Narrative Review Article

How Do Endowment and Disposition Effects Influence Portfolio Choices and Challenge the Assumptions of the Efficient Market Hypothesis?

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ABSTRACT

This paper examines how two behavioral biases, the endowment effect and the disposition effect, shape portfolio choices and challenge the assumptions of the Efficient Market Hypothesis (EMH). EMH assumes that asset prices completely incorporate all information available and that investors are rational in their behavior. Yet findings in behavioral finance on these two effects demonstrates systematic deviations from rationality. The disposition effect captures investors' tendency to sell winning assets too quickly while irrationally holding losing ones; the endowment effect describes individuals' assigning greater value to assets they already own than to identical assets they do not. These are the principal sources of bias examined in this paper. Far from random, these behaviors repeat themselves systematically across markets, investor groups, and time periods, thereby weakening EMH's methodological assumption that countervailing irrationalities cancel one another. They reduce diversification, delay portfolio rebalancing, and distort the intended risk–return trade-off, pushing investors away from the efficient frontier. Their persistence also constrains the EMH assumption that arbitrage always corrects mispricings, since real markets face transaction costs and structural frictions that prevent full adjustment. By showing that psychological factors—such as reluctance to realize losses, reference dependence, and ownership-driven attachment—steer investment decisions, this study argues that classical financial models must be extended. In brief, while EMH is a helpful theoretical benchmark, it cannot fully account for market action when psychology-based biases exist. To understand how investors choose, how portfolios evolve, and how markets actually function, behavioral perspectives must be integrated.

Keywords: Disposition; Endowment; Behavioral; Finance; EMH; Portfolio; Market; Arbitrage

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INTRODUCTION

For decades, the Efficient Market Hypothesis (EMH) has anchored modern finance by positing rational, frictionless markets in which prices fully and instantaneously reflect information and arbitrage eliminates transitory mispricings. This paper argues

that two robust behavioral regularities—the disposition effect and the endowment effect—systematically violate those premises and, in turn, reshape portfolio decisions. The disposition effect leads investors to realize gains too early and hold losers too long, consistent with reference dependence, loss aversion, and realization utility rather than optimal risk–return calculus. The endowment effect elevates reservation prices for owned assets (WTA > WTP), slowing sales and portfolio transitions even when fundamentals are unchanged. Far from random noise, these patterns persist across investor types and market cycles and are not reliably neutralized given real-world frictions that limit arbitrage. At the portfolio level, they reduce diversification, delay rebalancing, and push holdings off the mean–variance efficient frontier, weakening risk-adjusted performance. Accordingly, this paper reassesses the validity of EMH as a descriptive model of investor behavior and a benchmark for portfolio outcomes: while EMH remains a useful reference, its explanatory power is materially constrained unless reinterpreted—or revised—through the lens of behavioral finance. It synthesizes the theoretical mechanisms and empirical evidence behind these effects and maps their implications for portfolio construction and market efficiency, integrating findings from field brokerage datasets, laboratory experiments, and cycle-sensitive analyses to show when these biases intensify and why they persist (Table 1).

Table 1. Themes and Synthesis of Literature

Theme	Sub-Themes	Sources	Related Findings
Theme 1 Disposition Effect — Mechanisms, Evidence, & Cyclicality Overview: Investors systematically sell winners too early and hold losers too long; pattern survives lab/ field tests and varies with cycles.	Sub-theme 1.1 Psychological mechanisms (Prospect Theory; Realization Utility)	Shefrin & Statman (1)	Original formulation of the bias.
		Kahneman & Tversky (14)	S-shaped value function, loss aversion.
		Barberis & Xiong (8)	Realization utility; gains/losses at realization drive utility.
		Kaustia (4)	Sharp kink at zero-return threshold; reference-dependence.
	Sub-theme 1.2 Empirical & experimental evidence	Odean (2)	Brokerage accounts; winners sold more; sold winners outperform held losers.
		Weber & Camerer (3)	Experimental markets; auto-liquidation variant kills the effect → realization mechanism.
		Furche & Johnstone (17)	Trading behavior consistent with disposition in market data.
		Janssen et al. (9)	Double-auction; slower/less accurate price formation with stronger disposition.
		Syed & Bansal (6)	Mutual funds; manager/setting heterogeneity.
	Sub-theme 1.3 Cyclicality, mitigations, and surveys	Bernard, Loos & Weber (7)	Effect weakens in expansions, strengthens in recessions.
		Cheung & Rogut (27) .	Intervention: purchase price hiding reduces disposition.
		Amarnani (5); Hirshleifer (26), (34)	Reviews/surveys and psychology links.

