Heuristics and Stock Buying Decision: Evidence from Brazil, Pakistan, and Malaysia Stock Markets

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Abstract

Applying both qualitative and quantitative approaches, we investigate the influence of anchoring and adjustment, representativeness, and availability heuristics on stock buying decisions of individual investors at the Brazilian stock market and their relations with demographic aspects. We also compared the results with investors from Pakistan and Malaysia. To collect the data, a *survey* was administered. Data were analyzed by description, correlation, and regression analysis. The results show that all three heuristics are likely to affect the Brazilian investor's stock buying decisions. The effect of heuristics is similar across genders, type of subscriber, and level of education groups. However, for the older group and those with income higher than BRL15,000.00 per month (about USD 3,000.00), the anchoring heuristic exhibit a more extreme effect. From these findings, this paper reveals the presence of the heuristics in stock market decisions in developing countries, such as Brazil, as well as Pakistan and Malaysia. However, the effect on Asian' individual investors is more prevalent.

Keywords: heuristics, anchoring and adjustment, representativeness, availability, stock purchase decision

1. Introduction

The debate on behavior of individuals in the face of their investment decisions has been a subject of academic research. A large volume of papers produced in recent decades reveals that individual investors are inclined to use heuristics. It is a mechanism for processing information that allows the decision maker to select some information and ignore other information as a way to make a quicker or 'easier' (less complex) decision. Although heuristics are quite useful in decision-making processes, they often lead to a biased decision (Tversky; Kahneman, 1974). The heuristics can affect all types of decision-making but have particular implications in relation to money and investing. The literature provides many examples of poor decision making, such as excessive trading, sell winning investments while holding losing investments, tendency to buy popular stocks at over-price and hold undiversified stock portfolios (Odean, 1999; Barber, Odean & Zhu, 2008; Goetzmann & Kumar, 2008).Generally, deviation from the correct and optimal investment decision in stock exchanges is one of the most important problems since it can affect the performance of the investors as well as the stock market.

The individual investors' participation in the Brazilian financial market has experienced a rapid growth over recent years. In 2020 the number of individual investors at the Brasil, Bolsa, Balcão[1] (B3) reached 4.9 million, an increase of 700% compared to 2018 (B3 Annual report, 2021). Even though the COVID-19, which began in 2020, had a negative repercussions in the stock market in the first stage, the impact had begun to decline as of mid-April, as supported by the findings of Gnahe, Huang & Ashraf (2021); Ashraf et al. (2022) and Gnahe et al. (2022) and individual investor participation continued to advance proving the Brazilian market with a high degree of resilience during periods of volatile portfolio flows.

Stock market participation has extraordinary significance in many reasons. For the households, it helps asset accumulation, welfare, and consumption smoothing (Cole and Shastry, 2009). For the Financial system as a whole, the depth and breadth of participation are important determinants of the equity premium, the volatility of markets, and

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[1] Brazilian stock exchange.

household expenditure (Heaton and Lucas, 1999; Vissing-Jorgensen, 2002; Brav, Constantinides, and Gezcy, 2002). On the other hand, the presence of individual investors can also have a negative impact on market quality. Some academics believe individual investors are unsophisticated, who are prime candidates to be affected by the heuristics on their financial decision-making (Barber and Odean, 2013; Chuang and Susmel, 2011; Chuang et al., 2014; Liu et al., 2016).

The presence of the heuristics in stock market decisions has been widely documented, however little attention has been given to the developing countries (Khan, Naz, Qureshi, and Ghafoor, 2017), as in Brazil, where is less studied (Vitor Jordão da Gama Silva et al., 2019). Therefore, we consider it worthwhile to investigate the behavior of individual investors in developing markets in more depth.

This paper sheds some light on this debate by examining the following research question: what is the influence of anchoring and adjustment heuristics, representativeness, and availability on the Brazilian individual investor's stock buying decisions and how does it compare with the markets of Pakistan and Malaysia? Our objective is to examine the influence of the three heuristics on investor's stock buying decisions in the context of Brazil stock markets. We also investigate the influence of demographic factors. In doing so, we compare the differences in investor's vulnerability to these heuristics across the Brazil, Pakistan and Malaysia countries.

This study can offer a new understanding that can be an essential expansion to the knowledge that previously exists. Thus, this research can fill the gap in research that explains the influence of heuristics in the developing markets such as Brazil. Besides, this study has implication for investors, financial agents and stock market policymakers since education and financial knowledge predicts positive monetary practices (Pompian, 2006), signaling that knowledge plays a fundamental role in financial decisions, and can be a powerful tool to combat the irrationalities of human behavior (Wu & Cheng, 2011; Dhar & Zhu, 2006; Hibbert, Lawrence & Prakash, 2013).

