BEHAVIOURAL BIASES TOWARDS INVESTMENT DECISION WITH THE MODERATING ROLE OF TECHNICAL ANALYSIS: A CONCEPTUAL PAPER

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ABSTRACT

Traditional finance believes that an investor always gathers all the necessary information and rationally reacts in their investment decisions. However, behavioural finance recognizes that human emotions, biases, and cognitive errors have a significant impact on making decisions for investment in the stock market. Investment decisions involve the process by which investors select the most appropriate investment strategy when analyzing various investment opportunities. Behavioural biases on the other hand can influence individuals' investment decisions and lead them to make choices that deviate from their objectives because rely more on emotion. Knowledge of technical analysis as an investment tool will control and help investors make investment decisions properly and achieve positive returns. Hence, this conceptual paper aims to propose a research framework that empirically examines the relationship between behavioural biases toward investment decisions with the moderating role of technical analysis. The finding will become a starting point for future research where this knowledge has uses in both academic and business practitioners.

Keywords: Behavioural Biases, Investment Decision, Technical Analysis

1.0 INTRODUCTION

In traditional finance, individuals are assumed to be rational, considering all available information when making investment decisions. The Efficient Market Hypothesis (Fama, 1970), the Capital Asset Pricing Model (Sharpe, 1964), the Modern Portfolio Theory (Markowitz, 1952), and the Arbitrage Pricing Theory (Ross, 1976) can be used by investors to make intelligent, rational, and optimal investment decisions. Unfortunately, individuals' investment decisions are not entirely rational. Emotions, cognitive psychology, and environmental factors can cause investors to make irrational and suboptimal decisions. Irrationality in decision-making negatively impacts the portfolio return of an individual and generates several market anomalies that cannot be explained by traditional finance theories (Fama and French, 1993).Traditional finance theories, rooted in the efficient market hypothesis, assume that investors are rational, have access to all relevant information, and make decisions solely based on maximizing returns while minimizing risks and these theories often overlook the impact of human emotions, biases, and cognitive errors on investment decisions. Market anomalies challenge traditional finance theories by highlighting discrepancies between the assumptions of rationality and market efficiency upon which traditional finance is based and the actual behaviour observed in financial markets.

Traditional finance theories, such as the efficient market hypothesis, assume that investors are rational and that asset prices reflect all available information accurately Malkiel & Fama (1970). However, anomalies in market behaviour, such as bubbles, crashes, and persistent price inefficiencies, cannot be explained by traditional finance theories alone (Pradhan, 2021).

On the other hand, behavioural finance theories consider the psychological and emotional aspects of investors, acknowledging that individuals do not always make rational decisions due to cognitive biases, emotions, and social influences (Devadas & Vijayakumar, 2019). Behavioural finance focuses on how investors and markets behave in practice, rather than in theory, by studying actual investor behaviour and decision-making processes (Bankole, 2020). Behavioural finance acknowledges that financial decision-making and market outcomes are heavily influenced by human emotions, biases, and cognitive errors. Hence, it is important to comprehend the genuine conduct of investors to enhance efficiency in making investment decisions. The behaviour of investors significantly influences the performance of financial markets and the broader economy (Kumari et al., 2022). The field of behavioural finance has recently evolved as a distinct academic study to comprehend the psychological biases exhibited by individuals in financial markets, and subsequently enhance the ability in decision making (Wheatcroft & Wynn, 2021). The fundamental underpinnings of behavioural biases can be attributed to heuristic, prospect, and herding theories (Shefrin, 2000; Tversky & Kahneman, 1973). These ideas include substantial consequences for comprehending the real-life conduct of investors and the choices they make within financial markets. Additionally, behavioural finance, often known as the behavioural element of finance, is a financial market model that places significant emphasis on the potential consequences of psychological factors that influence the behaviour of investors. The emergence of theories on behavioural finance might be attributed to the disparities observed in comparison to traditional finance, wherein the participants are assumed to be rational individuals.

Additionally, behavioural finance, recognizes that investors are not always rational and that their decisions are influenced by cognitive biases, emotions, and social factors (Fama, 1970). Anomalies in financial markets, such as herding behaviour, overconfidence, and loss aversion, challenge the notion of rational decision-making assumed in traditional finance theories (Rehan et al., 2021). These anomalies suggest that investors do not always act in accordance with the principles of rationality and efficiency that traditional finance theories propose. The failure of traditional finance models to explain market anomalies has led to the development of behavioural finance, which integrates insights from psychology, sociology, and other disciplines to better understand investor behaviour and decision-making processes (Khaskhelly, 2023). Behavioural finance theories aim to explain the irrationalities and anomalies observed in financial markets by considering the psychological factors that influence investor decisions. By acknowledging the impact of behavioural biases on investment decisions, behavioural finance provides a more comprehensive framework for understanding market dynamics and anomalies (Natahadi, 2024). In summary, while traditional finance theories assume rationality and efficiency in investor decision-making, behavioural finance theories highlight the role of psychological factors, biases, and emotions in shaping investment choices. By considering the human element in decision-making, behavioural finance provides a more suitable understanding of how investors behave in real-world scenarios, offering valuable insights into the complexities of financial markets.

Furthermore, investment decision-making entails a thorough analysis and assessment of investment goals, risk preferences, anticipated returns, market conditions, and other relevant aspects. It also involves the allocation and modification of the investment portfolio (Bihari et al., 2023). Behavioural biases are psychological and behavioural tendencies exhibited by investors while making investing decisions that deviate from reasonable objectives and expectations. These biases are indicative of investors' specious beliefs, emotions,

preferences, and habits (Kumar and Goyal, 2015). Gaining insight into the significance of behavioural biases in investing decision-making is beneficial for investors to enhance their self-awareness and mitigate or minimize the adverse effects of irrational behaviour on investment outcomes. Investors may disregard or misinterpret market information, exhibit excessive confidence or caution, conform to popular opinion, hold strong opinions, pursue gains and losses, or strongly adhere to expenses due to behavioural biases. At the same time, research has found several biases, including overconfidence, anchoring, disposition effect, herding behaviour, and cognitive biases such as availability, regret aversion, and loss aversion. These biases result in illogical decision-making processes, which affect investment outcomes (Madaan & Singh, 2019; Singh et al., 2020; Gupta & Shrivastava, 2021; Mohammad, 2023). The impacts of these biases are not restricted to individual investors but also apply to group settings, where biases associated with the collective might surpass individual biases in influencing unsustainable behaviour (Engler et al., 2019; Brito & Jardim, 2020).

