed funds underperformed the S&P 500 Index during the 10 years prior to 1975 and that the median fund’s rate of return was about 10% below the S&P 500 over that same period placed the burden of proof on the money managers who claimed they could outperform.

The argument for indexation initially appeared in the *Journal* in 1960. Renshaw and Feldstein (1960) argued that when investing in the Dow Jones Industrial Average (DJIA), one forgoes the possibility of doing better than the average, but one can be assured of never doing significantly worse. Bogle

(writing under the pen name of John Armstrong 1960) was originally opposed to the idea of indexation, not for performance reasons but because in his view, the DJIA was not representative of the market. The arbitrary rules that apply when stocks enter or leave the index or split and the costs associated with maintaining this particular average stock index in terms of commissions and fees imply that this index is not representative, and it is highly costly to replicate. In contrast, the S&P 500 is representative and can be replicated at low cost. The Vanguard 500 Index Fund, on which it was based, was established in 1975 by Bogle with the objective of becoming the world's lowest-cost provider of mutual funds in an industry in which costs matter (Bogle 2016).<sup>4</sup> As Ellis (2016) observed, by 1975, the pension fund of AT&T and its associated companies (at that time, one of the largest equity funds in the world) began to argue for the virtues of indexation at the same time that Bogle was establishing the Vanguard fund. By 1977, as Wilson and Cummin (1977) suggested, the argument for indexing the core of a pension fund was well established.

Within 10 years of the establishment of the Vanguard 500, AT&T had succeeded in indexing a substantial portion of its pension fund. I had been persuaded by William Burns, the treasurer at AT&T, to come over from Bell Laboratories to serve as a district manager at the fund (1979–1980). The case for indexation was clear. With 108 managers in 253 separate accounts in the Bell System, its pension fund as a whole had difficulty beating the S&P 500 benchmark; to several decimal places, however, the fund was identical to the S&P 500 in its security allocations. Therefore, it could be managed as an index fund at considerably less cost than if it were actively managed. John English, who was in charge of the fund at that time, explained that it was hard to argue against a fund that represented a share of America.

The success of indexation was an immediate challenge to active investors. Ambachtsheer and Farrell (1979) argued that in this new world, active management had to show that it could produce returns high enough to offset its higher risks and fees. Within a short time, Sorensen, Miller, and Samak (1998) argued that (1) indexation was a highly effective and cost-efficient means to provide equity market returns and (2) this characteristic was a major factor in explaining why the amount deployed to index funds was at that point easily in excess of \$1 trillion and growing. Elton, Gruber, and

de Souza (2019) observed that from 2013 to 2018, passive mutual funds increased from 16.4% of assets under management to 26%. This change suggests that many investors were questioning the value of active management.<sup>5</sup> The focus of the discussion properly turns on whether active managers have skill—defined, *ex ante*, as the ability of the manager to pick the better-performing stocks appropriately while accounting for risk. The difficulty is that skill is hard to determine *ex ante*.

How to determine skill has been the subject of much research, which has been surveyed in Jones and Wermers (2011). But skill alone is not enough. As Cremers (2017) explained, success as an active manager also requires the right judgment, willingness to choose prudently among the alternatives identified, and sufficient opportunity (or absence of practical obstacles) to do so persistently. But professional expertise of this kind is expensive. Berk and Van Binsbergen (2015) found strong empirical evidence that active mutual fund portfolio managers have skill and do add value but that this value is often absorbed by the fees they charge.

Bogle (2016) argued that the low costs of indexation and the inability of active managers to consistently outperform the index benchmarks led to the dramatic rise in indexation. At the same time, he was concerned about the rise of ETFs, first introduced in 1993. These funds provide a way for investors to gain effective exposure to a wide range of asset classes without paying substantial fees for asset management. As Hill (2016) explained, before the introduction of fixed-income ETFs, index investing was a tiny portion of fixed-income mutual funds and institutional assets. Once ETFs became available, bond index investing grew considerably because ETFs were an efficient and transparent vehicle for gaining exposure to portfolios of fixed-income securities. Furthermore, Elton et al. (2019) argued that because many sector-based passive benchmarks are not investable or are investable only at significant cost, sector-based ETFs may themselves be a more appropriate benchmark for performance than passive benchmarks.