To collect the data a questionnaire was administered. An items descriptive analysis has been used as the main approach to analyze the data, while correlation and regression analyses have been used as a supplementary approach to support the findings from the descriptive analysis. Our results provide evidence that both the Brazilian and the Asian investors are likely susceptible to the effects of all three heuristics while making the stock buying decisions. However, the effect on Asian' individual investors is more prevalent than at the Brazilian ones.

The rest of the research is organized as follows: Section 2 presents the relevant literature on the heuristics of anchoring and adjustment, representativeness, and availability; the next section presents the methodology; in Section 4, we discuss the results of the descriptive, correlation and regression, in addition, we discuss the comparison with the markets of Pakistan and Malaysia and, finally, section 5, we present our conclusions.

2. Theoretical Background

2.1 Heuristics

Research on heuristics gained ground in the academic world with Tversky and Kahneman, when they found that many of the individuals in their research use mental shortcuts, called heuristics, which simplify the decision-making process. However, such simplifications can lead to serious systematic errors, which direct the decision-maker to make wrong or inefficient decisions.

2.2 Anchoring and Adjustment Heuristics

According to Tversky and Kahneman (1974), anchoring and adjustment heuristic occurs when people rely too much on pre-existing information or the first information they find when making decisions (anchor). Then, adjustment is made on such perception.

There are several implications of this heuristic for investors. First: investor estimates concerning future market developments tend to be at closer levels to those observed when the estimate is made (Lobão, 2020, p.156). Secondly, most of the investors continue to remember the buying price of shares in their portfolio. The selling decision is frequently based on the buying price as the reference point. (Mosca & Behaviorais, 2009, p. 83). Third, investors may become anchored to their initial views on the profitability or risk of a company, sector, or economy. Anchoring makes it difficult to update opinions and initial perceptions remain valid for investors even after sufficient information has emerged to justify revising these opinions (Pompian, 2006). The author also adds that investors can be anchored in the historical economic perception of a country or a company or, still, historical minimum or maximum prices.

Fourth, the anchoring and adjustment heuristic tends to cause the investor to be anchored to the asset's most recent historical quotes. In a scenario in which stock returns are positive and growing, investors can be influenced to anchor their expectations of future returns based on historical averages (Pompian, 2006), without considering the information necessary to assess whether the company has a chance of growing or not. Thus, these investors expect that the level of increasing returns of the shares will be prolonged, which leads to an increase in demand, and consequently to an increase

in prices if the market does not issue more shares. This increase in the share price encourages, in the investor's memory, that prices are growing, leading him to readjust his expectations for future share growth.

Such an investor must be wary of anchoring and adjustment heuristic.

2.3 Representativeness Heuristic

The representativeness heuristic refers to someone's tendency to make decisions based on certain stereotypes or prior knowledge or experiences. In their studies, Tversky and Kahneman (1974) found that individuals tend to make decisions based on limited information from the surrounding environment and ignore other information or the important events that may happen in the future.

The literature on representativeness heuristic in context of capital market clearly indicate the role of this heuristic in investors decisions. Shefrin (2001) shows that investors associate good stocks (those that provide security and greater profitability in the long run) with good companies (large companies with a low *book-to-market ratio*). In this perspective, Pompian (2006) states that investors try to determine the potential success of an investment, through the use of their own easy-to-understand models, which are usually incomplete. Therefore, investors tend to interpret the good characteristics of a company, such as product quality, reliable managers, and high growth as the characteristics of the company that has a worthwhile investment. This view may be a consequence of sympathy for the company, the company's past performance, or information obtained from other investors or media outlets (Kimura, 2003).

In addition to ignoring many of the relevant characteristics in the valuation of investments, representativeness can also lead investors to extrapolate the returns of the recent past of stocks to the future. Investors who are affected by this heuristic can assume that past performance is the best indicator to predict future performance (Fisher and Statman, 2000). In other words, investors often believe that past rates of return represent future expected return. If a company announces successive profit increases, investors will assume that it will continue to rise and consider this company a good company, which means good investment. Therefore, investors expect higher returns for past winners' stocks and use this trend as a stereotype for future stock movements. It is supported by the findings of Frieder and Shanthikumar (2008) who revealed that investors invest more in stocks after successive positive gains and returns. Thus, the history of high earnings becomes representative of the judgment of future earnings. Therefore, such investors present overly optimistic forecasts, which distance themselves from the fundamental values. An example of this phenomenon can be seen in IPOs[2], many investors consider them as good long-term investments due to the initial *frenzy* that surrounds them. This common misperception of investors is probably because IPO investors generally make money in the first few days after the offering. However, over time, they tend to keep up with market prices.

In his studies, Pompian (2006) showed that investors often fail to consider the sample size of the data on which they base their decisions. For the author, investors are likely to use small samples or short historical series when making investment decisions. Lobão (2020, p.179), complements that investors can overvalue the importance of the results obtained by financial analysts, when they evaluate them, from a reduced sample of results.