Furthermore, a study conducted by Santoso et al. (2022) examined the behaviour of retail investors in the Indonesian capital market amidst the Covid-19 pandemic. Their findings indicate that investment decision-making in retail investors is notably influenced by overconfidence and representativeness biases. However, herding behaviour was not found to have a significant impact. The formation of these two biases can be attributed to the presence of market uncertainty resulting from the impact of the COVID-19 epidemic. In a study conducted by Jaiyeoba et al. (2018) on the perception bias observed among retail and institutional investors in Malaysia, it was shown that both categories of investors are susceptible to the influences of overconfidence, representativeness, and anchoring biases. The disposition effect, herding behaviour, and overconfidence are three perception biases that have been extensively examined in the context of Pakistan and have been found to exert substantial influence on investment decision-making. Raut et al. (2020) identified three psychological biases, namely overconfidence, anchoring, and representativeness, that are prevalent among retail investors in the Indian capital market during the process of making investment decisions. Retail investors in Malaysia face important issues, such as a lack of financial knowledge and education, which can lead to bad investment choices and possible losses. Aside from that, there have been cases of market manipulation and scams that target retail investors. This shows how important it is for regulators to keep a closer eye on the market and protect investors. In a media release on August 2023, the Securities Commission Malaysia (SC) warned the public, especially investors, that some entities and companies are using the SC's name and logo without permission in marketing materials for their investment goods. In particular, the SC wants to stress that it does not endorse or approve any cash trust investment goods on the market. So, it is against the rules to use the SC's name and image in marketing materials for cash trust investments. In addition to that, the New Straits Times reported in March 2023 that the fraudulent investment syndicate had a strategy of offering an enticing dividend ranging from 15 to 17 percent. This method successfully deceived over 150 investors, resulting in significant losses of RM830 million. Both cases indicate that retail investor needs to polish their knowledge in investment tools such as technical analysis or fundamental analysis to improve their investment decision. Retail investors frequently depend on multiple sources of information, such as newspapers, media, and market rumours in making investment decisions whereas professional investors make more extensive use of fundamental and technical studies (Jaiyeoba and Haron ,2016).

Therefore, this study aims to investigate the influence of behavioural biases toward investment decisions with the moderation effect of technical analysis among retail investors in Malaysia.

2.0 LITERATURE REVIEW

2.1 Behavioural Biases and Investment Decisions

Behavioural biases and investment decisions reveal the significant influence of various biases on investment outcomes. Behavioural biases can lead investors to deviate from rationality, resulting in irrational investment decisions (Kumar & Goyal, 2016; Madaan & Singh, 2019; Wang, 2023;). Understanding these biases is crucial as they can influence individuals either positively or negatively from achieving their investment goals (Kumar & Goyal, 2016; Gupta & Shrivastava, 2021). Additionally, behavioural biases have been identified as significant predictors of investment decisions, influencing choices such as loss aversion and overconfidence (Mohammad, 2023).

Furthermore, other biases such as loss aversion, overconfidence, representativeness, disposition effect, herding effect, and more, influence decision-making in stock markets, mutual funds, and real estate (Zhang, 2023). Likewise, research on the moderating effects of factors like the preferred sector of investment influences the relationship between behavioural biases and investment decisions (Gupta & Shrivastava, 2021). At the same time, behavioural biases also play a crucial role in moulding investment decisions and affecting both individual and institutional investors (Ahmad et al., 2017).

2.1.1 Overconfidence Bias

Overconfidence plays a significant role in investment decision-making, as evidenced by most studies related to behavioural biases toward investment decisions. Pikulina et al. (2017) found that strong overconfidence leads to excess investment, while moderate overconfidence results in accurate investments. Furthermore, Seraj et al. (2022) highlighted that overconfidence positively influences investment decisions and moderates the relationship between financial literacy and investment decisions. Overconfidence positive and significant influence on investment decisions (Almansour et al., 2023; Adil et al., 2021; Akgul & Cetin, 2021; Hafez, 2021; Kunjal, 2021; Nurbarani & Soepriyanto, 2022).

Likewise, Ranaweera & Kawshala (2022) analyzed the impact of overconfidence bias on investment decisions, considering financial literacy and risk attitude as moderating factors. Syarkani & Tristanto (2022) demonstrated that overconfidence has a positive influence on investor attitudes and decisions, with financial literacy also playing a significant role in shaping investment decisions. These studies collectively emphasize the importance of understanding and managing overconfidence in investment decision-making processes to enhance investment outcomes. Conversely, a study by Adil et al. (2021) found that overconfidence has no significant impact on investment decisions. Hypothesis based on the above discussion:

H1 a: There is a significant influence of overconfidence bias on investment decision

2.1.2 Representative Bias

Psychologically, representativeness bias worsens the investment decision-making process and perceived market efficiency because investors who are suffering from representativeness bias cannot make rational decisions. This leads to trading mistakes or poor trading decisions and misinterpretation of probabilities associated with non-relevant situations that ultimately affect the efficiency of the market (Shah et al. 2018; Maiziyah & Helmayunita, 2023). The impact of heuristic biases, specifically availability bias and representativeness bias, significantly and positively influences the investment decisions of investors (Khan et al., 2021).

Moreover, representative bias has a positive effect on investment decisions (Loris & Jayanto, 2021; Hafez, 2021; Talwar et al., 2021; Santoso et al., 2022). Recognizing the presence of representativeness bias while making investment decisions is crucial for stock

market investors and advisors to take preventive measures for both current and future transactions (Khan & Bashir, 2020). These findings underscore the need for strategies to address representativeness bias in investment decisions. Based on the above discussion it is hypothesized that:

H1 b: There is a significant influence of representative bias on investment decision

2.1.3 Anchoring Bias

Anchoring bias is the tendency for individuals to heavily rely on initial information or reference points when making decisions, even if these points are irrelevant or arbitrary (Kudryavtsev & Cohen, 2010). Studies have shown that this bias especially significantly anchoring bias and loss aversion influences investment decisions, leading individuals to make suboptimal choices based on the initial information they receive (Ermulyawati, 2024). Moreover, a study by Jain et al. (2019) assessed how behavioural biases, including anchoring bias, affect the decision-making of individual equity investors using the fuzzy analytic hierarchy process. The research emphasized that anchoring bias, along with biases like loss aversion and overconfidence, plays a crucial role in shaping investment decisions. Additionally, Arora & Rajendran (2023) investigated the impact of anchoring bias and the disposition effect on portfolio performance under different market conditions, highlighting the influence of these biases on investment outcomes.

To add with that, other studies have explored the interaction between anchoring bias and other biases such as herding, overconfidence, and the representativeness heuristic in investment decision-making (Silwal & Bajracharya, 2021; Gyanwali, 2021; Kudryavtsev & Cohen, 2010). These studies have demonstrated that anchoring bias, when combined with other cognitive biases, can significantly impact investment performance and decision-making processes. Contradict with a study by Madaan and Singh, 2019 found that anchoring bias has no significant impact on investment decisions. Hypothesis based on the above discussion:

H1 c: There is a significant influence of anchoring bias on investment decision

2.1.4 Confirmation Bias

Literature has extensively explored the influence of confirmation bias on investment decision processes. Confirmation bias acts as cognitive bias where individuals seek out information that confirms their pre-existing beliefs or hypotheses while ignoring contradictory evidence, has been identified as a significant factor affecting investment choices (Armansyah, 2022; Cheng, 2019; Shah et al., 2018). They also find that confirmation bias can lead investors to selectively seek information that aligns with their initial beliefs, potentially distorting their decision-making processes. Moreover, this bias can impact various aspects of investment decisions, such as stock selection, portfolio management, and risk assessment. On top of that, confirmation bias has been found to mediate the relationship between psychological and social factors and investment decisions in cryptocurrency markets (Shahani & Ahmed, 2023).