Bogle (2016) was concerned that the rise of ETFs would encourage excess trading and a short-term approach to investment management. Indeed, the so-called flash crash related to the market disruption that occurred on 6 May 2010 led to dramatic fluctuations in the values of these funds. ETFs do trade more intensely in times of market volatility. But as Hill (2016) observed, the active trading of

ETFs that dismayed Bogle was partly the process of liquidity provision and market making by traders making sure that the fund prices were aligned with the prices of the component securities. Madhavan (2012) argued that the flash crash was a result of deficiencies in market structure that have been resolved since that event.<sup>6</sup> Indexation and the availability of ETFs that provide investors access to a wide range of assets, strategies, and sectors at extremely low cost represent a serious challenge to active managers.

Part of the response to this challenge by the asset management industry was to improve the technological basis of asset management. Much of this technology is an application of approaches developed in the academic sphere. Fundamental indexation, which first appeared in the pages of the *Journal* (Arnott, Hsu, and Moore 2005), was largely responsible for an explosion of interest in **smart beta and related factor investing**, which promised to address both performance and cost concerns of traditional active management. Ironically, the response to the existential challenge that the EMH represents has, in fact, led to a great expansion of the investment management industry to provide investors with a large range of passive and semi-passive investment strategies and products. This development, and the technical issues and challenges associated with this development, were surveyed in Giamouridis (2017). Although these approaches are marketed as “enhanced indexation,” Asness (2014) warned, on the one hand, that if you deviate markedly from capitalization weights, you are, by definition, an active manager making bets. Many investment managers, however, incorrectly fight the label of “active”; they call their deviations from market capitalization—among other labels—smart beta, scientific investing, fundamental indexing, or risk parity. On the other hand, Jack Treynor explained that successful active managers actually must take views that differ from the consensus (Treynor 1976). His work foreshadowed that of Cremers and Petajisto (2009), who showed that to outperform, a portfolio must significantly deviate from capitalization weights, a deviation referred to as “active share.”

Treynor was editor of the *Journal* at the critical time in the 1970s when the practical implications of the EMH were beginning to be understood and acted upon.<sup>7</sup> As Treynor (1976) explained, one of the most important practical implications of the theory is the shift in focus from short-term investing

based on ideas whose implications are obvious, and consequently travel quickly, to a long-term focus based on ideas that require reflection, judgment, and special expertise for their evaluation. In other words, this shift in focus marked a transition from financial analysis involving the selection of individual securities for short-term gain to the profession of investment management that involves selection of securities within portfolios carefully designed to meet long-term client objectives.

## The Academic Response to the EMH

In 1976, Treynor clearly understood the profound importance of Fama’s academic contribution and the important implications it would have for investment management far into the future. An interesting point is that Fama’s 1970 work was actually the high point for the EMH from an academic point of view. After that date, academic writers began to raise questions about this hypothesis. As of this writing, few academics actually believe in the EMH—at least, in its most rigorous formulation.

Based on an early grant from Merrill Lynch, the Center for Research in Security Prices at the University of Chicago had in the mid-1960s compiled and made available for the first time a comprehensive database of prices and returns on stocks trading on the New York Stock Exchange that dated back to December 1925. In light of the conventional wisdom that making money trading securities was easy, the astonishing fact is that these data indicated that something like the EMH was nearly true. Much of the later work summarized in Fama (1991) documents the small and transient ways in which the data appear to contradict the EMH. As Lucas (2009) observed, even the smallest of deviations are interesting and important because they provide profit opportunities for large investors. But the bottom line appears to hold: Small investors, who are not professionals and who have limited capital and limited access to special information, may as well assume that the EMH is a complete and accurate description of the way in which the equity markets work.

The first challenge to Fama (1965b) was in the form of an extended dialogue on whether the random walk hypothesis that he used to represent the EMH was descriptively accurate. Much of this early debate appeared in the pages of the *Journal* (for example, Levy 1967, Jensen 1967, and Van Horne and Parker 1967). As Granger (1970) observed,

the random walk hypothesis does not constitute an attack on the professional ability of financial analysts, although it was often interpreted that way. After all, this hypothesis merely implies that future price changes cannot be predicted from past prices alone. It does not consider all available information, such as earnings, dividends, expectations, indexes of business confidence, or even prices of other stocks. At this point, most academics agree that the random walk hypothesis is false. It is not generally understood that the random walk hypothesis requires, among other things, that the volatility of successive price changes be constant. Indeed, casual observations of the dramatic rise in stock market volatility around market crises are enough to invalidate the hypothesis. Lo and MacKinlay (1988) showed conclusively that volatility estimated on the basis of monthly or longer movements in stock prices significantly underestimates volatility estimated from weekly movements in stock prices—a further contradiction of the random walk hypothesis. This evidence does not, however, invalidate the EMH, which is actually silent on the issue of stock market volatility.