2.4 Availability Heuristic

This is the tendency of individuals to judge the frequency or probability of an event in terms of how easy it is to think of an example of that event. According to Tversky and Kahneman (1974), people rely on the ease with which past experiences or information can be brought to mind to assess the probability of an event.

Availability is found to be relevant to the stock market: Barber & Odean (2008) studied investors' stock selection criteria and concluded that investors are more likely to invest in stocks that caught their attention recently (stocks in the news, stocks with high trading volume, stocks with an extreme return of one day). Pompian (2006) discover that investors are prone to choose investments based on categories previously known and available in their memory. Categories other than those already existing, or not easily understood, are ignored. For example, individuals tend to invest in stocks of companies they know about and have information about. In addition, the author document that investors choose their portfolio towards stocks that are most closely related to them, either professionally (e.g., a financial professional investing in a finance stock) or geographically (e.g., a Brazilian investor investing in a Brazilian stock (narrow range of experience). Pompian also points out that individuals are prone to select investments that best match (resonate) with their personality or that have characteristics similar to their behavior or belief.

In addition, Waweru *et al*., 2008 concluded that investors prefer to invest in more familiar local companies, based on easily available information. Thus, investors tend to buy more local stocks than international stocks and consider the information of their close colleagues and relatives as a reliable reference for their investment decision.

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[2] Initial public offering.

2.5 Research in Pakistan and Malaysia

Khan et al. (2017) investigated the influence of three heuristics (anchoring and adjustment, representativeness and availability) on investor's stock buying decisions in the context of Malaysian and Pakistani markets. Further, they compare investors' vulnerability to these heuristics based on their economic association, their type and demographic factors such as income, education and experience. The results indicate that all three heuristics are likely to affect the investors' stock buying decisions. The effect of heuristics is similar across the sample countries, the type of investors, and the income groups. However, the investors with a higher level of education and more experience are less likely to be affected by the heuristics.

3. Methodology

3.1 Population, Data Collection Instrument, and Data Analysis

Brazilian investors, over the age of 18 years, active in the base of 400 thousand subscribers of Empiricus[3] constitute the population of this study. Of the total of 1405 responses received, some were discarded for incompleteness. A total of 1146 (82%) were used in the data analysis. A descriptive analysis of the items was used as the main approach to analyze the data, whereas correlation and regression analyses were used as an additional approach to support the findings of the descriptive analysis.

To capture the presence or absence of heuristics, a questionnaire was used[4], structured, and tested internationally by Khan *et al.* 2017. In addition to the 20 specific items, which reflect the presence or absence of the three heuristics studied, the questionnaire had a variable for stock buying decision[5], which measures the inclination of investors to invest in the stock as compared to other investment opportunities, such as bonds, etc. The questionnaire consists of 27 questions[6], each item capturing the answers on the *Likert 5-point* scale (from "strongly disagree" to "strongly agree").

The descriptive analysis of the questions is conducted as a primary analysis technique to explain the most frequent responses of the respondents to different aspects of the heuristics. As a robustness check, data were also analyzed through correlation and regression. The descriptive analysis of the questions demonstrates the frequency of investor's responses to a specific question, which can be interpreted in terms of the presence or absence of a particular heuristic. For example, if more frequent responses on a *Likert 5-point* scale (from "strongly disagree" to "strongly agree") are "agree" or "strongly agree," this can be interpreted as the presence of a specific aspect of the heuristic.

To compare the results of Brazil with the results of Malaysia and Pakistan, *Student's t-tests* were used on the coefficients that represent the intensity of association between the heuristics with the stock buying decisions.

4. Analysis and Discussion of Results

4.1 Item's Descriptive Analysis

To "identify whether the heuristics are present in the sample profile", the statistics of absolute frequency (number of respondents) and relative frequency (proportion of respondents) are presented for each of the questions that measure the main constructs of this research. These analyzes are divided into three parts, one for each construct: anchoring and adjustment heuristic (Table 1), representativeness heuristic (Table 2), and availability heuristic (Table 3). A heuristic is considered to be present among investors if the sum of the responses to "strongly agree" and "agree" dominates the sum of the responses to "strongly disagree" and "disagree".

The first question is proposed to check the tendency of the investors to make general market forecasts that are too close to current levels. forecasts regarding future market developments are at levels very close to those seen when the estimate is made. The responses to this item have a greater tendency to agree, 47.74%, against 20.86% "disagree".

The second question measures the investors' tendency to anchor their forecasts on historical minimum or maximum prices. The answers show a considerable part of the respondents as disagreeing (57.76%).

Third question gauges the tendency of investors to make a forecast of the percentage that a particular asset class might rise, or fall based on the current level of returns, and to capture the investors' tendency to anchor their forecasts for prices on the

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[3] Empiricus is a Brazilian company specialized in the production and marketing of reports with information and recommendations on investment, founded in 2009 and has become one of the largest independent publishers of financial content and investment recommendations.

[4] Some questions were slightly changed to incorporate the local currency into the numerical examples.

