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# Cognitive Biases in Retail Investor Decision Making and HCI: A Research Agenda

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## Abstract

The effects of news media and misinformation are not only important in the political domain, but also in other ambiguous and high-stakes situations such as finance. Individual investors are particularly prone to cognitive biases that lead to poor investment decisions, which algorithms and design may either worsen or reduce. Although a growing number of studies have explored cognitive biases among individual investors in behavioral economics, little research has explored how

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investing applications and new mobile devices impact decision-making, and how we might detect, reduce, or inoculate investors against their own biases. In this position paper I argue that researchers should focus on the effects of aggregated news, network effects, and data visualization on retail investor decision-making. I review some relevant literature and discuss ways that researchers can continue to explore these topics.

## Author Keywords

Cognitive bias; investing; finance; news; communities.

## CSS Concepts

• **Human-centered computing~Human computer interaction (HCI);**

## Introduction

Approximately 43 million American households have a brokerage accounts for investing their money in the stock market [30], and that number is likely to continue rising as mobile apps and new investing technologies, such as fractional shares and free trades (i.e. buying and selling stocks), reduce barriers to entering the stock market.

This growth has been accelerated by new tech companies focusing on a mobile-first strategy in the financial industry. Many new applications are changing the way people invest and learn about investing. Apps such as Yahoo Finance provide aggregated news and financial market information, while others such as Robinhood introduced free stock trading [25] and a mobile-first approach that traditional brokers have since followed. Other apps, such as Acorns, allow people to invest extra change they have, and larger brokers, such as Fidelity, Schwab, and Vanguard have also been innovating and developing new mobile applications to meet the shifting needs of retail investors [31,32].

These investing applications provide varying levels of information to investors about assets, such as whether financial experts suggest buying, holding, or selling specific stocks; corporate earnings reports; news articles; and real-time market information such as stock prices, histories, and buying trends [33,34]. Although there is less research on how types of information, their presentation, and their algorithmic curation impacts decision-making, or whether some people are more likely to succumb to biases as a result of these, there is considerable research that suggests this information does impact people's decision making (e.g. [3,4]). Moreover, the regulation of the financial industry poses unique challenges to exploring these topics as well.

Since financial markets are characterized by high levels of ambiguity, they are fertile ground for the spread of rumors [26], speculation, and biased decision making [2]. Some investors are particularly prone towards certain biases as well [22], such as novice investors

[14,29], people without financial advisors [35], and people who have less knowledgeable and affluent networks to learn from [29]. These suggest that algorithmic and decision-making biases may result in further gaps of wealth and economic inequality as investing becomes democratized and available to more diverse groups of people.

Financial news isn't consumed in a vacuum either. Many people share and discuss financial news articles on forums and social network sites such as Reddit, Twitter, and Facebook. These sharing behaviors provide opportunities to explore how investing strategies are socialized and financial news spread and interpreted in social contexts.

In this position paper, I discuss some relevant literature on bias and news. I also engage with this literature to start identifying topics for further research into cognitive biases in the context of financial HCI and social computing, focusing specifically on retail investors (i.e. non-professional investors in the general population). I hope that my knowledge of investing, HCI, and cognitive biases will be beneficial to the workshop, that I can support the growth of this research initiative and learn from the community.

## **Related Work**

### *Biases and Investor Behavior*

Although less work has explored financial biases in HCI, there has been considerable research exploring investor biases in behavioral economics and finance. People often make suboptimal decisions when investing by acting on emotion or making quick decisions guided by faulty heuristics. Due to the ambiguous nature of financial markets, especially in the short-term,

investors are frequently faced with difficult, uncertain decisions and competing information [1].

Some of the more common biases explored in behavioral finance include overconfidence, disposition effects, representativeness bias, hindsight bias, herding mentality, and availability bias (e.g. [3,4,5,6,11,19,22,27]). The ways in which financial news and data are presented to people may bolster or reduce biases and impact decision-making, but research is required to understand if, and how, that might be.