Continued Table 1. Themes and Synthesis of Literature

Theme	Sub-Themes	Sources	Related Findings
Theme 2	Sub-theme 2.1	Knetsch & Sinden (13)	WTP vs WTA disparity.
Endowment Effect — Ownership-Driven Valuation (WTA > WTP)	Laboratory foundations (WTA–WTP gap, status quo)	Kahneman, Knetsch & Thaler (11), (12)	Randomized mug experiments; anomaly codified.
		Samuelson & Zeckhauser (15)	Status quo bias as driver.
		Weaver & Frederick (19)	Reference-price theory of endowment.
Overview: Ownership raises reservation prices; slows selling and portfolio transitions even when fundamentals are unchanged.	Sub-theme 2.2 Field & market evidence	Anagol, Balasubramaniam & Ramadorai (16)	India IPO lotteries; causal ownership → longer holding & repurchase.
		Apicella et al. (18)	Hadza: effect emerges with market exposure (learned bias).
		Kalunda & Mbaluka (22)	Investor behavior on NSE (Kenya).
		Pan (20)	Mutual funds; attachment and endowment motifs in practice.
Theme 3	Sub-theme 3.1	Markowitz (23)	Mean–variance framework; efficient frontier.
Portfolio Allocation & EMH — Interactions and Implications	Portfolio theory baselines & allocation stability	Sharpe (24)	CAPM; beta–return relation.
		Black–Litterman (25)	Blending equilibrium with views to stabilize weights.
	Sub-theme 3.2	Fama (28), (29), (30)	EMH formalization and debates.
Overview: Biases create drift from efficient frontier, delay rebalancing; limit EMH's assumptions under realistic frictions.	EMH, anomalies, and limits to arbitrage	Malkiel (31)	EMH & critics.
		Shiller (32)	Behavioral challenge to EMH.
		Shleifer & Vishny (33)	Limits to arbitrage.
		Hirshleifer (34), (26)	Psychology & asset pricing survey.
		Li & Yang (10)	Prospect-theory primitives in general equilibrium.
		Renshaw (35)	Crisis/panic context and market dynamics.

DISPOSITION EFFECT

The disposition effect, as one of the core concepts of behavioral finance, refers to investors' tendency to sell appreciating assets too early—prematurely realizing them despite the potential to obtain further profit—and, conversely, to irrationally keep depreciating assets in their portfolios; this behavior clearly contradicts the rational investor model of the Efficient Market Hypothesis (EMH). This effect was first defined by Shefrin and Statman in 1985 and has been explained through psychological mechanisms such as loss aversion, mental accounting, regret aversion, and self-control (1). The theoretical basis of the disposition effect rests on prospect theory, developed by Kahneman and Tversky in 1979. This theory posits that individuals evaluate outcomes not according to absolute wealth levels but as gains or losses relative to a reference point,

which is the asset's purchase price. It further suggests that people display risk-averse behavior in the domain of gains and risk-seeking behavior in the domain of losses—especially through the S-shaped value function (Figure 1). The value function is concave in gains (diminishing marginal utility implies risk aversion), convex in losses (increasing marginal "pain" implies risk seeking), and features a sharp kink at the reference point (loss aversion, whereby losses are felt more intensely than gains). This structure is among the most fundamental behavioral underpinnings of the early realization of gains and the deferral of losses (Figure 1).

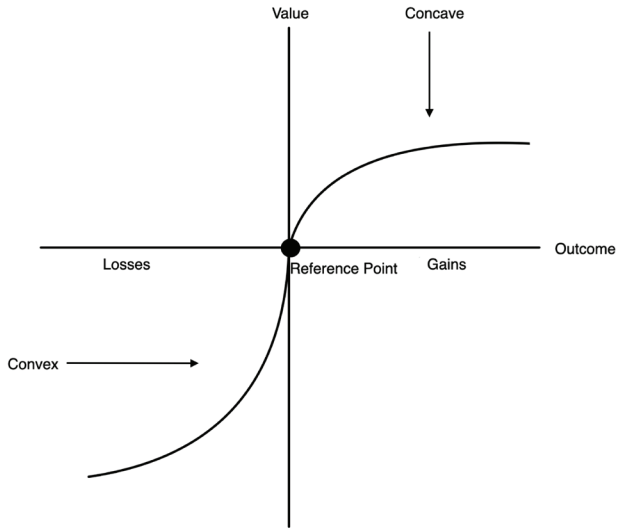

Figure 1. Author's schematic of the Prospect Theory value function, based on (18). The S-shaped value function from Prospect Theory illustrates how individuals are risk-averse in the domain of gains (concave curve) and risk-seeking in the domain of losses (convex curve), with a sharp kink at the reference point reflecting loss aversion.