[5] Questions 21 through 27 are intended to capture investors' stock buying behavior.

[6] These 27 questions are added to those aimed at capturing demographic aspects such as gender, age, income, education and type of subscriber.

most recent historical percentage increase or decrease. The responses indicate a substantial part of the respondents as disagreeing (86.40%).

The investors are likely to anchor on the current economic conditions of a particular country; question four is asked to measure this tendency. The answers indicate 43.02% of disagreement and 32.20% agreement.

The investors, who are affected with anchoring and adjustment, tend to anchor on historical maximum or minimum stock prices; question five measures this phenomenon. The answers are mostly in disagreement (77.84%), against 14.05% agreeing.

The investors are likely to be anchored in the initial value given, question 6 is asked to measure this tendency. This effect can occur when investors attach too much importance to a target price, defined by market analysts, ignoring relevant information. Responses to this item have a greater tendency to agree (45.9%).

Question seven measures the phenomena that the investors, who are exposed to anchoring and adjustment, tend to anchor to current economic conditions of a particular company. The answers to this statement focus on "disagree", with 48.78%, against 34.12% agreeing.

Table 1. Percentage responses to question on anchoring and adjustment

Questions for Anchoring and Adjustment	Absolute Frequency					Relative Frequency (%)				
	DT	D	N	C	CT	DT	D	N	C	CT
1 - Suppose that the IBOVESPA B3 Index is currently at 106,000, in your opinion, the IBOVESPA B3 index at the end of year 2021 would be somewhat closer to the current level.	38	201	360	509	38	3.32	17.54	31.41	44.42	3.32
2 - Suppose you own a stock that is now at its highest price level in 52 weeks, you are likely to sell the security at this price level because, in your opinion, it has reached the maximum price level.	141	521	179	271	34	12.30	45.46	15.62	23.65	2.97
3 – Suppose price of a stock increased by 17% over the past year. Then the expected increase in this stock till the end of current year would be somewhat closer to 17%.	467	523	99	53	4	40.75	45.64	8.64	4.62	0.35
4 - Brazil's overall economic growth has been declining for the past many years. You forecast a similar trend of growth in the coming years.	73	420	284	341	28	6.37	36.65	24.78	29.76	2.44
5 - Suppose you bought the stock of ABC Corporation at R $12.00. Couple of months ago, the stock reached R$20.00. You thought to sell it then, but somehow you didn't. Unfortunately, the stock dropped to R$15.00 and currently trading at BRL15.00. Now, to sell this stock, you are likely to wait until it returns to RS 20.00.	289	603	93	141	20	25.22	52.62	8.12	12.30	1.75
6 - Suppose you want to sell your house. The price assessed by your real estate agent is BRL900,000.00. For a few days, you didn't get any offers. One day, your agent tells you that on-site property prices have dropped 10% on average and that you also need to revise the price you're asking. Regarding this recommendation from your agent, you have the opinion:	58	299	263	481	45	5.06	26.09	22.95	41.97	3.93
7 - Suppose that the stock of ABC Corporation has outperformed the market for past several years, considering its past, this stock is expected to show similar performance in future.	136	423	196	369	22	11.87	36.91	17.10	32.20	1.92

Source: research data (2021).

***DT=Strongly Disagree, D= Disagree, N=Neutral, C=Agree, CT=Strongly Agree

To test the hypothesis that respondents are influenced by the representativeness heuristic, questions 8 to 14 were formulated. The answers can be seen in Table 2. Interpretation of responses is the same as in case of anchoring and adjustment heuristic.

Question 8 measures the phenomena that while judging the likelihood of a particular investment outcome, investors often fail to accurately consider the sample size of the data on which they base their judgments The answers total a considerable part of the respondents as disagreeing (70.07%), against 8.55% agreeing.

Similarly, the investors who are affected by the heuristic of representativeness, tend to neglect the sample size while analyzing the performance of stocks, questions 9 measures. this phenomenon. The responses received were 45.73% in

disagreement against 30.02% agreeing.

Question 10 measures the fact that representativeness heuristic can lead investors to ignore the base reality and consider a given characteristic as representativeness of whole the scenario. This statement was the one to which the respondents showed a greater predominance of disagreement, 75.83%, against 7.86% agreeing.

Another indication of the presence of the representativeness heuristic, measured by question 11, is the investor's tendency to determine the potential success of an investment in a company by contextualizing the venture in a familiar, easy-to-understand classification scheme, known as base rate neglect. The responses received indicated a preference for disagreement (56.72%) versus 18.85% for "agree".

Question 12 measures the investors' tendency to ignore the base reality. The answers followed the pattern of disagreement (63.26%), against 14.05% of "agree".

Again, the investor's tendency to show base neglect was measured, at this time, by question 13. The results obtained confirm the predominance of disagreement (40.32%) against 36.13% in "agree".

