Idiosyncrasies of biased investment choices in a culturally diverse context

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Abstract: The purpose of this study is to determine the impact of personal and cognitive factors, decision making stylistic differences on investment decision making in various cultural settings, and their connections with cognitive biases and heuristics. A complex combination of psychological tests, financial tasks and self-assessment surveys was conducted among one hundred investors in the USA and seventeen investors Armenia to identify links between personality types and psychological characteristics of trading decision-making in multi-cultural study. This allowed us to visualize connections between personal factors (age, gender, education), decision-making styles, risk aversion and tolerance of ambiguity, financial literacy, and the impact of all these factors on biases we choose to utilize. Our results indicate that the knowledge and epistemic component function as a behavioral regulator, with financial literacy as a central determinant in investment patterns, determine tolerance towards uncertainty and risk aversion behavior. Gender and education, as well as investment stylistic factors determine the choice of biases. The lower number of participants from Armenia and stigma around investments and low trust in banks and financial market among Armenian investors is identifies as limitations for our study. This study is one of the first attempt to study and compare the distinctive features and peculiarities of Armenian investors and the factors determining their investing behavior.

Keywords: Cognitive heuristics and biases, Financial literacy, Investment decision-making, Risk, Uncertainty.

1. Introduction

Stock exchanges are part of civil society from 1531 and have started as a place for brokers and money lenders to buy, sell, trade debts. Further expansion of Dutch, French and British empires led to stock exchanges evolving to more complex initiative with wider range of stocks and commodities traded. From the 18th century London, Philadelphia, NY stock exchanges allowed more companies to seek funds for operations in exchange of ownership through stocks. Up until the 21st century it was the prerogative of brokers and licensed professionals to be an intermediary in the process and was widely spread among more financially stable layers of society [1].

Stock and options trading is a global phenomenon available to everyone if not restricted by law and regulations and no longer is a prerogative of wealthy socialites through brokers. Online trading, also referred to as 'eTrading,' has recently garnered significant attention due to its capacity to enable ordinary individuals—often labeled as 'retail investors'—to impact financial markets in previously unimaginable ways, going against better judgement of professionals [2].

In April 2024, according to the 2024 Market Outlook Report [3] published by the investment Vanguard Research Team, more than 1,300 million shares were traded in US alone per day. The number of investors worldwide ranges from 13.8-50 million, with approximately 5 million new investors emerging since 2017 with Internet financial instruments that make trading stocks and cryptocurrencies accessible to the general public. Based on market sentiment, economic events, global

markets can attract millions to billions of trades per day. As of the fourth quarter of 2022, 58,200 companies were publicly traded worldwide [4].

Buy, sell, hold decisions are the essence of trading [5]. These decisions are the result of market analysis, risk management, timing and execution. In addition to the previously widely used tools as earnings reports and financial analysis channels, charts, news feeds, and advanced trading platforms, the Internet has also created countless sources of information on stock movements and trading strategy recommendations on social media through newsletters, YouTube videos, trading activities on websites, and more, including short form content on social media, which can be an extremely influental tool, since provokes interest with little to no background.

Studies from the 1970s have proven that rationality is bounded because decision makers have limited information at a given moment, combinned with limited cognitive resources to process available information [6]. Research in behavioral finance and the psychological aspects of cognition and decision-making, further informs that perspective plays a key role in the process, and that our brains have developed useful mental shortcuts, or rules of thumb, that allow individuals to make decisions, or solve problems quickly and efficiently. Heuristics, the cognitive strategies or approaches that simplify complex tasks by using easily understood, approximate, or "good enough" methods to come to a solution, even if it may not be the most accurate or optimal one [7]. They help individuals make reasonably informed decisions or judgments without engaging in exhaustive analysis or calculation. However, because heuristics rely on simplifications and generalizations, they can sometimes lead to errors or biases, known as heuristic biases, in specific circumstances [8]. The study of psychological factors affecting stock trading is important for several reasons. Behavioral finance, a field that combines psychology and economics, provides insights into why investors make irrational decisions that deviate from traditional financial theories. Understanding these factors can significantly enhance market stability, investment strategies, and risk management [9]. Investors are affected by cognitive biases that lead to suboptimal investment decisions. Biases such as overconfidence, herd behavior, and loss aversion can lead to significant financial losses [10]. For example, overconfident investors may underestimate risks and trade, while herd behavior may cause the market to overreact to news. Research has shown that these biases can lead to mispricing of assets and increased market volatility. Overconfident investors can fuel market volatility by making excessive trades based on undue confidence in their forecasting abilities [11]. By understanding and mitigating these biases, investors can make more rational decisions, leading to improved financial performance. Another important aspect is the effective risk management, which is important for both individual investors and financial institutions.

