# OVERCONFIDENCE, REPRESENTATIVENESS AND HERDING BIAS AMONG GERMAN INVESTORS: HOW DEMOGRAPHIC AND OTHER VARIABLES INFLUENCE THEIR DECISION

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Abstract: The study assesses based on the responses from the survey of 342 persons how behavioural biases affect German investors' investment decisions. Three behavioural biases were examined: overconfidence, representativeness, and herding behavior. It was determined that demographic factors affecting German investors, such as gender, age, experience, education, and frequency of investment, influence this choice. Male German investors are more susceptible to all three biases than females. Young investors (<35 years) are more at risk for the overconfidence bias and the representativeness bias, while older investors (>35 years) are more at risk for the herding bias. Investors with a lower experience (<5 years) on the stock market have a higher tendency for the three biases than German investors with a higher experience (> five years). Investors with a high (i.e. university) education are more susceptible to the three biases than those with a low education. Investors with a high investing frequency (> three months) scored higher for all three biases than investors with a low investing frequency (<3 months).

Keywords: behavioural economics, behavioural finance, behavioural biases, overconfidence bias, representativeness bias, herding bias

## 1 Introduction

Behavioural biases are among the most common topics in behavioural finance (Baddeley, 2019). As they frequently result in decisions that do not maximize investment returns (Shukla et al., 2020). When an investor makes investment decisions, behavioural biases are psychological abnormalities they are prone to, resulting in illogical choices and an inability to meet investment objectives (Gupta and Shrivastava, 2021). Kapoor and Prosad (2017) referred to these behavioural biases as the cause of investors' irrational conduct in investment decisions impeding the growth viewpoint and defined them as instruments to analyze the anomalies from the economic fundamentals of rationality while making an investment decision.

Even in current times, it has been shown that it is crucial to comprehend how these behavioural biases affect investors' psychological well-being. By overcoming and avoiding the ensuing mistake of judgment, focusing on these behavioural biases will help individual investors improve their performance (Shabarisha, 2015; Sahi, 2012). Investors who focus more on a few investment options and prefer to disregard everything else owing to internal biases have become increasingly prevalent (Gupta and Shrivastava, 2021). Understanding these investors' motivations is crucial today more than ever because the number of investors is increasing and they can create unforeseen momentum in the stock market (Wood and Zaichkowsky, 2004). Most investors purchase high speculative investments and sell low on panic-related feelings. According to psychological research, the delight of making money is three times lower than the anguish of losing money through investments (Pashtoon, 2016). To grasp the core of behavioural finance, a wise investor must reflect on his or her investing decisions. Humans are prone to abnormal behaviors, which might significantly hinder maximizing wealth (Pashtoon, 2016).

The article aims to investigate whether 3 behavioural finance – overconfidence, representativeness and herding- affect German investors' investment decision and their potential consequences. According to our best knowledge, there is no other study that researches the impact of biases exclusively on German investors. The German financial market however belongs to the most advanced. This article looks at the following demographics in connection with the above-described biases: gender, age, experience, education and frequency.

The number of equity savers in Germany reached a new milestone in 2022, rising to 12.9 million, just above the previous peak in 2001. Nearly 830,000 more people than the previous year now own shares, equity funds, or equity-based ETFs. According to this, or nearly one in five people, 18.3% of people aged 14 and over participate in the stock market. 14.7%, or just one in seven persons, were affected ten years ago (Deutsche Aktieninstitut, 2023).

The article is organized as follows: The next chapter gives a short overview of the investigated biases. Material and methods describe our research approach (for instance questionnaire, Likert scale, Cronbach Alpha). Results are presented in the same name chapter when they are divided according to biases, gender, education and other factors. Our findings are compared to other studies and deeply explained in Discussion. Conclusion summarizes main points..

## 2 The essence of the investigated behavioural biases

### 2.1 Overconfidence bias

Overconfidence is the most debated bias in studies in the field (Ackert and Deaves, 2009). It is defined as a propensity to overestimate one's intelligence, skill, competencies, success expectation, and quality of the information one has and to put excessive trust in one's intuitive abilities (Ricciardi and Simon, 2000; Jha, 2016; Pikulina et al., 2017; Idárraga Calderón, 2018; Zahera and Bansal, 2018). Overconfident investors frequently overestimate their talents while underestimating uncertainties (Bhattacharya, 2012; Jain et al., 2015). They view their past achievement as a reliable indicator of future success (Combrink and Lew, 2020).