Specifically, investors tend to realize small gains—at the cost of foregoing possible future profits—while, in contrast, they avoid realizing losses in an effort to stay away from feelings of failure and psychological pain. For instance, consider an asset that has appreciated by 1%. Suppose there is a 50% chance its value increases further to 4% and a 50% chance it decreases to –1%. The expected return relative to the original purchase price in this case is $(0.5 \times 4\%) + (0.5 \times -1\%) = 1.5\%$, which is still positive. Nevertheless, many investors prefer to sell immediately after the initial 1% gain in order to lock in the psychological satisfaction of realizing a profit, rather than risk the emotional pain of a potential loss—even though holding the asset offers a higher expected payoff. This bias has been repeatedly documented in numerous empirical and experimental studies over the past forty years; various experiments have shown that it is not merely a random irrationality but a systematic cognitive deviation in the decision-making process under uncertainty.

The large-scale empirical validation of the disposition effect was brought to light in Odean's study, in which he analyzed more than 10,000 investor accounts obtained from a large brokerage. Odean revealed that investors realized their profitable positions much more than their losses; however, the winning stocks they sold continued to outperform the losers they held onto (2). This means that while people tend to "realize" profit by selling investments on which they have made gains, in loss situations they persistently do not sell even though the investments they sold continue to perform better than those they kept; this is precisely a behavioral situation that fits the definition of the disposition effect. This effect was not explained by other potentially rational explanations such as portfolio rebalancing. Therefore, these findings have shown that through this pattern of behavior investors reduce their own returns and that the behavior has psychological origins.

Another study that strengthens this result is the laboratory experiment conducted by Weber and Camerer. In the experiment, participants bought and sold simulated assets under uncertain price conditions, that is, in a sense a market was simulated. As a result, it was observed that winning assets were sold more quickly and losers were held; this showed that the disposition effect was experimentally reproduced. However, in the second and truly surprising version of the experiment, all assets were automatically sold at the end of each trading round, that is, the decision to sell and hence the psychological burden was removed from the subjects; when the experiment was repeated in this way, the disposition effect almost completely disappeared—showing that the driving force of the behavior is not market uncertainty but the very act of realizing losses and gains itself (3).

The disposition effect is not a behavioral pattern limited to certain countries or investor groups; rather, it has been repeatedly observed across different geographic regions, market structures, and investor profiles. For example, it was found that individual investors were more likely to realize gains, while irrationally holding

on to losing positions in their portfolios. The sharp jump in selling behavior at the zero-return threshold might superficially resemble a tax optimization effect, since capital gains taxes apply only to positive returns. However, evidence from markets with different or no capital gains taxation, as well as experimental settings without tax considerations, shows that this pattern persists. Therefore, the phenomenon cannot be fully attributed to tax or target price motivations, and instead reflects a deeper behavioral bias (4).

Similar tendencies have been observed among institutional investors as well. For instance, mutual fund managers have been found to sell losing assets more quickly during management transitions (5). The reason is that the incoming fund manager, being free from the psychological burden of having incurred losses—which is one of the factors that trigger the disposition effect—is able to evaluate loss-making positions more rationally. However, broader datasets reveal heterogeneity among funds, showing that some funds are more likely to realize losses than gains (6). This tendency has also been reported to have a negative correlation with fund performance in some cases.

A comprehensive dataset from Germany highlights the cyclical sensitivity of this behavioral bias. In a study analyzing the transactions of over 100,000 investors between 2001 and 2015, the disposition effect was found to be weaker during market expansions and stronger during recessions (7). The gap between gain realization and loss realization was 4.95 percentage points during expansions, rising to 9.35 percentage points during recessions. Specifically, during market downturns, the probability of investors realizing profitable positions increases by 26%. In contrast, the likelihood of realizing losses does not show a significant difference across market cycles. These results remain valid across different measurement methods and do not align with simple rational explanations. All of these findings clearly demonstrate that the disposition effect is a recurring, stable, and cycle-sensitive behavioral bias in a wide context—yet one that cannot be reduced to simple rational models.