For example, overconfidence bias – the belief that one’s judgments are reliably greater than the objective accuracy of those judgments – tend to be more prevalent among people who trade more frequently, among people who are less knowledgeable [17], and tend to be higher among men on average as well. Overconfident traders tend to underestimate the associated risks of active stock investing [6]. Trading frequency has been used as a proxy for overconfidence [11]. Despite the noise in trading log data, it serves as one behavioral signal that provides unique opportunities to explore the impact of design decisions and interventions on behavior.

News may impact investor judgments due to availability heuristics as well since people judge events that are more easily accessible, such as market events reported in the news, as more likely and frequent than other events that are difficult to imagine [28].

Anchoring and adjustment heuristics are two other processes linked to available information and cues that people seek out when researching investment options.

For example, many investors believe that recent returns are representative of what they can expect in the future [13] and overweight the importance of historical information more than the arrival of new macroeconomic information [16]. This extrapolation bias leads investors to buy stocks that have recently increased in price [22]. These are interesting building blocks on which researchers might explore different methods of presenting information to investors.

The body of literature thus far has not explored how these findings might carry over into the design of algorithms, design, or HCI more broadly. This means there is a wealth of opportunity to make a positive impact in the HCI community through understanding how new technologies and communities impact investor perceptions and behaviors. I am certainly not the first to suggest further research in this domain either (e.g. [10,18,21]).

*Bias in HCI: News, Misinformation, and Communities*  
Outside of behavioral finance research, there has been another parallel body of work exploring digital news practices, misinformation, and bias [7]. Some of this work suggests ways researchers might begin to explore and think about the impact of financial news consumption on investor behaviors.

With smartphones and apps that reduce the barriers to investing, people are now able to more easily “snack” or “graze” on investing news throughout the day [23] and make immediate decisions on whether to buy or sell stocks with little-to-no cost. Both the content and the ways that people engage with news may vary across different investor segments, and may result in different outcomes.

For example, news consumption varies by people's "need for cognition," [9] or the tendency to enjoy thinking, and can be used as a predictor of degree of news engagement and information [12,20]. Research finds that people with low need for cognition felt better informed by Facebook posts than those higher in this trait [24]. Does this trait impact *investor* news consumption, perceptions, or decision-making? People with low need for cognition may feel better informed and more susceptible to overconfidence bias.

Some research has explored perceptions of bias in financial news as well. For example, investors considered financial news as less biased than general news among media entities such as CNN, WSJ, and NYT [18], while others found that authors of the financial blog platform SeekingAlpha were viewed as more credible based on whether they held stocks and expressed negative sentiment about them [10]. However, little work has explored the impact of such news on *investor* biases.

Recent research has also identified demand-driven media bias in the financial context, suggesting that it is important for investors to "learn to differentiate stock-market-related information that is based on attempts to garner readership from information that is more likely to convey the underlying value of an asset" [15]. This begs the question of the ethical implications of algorithmically generated, advertising-based news aggregators. The same is true of various brokerages and the way they make money. If a brokerage like Robinhood makes money off of transactions and certain news items increase transactions, what's to stop them from doing what's in the business's best interest over

that of investors? Do these become regulatory concerns at some point?

Finally, herd mentality is a serious issue that impacts financial markets on a global scale. Future research could explore how network effects and echo chambers relate to investor decision making in ways that few researchers have yet explored.

Recent work suggests that echo chambers, which are online political discussions taking place in conditions of ideological homogeneity, might exist *because of* opposing viewpoints that are undermined and marginalized by a community [8]. These findings are particularly interesting, because it might create opportunities for new investors to be socialized into more or less successful strategies – for example, if new investors share ideas with a community that go against the communities' investing principles, that community might sanction and attempt to inculcate less risky positions. On a similar note, communities may also encourage risky, poor investment behavior. More work would have to explore such communities, and the perceptions or behaviors of people who contribute to them. Some such communities that could be explored are those on Reddit and other forums, like r/investing, r/WSB, or r/bogleheads.

