

The Application of Behavioral Finance in Personal Investment Decision-Making: Cognitive Biases and Market Anomalies

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Abstract. Traditional financial theories like the Efficient Market Hypothesis assume investor rationality. However, market anomalies, such as the size, value, and momentum effects, constantly challenge this assumption. This study is centered on exploring the impact of cognitive biases and market anomalies on personal investment decisions. It reviews the theoretical framework of behavioral finance, classifies cognitive biases into those in information-processing and decision-execution as well as individual and group biases, and conducts four case analyses of overconfidence, herd behavior, loss aversion, and other biases. By linking cognitive bias mitigation to market anomaly exploitation, the study demonstrates how behavioral tools can systematically address irrationality while uncovering profit opportunities. The results indicate that cognitive biases cause investors to make irrational decisions. Market anomalies, on the other hand, present chances for obtaining excess returns. Behavioral finance offers a more practical decision-making framework. It enables investors to identify biases, take advantage of anomalies, and optimize their portfolios. This, in turn, helps them recognize biases, utilize anomalies, and optimize portfolios, thus enhancing investment decision-making and improving financial outcomes.

Keywords: Behavioral finance, cognitive biases, market anomalies, personal investment decision-making.

1. Introduction

In financial markets, traditional theories like the Efficient Market Hypothesis (EMH) and Modern Portfolio Theory (MPT) have dominated academic and practical discourse. EMH asserts that asset prices instantaneously incorporate all available information [1], while MPT advocates for optimal risk-return portfolios through diversification [2]. These models, however, rely on a critical assumption: investors are rational entities, constantly striving to maximize their utility.

Nonetheless, empirical evidence repeatedly challenges this premise of rationality. Consider the size effect identified by Banz, where small - cap stocks tend to outperform large - cap stocks [3]. Then there is the value effect, indicating that undervalued stocks often generate higher returns [4]. Additionally, the momentum effect shows that past performance has a tendency to persist [5]. Collectively, these market anomalies go against the predictions of the EMH, suggesting the existence of systematic irrationality in the market. This is precisely where behavioral finance comes into play.

Behavioral finance, which integrates psychology into economics, contends that cognitive biases (e.g., overconfidence, loss aversion) and social dynamics (e.g., herding behavior) contribute to market inefficiencies [6,7]. A notable example is the GameStop frenzy in 2021. During this period, retail investors were influenced by confirmation bias, selectively interpreting bullish signals, and engaged in herd behavior. As a result, the stock price soared far beyond its fundamental value, vividly demonstrating the limitations of traditional financial models.

The purpose of this paper is to explore how cognitive biases and market anomalies impact personal investment decisions. Cognitive biases, such as anchoring, confirmation bias, overconfidence, loss aversion, and regret aversion, are systematic errors in decision-making that can lead investors to make suboptimal choices [6,8]. These biases can result in behaviors like overtrading, holding onto losing investments too long, and under diversification, which can negatively affect investment performance.

Market anomalies, on the other hand, are patterns in financial markets that contradict the predictions of traditional finance theories. These anomalies, such as the size effect, value effect, momentum effect, profitability effect, and asset growth effect, suggest that certain investment

strategies can potentially exploit market inefficiencies to achieve abnormal returns [9,10]. Understanding these anomalies can help investors develop more informed and effective investment strategies.

For individual investors, understanding behavioral finance principles is crucial. Recognizing cognitive biases helps them be more aware of their decision - making, take steps to mitigate bias impacts, and form more rational investment strategies for better outcomes. Comprehending market anomalies offers insights into outperforming opportunities, and integrating behavioral finance principles into decisions may help exploit these anomalies for higher returns. As the field of behavioral finance is in a continuous state of evolution, with ongoing exploration in emerging directions such as its integration with AI and utilization of big data, the discovery of new biases, anomalies, and strategies is inevitable. This paper aims to overview the application of behavioral finance in personal investment decision-making and highlight the significance of understanding cognitive biases and market anomalies for individual investors.