Likewise, research has highlighted the role of confirmation bias in influencing investors' perceptions of market efficiency and their strategies for processing information. The presence of confirmation bias, along with other cognitive biases like overconfidence and representativeness bias, has been shown to have a negative impact on investment decisions made by individual investors (Shah et al., 2018). Understanding and mitigating confirmation bias in investment decision-making is crucial for investors to make more rational and informed choices. By recognizing the influence of this bias, investors can strive to seek

diverse perspectives and consider a broader range of information to enhance the quality of their investment decisions. Based on the above discussion it is hypothesized that:

H1 d: There is a significant influence of confirmation bias on investment decision

2.1.5 Loss Aversion Bias

Loss aversion, a cognitive bias where individuals feel the pain of losses more acutely than the pleasure of gains, has been identified as a significant factor influencing investment choices (Benartzi & Thaler, 1995; Armansyah, 2021; Rahawarin, 2023). At the same time, their study also has shown that loss aversion bias significantly affects investors' decision-making processes, leading them to be more sensitive to losses than gains. This bias can influence various aspects of investment decisions, such as risk-taking behaviour, evaluation periods, and equity premium puzzles. Loss aversion has been found to play a crucial role in shaping investors' perceptions of risk and return, impacting their investment strategies (Haigh & List, 2005).

Moreover, research also has explored the interaction between loss aversion and other behavioural biases, such as herding bias, overconfidence, and regret aversion, in investment decision-making (Armansyah, 2021; Yuwono & Elmadiani, 2021; Rahawarin, 2023). These studies have demonstrated that loss aversion, when combined with other cognitive biases, can significantly impact investment performance and decision-making processes. Other than that, loss aversion was also found that positive and significant influence on investment decisions (Gupta & Shrivastava, 2021; Hafez, 2021; Talwar et al. 2021; Hala et al. 2020). In opposition, Hala et al., 2020 also show that negative and significant influence in the case of herding is an intervening variable between loss aversion and investment decisions. Hypothesis based on the above discussion:

H1 e: There is a significant influence of loss aversion bias on investment decision

2.1.6 Regret Aversion Bias

Regret aversion plays a significant role in behavioural biases to influence investment decision-making processes. Studies have shown that regretful experiences can influence subsequent investment choices and no interaction toward risk aversion (Elisa Daniati Edison & Hesty Aisyah, 2023). Furthermore, regret aversion bias, along with other behavioural biases, impacts investment decisions in the real estate sector, with financial literacy moderating the negative effects of these biases and risk perception mediating their relationships with decision-making processes (Wangzhou et al., 2021; Hafez, 2021).

Additionally, research on millennials in Indonesia revealed that financial behaviour had a significant positive effect on investment decisions, while financial literacy and regret aversion bias did not directly influence investment choices (Octivia et al., 2022). Oppositely, finding from Ardini and Achyani, 2023 found that regret aversion as well as loss aversion, herding behaviour, and risk perception have insignificant effects on investment decisions. These findings highlight the complex interplay between regret aversion, cognitive biases, financial literacy, and investment decisions. Based on the above discussion, it is hypothesized that:

H1 f: There is a significant influence of regret aversion bias on investment decision

2.1.7 Mental Accounting

A growing literature review on mental accounting on investment decisions reveals several key findings. Mental accounting has been found to significantly influence investment decisions in various contexts (Abdani, 2019; Santi, 2019; Sharma & Firoz, 2020; Talwar et

al., 2021). Furthermore, Rashwan, (2021) also agrees and suggests that mental accounting can enhance risk assessment and decision-making on investment. However, Road (2013) stands for the opposite finding and found a negative relationship between mental accounting and investor decisions in the Tehran Stock Exchange. These studies collectively highlight the complex and multifaceted nature of mental accounting in investment decision-making.

In the context of investment decisions, mental accounting aids in managing portfolios but can lead to high-risk choices and losses due to anomalies and prospect theory (Ginting et al., 2023). Additionally, a realistic mental accounting model competes with traditional utility alternatives, generating optimal portfolio allocations for various investor types (Hubner & Lejeune, 2022). Loss aversion and mental accounting positively influence investment decisions, with self-control moderating the effect of mental accounting on decisions (Anwar et al., 2023). Hypothesis based on the above discussion:

H1 g: There is a significant influence of mental accounting on investment decision

2.2 Technical Analysis and Investment Decision

A range of studies have explored the use of technical analysis in selecting stocks for their portfolio for investment decisions. Kubińska et al. (2016) found that professional traders in the futures market rely on technical analysis as a rational, cognitive tool, while neophyte(beginner) investors use technical analysis intuitively and experientially. However, a mix of fundamental and technical factors in stock investment decisions where neither the fundamental nor the technical analysis approach is more influential in making decisions (Layyinaturrobaniyah et al., 2016). Recently, research done by Liugita et al. (2024) applied both fundamental and technical analysis to stock investment and found that fundamental analysis focused on financial indicators, while technical analysis involved stock returns and selling prices. The study also aims to understand the fundamental analysis and technical analysis needed to make investment decisions. This research provides insights into the importance of utilizing both fundamental and technical analysis in the decision-making process.

Technical analysis is a method used in the stock market to analyze historical data, price patterns, and trading volumes to forecast future price movements and determine optimal entry and exit points for trading (Maghfira, 2022). This method complements fundamental analysis and psychological factors in influencing investment outcomes (Fikriyah & Suhartini, 2023). By analyzing indicators like moving averages and price trends, technical analysis aids investors in making informed decisions on when to buy or sell stocks (Joshi, 2022). Technical analysis is also beneficial for short-term traders who need to make quick decisions on buying, selling, or holding stocks to maximize profits. Investors use technical analysis to predict stock and asset price movements based on historical data and technical indicators and considered a crucial tool for decision-making in investments due to its ability to analyze market behaviour and trends (Maghfira, 2022). While fundamental analysis focuses on intrinsic stock value, technical analysis concentrates on supply and demand dynamics to predict short-term price changes (Mahina, 2018).

Investors often combine both fundamental and technical analyses to enhance their decision-making process (Bello, 2024). Moreover, technical analysis plays a role in forecasting stock price fluctuations and complements fundamental analysis in investment approaches (Mahina, 2018). It is utilized in predicting stock behaviour in the short term by combining financial theory, economic analysis, and time series evaluation (Wu et al., 2021). Additionally, the study of technical analysis indicators aids in forecasting market trends and making investment decisions based on historical price and volume data (Hung, 2023). On the other hand, finding from Riaz and Zubair, 2024 found that fundamental and technical analysis plays a mediating role in the relationship between self-control, over-confidence, and

investment decisions, providing valuable insights for institutional investors in their decision-making processes.