The sample size neglect can lead to the wrong conclusion about the performance of analysts or financial managers when relying on small samples or short historical series. Question 14 verifies this aspect. The answers to this question totaled 43.46% of agreement, while the point "disagree" found 41.01%.

Table 2. Percentage responses to questions on representativeness

Questions for Representativeness	Absolute Frequency					Relative Frequency (%)				
	DT	D	N	C	CT	DT	D	N	C	CT
8 - Suppose you are not satisfied with your analyst's suggestions about stock purchase. Your friend tells you about his own analyst, who suggested him three great stock options in the last month. You are likely to consider your friend's analyst a "successful" and decide to switch to this analyst.	266	537	245	92	6	23.21	46.86	21.38	8.03	0.52
9 - Suppose you analyzed the performance of a stock over the past ten quarters. You found that its performance during the initial 4 or 5 quarters has been unsatisfactory, but in the last four quarters it has been excellent, so you expect the same excellent performance from the stock in the future.	93	431	278	336	8	8.12	37.61	24.26	29.32	0.70
10 - Troubled steel companies can either be (A) The companies that will go out of business; or (B) The companies that are likely to recover. ln your opinion, a 75-year-old steel manufacturing company, which is currently facing some business difficulties, belongs to category (A) because recently there have been many bankruptcies in steel industry.	223	646	187	85	5	19.46	56.37	16.32	7.42	0.44
11 - Suppose you are looking for a long-term investment stock. A friend tells you about a new IPO from ABC Company and that most firms have place a buy rating on this stock. You are likely to buy this stock.	206	444	280	201	15	17.98	38.74	24.43	17.54	1.31
12 - New IPOs can either be (A) the stocks constituting successful long-term investment or (B) the stocks that will fail as long-term investment. ln your opinion, ABC Company (the new IPO) belongs to category (A) because IPOs are good long-term investments.	222	503	260	145	16	19.37	43.89	22.69	12.65	1.40
13 - AAA rated municipal bonds can either be (A) safe municipal bonds or (B) risky municipal bonds. ln your opinion, AAA rated bond issued by inner city of a racially divided country belongs to (B)	107	355	270	366	48	9.34	30.98	23.56	31.94	4.19

because of potential riskiness of the country (racial disputes).

14 - Analysis of track record of a money manager for past six months suggests that on average money manager has performed better than others. Thus, you are likely to conclude that his performance is result of skilled allocation and security selection.	134	336	178	449	49	11.69	29.32	15.53	39.18	4.28

Source: research data (2021).

***DT=Strongly Disagree, D= Disagree, N=Neutral, C=Agree, CT=Strongly Agree

Investor's responses to each question for availability heuristic are presented in Table 3. The interpretation of the answers is the same as those used for the anchoring and adjustment and representativeness heuristics.

In the behavioral finance literature, investors tend to choose investments based on information that is more easily accessible to them as a result of recommendations from analysts, news in the media, or suggestions from acquaintances. Question 15 measures this trend. The answers to this statement are 55.84% "disagree", while "agree" totaled 20.07%.

Question 16 measures the tendency of investors to make investment decisions based on categories previously known and available in their memory without, however, engaging in disciplined research or *due diligence* to verify that the selected investment is good. Responses to this item totaled 42.50% in "agree" versus 34.29% in "disagree".

Another form of manifestation of the availability heuristic is the tendency of investors to choose investments that best match (resonate) with their personality or that present characteristics similar to their behavior or belief. Question 17 measures this trend. In this statement, the respondents showed a greater tendency of disagreement of 75.04%, against 8.38% agreeing.

The narrow range of experience is also an effect of the availability heuristic. It makes investors select investments that fit life experience, such as the industry they work in, the region they live in, and the people they live with. Question 18 gauges the narrow range of experience. Question 19 also evaluates the presentation of the narrow range of experience. This trend was further tested in question 20. The answers to statements 18 and 20 showed a trend of agreement, with 47.99% and 48.34%, respectively. However, the answers to question 19 were 42.41% in "disagree" and 33.68% in "agree".

In general, the results suggest that the three heuristics influence, in some way, the stock buying decision by the Brazilian investor. However, the vulnerability of these investors to each of the three heuristics is of small intensity, since the answers present levels of disagreement for some statements.