2. Literature Review

2.1. The Theoretical Framework of Behavioral Finance and Market Anomalies

Behavioral finance challenges the traditional assumptions of financial economics by incorporating psychological and sociological factors into the analysis of financial markets [11]. It posits that investors are not always rational and that their decisions are influenced by emotions, cognitive biases, and social factors. The theoretical framework of behavioral finance includes concepts such as prospect theory, which suggests that investors evaluate potential gains and losses relative to a reference point rather than absolute wealth levels [6]. This can lead to risk-averse behavior in the face of potential gains and risk - seeking behavior when facing losses.

Market anomalies are deviations from the predictions of traditional finance theories. These anomalies, such as the momentum effect where stocks with past high returns tend to continue to perform well in the short-term [5] and the value effect where stocks with low price-to-earnings ratios outperform those with high ratios [9], cannot be easily explained by the EMH [1]. Behavioral finance offers alternative explanations for these anomalies, suggesting that they may be the result of investors' cognitive biases and irrational behavior. For example, the momentum effect may be driven by investors' overreaction to recent information [12], while the value effect could be due to investors' mispricing of stocks based on heuristics or biases [13].

2.2. Cognitive Biases: Systematic Errors in Decision-Making

Cognitive biases are systematic deviations from rationality that arise from the way humans process information and make decisions. These biases are not random errors but rather consistent patterns of thinking that can lead to suboptimal outcomes. They stem from various sources, including limited information processing capabilities, emotional influences, and social factors [8].

When exploring the crucial content of cognitive biases, the classification of cognitive biases is of great significance. The classification logic can be presented through a dual - dimension framework [14], as can be seen in Table 1. Classified by the decision - making stage, there are information - processing biases and decision - execution biases. Among information - processing biases, the anchoring bias is reflected in the fact that people rely on initial information and ignore new information when making decisions [8]. For example, IPO pricing is often anchored by the industry - average P/E ratio. The confirmation bias is manifested as investors selectively accepting information that supports their existing views, only paying attention to positive news [15]. In terms of decision - execution biases, the disposition effect is shown as investors selling profitable assets too early while holding onto losing assets for a long time. For instance, retail investors hold onto stocks that are in the red for a long time [16]. The overconfidence bias makes investors overestimate the accuracy of their own information and trade frequently. The higher turnover rate of male investors serves as an example [17].

Table 1. Classification by Decision-making Stage and Scope of Influence

Classification	Category	Bias Type	Definition	Example
decision-making stage	Information Processing Bias	Anchoring	Relying on initial information and ignoring new information	IPO pricing is anchored by the industry average P/E ratio
		Confirmation Bias	Selectively accepting information that supports existing views	Investors only pay attention to positive news
	Decision Execution Bias	Disposition Effect	Selling profitable assets too early and holding onto losing assets	Retail investors hold onto stocks that are in the red for a long time (Odean, 1998)
		Overconfidence	Overestimating the accuracy of one's own information and trading frequently	Male investors have higher turnover rates (Barber & Odean, 2001)
Scope of influence	Individual Bias	Individual Bias	Sensitivity to losses is twice that of gains	Investors avoid risky asset allocation
		Regret Aversion	Imitating others' decisions to avoid regret	Retail investors follow the crowd to buy hot stocks
	Group Bias	Herd Behavior	Imitating others' actions, leading to market bubbles	Reddit retail investors collectively buy GameStop
		Information Cascade	Individuals infer information based on others' actions, leading to group misjudgment	Bitcoin FOMO (Fear of Missing Out) buying spree

Classified by the scope of influence, there are individual biases and group biases. Among individual biases, the loss - aversion bias means that investors are twice as sensitive to losses as to gains, which leads them to avoid risky asset allocation [6]. The regret - aversion bias is that investors imitate others' decisions to avoid regret, such as retail investors following the crowd to buy hot stocks [18]. Among group biases, the herding - behavior bias is demonstrated by investors imitating others' actions, which in turn triggers market bubbles, like Reddit retail investors collectively buying GameStop stocks [19]. The information - cascade bias occurs when individuals infer information based on others' actions, resulting in group misjudgment. The Bitcoin buying spree is a typical example [20]. These rich and specific classifications and examples of cognitive biases are clearly presented in Table 1, providing us with an intuitive and comprehensive perspective for a deeper understanding of cognitive biases [21].