Academics then extended the discussion to challenge the intellectual bases of the EMH. A commonly heard argument is that if all information is indeed incorporated into security prices, no incentive to trade and no mechanism by which information can be reflected in prices can exist (Grossman and Stiglitz 1980). The price must be sufficiently noisy (or “inefficient”) to allow information production to be compensated. In a seminal paper on market microstructure, Treynor (see Bagehot 1971) suggested that the resulting wealth transfer from uninformed to informed investors occurs via the bid-ask spread. In response, Fama (1991) argued that an economically more reasonable version of the EMH would say that prices reflect information to the point where the marginal benefits of acting on information do not exceed the marginal costs of doing so, a view he attributed to Jensen (1978). In this view of the world, a perfectly reasonable supposition is that skilled managers can outperform passive benchmarks (Ippolito 1993). This view does not, of course, invalidate Sharpe’s dire arithmetic, but it does put the emphasis on costs. In Bogle’s “cost matters” approach (Bogle 2005), skilled managers are those who can execute informed investment strategies at the least cost. Many academics who study investment strategies neglect consideration of costs, although this disregard is changing (Novy-Marx and Velikov 2019). Indeed, an informed discussion of costs and other practical

considerations is a required element of all research that is now published in the *Journal*.

## Behavioral Finance and the EMH

Few academics today really believe in the EMH. The stock market crash of 1987 was a serious challenge to those who believed that the hypothesis was an accurate description of the way security markets work. The way securities are traded clearly influences prices, contrary to the EMH. Some argued that behavioral psychology had a role to play in explaining why the crash occurred (Ferguson 1989). The publication of *Irrational Exuberance* (Shiller 2000) was exquisitely timed to come out just a few weeks before the bursting of the dot-com bubble in March 2000. As a result, the study of the behavioral factors that influence prices is a standard part of the current academic writing in financial economics. Note, however, that the *Journal*—having published a special issue devoted to the new paradigm of behavioral finance in November/December 1999—was a thought leader in this development.

Ingersoll (1987) showed that the EMH is an implication of general equilibrium theory in a capital market dominated by informed and rational agents. The behavioral view of the markets challenges this framework. This view was largely based on a series of papers by cognitive psychologists Daniel Kahneman and Amos Tversky, who reported on human subject experiments in the 1970s. Their initial paper, which showed how individuals tend to overextrapolate from limited evidence (Tversky and Kahneman 1971), questioned the extent to which individuals could actually be informed. Their later work (e.g., Kahneman and Tversky 1979) showed that individuals react differently to losses than to gains. This result questioned whether individuals could be rational in the sense assumed in standard general equilibrium arguments of the kind often used to justify the EMH.

Richard Thaler is often credited with bringing these views into the mainstream of economic thought, which Kahneman himself acknowledged upon receiving the Nobel Prize for his work in 2002. By the time the special issue of the *Journal* was published in 1999, Thaler was arguing that the behavioral view of the markets was no longer controversial (Thaler 1999). By that point, he considered that most economists no longer believed that individuals are rational in the sense that they obey the axioms of expected utility theory or are

capable of making unbiased forecasts of the future. Therefore, he maintained that supporting the position that asset prices are set by rational investors is problematic. He used a striking analogy to explain that, although one cannot argue that the direction a drunken person takes across a field is based on rational choice, if asset prices depended on the path the drunk adopted, it would be a good idea to study how drunks navigate.

Many articles have been published in the pages of the *Journal* that address how behavioral factors influence asset prices. Early studies examined investor psychology as a way of explaining the day-of-the-week effect (Rystrom and Benson 1989) and other calendar anomalies (Jacobs and Levy 1988). In fact, the nonrandom behavior of price changes by day of the week had already been noted much earlier in the *Journal* (Cross 1973). The *Journal* has published a number of articles that advocate taking investment tilts on the basis of many behavioral biases that have emerged from academic research. For example, Scott, Stumpp, and Xu (1999) argued that *overconfidence*, the tendency to overestimate one's unique abilities and the quality of one's information for making decisions, and the *representativeness* bias, the tendency to overextrapolate from a small sample (Kahneman and Tversky 1972), might explain the use of relative-value metrics as measures of investor overconfidence for slow-growth companies. Earnings growth might be extrapolated irrationally to suggest that companies will continue to grow in the future. As Daniel and Titman (1999) observed, the representativeness bias might also explain the success of momentum strategies that assume that past performance will continue in the future—but at the risk of significant drawdowns (Daniel and Moskowitz 2016).<sup>8</sup> Indeed, since about 2000, the *Journal* has published many articles documenting the ways—both great and small—that financial market prices diverge from what might be perceived as rational. Most, if not all, of these anomalies can be attributed to behavioral factors.<sup>9</sup>

Shiller (2002) described the various behavioral biases that can lead to booms and crashes in the asset markets. In addition to overconfidence and the representativeness bias, he noted that *attention errors*, which arise from an inconsistent focusing of our energies, and *wishful thinking*, which comes from the tendency to ascribe too high a probability to a desired outcome, also have a role to play.