Overconfidence is also a byproduct of investors who frequently believe they are better investors than they are. They believe to be able to outperform the market (Singh 2012). They use their information broadly, which might lead to inefficient trading. Additionally, investors trade more frequently and take more significant risks than usual, raising market volatility and mispricing and reducing market efficiency (Waweru et al., 2014; Kasoga, 2021). Through overconfidence, investors can do serious harm to their wealth (Shefrin and Statman, 2000; Baker and Nofsinger, 2002). Daniel and Titman (1999) propose that investor overconfidence may explain the most significant market anomalies, and their study indicates that the investor's overconfidence may produce momentum in stock returns. Cooper et al. (2004) examined this issue and found that a rise in market prices would increase investors' overall overconfidence due to the bias of self-attribution, resulting in higher returns on momentum in the short term after cycles of market gains (Dhankar, 2019).

Women generally have lower confidence levels than men (Bayyurt et al., 2013). In a gender-related investor behavior analysis between 1991 and 1997, Barber and Odean (2001) tested the presumption that more overconfident investors traded (and were predicted to produce poorer results). They found that men traded 45 percent more than women. While women's returns were reduced by 1.72 percent over the same period, men's returns were reduced by 2.5 percent, confirming an over-correlation (Barber and Odean, 2001). Other studies also confirmed that men are mainly vulnerable to this, as they appear to be more overconfident in their trading ability and sell one and a half times more than women (Kliger et al., 2014; Liersch, 2015). When investing in shares, nearly all the effects of overconfidence are detrimental (Fieger, 2017).

### 2.2 Representativeness bias

Representativeness can be defined as an assessment of the extent of correspondence between the population and the sample (Gilovich et al., 1983). If an investor's previous investment were successful due to his judgments, he would likely make the same

choices in future investments without considering various patterns of uncertainty. This is like making assumptions based on recent previous experience (Masomi and Ghayekhloo, 2011). Investors tend to overreact by trying to acquire hot or strong stocks rather than underperforming ones, which is representational bias (DeBondt and Thaler, 1995; Mahina et al., 2017). This may lead investors to purchase an expensive stock since they may do so when the stock price increases and assume that the growth will continue, neglecting the stock while it is trading below its intrinsic value (Alrabadi et al., 2018). This bias causes investors to use stereotyped data about an investment choice and base their conclusions on examining a few specific cases. (Rasheed et al., 2018; Uribe et al., 2013). They tend to focus just on one aspect of a situation, like a company's previous performance, while ignoring any other information that would be useful in making a more informed choice (Kirs et al., 2001; Raut et al., 2020). Investors with representativeness bias often need to make better investing selections when acquiring stocks since they will attribute a company's positive features directly to its shares (Lakonishok et al., 1994). According to McDowell et al. (2013) and Krawczyk and Rachubik (2019), the representativeness heuristic assesses item similarity and organizes them based on the category prototype.

Kahneman and Tversky (1972) address representativeness by finding the nearest match to historical trends. Individuals attempt to forecast an occurrence and disregard the possibility of following the pattern, assigning too much weight to recent data and too little weight to previous odds or base rate frequencies (Kahneman and Tversky, 1973; Tversky and Kahneman, 1983; Dhankar, 2019). According to Kahneman (2003), people may frequently self-correct and make more accurate decisions when they become aware that they are applying the representativeness heuristic. Shefrin (2000) describes representativeness as a stereotype in overreliance-based decisions, with investors wanting their recent achievements to continue. Barberis et al. (1998) relate heuristic representativeness to overreaction. Investors overvalue a business by misinterpreting recent fast earnings growth to go too far into the future and then get frustrated when the optimistic return from this forecasted earnings growth is not realized (Dhankar, 2019). A significant feature of this heuristic is the so-called "base rate neglect," which means that people appear to disregard previously established information and replace it with one representative instead (Kahneman and Tversky, 1974; Ackert and Deaves, 2009). Male and female investors are both prone to representativeness bias. Female investors rely primarily on previous performance because they feel the return patterns will repeat themselves, whereas male investors make investment decisions focusing on stereotypes (Dickason et al., 2017).

**2.3 Hearding bias**

Herding, in the sense of finance, occurs when stock market actors mimic the actions of each other or a wider group, regardless of whether they take the same judgment personally, resulting in coordinated action. Investors fell into the pit of herding by merely doing what people around them do with their investment decisions (Scharfstein and Stein, 1990; Jordan et al., 2015; Loxton et al., 2020). Herding is the process that happens when people are swayed by the expectations of others when it comes to investment decision-making, as investors instead of gathering private information about possible investment options, they depend on recommendations of popular analysts, their family, friends, or colleagues, or publicly available data in general (Ackert and Deaves, 2009; Forbes, 2009; Malkiel, 2007; Subramaniam and Velnampy, 2017; Almansour and Arabyat, 2017).