Additionally, investor behaviour, influenced by psychological factors and market conditions, also plays a significant role in decision-making. For instance, investors may exhibit overconfidence during uptrend conditions and may not always consider the intrinsic value of stocks, although their decisions are generally rational and influenced by fundamental and technical analyses (Simanjuntak et al., 2023). Therefore, combining technical analysis with other analytical methods and understanding investor psychology can significantly enhance investment decision-making, providing a robust framework for navigating the financial markets.

In conclusion, technical analysis is a vital component of investment decision-making in the stock market. By analyzing historical data and market indicators, investors can gain valuable insights into market trends, price movements, and optimal trading points, ultimately influencing their investment decisions. Additionally, the research by Oktaba (2023) focuses on the modification of technical analysis indicators to increase the rate of return on investment. This study highlights the practical application of technical analysis in forecasting changes in financial asset prices to enhance investment outcomes. Then, Utami and Nughroho (2017) revealed a preference for technical analysis among Indonesian investors, with experience and time horizon being significant influencing factors in investment decisions. Based on the above discussion it is hypothesized that:

H2: Technical analysis significantly moderates the relationship between behavioural biases and investment decisions.
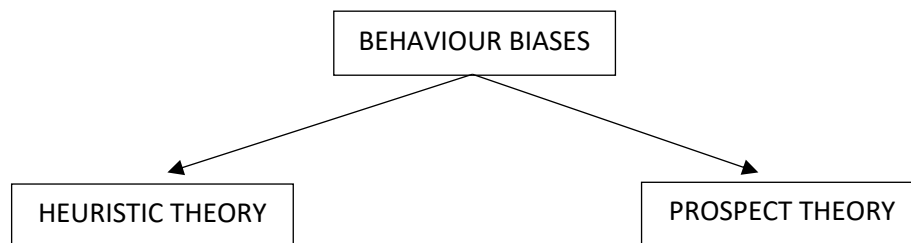
2.3 Underpinning Theory

Figure 1: *Theories related to behavioural biases*

2.3.1 Heuristic Theory

According to heuristic theory, when the situation is not absolute and significantly complicated for choice development, decision-makers follow a mental shortcuts or rules of thumb in order to avoid loss (Kumara & Kawshala 2021; Shah et al., 2018). The theory also acknowledges the presence of heuristic biases such as representativeness, availability, anchoring and overconfidence that impact investment decision-making (Haritha, 2023; Hoxha & Hasani, 2022; Kasoga, 2021). The major cause of irrational decision-making and investment performance together with the final portfolio outcomes is these biases (Peprah, 2024; Ahmad & Wu, 2023; Saputra, 2023; Khan et al., 2021 Sattar et al.,2020).

Moreover, heuristics, such as overconfidence, representativeness, anchoring, confirmation bias, and availability biases, play a significant role in shaping investors' perceptions and judgments, impacting their investment decisions. These cognitive shortcuts

can lead to biased decision-making, affecting investment strategies and outcomes (Sudirman, 2023; Ahmad et al., 2022; Juwita et al., 2022).

2.3.2 Prospect Theory

Expected utility theory does not represent the behaviour demonstrated by most people due to its simplifying assumptions about preferences and mistakes humans make in probability judgements (Kahneman & Tversky, 2013), which has led researchers turn into alternative models. Introduced by, prospect theory offers one of these alternatives amenable for understanding decision-making under risk conditions. It stated that people framed the outcome as a loss or gain on their own reference point, rather than judging it in terms of absolute magnitude. This framework was then elaborated in cumulative prospect theory with the goal of generalizing how prospects over outcomes under uncertainty and risk (Tversky & Kahneman, 1992). Among these studies, some applied prospect theory to modelling bounded rational behaviour of decision-makers for complex decisions such as risk assessment in construction project investments and supply chain sustainability (Sutrisno & Kumar, 2022; Gou et al., 2021).

Additionally, prospect theory has also shed light on numerous decision-making biases, including regret aversion, loss aversion and mental accounting that influence how individuals make investment decisions (Goyal et al., 2021). Prospect theory has been useful in property investment decision (Amorim et al., 2022), renewable energy investments (Hoxha & Hasani, 2022) and portfolio selection due to the theoretical implications of it have for behavioural finance researches (Ogbeide & Okpamen, 2020). The theory has also been used to evaluate the risk in investment decisions due mainly due to behavioural biases, and psychology of individual investors (Ilbahar et al., 2022; Ogunlusi & Obademi 2019).

Furthermore, studies have explored the application of prospect theory in risk assessment models, decision support systems, and investment behaviour analysis, demonstrating its versatility and relevance in various decision-making contexts (Tan et al., 2023; Lee et al., 2014; Barberis, 2013). Prospect theory has been instrumental in explaining deviations from rationality, such as the disposition effect and risk-seeking behaviour, providing valuable insights into the complexities of human decision-making (Zhang, 2024; Guo et al., 2022). In sum, the study of prospect theory and investment decision-making reveals important implications in explaining behaviour under risk/uncertainty, providing insights into cognitive processes that drive investment decisions.
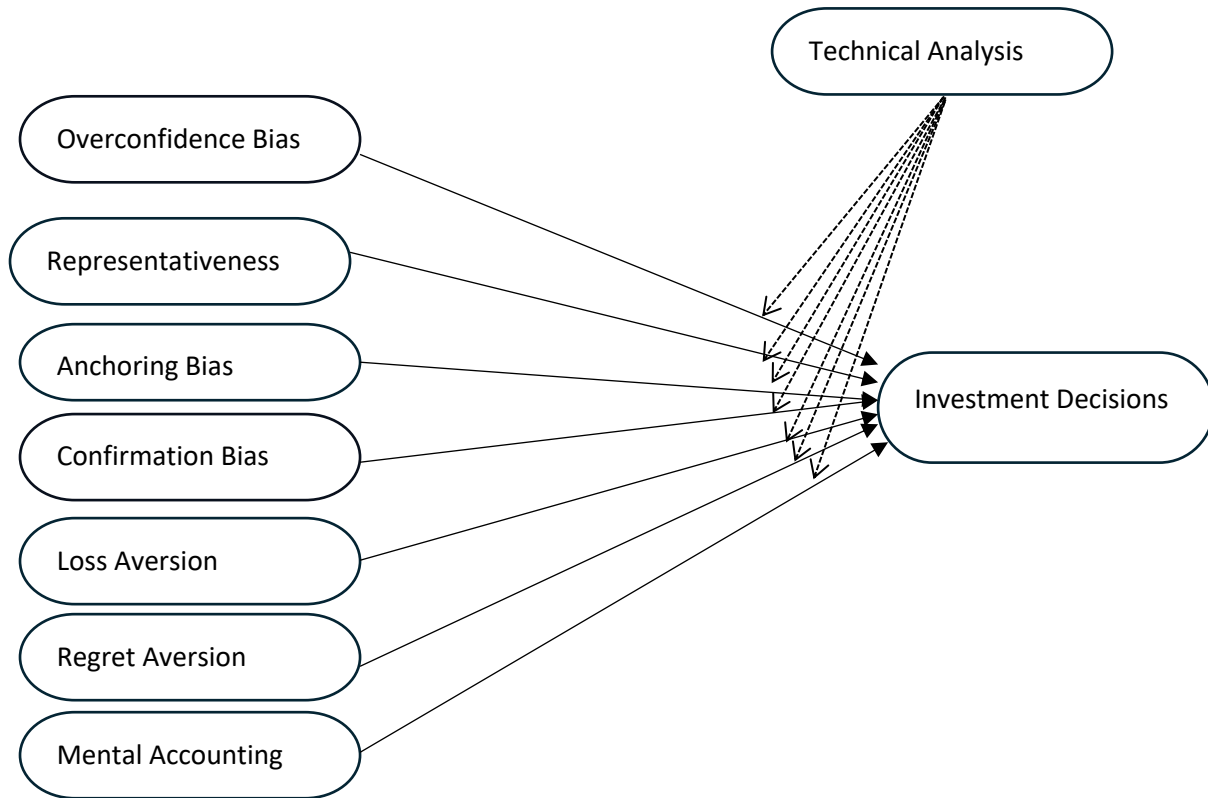
3.0 CONCEPTUAL FRAMEWORK