Whether the disposition effect is a systematic bias or a rational investor response to uncertainty is a central debate in the behavioral finance literature. Traditional financial models assume that investors process all available information and make logical, consistent decisions. However, more recent models suggest that investors operate under bounded rationality and do not always make such optimal decisions. In this context, Barberis and Xiong developed two different prospect theory models. The first accounts for the psychological impact of all unrealized gains and losses in an investor's portfolio, while the second assumes that only realized transactions create emotional feedback. Empirical findings show that only the second model reliably predicts the disposition effect. This indicates that the key driver of investor behavior is not merely whether an asset is in profit or loss, but the psychological impact triggered at the moment of realization (8). Conversely, Kaustia demonstrated that investors' selling behavior exhibits a sharp jump at zero returns, remains flat during moderate losses, and rises again in the gain domain, revealing that the classic prospect theory—particularly its S-shaped value function—fails to fully explain observed behavior (4, Figure 1).

Recent theoretical and experimental studies have further reinforced the systematic nature of the disposition effect. For instance, Janssen et al., in a double auction experiment, showed that participants exhibiting the disposition effect responded less to private information, leading to slower and less accurate price formation. This points to a behavioral bias that can cause short-term market inefficiencies (9). Similarly, Li and Yang, using a general equilibrium framework, found that the decreasing sensitivity to outcomes proposed in prospect theory could explain not only the disposition effect but also related market phenomena such as momentum and the equity premium (10). Together, theoretical development, empirical evidence, and experiments support the view that the disposition effect is not a temporary irrationality but a recurring and predictable behavioral bias shaped by limited cognitive capacity and emotional intuition. The consistency of this effect across investor types and market conditions presents a direct challenge to the strong form of the Efficient Market Hypothesis (EMH) and highlights how investor psychology—particularly how gains and losses are perceived and when they are realized—directly influences market behavior and price dynamics.

ENDOWMENT EFFECT

According to the classical assumptions of economic theory, individuals' preferences are expected to be consistent and independent of ownership status—that is, merely owning a security should not affect its price, because the theory assumes all investors are rational and, therefore, pricing should also be formed

in a rational manner (11). However, the endowment effect, much like the disposition effect, fundamentally challenges this assumption as a systematic deviation . In essence, once individuals own an asset, they tend to perceive its value as significantly higher than when they do not. This is expressed by the fact that the price an individual demands to part with an object (Willingness to Accept – WTA) is systematically higher than the price they are willing to pay to acquire the same object (Willingness to Pay – WTP) (11).

To give a concrete example, a wine collector who bought a special bottle years ago for $10 may refuse to sell it today for $200 and may also be unwilling to purchase another bottle at the same price; this is a clear manifestation of the endowment effect (12). Because of the psychological attachment produced by ownership, the individual irrationally overvalues the wine. This effect first drew attention in experiments by Knetsch and Sinden and subsequently secured a strong place in the behavioral economics literature through the university mug experiments by Kahneman, Knetsch, and Thaler (11,13). In comparisons between groups of Cornell University students randomly assigned mugs (sellers) and those offered the chance to buy one (buyers), the median selling price for owners ($5.25) was nearly twice the buyers' willingness to pay ($2.25–$2.75) (11). This finding shows that ownership influences valuation not only economically but also emotionally. Moreover, when the experiments were repeated, the results remained consistent; the fact that trade volumes fell far short of the 50% exchange rate one would expect under indifference indicated that traditional utility theories were overlooking—or ignoring—something important (11).

The psychological mechanism underlying the endowment effect is primarily explained by loss aversion. According to prospect theory, people feel losses more intensely than comparable gains (14), Figure 1). As a result, the psychological discomfort of giving up an existing object is perceived as greater than the benefit of acquiring it. In addition, the status quo bias identified by Samuelson and Zeckhauser is another trigger of the endowment effect (15). According to status quo bias, individuals tend to maintain the current situation regardless of whether an alternative option is more advantageous; deviating from the status quo is perceived as risky or irrational, which significantly lowers the inclination to change. Therefore, the endowment effect depends not only on the emotional valuation arising from ownership but also on reference points, past experiences, and resistance to change.