Behavioral finance, cognitive biases, and market anomalies are closely related concepts that together offer a more comprehensive view of financial markets. By integrating psychological and social factors into financial decision-making, behavioral finance challenges the traditional assumptions of investor rationality and market efficiency in conventional financial theories. Cognitive biases, as systematic errors in judgment, explain why investors deviate from rational behavior. Market anomalies, on the other hand, highlight the limitations of traditional financial theories, indicating that markets are not always fully efficient.

Understanding these elements is vital for both academic researchers and market practitioners. They not only enrich the knowledge system of financial theory but also provide valuable practical guidance for investors. By identifying and understanding cognitive biases, investors can optimize their investment strategies and thereby improve personal investment decision-making. At the same time, acknowledging market anomalies helps in constructing more complex and accurate financial models that better reflect the true dynamics of the market.

3. Case Analysis of Cognitive Biases and Market Anomalies

3.1. Overconfidence and Market Volatility

The COVID-19 pandemic created an ideal natural experiment for observing how investor overconfidence interacts with market turbulence, with the Ghana Stock Exchange (GSE) serving as a revealing case study. By comparing two distinct phases—the stable pre-pandemic environment and the volatile pandemic period—this research dissects behavioral patterns among market actors under stress conditions [22].

Weekly returns systematically predicted subsequent trading volumes during the crisis window. This pattern suggests investors interpreted prior gains as evidence of personal skill rather than circumstance, triggering disproportionate trading activity. In rising markets, participants displayed performance illusion—overweighting their analytical capabilities while discounting external indicators. During downturns, a subgroup exhibited loss defiance, persisting with countercyclical trades despite mounting evidence of sustained decline.

The study uses the GARCH (1,1) and GJR-GARCH (1,1) models to decompose the weekly market trading volume into components related (OVER_t) and unrelated (NONOVER_t) to investors' overconfidence and introduce them into the conditional variance equation [22]. The results show that the overconfidence bias significantly contributes to the market return volatility during the pandemic period. Overconfident investors often ignore public information, overly rely on private information when trading, and overestimate their control over the market. Their large - scale trading behaviors, whether buying or selling, can instantly change the market supply - demand relationship, increase the uncertainty of market prices, and thus widen the market volatility range.

This case is highly consistent with the theories of behavioral finance. Overconfidence bias in the market is mainly manifested as overprecision, overplacement, and overestimation. In this case, investors relying too much on their own information and judgment for trading reflects overprecision; frequent trading in the market, believing that they can obtain higher returns, shows overplacement; and overestimating their trading abilities and return expectations is an embodiment of overestimation. This overconfidence leads to abnormal trading behaviors of investors, thereby affecting market volatility, which confirms the close connection between overconfidence bias and market volatility.

3.2. Herd Behavior and Asset Bubbles

Herd behavior is a common phenomenon in financial markets, which is closely related to the formation and development of asset bubbles. When investors rely too much on the behaviors and decisions of others during the decision - making process and ignore the information they possess, herd behavior is likely to occur. This kind of behavior often drives asset prices away from their fundamental values, thus triggering asset bubbles.

Take the cryptocurrency market as an example. This market has developed rapidly in recent years, but its prices are extremely volatile, showing typical characteristics of asset bubbles. In this market, the herd behavior of investors is particularly significant. Many investors have relatively limited information - gathering and analysis capabilities. When faced with cryptocurrencies that are complex and lack a clear value - measurement standard, they tend to refer to the investment decisions of others. For example, when some investors see the price of Bitcoin rising and many people around them buying Bitcoin, they will be influenced by the group behavior. Even if they don't understand the true value and potential risks of Bitcoin, they will follow the trend and buy it [23]. This behavior is not based on a rational analysis of the asset's fundamentals but is driven by group sentiment and market atmosphere.

From a theoretical perspective, the cryptocurrency market lacks the clear valuation system and regulatory mechanisms that traditional financial markets have, making investors rely more on the behaviors of others as a reference when making decisions. According to behavioral finance theory, investors are prone to being affected by information cascades and herd mentality in such situations. An information cascade refers to the phenomenon where an individual, after observing the decisions

of others, ignores their private information based on these observations and chooses to follow the actions of others [23]. In the cryptocurrency market, investors infer the value of assets based on price changes and the trading behaviors of others in the market, thus forming a collective investment decision - making model.