Cross-cultural studies examine how cultural factors influence financial behavior. For example, research by Chui, et al. [12] suggests that individualism versus collectivism influences investment decisions and market outcomes. Many monographs have been published in the international academic community on various heuristics and biases and how these phenomena can directly influence investor behavior. However, we could find no direct research on how these phenomena relate to investor psychological characteristics, whether there is a psychological antecedent to biased investor behavior, or whether certain personality or decision-making types types have any influence on biased behavior. Are biases and heuristics universal flaws that cannot be further influenced by other psychological traits? In addition, in best of our knowledge, no attempts were made to study the above mentioned personality characteristics of investors in Armenia in order to compare them with investors from other countries. This work attempts to understand the effects of the Armenian reality and the Armenian national financial mindset on investment behavior, an attempt to understand whether the relatively low level of mass financial literacy has any effect on investment decision-making. These issues have been identified by our team as subject research gaps.

The aim of our research is to identify if psychological characteristics and biases of decision-making, combined with the investor's financial literacy, condition positive outcome and efficiency expectations, which are reflected in the investment style of investors.

2. Materials and Methods

The thorethical bases of our research was built on following fundamental pillars:

- Bounded Rationality Model (Herbert Simon) - This model proposed by Herbert Simon assumes that individuals are limited in their ability to make decisions by the information they have, the cognitive limitations of the mind, and the limited time they have to make decisions. Instead of seeking an optimal solution, people often settle for a satisfactory solution.
- Prospect Theory (Daniel Kahneman and Amos Tversky) - the theory describes how people choose between possible alternatives that involve risk. It shows that people value gains and losses differently, which leads to irrational decision making.
- The Myers-Briggs Type Indicator (MBTI) typology of personality traits, designed to measure individual personality types based on Carl Jung's theory of psychological types.
- Markowitz's risk-return framework, which is fundamental to finance and investment theory. It assumes that the potential return of any investment is correlated with the amount of risk the investor is willing to take.

A complex combination of psychological tests, financial tasks and surveys was conducted among 100 investors in the USA and 17 investors in Republic of Armenia (RA) in order to identify possible links between personality types and psychological characteristics of trading decision-making in multi-cultural study. The sample was built on voluntary participation bases and self-identification of participants as investors. The subsequent methods were employed:

1. Myers-Briggs type indicator(MBTI) to understand individual characteristics of information acquisition, processing and decision making
2. The uncertainty tolerance scale by Budner [13]
3. Safe active versus risky (SAVR) task to study risk aversion
4. The author-created a questionnaire to assess financial literacy, levels of confidence in trading, self-evaluation of knowledge, and the effectiveness of investments.
5. ThriveNt Mutual Funds Investment Style Questionnaire
6. Heuristics and bias identification questionnaire developed on the basis of Kahneman and Tversky's research questions.

3. Results

The MBTI offers a typology consisting of sixteen different personality styles for individuals. Due to complexity and volume of the research, we decided to use D. Keirsey's approach of MBTI typology , which combines basic psychological traits of 16 types of personality and generalizes them into 4 types [14]:

Table 1.

Administrator (SJ)	They are attentive to germs, can predict the consequences of actions and decisions, and prefer the evolutionary path to revolution. They value organization and structure.
Producer (SP)	Action oriented, focused on the present. Problems can be reformulated while searching for solutions.
Enterpreneur (NT)	They prefer the scientific, systematic approach to problem solving, they are oriented towards the future.
Integrator (NF)	They are focused on the justice of solving the problem, they pay attention to people's requirements.

Before discussing the correlations between variables, the following are some quantitative parameters from the study.

Generalizing the types of participants in our sample between RA and US participants, had an equal distribution between the intuitive-sensor N-S pair (9/8 RA; 50/50 USA respectively).

According to years of research, an average of Tolerance for uncertainty among general population is 48% , with data ranging from 40 to 70 [13]. Our sample showed an average of 51% among US investors and 51.7% among Armenian investors, indicating that investors show slightly higher tollerance towards uncertainity compared to general population.