The anomaly we call the endowment effect is not merely an irrationality that appears in laboratory experiments; it also holds under real market conditions. For example, a large-scale field study conducted on 1.5 million investors in India by Anagol, Balasubramaniam, and Ramadorai showed that, in IPOs (Initial Public Offerings) where shares are allocated by lottery due to oversubscription, investors who won the lottery held their shares for 1, 6, and even 24 months longer compared to investors who lost the lottery but later purchased the shares in the secondary market (16). This finding demonstrates that the endowment effect applies to real financial decision environments as well. Furthermore, these investors were more likely to make additional purchases of the same stock later on, indicating that ownership status meaningfully shapes value perception (16). Another study measuring the impact of the endowment effect on market behavior was conducted by Furche and Johnstone on the Australian stock exchange (17). The study found that individual investors (especially retail clients) tended to place sell orders above the market price, and that this tendency was much more pronounced than among institutional investors (17). This shows that investors place extra value on the shares they already own, meaning that the endowment effect directly shapes non-professional investor behavior.

So, is the endowment effect merely an irrational quirk, or does it follow certain patterns and represent a systematic human tendency? Apicella et al. in an experiment among the Hadza hunter-gatherer tribe in Tanzania, found that individuals with little exposure to modern markets traded goods at a rate of 50%, indicating no endowment effect (18). By contrast, among Hadza with greater exposure to modern markets, the exchange rate fell to 25% (18). These results suggest that the endowment effect is not innate but may be a learned psychological bias arising from trade and market culture and conditions.

Viewed through an evolutionary lens, human cognitive biases can be selected for or culturally learned in environments where they are beneficial; in low-information settings where claims of product "identity" are not credible, the endowment effect can operate as a protective heuristic that filters out potentially exploitative trades by coding exchanges below a salient reference price as "bad deals." Evidence is consistent with this interpretation: among the Hadza, the bias appears only with market exposure and is absent in isolated camps,

indicating dependence on environmental cues and on the very existence of reference prices formed through market experience (18). In modern asset markets, this mechanism is operationalized when IPO lottery losers anchor on the issue price and avoid paying more in the aftermarket—a formal "aversion-to-bad-deals" account within reference-dependent preferences (16).

In light of all this evidence, the literature converges on the view that the endowment effect does not stem from simple uncertainty or a lack of information, but from a deeply rooted systematic cognitive distortion. Weaver and Frederick proposed the "aversion to bad deals" theory to explain this effect (19). According to this theory, individuals perceive transactions below their self-set reference prices as "bad deals," even if those internal reference prices are themselves irrational; consequently, they tend to pass up opportunities because of the reference prices they assign to their own goods, which widens the gap between WTA and WTP (19). Moreover, in some cases, the emotional dimension of ownership also comes into play. Pan showed that Indian investors were reluctant to sell underperforming funds they had inherited or held for a long time, a decision linked to emotional attachment (20).

Whether the endowment effect disappears with market experience is also a matter of interest. While List argued that experienced traders "unlearn" this bias over time, other studies show that although the effect weakens as market experience grows, it does not vanish completely (21). For instance, in the Indian IPO study, the endowment effect remained clearly observable even among very experienced investors (16). Research by Kalunda and Mbaluka on the Nairobi Securities Exchange in Kenya found no significant relationship between the endowment effect and the amount of time an investor had spent in the market or whether they received professional advice; rather, the effect appears to be nourished more by internal psychological processes (22). Thus, although it may be possible to reduce the influence of the endowment effect by developing one's investment psychology, the fact that it is observed systematically across people indicates a strong psychological foundation. All these findings show that the endowment effect is not a temporary illusion or a posture unique only to inexperienced individuals; rather, it is a behavioral bias deeply rooted in the human decision-making mechanism—one that prompts us to question many fundamental economic assumptions, from individual investment choices to the market efficiency hypothesis.

PORTFOLIO CHOICES

Modern portfolio allocation, as taught in most finance courses, begins with Harry Markowitz's 1952 mean–variance theory (23). This model is grounded in the calculation built on the assumption that rational investors aim to maximize expected return for a given level of risk (or, equivalently, to minimize risk for a given expected return); here, risk is defined as the variance of portfolio returns (23). Investors choose weights (w_1, w_2, …, w_n) across n assets to optimize the balance between expected return (μ) and variance (Σ), thereby forming the "efficient frontier" (23). This optimal portfolio allocation is expressed by the following: the objective is to minimize $\sigma_p^2 = w^T \Sigma w$—that is, to keep risk as low as possible (23). While minimizing risk, the constraint $w^T \mu = \mu_p$ (the target expected return) is kept as high as possible (23). At the same time, the investments made in different instruments, when divided by total investment capital and summed, must equal 1—meaning all instruments are proportions of the total portfolio: $\sum w_i = 1$ (i = 1, …, n) (23).

