OXFORD JOURNAL
OF STUDENT
SCHOLARSHIP

The Cost of Cognitive Bias in Investor Decision-Making

Aryan Mehta
aryanalpinmehta@gmail.com

ABSTRACT

Investor decision-making can often be heavily biased from reality, resulting in undesirable trading results and worsened market efficiency. To quantify the overall impact in today's market, the present study aims at assessing how relevant these behaviour biases are in influencing cognitive biases such as overconfidence, loss aversion, and the disposition effect, therefore giving investors a way to combat this issue. Through brokerage transaction data along with the literature of other economists, this research paper identifies how biases affect trading frequency, asset allocation, and portfolio return. It shows how overconfident traders trade too much, incurring high transaction costs, while loss-averse investors keep depreciating stocks longer than warranted. Moreover, the disposition effect causes investors to sell winning stocks early, forgoing the subsequent price appreciation and reducing long-run portfolio returns. However, this paper also recognises that these biases serve important systemic functions, namely providing market liquidity and dampening panic selling during downturns, and therefore argues that the appropriate objective is not their elimination but the reduction of their private costs. The challenge, therefore, is not to make investors rational, but to make their irrationality less frequent and costly.

INTRODUCTION

While undergoing research on potential financial returns, the rationality of investors is taken as a given in financial market studies (Fama, 1970). However, many behavioural economists have revealed that cognitive biases lead investors astray from rational decision-making, causing inefficient trading behaviour and reduced portfolio performance (Shiller, 2003; Hirshleifer, 2001). These biases influence the investors' perception of risk, choice of asset, and execution of the trade, leading to inefficient market decisions.

A clear example of such cognitive error is the overconfidence effect (Barber and Odean, 2000), where the investor's belief in his ability to decipher the market signal is overstated. Such a belief propels the investors to excessively trade, confronting him with the ironic situation where his portfolio performance does not improve. (Thaler, 1999; Baker and Nofsinger, 2002).

Additionally, there is loss aversion, where rather than selling right away, the investor decides to keep an asset that is depreciating longer than he theoretically ought to have in order to postpone the psychological effects of processing an actual loss (Kahneman and Tversky, 1979). The disposition effect makes the investor cash their winnings way too early but perhaps ultimately lose much larger profitable opportunities (Shefrin and Statman, 1985). These biases aggravate the effectiveness of trading with other transactional costs and taxes.

Moreover, with algorithmic trading edging much further forward and broker platforms becoming more open to individual traders, such behaviour flaws have been more supplemented to the retail traders' circumstances (Barberis and Thaler, 2003); there has been an increasing need for structured intervention such as financial education and automated programming, and behavioural insights have gradually been increasing as a result (Lusardi and Mitchell, 2014). Therefore, this study measures the extent of behavioural bias' impact on trading performance, as well as the possible strategies to mitigate the influence of behavioural biases for investors to come to more rational, profit-maximising decisions.

METHODOLOGY

The main methodology of this research paper consists of a synthesis of a range of scholarly articles and brokering transaction data, to examine the effects of common behavioural biases on trade performance. This enables the analysis of how trading behaviours differ between investor segments, especially excessive trading due to overconfidence, delayed sale of depreciating stocks due to loss aversion, and premature liquidation of possible assets. Furthermore, the intent is to measure the influence of these biases on trading frequency, portfolio rebalancing, and net returns, while detecting structural measures that would detrimentally reduce such biases. Examining actual trading behaviours enables the investor to collect evidence on how far such cognitive bias operates to distort rational decision-making from a financial market perspective.

Moreover, the research paper also investigates the impact of trading costs such as a payment for order flow (PFOF) while brokerage commission structures on portfolio performance. Given the rapid increase of zero-commission trading platforms, serious attention is turned to the possibility of these transactions creating an increased amount of trading along with their underlying costs that tend to constantly decrease the final net returns of their users.