Table 3. Percentage responses to questions on availability

Questions for Availability	Absolute Frequency					Relative Frequency (%)				
	DT	D	N	C	CT	DT	D	N	C	CT
15 - Suppose you hear about a great stock tip from your friend who has a good stock market sense, he recommends you purchase the stock of ABC Company. You are likely to buy some shares because your friend is usually right about these things.	163	477	276	216	14	14.22	41.62	24.08	18.85	1.22
16 - Suppose you recently studied a success report about a generic drug maker company, and you plan to purchase 100 shares of it. Right before you do, you hear on popular financial news that another drug maker company just reported great earnings and its stock is up by 10%. You are likely to take this information as confirmation that generics are a good area for investment and proceed with the purchase.	62	331	266	460	27	5.41	28.88	23.21	40.14	2.36
17 - What type of music do you like? ln your opinion, the percentage of people who have similar taste in music as yours is more than the percentage of people who like the other types.	365	495	190	81	15	31.85	43.19	16.58	7.07	1.31
18 - In his opinion, the United States offers the best investment opportunities.	45	261	290	455	95	3.93	22.77	25.31	39.70	8.29

19 - Suppose during a visit to a Hi Tech Company, you meet many of your college fellows who studied mathematics at college and were very good at it. You can conclude from this experience that good mathematics students tend to join the Hi-Tech companies	93	393	274	365	21	8.12	34.29	23.91	31.85	1.83
20 - Suppose you are working in a fast-growing Hi-Tech company, and you are asked which industry generates most successful investments? You are likely to refer to Hi Tech industry because you have witnessed this industry generating very good investments in the past.	50	293	249	514	40	4.36	25.57	21.73	44.85	3.49

Source: research data (2021).

***DT=Strongly Disagree, D= Disagree, N=Neutral, C=Agree, CT=Strongly Agree

4.2 Correlation and Regression Analysis

To support the results of descriptive analysis, we also perform the correlation and regression analyses.

For this purpose, we used the same method used in the original study: we take the median of responses from each respondent for each variable. For example, there are 7 questions for anchoring and adjustment, each respondent answers to all of the seven questions on a scale of 1 to 5. The median of these seven questions from a single respondent constitutes the anchoring and adjustment variable. Thus, we have as many anchoring and adjustment observations as the number of respondents. This method was applied to each of the variables such as anchoring and adjustment, representativeness, availability and stock buying decision to compute the data for correlation and regression analysis[7].

The results of the correlation analysis are shown in Table 4. The last line shows the relationship of stock buying decision with anchoring and adjustment, representativeness, and availability. Such relationships are statistically different from zero and can be considered as of small intensity, but with a positive and well-defined relationship (HAIR JR.; PAGE; BRUNSVELD, 2020); implying that heuristics are related to stock buying decision.

Table 4. Correlation analysis

Variables:	(1)		(2)		(3)		(4)
(1) Anchoring and Adjustment	1						
(2) Representativeness	0.31	***	1				
(3) Availability	0.28	***	0.36	***	1		
(4) Stock buying decision	0.22	***	0.30	***	0.32	***	1

Legend: p-value > 0.1: non-significant; p-value < 0.1: *; p-value < 0.05: (**); p-value < 0.01 (***).

Source: research data (2021).

Subsequently, we perform the regression analysis based on the Equation (Model 1) which represents the stock purchase decision as a function of the three heuristics. The abbreviations SBD, ANC, REP, and DIS represent, respectively, the stock buying decision, anchoring and adjustment, representativeness, and availability; β_1 β_2,β_3, are the regression coefficients for the three heuristics, and ε is the error term.

Model 1

$$SBD = \beta_0 + \beta_1 ANC + \beta_2 REP + \beta_3 DIS + \varepsilon$$

The estimation results from regression analysis are reported on Table 5.

The first model represents the main estimation model where the stock buying decision is regressed on three heuristics without considering the interactions of investors' type and the demographic factors such as gender, age, level of income and level of education. The coefficients on all three heuristics are significant implying that heuristics prevail in the investors while investing the in the stocks. These behaviors may lead to an investment portfolio far from the optimal portfolio and arguably expose investors to unnecessarily high levels of idiosyncratic risk.

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[7] Questions 21 to 27 are intended to capture investors' stock buying behavior. The average value of these questions indicates the variable "decision to buy shares", which was used as a dependent variable in the regression analysis.

In addition to the main regression, we estimate five more models to study if the impact of heuristics on stock buying decision differs across: type of subscriber; gender; age; level of income and level of education. The details of these models along with the discussion of the results are given next.

Model two is structured to capture the differences among investors with respect to their vulnerability to the heuristics based on the type of subscriber.

Model 2

$$SBD = \beta_0 + \beta_1 ANC + \beta_2 REP + \beta_3 DIS + \lambda_1 ANC.D(Tipo) + \lambda_2 REP.D(Tipo) + \lambda_3 DIS.D(Tipo) + \varepsilon$$

Where $D(Tipo)$ is a dummy variable that is equal to 1 if the respondent is a subscriber and 0 otherwise; λ_1, λ_2 and λ_3 are coefficients in the terms of interaction between the dummy variable and the heuristics.

The estimation results are shown in Table 5, in model 2. The coefficients on all interaction terms were insignificant, indicating that the impact of all studied heuristics is similar for this group.

Subsequently, the Model 3 is constructed to examine the impact of heuristics on stock buying decision for different types of gender.