In this formulation:

w is the vector of portfolio asset weights (each weight should be between zero and one both inclusive).

μ is the vector of each asset's expected return.

Σ is the variance-covariance matrix.

μ_p is the portfolio's target expected return.

σ_p^2 is the portfolio variance.

Subsequently, Sharpe introduced the Capital Asset Pricing Model (CAPM), which proposed a single market portfolio composed of all risky assets and established a direct relationship between expected returns and an asset's systematic risk (beta) (24). Beta can be defined as a key metric used to identify an individual stock or portfolio's level of volatility against the market standard (24).

The CAPM equation is: $E(R_i) = Rf + \beta_i \times (E(R_m) - Rf)$ (24).

Here:

$E(R_i)$ is the expected return of the asset i.

Rf is the risk-free interest rate; β_i (beta) is the asset's sensitivity to market risk.

$E(R_m)$ is the expected return of the market portfolio.

To address practical challenges such as the instability and extreme (often concentrated) weights produced by mean–variance optimization when expected-return inputs are noisy, and the lack of a disciplined way to blend equilibrium-implied returns with an investor's own views, Black and Litterman proposed a model that

blends market equilibrium returns with investor views, with the aim of obtaining more stable and balanced portfolio allocations (25).

Nevertheless, despite the rational and mathematical structure offered by these formal frameworks, the behavioral finance literature identifies a range of specific cognitive biases—including loss aversion, realization utility (disposition), status quo and endowment effects, limited attention, and overconfidence—that systematically distort investor behavior. These biases lead to under-diversification, delayed loss realization, and gradual drift away from optimal portfolio allocations over time (26). The disposition effect refers to investors' tendency to sell assets that have gained value too early while holding onto assets that have lost value (1). This behavior delays loss realization, accelerates the realization of gains, and thus leads to a drift away from the intended risk–return profile (1, 2). As we see in Weber and Camerer's experimental markets and in Odean's brokerage data, this pattern persists independently of tax or rebalancing motives (3, 2). It becomes especially pronounced during market downturns (7).

Psychological explanations such as realization utility and reference-dependent valuation account for the balance between the satisfaction from booking gains and the avoidance of realizing losses (8). Barberis and Xiong define an investor utility function that is reference-point dependent: investors experience a positive burst of utility when they realize a gain and a negative burst when they realize a loss, both evaluated relative to a reference price (usually the asset's original purchase price). Because realized outcomes matter more than paper ones in this framework, investors tend to sell appreciating assets to "book" gains and hold depreciating assets to avoid realizing losses, reproducing the disposition effect, and gradually pushing portfolios away from formula-based target allocations (8).

On the other hand, the endowment effect concerns the tendency of individuals to assign greater value to assets they already own than to those they do not, which is observed in the gap between the "willingness to accept" and the "willingness to pay" (11). In financial decisions, this results in investors continuing to hold the assets they own regardless of rational analysis (11). Evidence from the Australian Stock Exchange shows that retail investors place their sell orders farther from market prices than their buy orders, which can be explained by ownership-driven valuation differences (17). Evidence from the Australian Stock Exchange using full order-book data (2000–2003) shows that retail investors (individual/retail investors) place their sell orders systematically farther from the contemporaneous best quote—the best bid/ask (the best available buying and selling quotes at that moment)—than their buy orders. This "distance" is roughly 23.4% larger on a value-weighted basis and roughly 57.1% larger on an equal-weighted basis, consistent with an ownership-driven reservation-price wedge (the seller's minimum acceptable price exceeding the buyer's willingness to pay; WTA > WTP) (17). The asymmetry is much stronger for retail orders than for institutional orders (≈ 77.3%/77.7% versus ≈ 6.7%/41.4%), suggesting that trading experience/sophistication mitigates ownership-induced overvaluation (17). The pattern persists in both rising and falling markets and becomes more pronounced with the rise of online day trading, indicating a persistent, time-varying friction rather than a narrow microstructure artifact (17). From an efficiency (EMH) perspective, this ownership-driven order placement reduces market depth and liquidity, potentially slowing the accumulation of trading volume around "true" prices—an operational challenge to EMH even if long-run price discovery remains intact (17).