Figure2: *Proposed Conceptual Framework*

From the proposed conceptual framework, the following hypotheses are suggested:

H1 a,b,c,d,e,f,g: Behavioural biases (overconfidence, representativeness, anchoring, confirmation, loss aversion, regret aversion and mental accounting) significantly influence investment decisions.

H2: Technical analysis significantly moderates the relationship between behavioural biases (overconfidence, representativeness, anchoring, confirmation, loss aversion, regret aversion and mental accounting) and investment decisions.

4.0 CONCLUSION

In conclusion, this conceptual paper presents the research framework for behavioural biases and investment decisions among retail investors in Malaysia. The potential of the moderating influence of technical analysis remains untested for the direct relationship between behavioural biases towards investment decisions. For retail investors, knowledge in technical analysis provides a structured approach to analyzing market data, such as price movements, volume, and patterns. By relying on objective data, traders are less likely to make impulsive decisions based on emotions like overconfidence, fear, or greed as investors rely on data and charts rather than gut feelings. Other than that, when retail investors understand technical analysis, they feel more in control of their decisions. This knowledge can boost confidence, making them less likely to panic during market volatility. At

the same time, equipped with technical skills, investors are less likely to follow the crowd or make decisions based on market rumours, which can be emotionally driven. Furthermore, technical analysis often involves looking at longer-term trends, which can help investors focus on the bigger picture rather than getting caught up in short-term market noise, thus reducing emotional reactions to daily fluctuations.

By discovering the moderation influence of technical analysis whether strengthens or weakens the direct relationships, the finding will become a starting point for future research where this knowledge has uses in both the academic and business realms. Furthermore, the direction of behavioural biases toward investment decisions is an evolving area, and this study can contribute to the field's literature by providing insights into how behavioural biases need to be controlled to improve decision-making in investment among retail investors. Educating retail investors on the psychological factors that influence their trading behaviour and providing recommendations to prevent the negative effects and will assist individuals in making better decisions and achieving higher portfolio performance in the stock market.

REFERENCES

Abdani, F., & Nurdin, F. (2019). Kausalitas Mental Accounting dan Pengambilan Keputusan Investasi Mesin Produksi: Suatu Studi Eksperimen. *Akuntabilitas: Jurnal Ilmu Akuntansi*, *12*(2), 146-156.

Adil, M., Singh, Y., & Ansari, M. N. (2021). How financial literacy moderate the association between behaviour biases and investment decision? AJAR (Asian Journal of Accounting Research), 7(1), 17–30. https://doi.org/10.1108/ajar-09-2020-0086

Adil, M., Singh, Y., & Ansari, M. N. (2021). How financial literacy moderate the association between behaviour biases and investment decision? AJAR (Asian Journal of Accounting Research), 7(1), 17–30. https://doi.org/10.1108/ajar-09-2020-0086

Ahmad, M., & Wu, Q. (2023). Heuristic-driven biases as mental shortcuts in investment management activities: a qualitative study. *Qualitative Research in Financial Markets*, *16*(2), 291-309.

Ahmad, M., Wu, Q., & Abbass, Y. (2023). Probing the impact of recognition-based heuristic biases on investment decision-making and performance. *Kybernetes*, *52*(10), 4229-4256.

Ahmad, Z., Ibrahim, H., & Tuyon, J. (2017). Institutional investor behavioral biases: syntheses of theory and evidence. *Management Research Review*, *40*(5), 578-603.

Akgül, E. F., & Cetin, I. B. (2021). An investigation on behavioral biases in ship investments of small-sized shipping companies. Maritime Business Review, 6(4), 377-391. https://doi.org/10.1108/mabr-08-2020-0049

Almansour, B. Y., Elkrghli, S., & Almansour, A. Y. (2023). Behavioral finance factors and investment decisions: A mediating role of risk perception. *Cogent Economics & Finance*, *11*(2), 2239032.

Amorim, J. Q., Sales, G. A., & Grecco, M. C. P. (2022). Covid-19 and its impacts on financing and investment policies. *RAM. Revista de Administração Mackenzie*, *23*(2), eRAMF220225.

Anwar, M., Irbayuni, S., Wikartika, I., & Pratikto, H. (2023). Behavioural bias in investment decisions: moderate role of self-control.

Ardini, F., & Achyani, D. (2023). The influence of overconfidence, regret aversion, loss aversion, and herding behavior of investment decision in the capital market with the moderating role of risk perception in generation Z students. *Int. j. of Social Science and Economic Research*, *8*(5), 936-950.

Armansyah, R. F. (2021). Over confidence, mental accounting, and loss aversion in investment decision. *Journal of Auditing, Finance, and Forensic Accounting*, *9*(1), 44-53.

Armansyah, R. F. (2022). Herd instinct bias, emotional biases, and information processing biases in investment decisions. *Jurnal Manajemen dan Kewirausahaan*, *24*(2), 105-117.

Arora, R., & Rajendran, M. (2023). Moored minds: An experimental insight into the impact of the anchoring and disposition effect on portfolio performance. *Journal of Risk and Financial Management*, *16*(8), 349.

Bankole, O. E. (2020). Influence of Cognitive Errors on Investor's Decision Making in Nigeria. *The Journal of Accounting and Management*, *9*(3)

Barandagh, M. I., & Hasanzadeh, M. (2013). Examining the impact of mental accounting on the investment decisions in the Tehran stock exchange. *International Journal of Accounting Research*, *1*(5), 6-10.

Barberis, N. C. (2013). Thirty years of prospect theory in economics: A review and assessment. *Journal of economic perspectives*, *27*(1), 173-196.