Academic research of Risk aversion shows an average of 48% [15] the data varies between 40 and 70 among general population. The research suggests that investors in Armenia appear to be less risk averse (M=41.76) than their US counterparts (M=49.5). The Shapiro-Wilk test for normality on the Risk Aversion data yields the following results: Statistics: 0.947; P-value: 0.00054.

Investment Style Allocations distribution indicated that about 50% of our US investors invest in a moderate style without being overly aggressive or conservative, about 30% invest aggressively, and about 20% invest conservatively. These data also follow the normality curve for US participants.

In a very interesting example, we observed that participants in Armenia differ more, show signs of moderately aggressive(M=11.8%) and moderately conservative(M=35.3%) behavior, appear more cautious and nuanced compared to US investors ($\chi2$=(4, N=117)=52, p<0.05). This is extremely interesting data for us and requires further research.

US participants rated their financial literacy much higher (M=79.45) than RA participants(M=56.94); however, RA participants rated their knowledge higher(M=54.82 vs M=51.4); US participants are more risk averse(M=49.5 vs 41.76, r=0.4, χ^2=0.6), therefore RA participants are more prone to risky decisions; US participants rate their investment activities more effective than Armenian counterparts.

When asked about the average level of certainty required to decide to buy a stock, participants from Armenia and the US provided similar responses, with 63% and 65%, respectively. However, women in the Armenian sample demonstrated a higher threshold(M=79), indicating that they require a greater sense of confidence for making trading decisions.

When comparing investment style with self-rated financial literacy, we found that both men and women had fairly close averages(M=75.6 vs M=77.4, p=0.02), and both men and women who rated themselves highly in financial literacy exhibited aggressive investment behavior (($\chi2$=(4, N=117)=5.112, p<0.02.

While analysing Age as a factor, the results signal a positive correlation with factors such as irrational investment diversification (r=0.5, p=.042). This suggests that as individuals age and attain higher levels of education, they exhibit more diverse investment behaviors. The research has also revealed negative correlations between age and uncertainty tolerance(r=-0.2, p=.04), trading certainty (r=-0.16, p=.05), and mental accounting bias(r=-0.5, p=.05). This suggests that older individuals may have a lower tolerance for uncertainty, prefer less trading certainty, and be less affected by mental accounting bias.

The education as a personal factor also demonstrated an impact on other parameters. Higher education levels are associated with certain cognitive characteristics, such as better financial literacy and more effective investment self-assessment. There are notable differences between heuristic bias scores across educational levels, indicating that educational level can influence cognitive biases. For individuals with a master's degree, the mean Availability Heuristic scores are 1.5 for women and approximately 1.43 for men, compared to mean value 1.4 among all participants. For PhD holders, the mean Gambling Delusion Bias scores were 2.5 for women and 1.75 for men, indicating a greater tendency for this bias among female PhD students than men, whereas sample mean was 1.4.

At the same level of education, there are significant differences in heuristic bias scores between males and females, suggesting that gender may also play a role in the perception or communication of bias. Women with a master's degree showed more consistency in their responses to the Availability Heuristic, showing a lower standard deviation than men($\chi2$=(3, N=117)=8.4, p=0.03). Male graduate students showed greater variability in their responses to Gambling Delusion Bias compared to female students, by highlighted higher standard deviation($\chi2$=(3, N=117)=5.616, p=0.03). Specific biases, such

as Gambling Delusion Bias and Confirmation Bias, have shown significant differences between genders at the same educational level, especially among those with a master's degree and those with a PhD. In several cases, women scored higher on average than men at the same educational level, particularly on Confirmation Bias and Temporary Discounting Bias among graduate students. There were cases where males scored higher on average than females, such as on the Master's 'Crowd-Following Bias' where the difference was markedly negative.