In the actual market, the rise in cryptocurrency prices often attracts more investors to enter the market, forming a positive - feedback loop. The profit - demonstration effect of early investors makes more people believe that investing in cryptocurrencies is profitable, thus attracting more people to follow suit [23]. As more and more people participate, the demand for assets continues to increase, driving up prices further, which in turn attracts more investors. Eventually, the asset price far exceeds its intrinsic value, forming an asset bubble.

By constructing an empirical model, it can be found that there is indeed significant herd behavior in the cryptocurrency market. During periods of high market stress, investors tend to trade following the market consensus and ignore their private information. This herd behavior exacerbates market volatility to a certain extent, making it easier for asset prices to deviate from their fundamental values. When the market is in an uptrend, herd behavior will push prices further up, creating an overly optimistic market atmosphere. When the market shows a downward trend, herd behavior will cause investors to sell in a panic, accelerating the price decline and further amplifying market volatility.

In brief, herd behavior plays an important role in the formation and development of asset bubbles in the cryptocurrency market. This phenomenon not only reflects the irrational behavior of investors in an environment of information asymmetry and uncertainty but also reveals the limitations of traditional financial theories in explaining emerging financial market phenomena. Understanding the relationship between herd behavior and asset bubbles is of great significance for investors to develop reasonable investment strategies, for regulatory authorities to strengthen market supervision, and for maintaining the stability of financial markets.

3.3. Loss Aversion and the Disposition Effect

Loss aversion and the disposition effect significantly influence individual investment decisions. A practical case can provide a more intuitive understanding of their mechanisms. Take the stock market crash in the US in 2020 as an example. At that time, the market experienced a significant decline, and the psychology of loss aversion spread among investors. Many investors panicked and sold their stocks when the stock price dropped sharply, fearing continuous asset shrinkage. For example, some investors who held airline stocks sold them in a hurry during the stock price slump, despite the potential for the airline industry to recover. They were overly sensitive to losses and completely ignored the long - term investment value. This is a typical manifestation of how loss aversion affects investment decisions [24].

The disposition effect was also evident in this case. Before the market crash, some investors had substantial profits from technology stocks in their portfolios. However, due to the disposition effect, they were worried about losing their profits and sold these stocks prematurely, even though the stock prices had not reached the upper limit of a reasonable valuation. As a result, they missed out on potential subsequent gains. On the other hand, for financial stocks that incurred losses during the market decline, investors were reluctant to accept the losses. Even as the fundamentals of these financial stocks deteriorated, they continued to hold them for a long time, hoping that the stock prices would rebound, which led to an expansion of losses [24].

Theoretically, these two effects are closely related to Prospect Theory. Investors evaluate gains and losses with reference to the purchase cost. When in profit, they tend to lock in profits to avoid risks, resulting in the early sale of profitable assets. When in loss, they become more risk - seeking to avoid realizing the losses and choose to hold losing assets for a long time.

For individual investors, loss aversion and the disposition effect can damage the performance of investment portfolios, disrupt the rational diversification of portfolios, and increase investment risks. From the perspective of the overall market, the behaviors of a large number of investors influenced by these two effects can interfere with the market price - formation mechanism, reduce market

efficiency, exacerbate the downward trend when the market is falling, and hinder prices from reasonably reflecting the value of assets when the market is rising.

3.4. Other Biases and Anomalies

In financial markets, besides well - known phenomena such as herding effects, loss aversion, and the disposition effect, there are numerous other biases and anomalies. These phenomena challenge the validity of traditional financial theories and profoundly influence personal investment decisions. Taking the trading behavior of Robinhood users as an example, we can clearly observe these complex market phenomena and the underlying influencing mechanisms.