## **Conclusion**

I hope that this paper will interest and encourage further research into investing biases as they relate to HCI, social computing, and design. There are a wealth of topics to explore and researchers have only just begun to dig into them. I discussed a few different bodies of literature that point towards fruitful opportunities for researchers to begin, or continue,

exploring. To recap, researchers could explore ways to reduce biases (or their effects), such as through data visualization, informational content, or socialization within a community of more knowledgeable peers.

Researchers could also explore how anchoring and adjustment biases, or other biases such as herding behavior, relate to how news and data about stocks or funds are presented, framed, and shared.

There is also a wealth of research to be done on the relationship between news aggregators and investment decision making, such as what kinds of news content aggregators serve and how various types of content relate to investing behaviors across different investor segments.

These are high-impact topics that can lead to opportunities to begin reducing wealth inequality and helping all retail investors better manage their long-term financial health and wealth.

## References

1. H. Kent Baker and Vesa Puttonen. 2017. *Investment Traps Exposed: Navigating Investor Mistakes and Behavioral Biases*. Emerald Group Publishing.
2. H. Kent Baker and Victor Ricciardi. 2014. *Investor Behavior: The Psychology of Financial Planning and Investing*. John Wiley & Sons.
3. Brad M Barber, Yi-Tsung Lee, Yu-Jane Liu, Terrance Odean, and Ke Zhang. 2020. Learning, Fast or Slow. *The Review of Asset Pricing Studies* 10, 1: 61–93.
4. Brad M. Barber and Terrance Odean. 2000. Trading is hazardous to your wealth: The common stock investment performance of individual investors. *The Journal of Finance* 55, 2: 773–806.
5. Brad M Barber and Terrance Odean. 2001. The Internet and the Investor. *Journal of Economic Perspectives* 15, 1: 41–54.
6. Brad M Barber and Terrance Odean. Boys will be boys: Gender, overconfidence, and common stock investment. *Quarterly Journal of Economics* 116, 1: 261–292.
7. Frank Bentley, Katie Quehl, Jordan Wirfs-Brock, and Melissa Bica. 2019. Understanding Online News Behaviors. *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems - CHI '19*, ACM Press, 1–11.
8. Jonathan Bright, Nahema Marchal, Bharath Ganesh, and Stevan Rudinac. 2020. Echo Chambers Exist! (But They're Full of Opposing Views). *arXiv:2001.11461 [cs, stat]*.
9. John T. Cacioppo and Richard E. Petty. 1982. The need for cognition. *Journal of Personality and Social Psychology* 42, 1: 116–131.
10. John L Campbell, Matthew D DeAngelis, and James R Moon. Bias in the Crowds? An Examination of Whether Financial Positions Affect Investor Perceptions of Stock Opinions Transmitted Through Social Media. *SSRN Scholarly Paper ID 2837321*: 49.