The data analysis of cultural impact on biases, indicated that Armenian investors are more inclined to maintain the status quo and follow the crowd than the US participants, who also demonstrated higher financial literacy. Indicators and results of characteristic statistics of heuristic expression showed general equal trends among almost all heuristics, but Status Quo and crowd-following heuristics were high among Armenian participants and caused overall higher heuristic expression rates among RA participants.
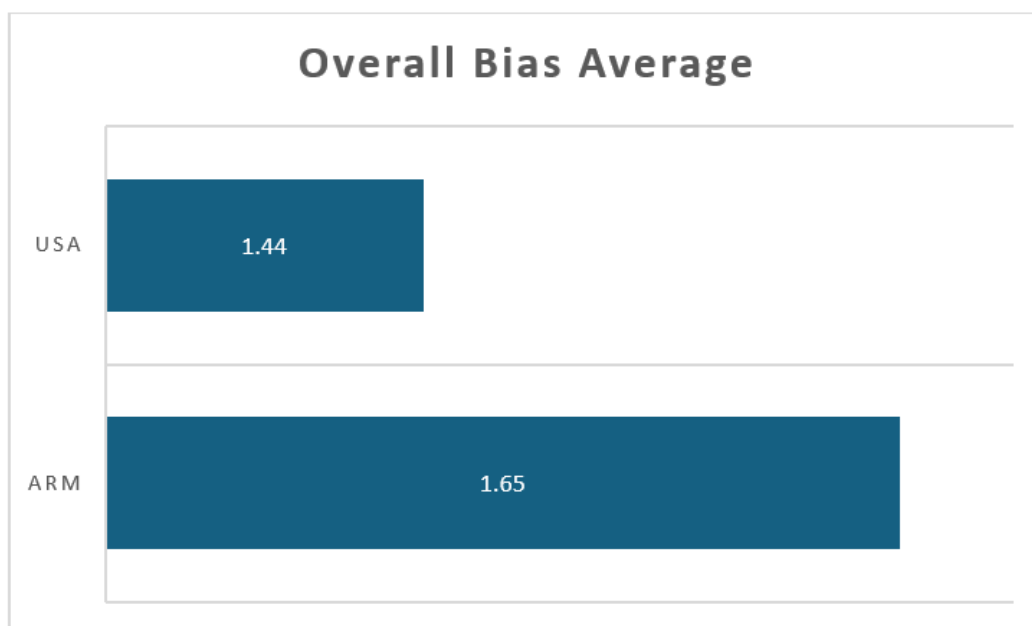

Figure 1.
Overall average of biases in USA and RA samples.

The average values of crowd-following bias are 79 in Armenia and 55 in the USA. The Mann-Whitney U shows a significance of 0.004, indicating the significance and provability of this difference.
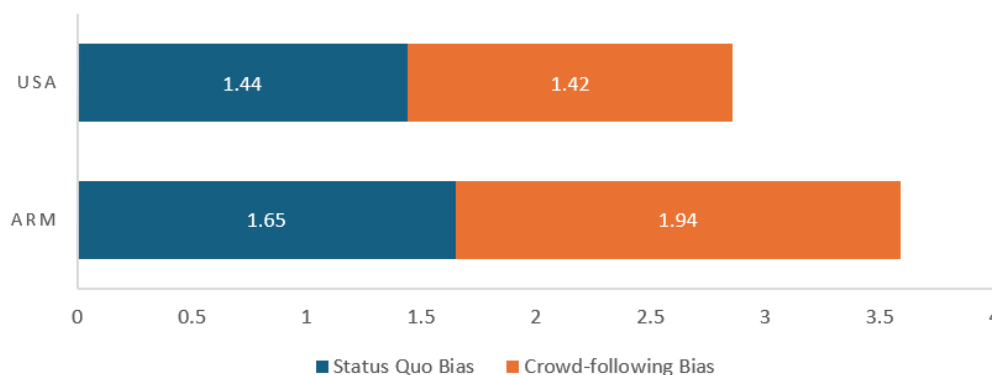
Figure 2.
The distribution of biases in USA and RA samples.

4. Discussion of Findings

Our aim was to understand the impact of personal and cognitive factors, decision making stylistic differences on investment decision making in various cultures, and their connections with universal cognitive biases and heuristics. Due to the number and variability of compared parameters, the main findings are grouped below:

4.1. Cultural Determinants of Decision-Making Biases

- Heuristics and biases are more pronounced among Armenian investors compared to US investors, and this difference is mainly due to status quo and crowd-following biases.
- Armenian investors are less averse to risky decisions, and with a lower assessment of financial literacy, still rate their knowledge higher than US investors. American investors show more aggressive behavior and evaluate their behavior more efficiently, while Armenian investors show more moderately nuanced aggressive and conservative behavior. This can be explained in part by the older and more widespread social investment behavior among US residents. All residents from the age of 18 are actively involved in the creation of their credit history, because this credit history ensures making large purchases under the most advantageous conditions; In addition, in most workplaces, pension contributions are made by both the employer and the employee, and in many cases the employer matches the contribution of the employee, which forces working individuals, even if they are not involved in the investment activity, to constantly monitor and reassess their own salary, Investments and portfolios.