Model 3

$$SBD = \beta_0 + \beta_1 ANC + \beta_2 REP + \beta_3 DIS + \lambda_1 ANC.D(Masc) + \lambda_2 REP.D(Masc) + \lambda_3 DIS.D(Masc) + \varepsilon$$

Where $D(Masc)$ is a dummy variable that is equal to 1 if the respondent is male and 0 otherwise; λ_1, λ_2 e λ_3 are coefficients in the terms of interaction between the dummy variable and the heuristics.

The results are presented in Table 5, in model 3. The coefficients on the interaction terms of investor's gender with three heuristics are insignificant, suggesting that the impact of the heuristics on investor's buying decision is similar for investors across different genders.

The investors' vulnerability to heuristics across different age groups is determined through Model 4.

Model 4

$$SBD = \beta_0 + \beta_1 ANC + \beta_2 REP + \beta_3 DIS + \lambda_1 ANC.D(Idade) + \lambda_2 REP.D(Idade) + \lambda_3 DIS.D(Idade) + \varepsilon$$

Where $D(Idade)$ is a dummy variable that is equal to 1 if the respondent's age is at least 37 years old and 0 otherwise; λ_1, λ_2 and λ_3 are coefficients in the terms of interaction between the dummy variable and the heuristics.

The results are reported in Table 5, under model 4. The coefficients on interaction terms are significant only with two heuristics: anchoring and representativeness. These findings indicate that the older investors (at least 37 years old), are more influenced by the anchoring and adjustment heuristic. When it comes to the representativeness heuristic, the results indicate that this heuristic influence is less prominent.

The influence of heuristics on stock purchase decision across different income groups has been analyzed through.

Model 5

$$SBD = \beta_0 + \beta_1 ANC + \beta_2 REP + \beta_3 DIS + \lambda_1 ANC.D(Income) + \lambda_2 REP.D(Income) + \lambda_3 DIS.D(Income) + \varepsilon$$

Where $D(Income)$ is a dummy variable which equals1 if the respondent's income is higher than BRL15,000.00 (about USD 3,000.00) and 0 otherwise; λ_1, λ_2 and λ_3 are coefficients in the terms of interaction between the dummy variable and the heuristics. The estimation results are presented in Table 5, model 5. The coefficients on interaction terms are significant only with two heuristics: anchoring and representativeness and have sings opposite. These findings imply that in the investors with an income superior to BRL15,000.00 (about USD 3000.00) are less likely to fall prey to the heuristic of representativeness.

To examine if the investors with more/less education are affected differently, we construct equation Model 6. The present study separated respondents into two large groups: those with up to higher education and those with at least one specialization.

Model 6

$$SBD = \beta_0 + \beta_1 ANC + \beta_2 REP + \beta_3 DIS + \lambda_1 ANC.D(Educ) + \lambda_2 REP.D(Educ) + \lambda_3 DIS.D(Educ) + \varepsilon$$

Where $D(Educ)$ is a dummy variable that is equal to 1 if the respondent's education is up to higher education and 0 otherwise; λ_1, λ_2 e λ_3 are coefficients in the terms of interaction between the dummy variable and the heuristics. The estimation results are presented in Table 5, model 6. The coefficient on interactions terms is not significant for both groups, suggesting that the influence of heuristics is similar across the individuals' level of education.

Table 5. Regression analysis.

Variables	Model 1 β/(ep)	sig.	Model 2 β/(ep)	sig.	Model 3 β/(ep)	sig.	Model 4 β/(ep)	sig.	Model 5 β/(ep)	sig.	Model 6 β/(ep)	sig.
Intercept	1,732	***	1,724	***	1,732	***	1,739	***	1,735	***	1,742	***
	(0.115)		(0.116)		(0.116)		(0.116)		(0.117)		(0.117)	
Anchoring and Adjustment	0.099	***	0.106		0.006		-0.012		0.036		0.097	**
	(0.033)		(0.075)		(0.071)		(0.074)		(0.04)		(0.045)	
Representativeness	0.183	***	0.177	**	0.204	**	0.290	***	0.235	***	0.164	***
	(0.033)		(0.086)		(0.084)		(0.069)		(0.042)		(0.045)	
Availability	0.226	***	0.206	**	0.291	***	0.234	***	0.240	***	0.248	***
	(0.033)		(0.089)		(0.075)		(0.074)		(0.044)		(0.047)	
Anchoring x Subscriber Type			-0.007									
			(0.081)									
Representativeness x Subscriber Type			0.010									
			(0.093)									
Availability x Subscriber Type			0.021									
			(0.092)									
Anchorring x Male					0.102							
					(0.077)							
Representativeness x Male					-0.023							
					(0.09)							
Availability x Male					-0.072							
					(0.079)							
Anchoring x Age Group							0.133	*				
							(0.08)					
Representativeness x Age Group							-0.132	*				
							(0.076)					
Availability x Age Group							-0.012					
							(0.078)					
Anchoring x Income									0.136	**		
									(0.062)			
Representativeness x Income									-0.128	**		
									(0.064)			
Availability x Income									-0.024			
									(0.058)			
Anchorinsg x Instruction											0.003	
											(0.06)	
Representativeness x Instruction											0.029	
											(0.063)	