LITERATURE REVIEW

Behavioural finance challenges the widespread efficient market hypothesis (EMH) by proving that investors often deviate from rational choice because of inherent cognitive biases (De Bondt and Thaler, 1985). While conventional finance assumes investors make risk-neutral decisions to maximise their utility and return of portfolios (Markowitz, 1952), there is often a lack of available information rendering them unable to achieve such a feat and giving rise to market inefficiencies (Shleifer and Vishny, 1997). This is especially the case for retail investors, who are more susceptible to emotional trading than institutional investors. Research illustrates that psychological factors influence financial decisions even in automated trading environments, where human bias persists despite algorithmic interventions (Kirilenko et al., 2017). Despite there being many cognitive biases documented by empirical studies, the most common ones are listed below:

Overconfidence Bias

Overconfidence bias leads investors to overestimate their ability to read market signals (Daniel, Hirshleifer and Subrahmanyam, 1998). As a result, they assume they can predict market movements and engage in excessive buying and selling based on the perception of having better information, according to Barber and Odean (785). Modern studies also support this theory, and Sharma and Prajapati (4) concluded that social trading sites fuel overconfidence because investors get undue confidence due to the support of other investors.

Loss Aversion

Prospect theory, developed by Kahneman and Tversky (1979), holds that people place more value on losses than on gains of equal monetary value. As a result, this creates loss-averse behaviour, where investors are so afraid of recording a loss that they hold on to poorly performing stocks for longer periods, negatively influence ideal portfolio management and harm long-term performance (Genesove and Mayer, 2001).

Furthermore, market volatility during times of crisis, such as the COVID-19 pandemic, is related to heightened loss aversion, prompting investors to sell assets at inopportune times as they are worried their assets would potentially crash in the short-term (Ortmann, Pelster and Wengerek, 2020). This highlights how external economic conditions can heighten behavioural biases in financial decision-making processes (Baker and Wurgler, 2007).

The Disposition Effect

The disposition effect refers to the tendency of investors to sell stocks in advance if they have increased in value, losing out on massive potential for long-term gains for small short-term profit (Shefrin and Statman, 1985). This occurs due to the investor's emotional attachment to the security where his fear of regret and the preference for realising losses over gains inhibit potential growth in his portfolio (Dhar and Zhu, 2006). Experiments on ultra-high-frequency traders in the Taiwan futures market show that the disposition effect also affects experienced traders as well, indicating expertise does not remove cognitive biases (Locke and Mann, 2005).

RESULTS

Behavioural economists' predictions claim systematic cognitive errors distort trading decision-making in predictable ways. The results here typically align with the theories suggested as each bias eats away at potential gains. When combined with external factors also mentioned, the overall effect is heightened and associated with greater financial consequences.

Overconfidence in Trading Volume and Costs

The overconfidence bias is one of the primary drivers of excessive trading performance (Statman, Thorley and Vorkink, 2006). In Barber and Odean's foundational study of 66465 households, they reveal that active traders earned net returns of 11.4% per year, while the least active quintile earned 18.5%, making it a 7.1 percentage point difference caused primarily by the transaction costs rather than the choice of security traded (2000). This excess trading pattern creates compounding drag, where the most active quantile of investors earn, monthly, three-factor alphas of -86.4 basis points after costs. This is equivalent to -10.4 percentage points annually, versus -3.7 percentage points for the average individual investor (Barber and Odean, 2000).

On the other hand, on zero-commission platforms, the largest brokerages earned $3.8 billion in PFOF revenue in 2021 alone, with Robinhood collecting approximately $974 million, representing roughly half of its revenue that year (U.S. Securities and Exchange Commission, 2021). While it may seem like there is no cost to the investor per trade, this revenue model incentivises trading volume rather than investor outcomes and disproportionately damages overconfident, high-frequency retail traders (Barber et al., 2022).

Research suggests that men are the most affected by this issue, as in the "Boys Will Be Boys" study, the least active quintile of investors (roughly 1% annual turnover) earned 17.5% annually, while the most active quintile (monthly turnover exceeding 9%) earned only 10% — a pretax gap of 7.5 percentage points (Barber and Odean, 2001). The stocks men and women selected performed similarly; the performance gap was explained almost entirely by trading costs arising from overconfidence-driven excess activity.

Loss Aversion and Patterns of Stock Retention

According to Kahneman and Tversky's (1979) loss aversion coefficient from prospect theory, losses are perceived as approximately 2 to 2.5 times more painful than equivalent gains are pleasurable (Tversky and Kahneman, 1992). The asymmetries are the psychosocial engine that drives investors into avoiding losses (Benartzi and Thaler, 1995).

Furthermore, despite the incentive to harvest capital losses, which reduces the investors' overall tax burden, loss aversion is a prevalent issue (Shefrin and Statman, 1985). This causes many investors to hold on to their investment, with speculations that it would increase in the future, for the hope of marginal gains rather than reducing their tax load (Genesove and Mayer, 2001). This reluctance is particularly costly because it causes a double opportunity cost, where the investor forgoes the tax benefit while continuing to hold an underperforming asset.