Bello, S. T. (2024). The Fundamentals of Stock Market Investing in the Twenty-First Century.

Benartzi, S., & Thaler, R. H. (1995). Myopic loss aversion and the equity premium puzzle. *The quarterly journal of Economics*, *110*(1), 73-92.

Bihari, A., Dash, M., Muduli, K., Kumar, A., Mulat-Weldemeskel, E., & Luthra, S. (2023). Does cognitive biased knowledge influence investor decisions? An empirical investigation using machine learning and artificial neural network. *VINE Journal of Information and Knowledge Management Systems*.

Cheng, C. X. (2019). Confirmation bias in investments. *International Journal of Economics and Finance*, *11*(2), 50-55.

Devadas, M., & Vijayakumar, T. (2019). Investment decisions, herd behaviour and retail investors. *International Journal of Innovative Technology and Exploring Engineering*, *8*(10), 3291-3294.

Edison, E. D., & Aisyah, H. (2023). The Effect of Regret Experienced in Investment Decision: an Experimental Study. *International Journal of Asian Business and Management*, *2*(1), 85-98.

Engler, J. O., Abson, D. J., & von Wehrden, H. (2019). Navigating cognition biases in the search of sustainability. *Ambio*, *48*, 605-618.

Ermulyawati, E., Hariyanto, D., & Safitri, H. (2024). The Influence of Loss Aversion, Herding Bias and Regret Aversion Towards Investment Decision to Shareholder in Pontianak. *Kompartemen: Jurnal Ilmiah Akuntansi*, *22*(1), 99-108.

Fama, E. F. (1970). Efficient capital markets. *Journal of finance*, *25*(2), 383-417.

Fama, E. F., French, K. R., Booth, D. G., & Sinquefield, R. (1993). Differences in the risks and returns of NYSE and NASD stocks. *Financial Analysts Journal*, *49*(1), 37-41.

Fikriyah, T. M., & Suhartini, D. (2023). Analysis of Factors that Influence Investment Decisions with Financial Literacy as a Moderating Variable. *Indonesian Journal of Business Analytics*, *3*(4), 1363-1376.

Ginting, R., Crystopher, D., & Yunita, K. (2023). Revealing the Meaning of Indonesian Cryptocurrency Investment Decisions Based on Mental Accounting: A Phenomenological Study. *Jati: Jurnal Akuntansi Terapan Indonesia*, *6*(1), 45-57.

Gou, X., Xu, Z., Zhou, W., & Herrera-Viedma, E. (2021). The risk assessment of construction project investment based on prospect theory with linguistic preference orderings. *Economic research-Ekonomska istraživanja*, *34*(1), 709-731.

Goyal, P., Gupta, P., & Yadav, V. (2023). Antecedents to heuristics: decoding the role of herding and prospect theory for Indian millennial investors. *Review of Behavioral Finance*, *15*(1), 79-102.

Guo, G., Xiao, Y., & Yao, C. (2022). Multi-period uncertain portfolio selection model with prospect utility function. *Plos one*, *17*(9), e0274625.

Gupta, S., & Shrivastava, M. (2021). Herding and loss aversion in stock markets: mediating role of fear of missing out (FOMO) in retail investors. International Journal of Emerging Markets, 17(7), 1720–1737. https://doi.org/10.1108/ijoem-08-2020-0933

Gupta, S., & Shrivastava, M. (2021). Impact of behavioral biases on investment decisions: Moderating effect of preferred sector of investment. *Ramanujan International Journal of Business and Research*, *6*, 37-48.

Gyanwali, I., & Neupane, G. (2021). Individual Investors Psychology and Investment Decision in NEPSE. *The Lumbini Journal of Business and Economics*, *9*(1-2), 43-53.

Hafez, H. M. (2021). Investigating the psychological factors that affect Egyptian investors' behaviour and decisions before and after the pandemic. Journal of Governance and Regulation, 10(4), 113–129 https://doi.org/10.22495/jgrv10i4art10

Haigh, M. S., & List, J. A. (2005). Do professional traders exhibit myopic loss aversion? An experimental analysis. *The Journal of Finance*, *60*(1), 523-534.

Hala, Y., Abdullah, M., Andayani, W., Ilyas, G. B., & Akob, M. (2020). The Financial Behavior of Investment Decision Making Between Real and Financial Assets Sectors. The Journal of Asian Finance, Economics and Business, 7(12), 635–645. https://doi.org/10.13106/jafeb.2020.vol7.no12.635

Haritha, P. H. (2024). The Effect of Heuristics on Indian Stock Market Investors: Investor Sentiment as a Mediator. *Management and Labour Studies*, *49*(1), 43-61.

Henriques de Brito, M., & do Valle Jardim, P. E. (2020). GROUP BEHAVIORAL BIASES AFFECT FINANCIAL DECISIONS UNLIKE INDIVIDUAL BEHAVIORAL BIASES. *IADIS International Journal on Computer Science & Information Systems*, *15*(1).

Hoxha, V., & Hasani, I. (2022). Decision-making biases in property investments in Prishtina, Kosovo. *Journal of Property Investment & Finance*, *41*(2), 155-181.

Hübner, G., & Lejeune, T. (2022). Portfolio choice and mental accounts: A comparison with traditional approaches. *Finance*, *43*(1), 95-121.

Hung, N. V. (2023). Forecasting The Vietnamese Stock Market Using Technical Analysis Indicators. *International Journal of Management & Entrepreneurship Research*, *5*(12), 1076-1084.

Ilbahar, E., Kahraman, C., & Cebi, S. (2022). Risk assessment of renewable energy investments: A modified failure mode and effect analysis based on prospect theory and intuitionistic fuzzy AHP. *Energy*, *239*, 121907.

Jain, J., Walia, N., & Gupta, S. (2019). Evaluation of behavioral biases affecting investment decision making of individual equity investors by fuzzy analytic hierarchy process. *Review of Behavioral Finance*, *12*(3), 297-314.

Jaiyeoba, H. B., & Haron, R. (2016). A qualitative inquiry into the investment decision behaviour of the Malaysian stock market investors. *Qualitative Research in Financial Markets*, *8*(3), 246-267.

Jaiyeoba, H. B., Adewale, A. A., Haron, R., & Che Ismail, C. M. H. (2018). Investment decision behaviour of the Malaysian retail investors and fund managers: A qualitative inquiry. *Qualitative Research in Financial Markets*, *10*(2), 134-151.

Joshi, D. L. (2022). Use of moving average convergence divergence for predicting price movements. *International Research Journal of MMC (IRJMMC)*, *3*(4), 21-25.

Kahneman, D., & Tversky, A. (2013). Prospect theory: An analysis of decision under risk. In *Handbook of the fundamentals of financial decision making: Part I* (pp. 99-127).

Kasoga, P. S. (2021). Heuristic biases and investment decisions: multiple mediation mechanisms of risk tolerance and financial literacy—a survey at the Tanzania stock market. *Journal of Money and Business*, *1*(2), 102-116.