People depend less on critical thinking and more on emotions and intuition (Chaudhary, 2013). The idea of peer pressure is a central aspect of herding, both an investor's worry about how people will view his or her decision and the sense or concern that someone moves in a specific direction. They must have a solid justification to do so or have important information leading them in that direction (Valsová, 2016). Nofsinger and Sias (1999)

simplified this by stating that herding is a collective of investors trading in the same direction for a while. Not unexpectedly, individual private investors tend to be influenced by competent financial analysts in their investment decision-making. However, as Welch (2000) found in his report, it is pretty interesting that these trained analysts could also be the victims of herding behavior, especially in revising their recommendations – the propensity to obey the market opinion was very evident. Venezia et al. (2011), on the opposite, investigated that among experienced investors, there was a lower tendency to herd than among amateur investors, which can be due to their financial preparation. Additionally they observed that herding behavior is strongly and substantially associated with the degree of stock market volatility, which poses a more significant problem since Spyrou (2013) demonstrated that during periods of crisis and instability, investors frequently emulate others' acts. This creates a never-ending loop where, as investors panic, herding and market uncertainty intensifies concurrently.

Economists agree that herding harms the economy by destabilizing markets and triggering bubble-like episodes (Andersson et al., 2014; Spyrou, 2013). Bubbles, such as the internet bubble at the end of 1990, are believed to be triggered to a degree by the herding mentality (Forbes, 2009). Research undertaken by Nofsinger and Sias (1999) explores both individual and institutional investors herding behavior. The findings suggest that individual investors display herding behavior as a function of observing patterns, related market signals to other investors, or as a consequence of market overreaction. It is often considered that positive feedback trading is a consideration that can cause investors to herd (Patel et al., 1991; Sirri and Tufano, 1998). Venezia et al. (2011) and Sinha (2015) accepted that herding is primarily due to the existence or lack of information and an inherent lack of faith in one's information (Fieger, 2017). There is also much support that herding is a form of social control in humans where individuals seek to find things in common with others around them and feel better about themselves when their actions are in alignment with their companions (Andersson et al., 2014; Roider and Voskort, 2016; Spyrou, 2013). Mistakes made by the herd as a whole are more satisfying to an individual than a mistake by an individual member of the herd (Ahmad and Mahmood, 2020).

Zainul and Suryani (2021) discovered in their study that female investors in Indonesia are more likely to fall prey to the herding tendency while making financial decisions. The results contrast the findings by Kumar and Goyal (2015), who found that male investors in India are more susceptible to the herding tendency. On the contrary, Jamil and Khan (2016) observed that male and female investors in Oman are equally prone to herd behavior, demonstrating that the investor's gender does not influence the investor's herd behavior.

**3 Material and methods**

In this study, data collection was conducted through a questionnaire, a crucial quantitative research tool used to gather data for analysis (Acharya, 2010). This method is popular due to its cost-effectiveness and broad applicability (Maier et al., 2000). Questionnaires are particularly useful for quickly collecting information from a large group of people, and standardization of questions is essential to ensure consistency in responses (Siniscalco & Auriat, 2005).

The questionnaire was available in various formats, including online, computer-based, and traditional paper, allowing for easy data comparison from different sources (Kirchhoff et al., 2010). The questionnaire was used for an online survey, and transparency was provided to respondents by disclosing the average processing time and the number of pages at the beginning of the survey to prevent a high dropout rate (Homburg, 2016).

To ensure a representative sample, specific criteria were used to select sub-survey units, including investors who trade actively or passively on the German stock exchange and participants who

understood English. The study aimed to reach its target audience through a professional and private networks, including friends, family, and other doctoral students by email and Whatsapp.

Participants were asked to evaluate their investment decisions based on various biases, and the study aimed to identify prevalent behavioural biases among German investors, focusing on gender differences in responses. The mean values represented as percentages would be used for result comparisons.

Cronbach Alpha was used to test the reliability of the questionnaire Despite several misunderstandings, misinterpretations, incorrect applications, and even justifications for not being able to evaluate dependability accurately, this indicator is unquestionably one of the most popular, commonly used, and general statistics in research on the design and application of tests (Cortina, 1993; Osburn, 2000; Sijtsma, 2009; Ursachi et al., 2015; Crutzen & Peters, 2017).

If a group of items regularly assesses the same attribute, an individual needs to use this statistic to assist in making that determination. On a uniform 0–1 scale, Cronbach's alpha assesses the degree of agreement. Higher numbers denote more significant agreement (Frost, 2022). High Cronbach's alpha values suggest that each participant's response values are consistent throughout a set of questions. When participants provide a high reaction to one of the items, they are more likely to give a high response to the others. This consistency shows that the measurements are accurate, and the objects may measure the same property. Low values, on the other hand, suggest that the group of items does not dependably measure the same construct. High replies to one question do not imply that participants thought the other items were highly graded. As a result, because the measurements are inaccurate, the questions are unlikely to test the same attribute (Leontitsis & Pagge, 2007; Frost, 2022). It is usually measured against a baseline of 0.7. The items are sufficiently consistent at this level and above to suggest that the measure is reliable (Frost, 2022).