As a result of this, the average equity investor has underperformed the S&P investor under normal conditions (Dalbar, 2023). However, when the economic situation worsens, for example, in a year where the S&P 500 lost 18.11%, loss-averse investors tend to lose 3.06% more. This is due to the loss-averse investors not selling their investments and riding the entire recession instead of slowly taking their money out and waiting for better market opportunities, overall leading to them missing the market bottom and recovering, losing out on further market opportunities (Lo, 2004).

The Disposition Effect and Loss of Capital from Early Selling

According to the disposition effect, investors usually sell 'winning' stocks too early in order to secure short-term financial gains (Shefrin and Statman, 1985). According to trading records from 10,000 accounts at a discount broker from 1987 to 1993, Odean (1998) found that investors noticed 13.8% of gains, but only 9.8% of their paper losses. Thus, they are approximately 50% more likely to sell a winning position (Odean, 1998). Although the ratio is sometimes reversed in December, it is only due to tax-motivated selling (Ivković, Poterba and Weisbenner, 2005). However, while 70% can offset capital gains losses, 30% fail to do so, which reveals the severity of loss aversion (Dhar and Zhu, 2006).

Moreover, a study measuring the subsequent price performance discovered that stocks investors sold for gains typically outperformed the losing stocks they were holding by 3.4% over the following 12 months. This trend has persisted since the 1990s, where out of $3 trillion in U.S. retail-held equities in the 1990s, the wealth degradation due to selling premature winnings surpassed $100 billion (Barber and Odean, 2013).

The disposition effect is not only limited to retail investors but also mutual funds. Analysis of empirical mutual fund data between 1980 and 2002 found that underperforming mutual fund managers were 1.7 times more likely to realise a paper gain than a paper loss (Frazzini, 2006). Thus showing how widespread the issue is and how any expert can encounter it (Locke and Mann, 2005).

ANALYSIS AND EVALUATION

The previous chapter on findings illustrates that investors' decision-making is profoundly affected by behavioural biases, which leads to inefficient behaviour in markets and poor performance of investment portfolios (Hirshleifer, 2001). This economic analysis will examine the causes and consequences of these biases, including their contribution to reducing market efficiency and exploring possible structural interventions that can reduce negative impacts.

Overconfidence Bias and Trading Effectiveness

High-frequency traders, often driven by a surfeit of confidence, find themselves trading 40% more often every quarter than their contemporaries. While these individuals assume superior understanding of the markets, the reverse correlation that exists when correlating frequency with net returns is seen through the results, which suggest that their choice-making approach is not as predicted by rational economic frameworks (Grinblatt and Keloharju, 2009).

From an economic standpoint, this type of behaviour violates the foundations of optimal trading theory, which argues that investors should only trade when the expected marginal benefit exceeds the marginal cost (Grossman and Stiglitz, 1980). However, overconfident traders tend to show a bias towards underestimating trading costs while overestimating their ability to time the market correctly (Daniel, Hirshleifer and Subrahmanyam, 1998). brokerage data confirms that even on commission-free platforms like Robinhood, hidden costs such as bid-ask spreads and PFOF still eat into profits.

Furthermore, in a market dominated by overconfident traders, liquidity increases, but price distortions emerge (De Long et al., 1990). High-frequency trading contributes to short-term market volatility, as rapid buying and selling creates artificial price fluctuations rather than reflecting fundamental value (Kirilenko et al., 2017). This can result in market inefficiencies, where prices deviate from their true intrinsic value.

A classic example is the excess volatility puzzle, which is marked by asset price fluctuations that exceed the expectations of traditional valuation models. This phenomenon, which is partly caused by overconfident traders, shows that increased trading activity reduces market efficiency rather than enhancing it (Barber and Odean, 2000).

However, some "overconfidence" is rational signal extraction. In markets with genuine information asymmetry, informed traders should trade more (Kyle, 1985). Distinguishing overconfidence from legitimate information advantage is empirically harder than the literature often acknowledges. Additionally, overconfidence in the market may be necessary to ensure market liquidity. If all investors traded perfectly, according to the Milgrom-Strokey “no trade theorem”, the market would collapse as overconfident traders provide the counterparties that allow rational investors to execute trades at all (Black, 1986; De Long et al., 1990).