Robinhood, an innovative fintech brokerage firm, has users whose trading behavior exhibits distinct characteristics compared to traditional investors. Research shows that Robinhood users are more prone to trade under the influence of attention, and this behavior pattern has triggered a series of market anomalies. Their buying behavior is highly concentrated, with 35% of net buying concentrated in 10 stocks, far exceeding the 24% of general retail investors. This concentrated buying behavior is often influenced by app features such as the "Top Mover" list. This list displays the 20 stocks with the largest price movements on the current day, sorted by absolute price changes, making users pay high attention to both the top - gaining and top - losing stocks [25].

When Robinhood users massively buy a certain stock, it will drive up the stock price in the short term, creating price pressure. However, this kind of trading based on attention is not based on the fundamental value of the stock, causing the stock price to deviate from its intrinsic value. Subsequently, the stock price often reverses, generating negative abnormal returns. For example, stocks heavily bought by Robinhood users have an average abnormal return of -4.7% in the subsequent 20 days. In extreme cases, when the buying intensity of users is higher, the negative return rate can reach -19.6% [25]. This phenomenon indicates that the market is not completely efficient, there are systematic price biases, which is contrary to the view in traditional financial theories that prices should reflect the fundamental value of assets.

Other market participants will take advantage of the predictability of price movements brought about by the trading behavior of Robinhood users. Research has found that the abnormal short - selling volume significantly increases in stocks that are intensively bought by Robinhood users. This means that market participants are aware that the trading of Robinhood users may lead to subsequent stock price declines, and thus they short - sell to make profits. This phenomenon further proves that there are trading opportunities based on investors' behavioral biases in the market, and it also reflects that the market is not completely rational.

Half of the users on the Robinhood platform are first - time investors. The lack of investment experience makes them more susceptible to cognitive biases. Their trading decisions are often based on limited information and intuition, lacking in - depth analysis of the market. For example, when facing complex market information, they may rely more on the simple information provided by the platform, such as the "Top Mover" list, and ignore the fundamental analysis of stocks. This behavior makes them more likely to suffer losses in investments. Overall, the Robinhood community has an average loss of about 4.3% during herding events. After adjusting for market returns, the loss is approximately 5.5% [25]. This indicates that the lack of investment experience will exacerbate the negative impact of cognitive biases on investment decisions, leading to abnormal investment return situations in the market.

The simple interface design and information display methods of the Robinhood platform, while attracting users, also have a significant impact on users' trading decisions. Compared with traditional brokerage platforms, Robinhood only provides a small number of stock indicator information and prominently displays simple and easy - to - understand content such as the "Top Mover" list. This information display method makes users more inclined to rely on these intuitive pieces of information when making decisions, while ignoring a more comprehensive analysis of stocks. For example, the "Top Mover" list mixes the stocks with the largest gains and losses, resulting in users paying similar attention to both types of stocks, while other retail investors tend to buy stocks with the largest gains.

This difference reflects that the information display method can guide investors' attention and thus affect their trading decisions, triggering abnormal market trading behaviors.

4. Controversies and Criticisms

While behavioral finance offers a vital perspective for explaining irrational market behaviors, its theories and applications continue to encounter numerous controversies and challenges.

4.1. Limitations of Behavioral Finance

Key concepts in behavioral finance, such as "overconfidence" and "loss aversion," are primarily qualitative descriptions originate from psychology. A unified approach for quantifying these phenomena has yet to emerge. For instance, overconfidence is often assessed indirectly via trading frequency data or self-reported questionnaires [26]. However, these methods are prone to subjective influences, making it challenging to precisely gauge the extent of bias. Additionally, the expression of the same cognitive bias can differ markedly across various cultural contexts or market conditions, complicating empirical investigations.

Although extensive research has validated the existence of anomalies such as the value effect and momentum effect, questions remain regarding their persistence. Fama argued that some anomalies might result from data mining, representing statistical artifacts inadvertently identified by researchers during repeated analyses of historical data rather than genuine market patterns [27]. For example, certain anomalies initially observed have gradually faded in out-of-sample tests or over extended periods, diminishing their explanatory capacity.