The formula for the Cronbach's alpha is as follows (Leontitsis & Pagge, 2007):

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum s_i^2}{s_x^2}\right)$$

The total number of items or components is k, and $\alpha$ is the reliability coefficient. Where $s_x^2$ is the variance for all items (the i) on the scale, $s_i^2$ is the variance of each individual item i, and for the formula, the sum of the variance of each individual item i is needed (Bland & Altman, 1997; Amirrudin et al., 2021). To calculate, at least two items are needed. The problem will be undefined if k is not >1.

The questionnaire uses a Likert scale from 0-5 for the 20 questions about behavioural biases. The following results can be seen if the research values are applied to Cronbach's alpha.

- the number of items/factors, k = 20
- the sum of item variances, $\sum s_i^2 = 37.21$
- the total variance of the scale, $s_x^2 = 183{,}2$

## 4 Results

342 German investors made up the study's population. Among these 342 participants, 181 were men, and 161 were women. The age group of 25 to 34 years had the most responses (121), while those over 70 received the fewest (5 responses). The demographic parameters for this study, including age groups and gender, are shown in the table 1.

Table 1: Investor's demographic profile

| Demographic variables | Participants (in total) | Participants (%) |
|---|---|---|
| **Gender** | | |
| Male | 181 | 53% |
| Female | 161 | 47% |
| **Age** | | |
| Old investors (>35 years) | 184 | 54% |
| Young investors (<35 years) | 158 | 46% |
| **Experience** | | |
| High experience (>5 years) | 97 | 28% |
| Low experience (>5 years) | 245 | 72% |
| **Education** | | |
| High education (bachelor, master, PhD) | 209 | 61% |
| Low education (high school, apprenticeship) | 133 | 39% |
| **Frequency** | | |
| High frequency (>3 months) | 151 | 44% |
| Low frequency (>3 months) | 191 | 56% |

Source: own work

### 4.1 Gender

The overconfidence bias had a mean value in a total of 2.51. The males scored higher (1.46) than their female counterparts (1.05). The representativeness bias received a mean value in a total of 2.89. Again, men scored higher (1.55) than (1.33) women. The herding bias got a mean value of a total of 2.30. Female German investors scored higher (1.19) than males (1.11). The numbers for each behavioural bias by gender are shown in figure 1.

Figure 1: Overconfidence, representativeness, herding bias – Gender
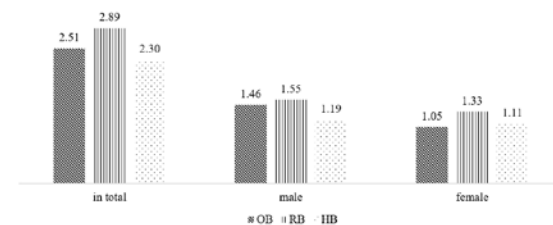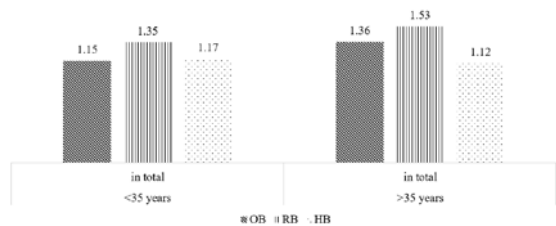
Source: own work

### 4.2 Age

The participants were divided between old (more than 35 years) and young investors (less than 35 years). 158 German investors were among the younger investor group, and 184 German investors were in the older investor group. We found the following results:

Older investors (1.53) scored higher for the representativeness bias than younger investors (1.35). In contrast, the younger investors scored higher for the herding bias (1.17). The opposite was the case for the overconfidence bias, as the older investors scored higher (1.36) than the younger counterparts (1.15).

This means that the representativeness bias is the strongest (1.35) among younger investors before the herding bias (1.17) and overconfidence bias (1.15). Among the older investors, the tendency for the representativeness bias is the strongest (1.53) as well, followed by the overconfidence bias (1.36) and the herding bias (1.12). Figure 2 shows the numbers.

Figure 2. Overconfidence, representativeness, herding bias – Age
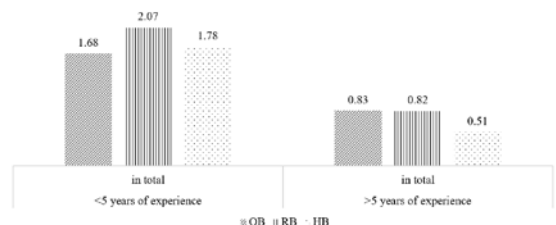


Source: own work

**4.3 Experience**

Regarding investing experience, 247 German investors had less than five years of investment experience, and 95 German investors had more than five years of investment experience.