Field studies such as the IPO lottery analysis by Anagol et al. show that even randomly allocated shares are held longer once they are owned compared to those who lost the lottery (16). Consequently, by assigning an emotional premium to investment assets relative to their model-implied values, the endowment effect introduces deviations during the portfolio formation process (19). Taken together, these two biases disrupt portfolio construction and maintenance in many ways. The disposition effect causes underperforming assets to occupy more space in the portfolio than they should; the endowment effect delays transitions to more efficient portfolios and slows re-assessment. As a result, these biases slow rebalancing, reduce diversification, and pull investors away from the efficient frontier. While delayed rebalancing overlooks opportunities and, by refusing to acknowledge losses, leads to greater losses—undermining one of the core missions of portfolio allocation, namely maximizing returns—reduced diversification negatively affects the other cornerstone, minimizing risk to the accepted level. Therefore, although classical models assume a frictionless and rational investment environment, psychological frictions are highly salient in the real world, and combating these biases may require structural solutions such as automated rebalancing systems or anonymizing purchase prices (27).

EFFICIENT MARKET HYPOTHESIS

After observing all these irrationalities—such as the disposition and endowment effects—and their impact on real-world markets, a single critical question arises: do these psychological deviations, by contradicting the assumptions of the Efficient Market Hypothesis (EMH), which we have long regarded as one of the cornerstones of economics, render EMH inadequate in the modern world? The Efficient Market Hypothesis (EMH) is one of the cornerstones of modern finance and was first set into a systematic framework by Eugene Fama in 1970. EMH asserts that asset prices reflect all available information instantly and fully; therefore, no investor can consistently earn returns above the market on the basis of public information (28,29,30). Fama classified this hypothesis into weak, semi-strong, and strong forms: the weak form holds that past prices are reflected; the semi-strong form holds that all public information is reflected; and the strong form holds that even private information is reflected in prices instantly and directly—so investors cannot use such information to earn returns above the market. Within this framework, investor behavior is assumed to be rational, information processing is assumed to be independent of reference points, and errors are assumed to be idiosyncratic (individual); these errors are quickly eliminated through low-transaction-cost, unconstrained arbitrage, and as a result, irrational gains and psychological deviations disappear in the long run (23, 24, 25). In portfolio selection, investors are agents who perform mean–variance optimization; prices serve as sufficient statistics for decision-making (sufficiency); and markets are liquid (28, 29).

However, the disposition and endowment effects documented by behavioral finance fundamentally challenge each of these assumptions through their so-called "irrational outcomes". The disposition effect concerns investors' tendency to realize gains quickly while keeping losses in their portfolios; this contradicts the classical theory's assumption that investors evaluate gains and losses symmetrically. For example, analyses using Odean's brokerage data show that investors sell winning stocks about 50% more often on average and hold losing stocks for longer, thereby lowering portfolio performance (2). Even in laboratory experiments, this behavior appears without tax or rebalancing motives—showing that it is a psychological reflex (3).

One of the core mechanisms behind the disposition effect is the realization utility model, which delays the psychological pain of loss and delivers sudden gratification from realized gains (8). This model shows that investors treat the purchase price as a reference point and avoid selling below that threshold (4). In other words, prices are acknowledged to depend not only on information but also on investors' internal psychology. Similarly, the endowment effect means that an investor assigns a higher value to an asset they own than to one they do not own. First systematically defined by Kahneman, Knetsch, and Thaler, this effect shows that ownership pushes reservation prices upward (11). In a study using full order-book data from the Australian Stock Exchange, Furche and Johnstone show that retail investors place sell orders much farther from the market than buy orders, that this behavior is much weaker among institutional investors, and that it becomes even more pronounced with the rise of online day trading (17). This proves that ownership has a strong and systematic effect on investor behavior. Anagol et al. show that this effect appears even in IPO lottery allocations, thereby indicating a causal link (16). It has also been shown that the endowment effect varies with market integration and cultural context (18). All these behavioral findings clearly question EMH's assumptions of rational information processing and reference-free utility.