4.2. Gender-Related Determinants of Decision-Making Biases

- Although biases exist among both female and male investors, women are more prone to confirmation and gambling biases, while men are more prone to temporary discounting and crowd-following biases.
- Stylistic determinants of decision-making biases
Individuals exhibiting the most aggressive investment behavior tend to use confirmation bias, and those with moderately aggressive behavior tend to use delusional gambling bias. Individuals with a moderately aggressive investment style exhibit low rates of irrational diversification and time discounting.

4.3. Personality-Based Determinants of Decision-Making Biases

- Representatives of the MBTI typology PRODUCER (SP) type are most inclined to use heuristics in the decision-making process, in particular, the tendency to follow the crowd. ADMINISTRATOR (SJ) type representatives showed simultaneously the most aggressive and the most conservative behavior, making the behavior of representatives of this group less predictable. This is quite an interesting trend among sensory perceivers as opposed to intuitive perceivers (N).

- No direct and correlational relationship was observed between investment styles and different groups of MBTI typology. Although there are certain trends, it is not possible to talk about a direct connection based on the results of our research. In the case of the expression of heuristics, trends were also observed, but no clear correlational relationship was brought out. The average value of heuristics in all groups is almost equal, with less variation in the expression of one or another heuristic, proving the universal nature of heuristics and biases.

- The availability heuristic is equally expressed in all MBTI groups. The largest difference in heuristics between groups was observed in measures of crowd-following heuristics, showing the highest value in the PRODUCER(SP) group and the lowest among the HANDS-ON(NT).

4.4. Cognizance And Financial Literacy Determinants of Decision-Making Biases

- A moderate positive correlation was observed between self-assessment of knowledge and tolerance for uncertainty. Individuals who tend to value their knowledge of the financial sector more highly, to understand the mechanisms of changes and effects of financial markets, are more tolerant of uncertainty. The knowledge and epistemic component acts as a behavioral regulator.

- Financial literacy, which was strongly emphasized by experts both at the public and individual level, as if it were a link between cognitive and behavioral manifestations, conditioning investment behavior. Individuals with high financial literacy show a high tolerance for uncertainty, show more risk-averse behavior, are more critical of their own behavior (they evaluate less effectively), show low indicators of the availability heuristic and rate neglect, and also tend to have an aggressive investment style at the same time. People with low uncertainty tolerance may be more prone to irrational investment diversification, be larger, or rely more heavily on information that is easily obtainable. Individuals with a low assessment of investment efficiency tend to believe that past events influence future events and to rely more on available and accessible information.

5. Conclusion

The complex cognitive process of decision-making is determind by multiple internal and external, personal and situational factors and investment decisions add another layer of time-contrain and informational limitations to the equation, resulting biased decisions. Our study suggests that key behavioral determininig factors in this elaborate mental process can be cognizance and financial literacy and as a cause higher tollerance towards uncertainty, leading to debiased behavior. Cultural factors, involvment in investing behavior also determins the usage of specific biases. Though biases have been proven to be universal and our research as well show the presence of biases in among all participants despite of gender, educational level and other factors, but the choice of biases is different depanding on physcial location. We didn't find any notable differences in MBTI typology. Gender and education can also have impact on the biases the investor is tent to use, however these connections need further and deeper research.

6. Limitations

One of the main limitations is the lack of objective measures of investment performance and the reliance on participant-reported aka self-reported information. The only way to solve this problem would be a laboratory simulation of the trading decision under controlled variables and conditions, but

this was impossible due to the geographical location of the participants. Another impactful limitation was the small number of participants from Armenia compared to our initial expectations. This is partly due to presence of an intermediary (trading Group administrators and initiative managers) in the search for participants. Another objective limitation that still needs to be explored is the problem raised by all interviewed experts in Armenia, and that is the public's low financial literacy and stigma around investment and trust in banks/investment systems, carried over from past economic collapses.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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