Thaler (1999) argued that the substantial empirical evidence should worry efficient market advocates.

He explained, however, that although market behavior often diverges from what we would expect in a rational efficient market, the anomalies do not necessarily create large profit opportunities that active managers, as a group, can exploit to earn abnormal returns. This warning is, in fact, what Sharpe's dire arithmetic implies.

This insight, however, has additional implications. The arguments of Shiller (2002) suggest that asset managers themselves face challenges brought up by this behavioral view of the markets. Indeed, behavioral factors might explain the mistakes of the experts as well as those of everyone else. Individual active managers might be able to earn abnormal returns, of course, and a growing academic consensus suggests that they can (Cremers et al. 2019). However, the fact that active managers are subject to the same behavioral biases as others removes the presumption that active managers *necessarily* add value. Extensive research in the behavioral finance literature leaves untouched the major implication of Fama (1965b) that the burden remains on the active manager to show that he or she can add value.

Part of the confusion here arises from a misperception of what the EMH is and what it says. Although the EMH is an implication of assuming equilibrium in a capital market dominated by informed and rational agents, the EMH does not, in turn, imply that all traders are informed or rational. Stephen Ross would argue that the absence of arbitrage is a more fundamental concept than these unrealistic equilibrium arguments because only a few rational agents are needed to bid away profit opportunities that arise, even in a sea of agents driven by John Maynard Keynes' "animal spirits" (Dybvig and Ross 1989). Indeed, this concept was the basis of the initial argument for the EMH presented in Samuelson (1965). So, the EMH is closer to being descriptively accurate for highly competitive public equity markets in the United States than it would be for, say, other asset classes or less developed asset markets.

The EMH states that security prices reflect all available information. As originally formulated, the hypothesis does not suggest that this information is correct or processed appropriately. Although many practitioners believe that the financial crisis of 2007–2008 was the final contradiction of the EMH, the hypothesis is actually silent on the issue of bubbles in asset prices and their bursting.<sup>10</sup> In his wonderful contribution, Malkiel (1973)

argued eloquently that security market prices are determined by behavioral factors, which he characterized as a “castles in the air” hypothesis. For traders to exploit this understanding to profit from technical analysis, however, is hard.<sup>11</sup> Charles Mackay’s (1841) “madness of crowds” may determine prices today, but how does one predict where the crowd will move tomorrow? Smith, Suchanek, and Williams (1988) provided experimental evidence that the madness of crowds that leads to the formation of bubbles in asset prices can be persistent in nature and that even experienced traders can be subject to it.<sup>12</sup> As Keynes is reputed to have once said, “Markets can remain irrational longer than you or I can remain solvent.”

Andrew Lo (2012) provided an interesting resolution of the apparent contradiction between behavioral biases and the difficulty of outperforming passive investment vehicles. The unintended consequences of technological change and other recent events in human history require adaptations of behavior. Such adaptations imply that, although the wisdom of crowds implied by the EMH governs over extended periods, it does not govern at every point in time. He referred to this characteristic as the “adaptive market hypothesis.” One implication of this view is that in times of economic crisis, asset markets should be more volatile, which recent experience has shown to be true. Another interesting implication can be found in the flight to indexation. Wurgler (2011) argued that the flight to indexation can cause increased correlations among the constituents of a fund that can produce significant mispricing at the individual-stock level. Lynch, Page, Panariello, Tzitzouris, and Giroux (2019) showed that the mispricing resulting from ETF trades can then present a significant profit opportunity for active traders, a profit opportunity that represents a cost to ETF investors. By itself, however, this observation is not an argument against indexation. Indeed, the adaptive market hypothesis implies that active management can coexist with indexation. This view of the markets does not force an either/or choice.

## Conclusion

An interesting interchange occurred in the pages of the *Journal* in response to a suggestion by Conant (1961) that the introduction of computers into the realm of financial analysis would magnify returns and reduce costs. Rischer (1961) went further to argue that the new technology would not only analyze information and speed up the processes that would

traditionally be performed by human labor but would also make information accessible that could not have been obtained previously. In short, it would help humans act rationally. In this way, prices would more accurately reflect available information, and for this reason financial analysts and investors would not have to spend much time piecing together the past history and current position of a company. This work would have already been done. Rischer argued that the appraisal of the future would continue to be characterized by uncertainty, however, even as to the background of a completely transparent present. This appraisal, he argued, is the proper role of financial analysis.