Investors with less investing experience are more prone to overconfidence bias (1.68) than highly experienced ones (0.83). Investors with less experience (2.07) are also more susceptible to the representativeness bias than German investors with more experience (0.82). Investors with less investment experience (1.78) are more prone to herding bias than investors with higher investment experience (0.51).

This means that the representativeness bias is the strongest (2.07) among investors with less experience before the herding bias (1.78) and overconfidence bias (1.68). Among the experienced investors, the tendency for the overconfidence bias is the strongest (0.83) as well, followed by the representativeness bias (0.82) and the herding bias (0.51). Figure 3 shows the numbers.

Figure 3. Overconfidence, representativeness, herding bias – Experience
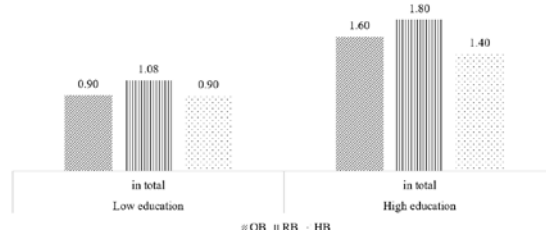


Source: own work

**4.4 Education**

Additionally, it should be researched to see if the three behavioural biases under investigation are influenced by education level. As a result, the 342 respondents were divided into groups according to their level of education. High-education participants were those who had earned a bachelor's, master's, or doctoral degree. However, participants with a high school diploma or an apprenticeship were classified as low-education. 209 German investors were among the group with a high level of education, while 133 German investors were among the group with a low level of education.

Investors with a low education level are less prone to overconfidence bias (0.90) than highly experienced ones (1.60). Investors with a lower educational level (1.08) are also less susceptible to the representativeness bias than German investors with a higher education (1.80). Investors with less education (0.90) are less prone to herding bias than investors with higher investment experience (1.40).

This means that the representativeness bias is the strongest (1.08) among investors with a low educational level before the herding bias (0.90) and overconfidence bias (0.90) with the same value. Among the high educational investors, the tendency for the representativeness bias is the strongest (1.80) as well,

followed by the overconfidence bias (1.60) and the herding bias (1.40). Figure 4 shows the numbers.

Figure 4. Overconfidence, representativeness, herding bias – Education
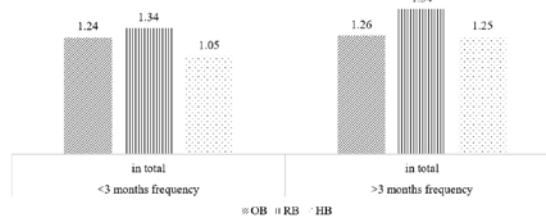


Source: own work

**4.5 Investing frequency**

In addition, it will also be interesting to see if the German investors' frequency influences the three investigated behavioural biases among German investors. The respondents were separated by high investing frequency if they invested in a timeframe of more than three months and low investing frequency if they invested in a timeframe of less than three months. Among the 342 German investors, 191 were low-frequency investors, and 151 were high-frequency investors.

High-frequency investors (1.26) are more prone to overconfidence bias than low-frequency investors (1.24). Investors with a high frequency (1.54) are also more susceptible to the representativeness bias than German low-frequency investors (1.34). High-frequency investors are more prone (1.25) to herding bias than low-frequency investors (1.05).

This means that the representativeness bias is the strongest (1.54) among high-frequency investors before the overconfidence bias (1.26) and herding bias (1.25). Among the low-frequency investors, the tendency for the representativeness bias is the strongest (1.34) as well, followed by the overconfidence bias (1.24) and the herding bias (1.05). The following figure shows the numbers.

Figure 5. Overconfidence, representativeness, herding bias – Investing frequency



Source: own work

Table 2 summarizes all above described results.

Table 2. Demographics influencing behavioural biases

| Demographics | | Overconfidence bias | Representativeness bias | Herding bias |
|---|---|---|---|---|
| Gender | Male | 1.46 | 1.55 | 1.19 |
| | Female | 1.05 | 1.33 | 1.11 |
| Age | Old (>35 years) | 1.15 | 1.35 | 1.17 |
| | Young (<35 years) | 1.36 | 1.53 | 1.12 |
| Experience | High level (>5 years) | 0.83 | 0.82 | 0.51 |
| | Low level (<5 years) | 1.68 | 2.07 | 1.78 |
| Education | High level | 1.60 | 1.80 | 1.40 |
| | Low level | 0.90 | 1.08 | 0.90 |
| Investing frequency | High (>3 months) | 1.26 | 1.54 | 1.25 |
| | Low (<3 months) | 1.24 | 1.34 | 1.05 |

Source: own work

**5 Discussion**

**5.1 Overconfidence bias**

The results from the study are consistent with those of Prosad et al. (2015), who investigated whether Indian investors in the Delhi/NCR region had an overconfidence bias. It also looked into how demographics and investment intelligence may affect the bias. The poll results indicate that the overconfidence bias depends on the demographics of investors and the trading expertise, with age, occupation, and trading frequency having the most influence.