Khan, A., & Bashir, T. (2020). Scale Development and Exploration in Representativeness Bias Intervening Investment and Financial Decisions. *Pakistan Social Sciences Review*, *4*(1), 403-417.

Khan, I., Afeef, M., Jan, S., & Ihsan, A. (2021). The impact of heuristic biases on investors' investment decision in Pakistan stock market: moderating role of long term orientation. *Qualitative Research in Financial Markets*, *13*(2), 252-274.

Khaskhelly, I. Z. (2023). How Behavioral Finance Impacts Investor Decision-Making: an Empirical Study of the Pakistan Stock Exchange. *International Journal of Contemporary Business and Economics (IJCBE)*, *1*(02), 56-68.

Kubinska, El˙ zbieta, Marcin Czupryna, Łukasz Markiewicz, Jan Czekaj (2016). Technical Analysis as a Rational Tool of Decision Making for Professional Traders. Emerging Markets Finance and Trade, 52(12), 2756–2771.

Kudryavtsev, A., & Cohen, G. (2010). Anchoring and pre-existing knowledge in economic and financial settings. *American Journal of Social and Management Sciences*, *1*(2), 164-180.

Kumar, S., & Goyal, N. (2015). Behavioural biases in investment decision making–a systematic literature review. *Qualitative Research in financial markets*, 7(1), 88-108.

Kumar, S., & Goyal, N. (2016). Evidence on rationality and behavioural biases in investment decision making. *Qualitative Research in Financial Markets*, 8(4), 270-287.

Kumara, R. R., & Kawshala, B. A. H. (2021). The Impact of Heuristic Biases on Investors' Investment Decision Making; Evidence from Colombo Stock Exchange. *Journal of Business and Technology*, 5.

Kumari, K. M. P. G. G. D., Kumari, J. S., & Senani, K. G. P. (2022). Impact Of Emotional Intelligence On Investment Decisions Of Individual Stock Market Investors.

Kunjal, D. (2021). Investor overconfidence in the South African exchange traded fund market. Cogent Economics & Finance, 9(1), 1978190. https://doi.org/10.1080/23322039.2021.1978190

Layyinaturrobaniyah, Masyita, D., & Sekartadjie, G. (2016). Fundamental and technical analyses for stock investment decision making. Journal of Administrative and Business Studies, 2(1), 1-7. doi:https://doi.org/10.20474/jabs-2.1.1

Lee, J. S., Yen, P. H., & Chan, K. C. (2014). Investor sentiment and investment behavior in the chinese mutual fund market. *Chinese Economy*, *47*(1), 38-52.

Liugita, P., Salsabilla, S., & Meythi, M. (2024). Fundamental Analysis And Technical Analysis In Investment Decision Making. *International Journal of Innovative Technologies in Economy*, (1 (45)).

Loris, R. P., & Jayanto, P. Y. (2021). The effect of representativeness, availability, anchoring, risk perception, and herding on investment decisions syariah investors. *Jurnal akuntansi*, *11*(1), 81-92.

Madaan, G., & Singh, S. (2019). An analysis of behavioral biases in investment decision-making. *International Journal of Financial Research*, *10*(4), 55-67.

Maghfira, Y. H. S. P. Technical Analysis: Penny Stock Manipulation Company Share Listed on the Indonesian Sharia Stock Index in 2022.
Mahina, J. N., & Bashaija, W. (2018). Measuring the Effect of Confirmatory Bias on the Level of Investment at the Rwandan Stock Market. *European Business & Management*, *12*(3), 67-74.

Maiziyah, A. R., & Helmayunita, N. (2023). Pengaruh Representativeness Bias dan Availability Bias terhadap Pengambilan Keputusan Investasi. *Jurnal Nuansa Karya Akuntansi*, *1*(3), 261-273.

Markowitz, H. (1952). The utility of wealth. *Journal of political Economy*, *60*(2), 151-158.

Mohammad, E. A., & Salhy, B. B. (2023). The Economics of Behavioral Finance and its Effects on Investment Decisions in Kurdistan Region of Iraq for the Period 2020-2022. *Koya University Journal of Humanities & Social Sciences*, *6*(1).

Natahadi, H., Makaryanawati, M., & Keliwon, K. B. (2024). Impact of Influencer Trustworthiness and Financial Literacy on Herding Behavior with Risk Perception Mediating

Variables of Indonesian Millennial Investors. *International Journal of Social Service and Research*, *4*(01), 15-30.

Nurbarani, B. S., & Soepriyanto, G. (2022). Determinants of Investment Decision in Cryptocurrency: Evidence from Indonesian Investors. Universal Journal of Accounting and Finance, 10(1), 254–266. https://doi.org/10.13189/ujaf.2022.100126

Octavia, A. D., Yuwono, C. C., & Monangin, F. G. (2022). The Effect of Financial Literature, Financial Behavior, & Regret Aversion Bias on Millennial Investment Decisions. *Indikator*, *6*(1), 411888.

Ogbeide, S. O., & Okpamen, P. E. (2020). Cumulative Prospect Theory and Radner Theory: A Critical Assessment from Nigeria.

Ogunlusi, O. E., & Obademi, O. (2021). The Impact of behavioural finance on investment decision-making: A study of selected investment banks in Nigeria. *Global Business Review*, *22*(6), 1345-1361.

Oktaba, P., & Grzywińska-Rąpca, M. (2023). Modification of technical analysis indicators and increasing the rate of return on investment. *Central European Economic Journal*, *10*(57), 148-162.

Peprah, W. K., Kwakwah-Oppong, C. A., Osei-Kuffour, F., & Evinita, L. L. (2024). The mediating effect of the COVID-19 pandemic on heuristic techniques and cognitive biases on investment decision-making. *International Journal of Applied Economics, Finance and Accounting*, *18*(2), 351.

Pikulina, E., Renneboog, L., & Tobler, P. N. (2017). Overconfidence and investment: An experimental approach. *Journal of Corporate Finance*, *43*, 175-192.

Pradhan, A. (2021). Quantitative model for impact of behavioral biases on asset allocation decisions: a case study of investors in UAE. *Journal of Asset Management*, *22*(7), 573-580.

Rahawarin, F. R. (2023). The effect of loss aversion bias and regret aversion bias on financial decisions with financial literacy as an intervening variable. *Accounting and Finance Studies*, *3*(1), 24-37.

Ranaweera, S. S., & Kawshala, B. A. H. (2022). Influence of behavioral biases on investment decision making with moderating role of financial literacy and risk attitude: A study based on colombo stock exchange. *Journal Homepage: Https://Sajf. Sljol. Info*, *2*(1), 56-67.

Rashwan, A. E. R. M., Khalil, I. S. (2021). "Measuring the Impact of Mental Accounting on Financial and Investment Decisions among Investors." Arab Journal of Administration, 44(1), 227-243.

Raut, R. K., Das, N., & Mishra, R. (2020). Behaviour of individual investors in stock market trading: Evidence from India. *Global Business Review*, *21*(3), 818-833.