In many ways, Rischer’s (1961) prescient views have come to pass. High-speed computing and access to almost unlimited sources of data have revolutionized the practice of investment management. As O’Hara (2014) argued, in the new world of high-frequency trading, portfolio managers need to think beyond trading to information acquisition and the fact that the same technology that can send orders so swiftly can also get fundamental information more quickly than any human analyst can. For this reason, no longer is the role of the financial analyst to gather data to invest in financial securities for short-term gain. Rather, the analyst is to

- use this technology in an intelligent way,
- understand the implications of the data for the future prospects of companies,
- choose among the alternatives presented to construct an appropriate investment portfolio, and
- meet long-term client objectives and do so in an appropriate and cost-effective manner.

In addition, as Leibowitz (1995) has explained, the professional analyst should strive to communicate to the client a balanced perspective on the risk dimension in each and every investment opportunity. Although not as exciting as trading for short-term gain, investment counseling of this nature, according to Ellis (2014), is what is greatly needed by most, if not all, investors and is far more fulfilling, from a professional perspective, than short-term trading. The role of the *Journal* has been to follow these developments with a view to providing the investment management profession with the tools it needs to address the significant challenges that lie ahead.

The central importance of Fama (1965b) was to shift the burden of proof onto financial analysts to show

that they can add value. In this sense, the article can be understood as a strong affirmation of the need to establish a professional status for investment managers, which Benjamin Graham (1945) argued was a major reason for the initial publication of the *Financial Analysts Journal*.

### Editor's Note

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### Notes

1. Fama (1965b) discussed the practical implications of the random walk model that Fama examined empirically in his doctoral dissertation, which was published in the *Journal of Business* in the same year (Fama 1965a).
2. An excellent summary of this literature appears in Cremers, Fulkerson, and Riley (2019).
3. As Pedersen (2018) observed, because of index reconstitutions and other factors, the standard benchmark indexes do not necessarily represent the average investor. On the margin, this characteristic implies that active managers can add value, but as Pedersen indicated, whether they actually do is an empirical question.
4. Bogle (1999) attributed the first index fund to William Fouse and John McQuown who, at Wells Fargo in 1971, constructed an equally weighted fund for the Samsonite Pension Fund. Cuneo and Wagner (1975) described the experiments Wells Fargo ran in July, August, and September of 1971 to examine the costs of establishing this fund. The fund was replaced by a value-weighted fund in 1976. Batterymarch Financial Management attracted its first value-weighted index fund client in 1974.
5. The flight to indexation is not necessarily, however, an indication that investors were particularly rational in their investment behavior. The results provided by Elton, Gruber, and Busse (2004) suggest that investors make suboptimal choices among the large range of index fund alternatives offered to them.
6. Pagano, Serrano, and Zechner (2019) suggested, however, that the flash crash may indicate that the growth of plain and exotic (or so-called synthetic) ETFs may pose a systemic risk to global financial markets.
7. Treynor was editor of the *Journal* for 11 years starting in 1969.
8. Readers may be surprised to learn that the success of momentum strategies was first discussed in the pages of the *Journal* in the 1960s. Levy (1967), who does not normally receive credit for this development, referred to momentum as “relative strength.” I am indebted to Elroy Dimson for this observation.
9. For an excellent review of the academic literature related to these issues, see Hirshleifer (2015).
10. Jeremy Grantham was quoted in the *New York Times* on 5 June 2009 (Nocera 2009) arguing that the absolutely worst part of the belief set represented by the EMH was that it led to a chronic underestimation of the dangers of asset bubbles breaking. Although many observers would agree with this interpretation, little evidence supports the idea that active managers, as a group, were able to outperform the market in this difficult time—another important implication of the EMH. Ross (1987) observed that events of this nature are questionable as evidence against the EMH because one generally learns of the bubble only when it bursts. Brown, Goetzmann, and Ross (1995) argued that many of the apparent empirical contradictions of the EMH involve this kind of look-ahead bias.
11. In a similar way, Amihud and Mendelson (1986) and Ibbotson, Idzorek, Kaplan, and Xiong (2018) argued that an appropriately defined asset-pricing model would include additional investor preferences beyond risk aversion, such as liquidity and brand preference. Because these attributes are persistent, however, understanding them does not immediately represent a profit opportunity.
12. Xiong (2013) presented an extensive review of the academic literature that argues that bubbles of this nature can arise from heterogeneous beliefs among investors.

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