When making investment selections among 600 respondents from the Indian city of Gurugram, Sharma et al. (2022) looked at the impact of demographic factors on several behavioural dispositions of individual investors. Gender, age, educational attainment, employment, and yearly income are among the demographic factors that have been studied that significantly affect the overconfidence bias.

The link between investors' rationality and behavioural biases like overconfidence was experimentally examined by Mushinada et al. (2019) among 384 Indian investors. The findings demonstrate that overconfidence bias is influenced by an investor's traits, including gender, age, employment, yearly income, and trading experience.

Among 500 individual investors in India, Baker et al. (2019) looked at the relationship between behavioural biases and financial literacy and demographic factors (gender, age, income level, education, employment, marital status, and investing experience). The findings show that among Indian investors, overconfidence, representativeness, and herding are evident. The most significant demographic factors that correspond to the behavioural biases of individual investors in the sample are age, employment, and investing experience. In terms of gender, men are more overconfident in their stock market expertise than women are.

The impact of demographic factors, including age, gender, income, and occupation, on investor behavioural biases, such as overconfidence bias, was studied by Elizabeth et al. in 2020. The study involved 151 stockholders on the Indonesia Stock Exchange who were at least 17 years old. The study's findings demonstrated that gender and income impacted overconfidence bias.

In their study, Baker et al. (2018) explored the relationship between a person's propensity to engage in behavioural biases and their age, experience, education, and gender. The study's results demonstrate that SME owners are prone to overconfidence bias using responses from 154 Indian SME owners. The likelihood of engaging in behavioural biases is greatly influenced by gender, age, and experience.

Investigating trading behavior among 491 Thai retail investors in 2016, Paisarn et al. (2021) looked at the traits and behavioural patterns that cause investor prejudice. They discover that investors frequently have biases and that males are more overconfident than women. Additionally, they find that an investor's age, income, and trading experience affect their investing behavior. This research supports the conclusions published for Turkey, India, and Vietnam, showing that demographic characteristics might help differentiate investors based on the severity of their overconfidence bias.

In a study of 391 people in Pakistan, Hassan et al. (2014) looked at how gender and age affected two behavioural biases: overconfidence and loss aversion. According to the research, men and older investors were more overconfident.

233 Swedish private investors were the subjects of an investigation by Gustavsson and Svenler (2020) to determine if there is an overconfident bias present and whether demographic parameters such as gender, age, marital status, education, and

experience affect the degree of overconfident behavior. The results indicate that Swedish private investors are overconfident. Results with statistical significance show that overconfident behavior is influenced by gender, age, education, and experience.

Mwaka (2013) used the behavioural finance theory to describe how a person's demography impacts decisions about investing. Gender, age, education, and income are the demographic factors examined. Results indicated that gender, age, and education all impacted the overconfidence bias.

To examine the impact of demographic variables on rational decision-making processes and how those differences manifest themselves in the form of behavioural biases, Kumar and Goyal (2016) looked at the relationship between rational decision-making and behavioural biases among 386 individual investors in India. The results demonstrate that gender and income significantly affect the ability to make reasonable decisions. In India, male investors are more likely to exhibit overconfidence.

On the contrary, other findings only confirmed partial demographic influences on the overconfidence bias.

In Taiwan, Lin (2011) examined the effects of demographic factors on the behavioural biases of 430 respondents who were voluntary individual investors. There is evidence that gender influences the overconfidence bias, but there is little to no evidence that employment or the amount of yearly income does.
In his study, Koc (2021) sought to uncover the factors influencing overconfidence bias in a sample of Turkish institutional investors. The independent factors in the study include age, gender, marital status, education, having children, and institutional investment experience. The findings revealed that only education level and marital status substantially impact overconfidence bias.

The impact of demographic characteristics, including gender, age, education, employment, income, and investing experience, on investor behavior biases, such as overconfidence bias, was studied by Beatrice et al. in 2021. To perform this study, questionnaires were sent to 152 investors listed on the Indonesia Stock Exchange who were at least 17 years old. The findings demonstrated that only investment experience had an impact on overconfidence bias.

Other findings showed that there were no demographic influences on the overconfidence bias.