Rehan, M., Alvi, J., Javed, L., & Saleem, B. (2021). Impact of behavioral factors in making investment decisions and performance: Evidence from Pakistan Stock Exchange. *Market Forces*, *16*(1), 22-22.

Riaz, M., & Zubair, A. M. (2024). Does Self-Control and Over-Confidence Influence Investment Decision: The Mediating Role of Fundamental and Technical Analysis. *The Asian Bulletin of Contemporary Issues in Economics and Finance*, *4*(1), 1-26.

Road, E. R. P., M. I. Barandagh, & M. Hasanzadeh. (2013). "Examining the Impact of Mental Accounting on the Investment Decisions in the Tehran Stock Exchange." International Journal of Accounting Research, 1(5), 6-10.

Ross, S. (1976). The arbitrage pricing theory. *Journal of Economic Theory*, *13*(3), 341-360.

Santi, F., Sahara, N. V., & Kamaludin, K. (2019). The effect of mental accounting on student's investment decisions: a study at investment gallery (GI) FEB University of Bengkulu and Syariah investment gallery (GIS) FEB Iain Bengkulu. *Jurnal Ilmiah Ekonomi Bisnis*, *24*(2), 137-152. International Journal of Financial Research. 11(2), 26-39. https://doi.org/10.5430/ijfr.v11n2p26

Santoso, N. B., Farida, N., & Wijayanto, A. (2022, September). Individual Investors Trading Behavior in Indonesia Stock Exchange and the Covid-19. In *ICISPE 2021: Proceedings of the 6th International Conference on Social and Political Enquiries, ICISPE 2021, 14-15 September 2021, Semarang, Indonesia* (Vol. 248). European Alliance for Innovation.

Saputra, S. E., Adrianto, F., Alfarisi, M. F., Hamidi, M., & Muharja, F. (2023). Endogeneity testing: Heuristic behavior AS a reference for beginning investors in making investment decisions. *Jurnal Apresiasi Ekonomi*, *11*(2), 339-347.

Sattar, M. A., Toseef, M., & Sattar, M. F. (2020). Behavioral finance biases in investment decision making. *International Journal of Accounting, Finance and Risk Management*, *5*(2), 69.

Seraj, A. H. A., Alzain, E., & Alshebami, A. S. (2022). The roles of financial literacy and overconfidence in investment decisions in Saudi Arabia. *Frontiers in psychology*, *13*, 1005075.

Shah, S. Z. A., Ahmad, M., & Mahmood, F. (2018). Heuristic biases in investment decision-making and perceived market efficiency: A survey at the Pakistan stock exchange. *Qualitative Research in Financial Markets*, *10*(1), 85-110.

Shahani, R., & Ahmed, S. F. (2022). Psychological and social factors determining investment decisions in cryptocurrency: exploring the mediating role of cognitive biases. *Journal of Organisational Studies and Innovation*, *9*(4), 24-45.

Sharma, M., & Firoz, M. (2020). Do Investors' Exhibit Cognitive Biases: Evidence from Indian Equity Market.

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *The journal of finance*, *19*(3), 425-442.

Shefrin, H., & Statman, M. (2000). Behavioral portfolio theory. *Journal of financial and quantitative analysis*, *35*(2), 127-151.

Silwal, P. P., & Bajracharya, S. (2021). Behavioral factors influencing stock investment decision of individuals. *The International Research Journal of Management Science*, *6*(1), 53-73.

Simanjuntak, R., Putri, S., & Muda, I. (2023). The influence of technical and fundamental analysis on investment decision making for traders with theory of reasoned action. *Brazilian Journal of Development*, *9*(12), 31972-31986.

Sudirman, W. F. R., Winario, M., Priyatno, A. M., & Assyifa, Z. (2023). Risk Tolerance: Heuristic Bias Towards Investment Decision Making. *Jurnal Manajemen Teori dan Terapan*, *16*(2).

Sutrisno, A., & Kumar, V. (2022). Supply chain sustainability risk decision support model using integrated Preference Selection Index (PSI) method and prospect theory. *Journal of Advances in Management Research*, *19*(2), 316-346.

Syarkani, Y., & Tristanto, T. A. (2022). Examining the predictors of crypto investor decision: The relationship between overconfidence, financial literacy, and attitude. *International Journal of Research in Business and Social Science (2147-4478)*, *11*(6), 324-333.

Talwar, S., Talwar, M., Tarjanne, V., & Dhir, A. (2021). Why retail investors traded equity during the pandemic? An application of artificial neural networks to examine behavioral biases. Psychology & Marketing, 38(11), 2142–2163. https://doi.org/10.1002/mar.21550

Tan, J., Liu, Y., Senapati, T., Garg, H., & Rong, Y. (2023). An extended MABAC method based on prospect theory with unknown weight information under Fermatean fuzzy environment for risk investment assessment in B&R. *Journal of Ambient Intelligence and Humanized Computing*, *14*(10), 13067-13096.

Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive psychology*, *5*(2), 207-232.

Tversky, A., & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and uncertainty*, *5*, 297-323.

Utami, W., & Nugroho, L. U. C. K. Y. (2017). Fundamental versus technical analysis of investment: Case study of investors decision in Indonesia stock exchange. *The journal of internet Banking and Commerce*, *22*, 1-18.

Wangzhou, K., Khan, M., Hussain, S., Ishfaq, M., & Farooqi, R. (2021). Effect of regret aversion and information cascade on investment decisions in the real estate sector: The mediating role of risk perception and the moderating effect of financial literacy. *Frontiers in Psychology*, *12*, 736753.

Wheatcroft, E., & Wynn, H. P. (2021). Probability distortion with applications to investment bias. *Journal of Statistics and Management Systems*, *24*(3), 591-611.

Wu, J. M. T., Li, Z., Srivastava, G., Tasi, M. H., & Lin, J. C. W. (2021). A graph-based convolutional neural network stock price prediction with leading indicators. *Software: Practice and Experience*, *51*(3), 628-644.

Yuwono, W., & Elmadiani, C. (2021, May). The effect of emotional contagion, availability bias, overconfidence, loss aversion, and herding on investment decisions in the millennial generation during the beginning of the Covid-19 pandemic. In *Proceedings of the 1st International Conference on Law, Social Science, Economics, and Education, ICLSSEE 2021, March 6th 2021, Jakarta, Indonesia*.

Yuyang Wang. Behavioral Biases in Investment Decision-Making. AEMPS (2023) Vol. 46: 140-146. DOI: 10.54254/2754-1169/46/20230330.

Zhang, L., Feng, J., & Feng, B. (2024). Research on PPP-ABS projects hesitant fuzzy multi-criteria investment decision-making with prospect theory and VIKOR method. *Journal of Industrial and Management Optimization*, 0-0.

Zhang, X. (2023). The Role of Behavioral Bias in Investment Outcomes. *Highlights in Business, Economics and Management*, *15*, 99-104.