4.2. Challenges in Merging with Traditional Theories

The synthesis of behavioral finance with traditional financial theories remains in its infancy. Consider Lo's Adaptive Market Hypothesis (AMH), which seeks to reconcile rational and irrational investor behaviors. This framework posits that market efficiency arises through dynamic evolutionary processes, where investors adjust to environmental changes via trial-and-error learning [28]. Nevertheless, the empirical foundation of AMH requires further refinement. Quantifying "adaptability" and forecasting market state transitions remain significant hurdles. Moreover, advocates of traditional theories contend that behavioral finance relies excessively on case-specific analyses, lacks a universal model, and struggles to displace the central role of the Efficient Market Hypothesis [29].

5. Future Research Directions

5.1. Neurofinance Advances

Neurofinance utilizes brain imaging techniques (e.g., functional magnetic resonance imaging, fMRI) to uncover the neural mechanisms underlying investment decisions, providing biological explanations for cognitive biases. For instance, studies have shown that loss aversion is positively correlated with amygdala activation, while overconfidence is linked to abnormal functional connectivity in the prefrontal cortex [30]. Future research could explore real-time intervention techniques, such as using neurofeedback to help investors identify and correct biases—for example, by monitoring amygdala activity in real time to alert against excessive risk aversion.

5.2. AI Applications in Behavioral Finance

Meanwhile, artificial intelligence (AI) offers novel tools for behavioral finance. Natural Language Processing (NLP) models (e.g., BERT, GPT-4) can analyze investor sentiment on platforms like Reddit and Twitter in real time to predict market anomalies. For example, during the 2021 GameStop frenzy, social media sentiment indices exhibited high synchrony with stock price volatility [31]. Additionally, machine learning models (e.g., random forests, neural networks) can diagnose

personalized bias patterns by analyzing historical trading data, such as identifying frequent trading as a sign of overconfidence, and generate tailored investment recommendations.

6. Conclusion

Behavioral finance holds significant practical implications for individual investment decision-making. Firstly, it provides investors with a more realistic decision-making framework by highlighting the cognitive biases that may influence their choices, such as overconfidence, loss aversion, and anchoring effects. These biases can lead to irrational decisions during market fluctuations, including excessive trading, premature profit-taking, or holding onto losing assets for too long. By recognizing these psychological tendencies, investors can evaluate their behaviors more objectively and avoid herd mentality or emotionally driven choices.

Secondly, investors can capitalize on market anomalies. Phenomena like the size effect, value effect, and momentum effect offer potential opportunities for excess returns. Through in-depth analysis of these anomalies, investors can develop targeted strategies – for instance, focusing on low P/E ratio stocks for long-term gains or employing momentum strategies to capture short-term price trends. However, investors must remain aware of the inherent uncertainty and evolving nature of these market anomalies, avoiding overreliance on any single approach.

Additionally, behavioral finance emphasizes the critical role of portfolio optimization in mitigating risks caused by emotional and cognitive biases. Investors should avoid over-concentration in their investments, ensuring adequate diversification across assets. A well-structured portfolio aligned with personal risk tolerance and financial goals can help minimize the impact of volatility in any single investment on overall returns.

In conclusion, behavioral finance offers investors a comprehensive framework to better understand their decision-making processes. By identifying and addressing cognitive biases, strategically leveraging market anomalies, and optimizing portfolio construction, investors can enhance their ability to manage investment behaviors and improve financial outcomes. This integrated perspective bridges psychological insights with financial theory, enabling more disciplined and effective wealth management practices.

This research is of significance in both theoretical and practical levels. In theory, it shatters the bounds of traditional financial theories. By bringing investors' irrational behaviors into the research purview, it uncovers the intricate laws of market operation and enriches the financial theory framework. The interdisciplinary approach adopted in this research propels the integration of finance with multiple disciplines. It broadens the research horizon and gives rise to new theoretical concepts. In practice, this research benefits investors. It allows them to identify cognitive biases and capitalize on opportunities presented by market anomalies. As a result, they can optimize their investment decisions and boost investment returns. It also offers regulatory authorities valuable insights for supervision. These insights assist in refining regulatory policies and maintaining market stability. Moreover, it spurs financial institutions to innovate their products and services based on investors' behavioral traits. This innovation can enhance their competitiveness, satisfy the diverse needs of the market, and drive the development of the financial industry.

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