225 respondents in Pakistan who were bankers, finance students, and investors were studied by Bashir et al. (2013) to determine the effects of demographics (residential area, age, gender, marital status, educational background) as well as personality traits (extraversion, openness, conscientiousness, neuroticism, and agreeableness), on the overconfidence bias. The findings indicate that personality qualities affect the overconfidence bias, but demographics have no discernible link.

In their work, Pandey and Dhami (2021) investigated how the respondents' behavioural biases, who were among 100 college and university professors in Punjab, were affected by the respondents' demographic features. The results revealed that age, gender, job title, and years of experience did not substantially affect the overconfidence bias

**5.2 Representativeness bias**

Results in the literature do not agree with these findings, as most researchers find the representativeness bias partially influenced by demographic variables.

Among 500 individual investors in India, Baker et al. (2019) looked at the relationship between behavioural biases and financial literacy and demographic factors (gender, age, income level, education, employment, marital status, and investing experience). The findings show that among Indian investors,

overconfidence, representativeness, and herding are evident. The most significant demographic factors that correspond to the behavioural biases of individual investors in the sample are age, employment, and investing experience.

When making investment selections among 600 respondents from the Indian city of Gurugram, Sharma et al. (2022) looked at the impact of demographic factors on several behavioural dispositions of individual investors. Gender, age, employment, and yearly income are demographic factors that significantly affect the representativeness bias, although educational background has less bearing.

In their work, Pandey and Dhami (2021) investigated how the respondents' behavioural biases, who were among 100 college and university professors in Punjab, were affected by the respondents' demographic features. The results demonstrated that neither gender nor designation substantially impacted the representativeness bias, only age and years of experience.

In his research, Koc (2021) sought to understand the variables that influenced the sample of Turkish institutional investors' overconfidence biases and representativeness. As independent factors, the research considers institutional investors' age, gender, marital status, educational attainment, having children, and experience. Results indicated that only gender, experience level, and education degree significantly impacted representativeness bias.

At the Nairobi Securities Exchange in Kenya, Onsomu et al. (2017) performed research to ascertain how demographics affect investor biases among individual investors. A cross-sectional analysis of 279 investors for the year 2015 was conducted. Age, education, and experience did not significantly alter investor representativeness bias in demographics. However, the impact of investor prejudices was significantly influenced by gender, with males being more impacted than women.

**5.3 Hearding bias**

The findings are in sync with the findings by Mwaka (2013), who used Behavioural Finance Theory to describe how demographic variables influence investor behavior. Gender, age, education, and income are the demographic parameters studied. Gender, age, and education were found to impact herding bias.

Nair et al. (2017) examined the effects of 52 respondents' cognitive biases on the demographics and different financial information sources of Indian stock investors. The herding behavior of stock investors is significantly influenced by gender, age, marital status, and word of mouth.

Hussain et al. (2022) used data from 210 investors trading at the Pakistan Stock Exchange to examine the impact of the herding bias and demographic disparities among investors. The findings demonstrated that income, occupation, and age considerably influenced the herding tendency.

The presence of herding bias among Indian investors in the Delhi/NCR region was investigated by Prosad et al. in 2015. It also looks into how demographics and investment intelligence may affect the bias. The poll results indicate that the herding bias depends on the demographics of investors and the complexity of their trading, with age, occupation, and trading frequency having the most influence.

Among 418 Nepalese investors, Pandit and Chitwan (2018) investigated the presence and impact of behavioural bias, specifically herding prejudice. This study demonstrates that the herding theory still holds even among experienced, educated, and regular traders. Additionally, the herding tendency is influenced by gender, age, profession, and income.

Among 500 individual investors in India, Baker et al. (2019) looked at the relationship between behavioural biases and financial literacy and demographic factors (gender, age, income

level, education, employment, marital status, and investing experience). The findings show that among Indian investors, overconfidence, representativeness, and herding are evident. The most significant demographic factors that correspond to the behavioural biases of individual investors in the sample are age, employment, and investing experience.

To examine the impact of demographic variables on rational decision-making processes and how those differences manifest themselves in the form of behavioural biases, Kumar and Goyal (2016) looked at the relationship between rational decision-making and behavioural biases among 386 individual investors in India. The results demonstrate that gender and income significantly affect the ability to make reasonable decisions. In India, male investors are more likely to exhibit herd mentality.

Other studies partially agreed with our findings, as not all investigated demographic variables influenced the herding bias. Sarkar and Sahu (2018) examined the stock market investing behavior of 400 randomly chosen individual investors from different West Bengal districts to see if three independent variables, including demographic considerations, impacted their choices. The findings indicate that the herding tendency is significantly influenced by age, employment, and yearly income but not by experience or investing goals.