11. Gongmeng Chen, Kenneth A Kim, John R Nofsinger, and Oliver M Rui. 2007. Trading Performance, Disposition Effect, Overconfidence, Representativeness Bias, and Experience of Emerging Market Investors. *Journal of Behavioral Decision Making*: 27.
12. Samar Das. 2003. The Effect of Interpersonal Trust, Need for Cognition, and Social Loneliness on Shopping, Information Seeking and Surfing on the Web. *Marketing Letters* 14, 3: 185–202.
13. Werner PM DeBondt. 1993. Betting on trends: Intuitive forecasts of financial risk and return. *International Journal of Forecasting* 9, 3: 355–371.
14. Ravi Dhar and Ning Zhu. Up Close and Personal: Investor Sophistication and the Disposition Effect. *Management Science* 52, 5: 726–740.
15. Hang Dong, Jie Ren, and Jeffrey V Nickerson. 2018. Be Careful What You Read – Evidence of Demand-driven Media Bias. *Proceedings of the Americas Conference on Information Systems*: 10.
16. Sandip Dutta and Han Yu. Exceeding Expectations: Economic Forecasts, Anchoring Bias and Stock Returns. 39.
17. Monica Gentile and Paola Soccorso. 2016. Financial Advice Seeking, Financial Knowledge and Overconfidence. Evidence from the Italian Market. *SSRN Electronic Journal*.
18. Carroll J. Glynn and Michael E. Hume. *How Pervasive Are Perceptions of Bias? Exploring Judgments of Media Bias in Financial News*. .
19. John R Graham. Herding among Investment Newsletters: Theory and Evidence. *The Journal of Finance*: 33.
20. Curtis P. Haugtvedt, Richard E. Petty, and John T. Cacioppo. 1992. Need for Cognition and Advertising: Understanding the Role of Personality Variables in Consumer Behavior. *Journal of Consumer Psychology* 1, 3: 239–260.
21. Kristin Johnson, Frank Pasquale, and Jennifer Chapman. Artificial Intelligence, Machine Learning, and Bias in Finance: Toward Responsible Innovation. *FORDHAM LAW REVIEW* 88: 32.
22. Satish Kumar and Nisha Goyal. 2015. Behavioural biases in investment decision making – a systematic literature review. *Qualitative Research in Financial Markets* 7, 1: 88–108.
23. Logan Molyneux. 2018. Mobile News Consumption: A habit of snacking. *Digital Journalism* 6, 5: 634–650.
24. Philipp Müller, Pascal Schneiders, and Svenja Schäfer. 2016. Appetizer or main dish? Explaining the use of Facebook news posts as a substitute for other news sources. *Computers in Human Behavior* 65: 431–441.
25. Jay Peters. 2019. Robinhood launches cash management feature a year after bungling its

- checking account launch. *The Verge*. Retrieved February 11, 2020 from <https://www.theverge.com/2019/12/12/21012815/robinhood-cash-management-fractional-share-trading-checking-savings-account>.
26. Ralph L. Rosnow. 1991. Inside rumor: A personal journey. *American Psychologist* 46, 5: 484–496.
27. Rasoul Sadi, Hassan Ghalibaf Asl, Mohammad reza Rostami, Aryan Gholipour, and Fattaneh Gholipour. 2011. Behavioral Finance: The Explanation of Investors' Personality and Perceptual Biases Effects on Financial Decisions. .
28. Amos Tversky and Daniel Kahneman. Availability: A heuristic for judging frequency and probability. *Cognitive psychology* 5, 2: 207–232.
29. Farheen Btool Zaidi and Muhammad Zubair Tauni. 2012. Influence of Investor's Personality Traits and Demographics on Overconfidence Bias. 4, 6: 17.
30. SEC.gov | The Evolving Market for Retail Investment Services and Forward-Looking Regulation — Adding Clarity and Investor Protection while Ensuring Access and Choice. Retrieved February 8, 2020 from <https://www.sec.gov/news/speech/speech-clayton-2018-05-02>.
31. Vanguard Continues to Lower the Cost of Investing with Expansion of Commission-Free Platform Beyond ETFs. Retrieved February 11, 2020 from <https://pressroom.vanguard.com/news/Press-Release-Vanguard-Expands-Commission-Free-Platform-Beyond-ETFs.html>.
32. Fidelity Simplifies Investing Again With Launch of Real-time Fractional Shares Trading for Stocks and ETFs - MarketWatch. Retrieved February 11, 2020 from <https://www.marketwatch.com/press-release/fidelity-simplifies-investing-again-with-launch-of-real-time-fractional-shares-trading-for-stocks-and-etfs-2020-01-29?siteid=bigcharts&dist=bigcharts>.
33. Yahoo Finance Premium. Retrieved February 11, 2020 from <https://finance.yahoo.com/premium-marketing/>.
34. #RobinhoodRewind 2019. *Under the Hood*. Retrieved February 11, 2020 from <https://blog.robinhood.com/news/2019/12/17/robinhoodrewind-2019>.
35. Vanguard - The value of advice: Improving portfolio diversification. Retrieved February 11, 2020 from <https://institutional.vanguard.com/VGApp/iip/site/institutional/researchcommentary/article/InvResValueAdvicePortfolio>.