So how does EMH respond to these criticisms? The answer to these criticisms comes on two main fronts: methodological reframing and the arbitrage mechanism—arbitrage refers to the practice of exploiting price discrepancies by buying undervalued assets and selling overvalued ones simultaneously, thereby correcting mispricings and restoring market efficiency without risk (30, 31). The methodological defense proposes that anomalies may actually stem from appropriate risk adjustments, sampling issues, or test errors. For example, it is argued that patterns of overreaction and underreaction offset each other over the long run and that some anomaly results depend on the sample (30, 31). However, even stronger and stricter tests have not been able to eliminate these behavioral patterns, because—as noted—the fact that psychologically based deviations are systematic and influence decision-making in a particular pattern prevents opposite behaviors from neutralizing each other as the methodological thesis suggests (26, 32).

The second and more important defense is the arbitrage mechanism. EMH assumes that if there is any mispricing in the market, rational and informed investors should take positions against that error and

correct the price. Yet this assumption belongs to an ideal theoretical world; in the real world, arbitrage faces transaction costs, limited funding, short-sale constraints, career risks for portfolio managers, and the social diffusion of irrational beliefs (33,34). These limitations become most pronounced precisely during stressful periods—when EMH should work best. For example, in episodes such as the 1987 stock market crash, the 2000 dot-com bubble, or the 2008 crisis, panic behavior and price collapses cannot be fully explained by classical theories (32, 35). Therefore, the assumption that arbitrage is practically unlimited and riskless is largely invalid, and because of the limits placed on arbitrage, factors that produce outcomes outside EMH's assumptions—such as the endowment and disposition effects—cannot be fully offset (33). At this point, it is possible to conclude that the endowment and disposition effects do not "falsify" EMH, but they do significantly limit EMH's explanatory power, especially in situations where psychological boundaries dominate, arbitrage is weak, liquidity is shallow, and investors do not behave homogeneously (26, 32, 30, 31).

In short, EMH remains valid in a theoretical sense—it explains, for example, why passive investing often outperforms active investing over the long run—but as a positive model of market behavior it is incomplete, or in other words, when we include human psychology we encounter deviations. It is clear that investors make decisions based on factors such as reference points, the psychology of ownership, and loss aversion, and that these decisions affect how much and how quickly prices respond to information. In this context, the endowment and disposition effects fundamentally shake EMH's core assumptions—especially rationality, reference independence, frictionlessness, and unconstrained arbitrage; and given the scope, frequency, and consistency of these effects, it is not possible to fully reflect market reality without re-examining EMH together with the alternative explanations of behavioral finance (28, 29, 36, 33).

CONCLUSION

Synthesizing theoretical, experimental, and field evidence, this paper shows that the disposition effect—selling winners too early while holding losers—and the endowment effect—ownership-driven overvaluation (WTA>WTP)—are not irregular curiosities but cycle-sensitive, often co-moving deviations. They appear in brokerage accounts and order-book data, in quasi-experimental settings (e.g., IPO lotteries), and—albeit heterogeneously—among institutional managers. Mechanistically, reference dependence, loss aversion, and realization utility explain why investors "book" gains yet delay losses, and why ownership inflates reservation prices. At the portfolio level, these behaviors reduce diversification, slow rebalancing, create unintended risk exposures, and push holdings away from the mean–variance efficient frontier; they can also cause standard theoretical tools to understate or misrepresent real-world outcomes. Taken together with market frictions and limits to arbitrage, these patterns constrain core EMH assumptions—not only that errors are reference-independent and short-lived, but also that offsetting deviations neutralize one another and that unlimited arbitrage restores irrational prices to rational levels. Even so, EMH remains a useful normative benchmark for thinking about prices and the long-run appeal of disciplined, low-cost strategies.

This synthesis is intentionally narrow: it focuses on two biases while others (e.g., overconfidence, attention limits) may interact in ways that amplify or offset the observed effects. Identification is difficult when taxes, fees, and institutional rules overlap with reference points; effect sizes vary by investor type and business-cycle phase; and external validity depends on culture, platform design, and data granularity. Accordingly, future research should (i) replicate the same experiments and observational tests across different markets to reach more definitive conclusions; (ii) map whether and when other behavioral biases reinforce or neutralize disposition and endowment effects; and (iii) quantify, under realistic limits to arbitrage, how strongly deviations can in fact be corrected. Progress on these fronts could support a behaviorally informed alternative market hypothesis—a practical framework that integrates psychological factors and frictions, better aligns models with how portfolios actually evolve, and improves decision-making in real markets.

CONFLICT OF INTEREST

The author declares that there are no conflicts of interest regarding the publication of this article.

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