In Taiwan, Lin (2011) examined the effects of demographic factors on the behavioural biases of 430 valid respondents who were voluntary individual investors. Age and gender affect the herding tendency, but there is no evidence that employment or the amount of yearly income has an effect.

In their study, Elvira et al. (2022) examined the influence of demographics and financial literacy on the behavioural biases of 204 investors in Indonesia. According to the findings, the herding bias is affected by financial literacy and occupation but not by age or income.

When making investment selections among 600 respondents from the Indian city of Gurugram, Sharma et al. (2022) looked at the impact of demographic factors on several behavioural dispositions of individual investors. The herding bias is significantly influenced by the demographic factors of gender, age, and yearly income but not by employment or educational background.

225 respondents in Pakistan who were bankers, finance students, and investors were studied by Bashir et al. (2013) to determine the impact of demographics (residential area, age, gender, marital status, educational background) and personality traits (extraversion, openness, conscientiousness, neuroticism, and agreeableness) on the herding bias. The findings demonstrate that personality factors affect overconfidence bias, but demographics are not associated with herding prejudice.

The impact of demographic factors, including age, gender, wealth, and occupation, on investor behavioural biases, such as the herding bias, was studied by Elizabeth et al. in 2020. The study involved 151 stockholders on the Indonesia Stock Exchange who were at least 17 years old. The study's findings demonstrated that only the profession impacted the herding behavior bias.

The impact of demographic characteristics, including gender, age, education, employment, income, and investing experience, on investor behavior biases, such as overconfidence bias and herding prejudice, was studied by Beatrice et al. in 2021. To perform this study, questionnaires were sent to 152 investors listed on the Indonesia Stock Exchange who were at least 17 years old. The findings demonstrated that age and profession were the only factors influencing herding bias.

In their research on 166 individual Retail Investors of the Pakistan Stock Exchange, Sabir et al. (2020) sought to emphasize the influence of demographic characteristics on the herding behavior of investors with the moderating role of

Islamic religiosity. The findings indicate that while gender does not affect herding behavior, age and income do.

Among the literature, one example was that the findings showed no influence of demographic variables on the herding bias. In their work, Pandey and Dhami (2021) investigated how the respondents' behavioural biases, who were among 100 college and university professors in Punjab, were affected by the respondents' demographic features. The results demonstrated that age, gender, job title, and years of experience did not significantly affect the herding bias.

## 6 Conclusion

This study looked at how behavioural biases affected the investing choices made by German investors. 342 German investors were given a questionnaire to complete, which was then used to debate and evaluate behavioural biases. The behavioural biases that this study focused on were overconfidence, representativeness, and herding. The issue was whether or whether factors like gender, age, experience, education, and frequency of investing had an impact on the behavioural biases of German investors and the ensuing investment judgments. The findings of the study imply that behavioural biases and demographics have an impact on German investors.

We specifically discovered that male German investors are more prone to three biases (overconfidence, representativeness, and herding) than females. Younger investors (<35 years) are more prone to overconfidence and representativeness biases, while older investors (>35 years) are at greater risk of the herding bias. Additionally, less experienced investors (<5 years) and those with a higher education level (i.e., university) tend to show these biases more, and investors who trade more frequently (> three months) demonstrate higher levels of all three biases compared to less frequent traders (<3 months).

Our findings emphasized once more how irrational the decision-making processes of financial market players are. Biases are deeply ingrained in an investor's subconscious thinking, and they nearly dictate every choice he makes. Behavioural finance seeks to address these biases to help individual investors deal with them.

Additionally, behavioural biases among investors have been shown to have a significant impact on how people spend, save, and invest. The emotional makeup of society and the brain's information-processing shortcuts are to blame for these behavioural biases. Because of this, the majority of investors experience the prevailing prejudices that induce them to behave poorly and maybe go against their best interests.

Furthermore, market swings induced by the pandemic and inflation crises show that investor behavior fluctuates over time, making this research incredibly difficult to conduct to acquire a deeper understanding of investor behavior. Investor behavior can be also impacted by a variety of factors that influence an investment or trading decision. As a consequence, factors including the traded stock industry and the business cycle, among others, tend to impact investment behavior. Some biases are assumed to feed off of one another, and the external environment and other biases in the process are two factors that influence bias intensity. However, while certain biases may be avoided in specific contexts, they cannot be completely eliminated.

According to the study, behavioural biases have influenced human judgment, and future research might look at other biases and demographic characteristics. It might also be claimed that, for whatever reason, making financial decisions can be difficult, causing many people to act impulsively at times. The same people, on the other hand, are more likely to feel at ease and in a better frame of mind while filling out a questionnaire, so they opt to react in a way that may represent them in a different light, especially in the context of hypothetical scenarios.

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