Loss Aversion and Capital Misallocation

As stated previously, Prospect Theory argues that investors place a heavier value on losses than on equivalent amounts gained, as losses are perceived as approximately 2 to 2.5 times more painful than equivalent gains are pleasurable, leading to risk-averse behaviour when markets are falling. From a capital allocation perspective, this behaviour is a suboptimal investment policy that leads to market inefficiencies (Benartzi and Thaler, 1995).

Firstly, the capital lock-in theory suggests that investors keep funds tied up in underperforming assets, missing opportunities to reallocate capital into higher-growth investments (Dayton, 1993). This leads to slower capital mobility and a suboptimal market resource distribution.

Moreover, there is also delayed price adjustment; when a significant number of investors refrain from selling falling stocks, the market correction process is extended, as the price discovery mechanism faces hindrance (Frazzini, 2006). This can be seen especially during times of financial downturn, where investors avoid selling until losses become unavoidable (Ortmann, Pelster and Wengerek, 2020). In essence, loss aversion distorts the natural cycle of markets into delay, preventing adjustments that would otherwise occur if investors acted purely rationally.

Additionally, while some investors practise tax-loss harvesting by selling poorly performing assets to offset tax-efficient losses, a considerable percentage does not use this strategy because of behavioural inertia (Ivković, Poterba and Weisbenner, 2005). That is, even with regulatory tax incentives, current measures have been shown to be ineffective at reducing cognitive biases, thus underscoring the necessity for systematic intervention.

On the other hand, holding assets with the hope that they bear profit in the future aligns with the neoclassical way of thinking, as the market will always self-correct itself until the price of a security eventually returns back to its original price. To add to this, forced selling during economic recessions may be even worse, as if investors panic sell, they eventually sell at the market bottoms instead of having the patience for the investment to recover (Shefrin & Statman, 1985). Moreover, the argument of tax-loss harvesting may be sub-optimal due to the wash-sale rule, where transaction costs and bid-ask spreads mean tax-loss harvesting is less valuable than models assume, particularly for small retail accounts. Failing to harvest isn't necessarily irrational (Constantinides, 1984).

The Disposition Effect

Market Fluctuations Pre-mature disposal of appreciating equities, as evidenced by disposition behaviour, makes fundamental market inefficiencies worse. The findings displayed showed that investors dispose of shares, leading to an overall wealth degradation.

In relation to economic efficiency, such behaviour leads to some transitory price pressures, where excessive divestment due to equity value appreciation causes short-run downward pressure on successful shares, which generates unjustified volatility. However, proactive divesting from equities prevents investors from experiencing the long-run benefits that come with price momentum, which is a prime catalyst for wealth accumulation.

The traditional efficient market hypothesis (EMH) assumes that asset prices at a given point in time reflect all relevant information (Fama, 1970). However, disposition effects create noise trading, where price fluctuations result from behavioural decision-making mechanisms and not from underlying economic forces (Black, 1986; De Long et al., 1990). This has implications for growing markets, which are markets with persistent price appreciation. If a large number of investors sell their investments prematurely due to disposition effects, there is the potential for a breakdown in emerging trends, which can lead to price anomalies.

Conversely, sometimes the premature selling of securities can be beneficial to retail investors, as selling certain assets can return the portfolio back to its original and optimal ratio to reduce the overall long-term risk. Hence, the disposition effect may lead to a more sensible choice for institutionalised investors. Moreover, Frazzini (2006) finds the disposition effect creates exploitable return predictability, where retail investors can profit as it limits the market-wide harm since arbitrage partially corrects the inefficiency.

External factors

While platforms like Robinhood advertise commission-free trading, brokerage data confirms that hidden costs still significantly impact returns. For example, the bid-ask spread, which is the gap between the ask price and the bid price, reflects that investors pay a latent cost for each transaction. PFOF market makers compensate brokers for order execution, sometimes leading to suboptimal trade execution prices (Angel and McCabe, 2013; Schwarz et al., 2024). Furthermore, regulatory fees are small but cumulative expenses that slowly erode profits over time. They have also proven that these charges translate into a 2.5% reduction in year-on-year returns, highlighting that notwithstanding the modern era of zero-fee trading, charges for trading are still considerable. From a purely economic perspective, this is what is described with the model outlined by Hirshleifer and Subrahmanyam (1998), which suggests that liquidity-driven traders do not properly value actual trading costs.

Additionally, there is wealth erosion over time due to frequent traders facing high hidden costs that lower their prospects of long-term capital growth. Exchanging a disproportionate number of transactions without any value addition will result in a low return due to transaction cost, thus classifying such transactions as value-destroying but not value-creating.

Macroeconomic Implications and economic policy

The collective impact of these biases goes beyond individual investor monetary losses and extends to affect financial markets at a broader level.

Firstly, if large segments of the market trade based on behavioural biases and price signals become distorted, overconfident and disposition-prone traders contribute to short-term volatility spikes, which can destabilise markets and cause market volatility for other investors (Scheinkman and Xiong, 2003). Moreover, low-efficiency investment due to loss aversion causes inefficient allotment of capital, resulting in a lack of actualisation of potential economic growth and, ultimately, low investment productivity.

To address these inefficiencies, economic policy and structural interventions are necessary. Key solutions include education for behavioural finance, as it is important that investors get taught about the impact cognitive biases have on their investment decisions. Empirical evidence shows that financial literacy programmes increase decision-making, which translates into better asset allocation (van Rooij, Lusardi and Alessie, 2011). Improving the overall financial literacy and offering behaviour training can empower investors with an understanding of cognitive biases and their implications, fostering more logical decision-making processes. Moreover, empirical evidence reveals that investors that receive financial education platforms experience lower impulsivity in trading behaviour and hence better portfolio performance (van Rooij, Lusardi and Alessie, 2011; Fernandes, Lynch and Netemeyer, 2014).

Secondly, automated trading systems and algorithmic approaches can remove emotional attachment from the investment process (D'Acunto, Prabhala and Rossi, 2019). Algorithmic and AI-driven trading systems, as automation can eliminate emotional decision-making, enforcing disciplined investment strategies. Studies show that robo-advisors reduce bias-driven trading errors, leading to higher net portfolio returns (D'Acunto, Prabhala and Rossi, 2019).

Thirdly, regulatory changes and structured changes improve transaction costs and place limits on PFOF, which helps investors make more economical trading decisions (Battalio, Corwin and Jennings, 2016). An example of this could be the integration of behavioural concepts into brokerage platforms, such as a cooling-off period to prevent high-risk trades and impulsive trading tendencies (Thaler and Sunstein, 2008; Benartzi et al., 2017).

CONCLUSION

The study presents significant evidence suggesting that behavioural biases, including overconfidence, loss aversion, and the disposition effect, significantly affect investors' trading performance, where all three biases lead investors to severely misjudge their own position relative to market signals.

The overconfidence effect leads investors to over-trade with the belief that they can consistently predict the direction of markets. However, brokerage data shows that high-frequency traders incur significant transaction costs, which reduce overall profits in the end. Further, intensified trading activity leads to high market volatility without necessarily improving returns and instead diluting it due to excessive transaction costs. Moreover, loss aversion argues that investors hold depreciating assets for long periods to avoid the recognition of losses. This behaviour creates an inefficient allocation of capital, leading to money being tied up in poorly performing stocks in the form of unliquidated shares rather than being reallocated to more profitable prospects. In addition, tax inefficiencies arise as most investors overlook or decline to implement tax-loss harvesting strategies. The disposition effect triggers the premature sale of winning stocks, thus preventing investors from benefiting from positive long-term price momentum. This behaviour creates market inefficiency, distorts pricing, and leads to poor investment performance. All of these effects compound to hurt the economy, leading to volatile markets that can also harm institutional trades, where commission and trading platforms are the main beneficiaries due to trading costs. These biases are not just a coincidence but structurally predictable patterns not only amongst retail but also institutionalised investors.

However, the findings of this study should not be interpreted as evidence that behavioural biases are uniformly destructive. As previously highlighted by the Milgrom-Stokey no-trade theorem, overconfident investors help supply liquidity in the market, allowing it to function better for rational traders to invest in. Loss aversion, while it may lead to holding the asset for too long, also prevents panic selling in times of economic crisis. Even the disposition effect can be used to align portfolios to their optimum ratios. So, the real question is not how to eliminate them but how to reduce their overall costs to investors while serving their functions to the economy.

Therefore, the most optimal interventions seem to be those that directly address and help enhance the investors' psychology to reduce these cognitive tendencies that lead to systematic errors. While brokerage platform changes such as a cooling-off period can be implemented, the viability of scale for the entire population has a low likelihood. This, combined with regulatory oversight of hidden costs such as PFOF, creates a meaningful solution that combines structural and educational interventions. Ultimately, the economic significance of behavioural finance will be measured not by the biases it identifies, but by the welfare gains its interventions can deliver.

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