Availability x Instruction						-0.043
						(0.059)
Adjusted R ²	0.147	0.145	0.145	0.148	0.151	0.146
Multicollinearity (Maximum VIF)	1,220	18,200	22,200	15,200	12,500	12,800
Breusch-Pagan Test (BP, p-value)	0.000	0.000	0.000	0.000	0.000	0.000
Shapiro-Wilk test (SW, p-value)	0.000	0.000	0.000	0.000	0.000	0.000
RESET test (p-value)	0.200	0.200	0.200	0.200	0.100	0.100

Legend 1: p-value > 0.1: non-significant; p-value < 0.1: *; p-value < 0.05: (**); p-value < 0.01 (***).

Legend 2: Standard errors (ep) are presented in parentheses.

the Variance Inflation Factor (VIF) is high for models 2 to 6 can be explained by the fact that the variables that interact with others (already included in the model) have been inserted. Thus, in a way, some of the information enters as repeated and increases collinearity levels. Therefore, these values can be ignored.

The Breusch-Pagan test showed that the model is heteroscedastic and thus White's robust correction was used, in which standard errors were adjusted based on the heteroscedasticity identified in the model. Therefore, the models presented in the Table have a robust correction for standard errors.

The Shapiro-Wilk test showed no adherence to the normal distribution, while the RESET test found no possible causes or evidence for the existence of omitted variables (p-value < 0.01), which may generate a poor specification for the parameters estimated in the model.

Source: research data (2021).

The findings of the correlation and regression analyses are in line with the results from item's descriptive analysis, which leads us to conclude that individual Brazilian investors are susceptible to the effects of the three heuristics, namely, anchoring and adjustment, representativeness and availability while buying the stocks in the stock market.

To compare the results of Brazil with the results of Malaysia and Pakistan, *Student's t-tests* were used on the coefficients that represent the intensity of association between the heuristics with the stock purchase decision. Given the homogeneity observed between the countries of the original study, the present study compared the results of the Brazilian sample (Table 6 – Model 1) with the general results of that first study.

Results are showing that the Asian investors exhibit more extreme results than the Brazilin ones. It implies that the influence of heuristics on buying decision on Asian' individual investors is more prevalent than at the Brazilian ones. However, regarding the anchoring heuristic, in the original study, a negative influence was found, indicating that the more investor is affect by anchoring and adjustment heuristic lower is stock buying decisions, and, in Brazil, a positive influence was found, indicating a contrary effect.

Table 6. Comparative results

	Anchoring	Representativeness	Availability
Brazil (β)	0.099	0.183	0.226
Pakistan and Malaysia (β)	-0.274	0.405	0.548
Δ	0.373	-0.222	-0.322
LI	0.211	-0.388	-0.484
LS	0.535	-0.056	-0.160
t	4,517	2,630	3,899
p-value	< 0.01	< 0.01	< 0.01

Source: research data (2021).

5. Conclusion

Recent research finds that individual investors are inclined toward behavioral heuristics and that they make investing mistake. However, the focus has mainly been on the developed markets. Thus, we investigated the influence of anchoring and adjustment, representativeness, and availability heuristics on the Brazilian individual investor's stock buying decisions and how it compares with the markets of Pakistan and Malaysia.

Our results provide evidence that the three heuristics addressed here (representativeness, anchoring and adjustment and availability) play a noticeable role in individual investment decision making process. These findings suggest that, whether in developed or developing countries, individual investors are susceptible to heuristics when making a stock buying decision.

There was no significant difference between type of subscriber, gender and formal education. Nevertheless, the older investors (at least 37 years old) and those with an income higher than BRL15,000.00 (about USD 3000.00), are more likely to fall prey to the anchoring and adjustment heuristic.

When we compared this study with the results of Khan *et al.* (2017), our findings suggest that the influence of heuristics on buying decision of Asian' individual investors is more prevalent than at the Brazilian ones. On the other hand, regarding the anchoring heuristic, the original study, indicate that the more investor is affect by anchoring and adjustment heuristic lower is stock buying decisions, in opposite to the Brazilian behavior individual investors.

The findings of this paper would help market participants, including investors, agents, and policymakers comprehend and consider the influence of common behavioral patterns that affect the decision making of investors in the Brazilian Stock Exchange. This will enhance the rationality of investment decisions and mitigate the influence of behavioral heuristics. Further, investment agents can offer better advice to their clients once they are aware of the heuristics that hinder their investment decisions. Moreover, it will help Brazilian stock market policymakers and regulators understand the mechanism and role of behavioral factors in investor decision-making. This will allow them to formulate policies and regulations considering these impacts.

Finally, there are academic contributions from the study in filling the research gap by contextualizing the stock market in developing countries. In addition, it complements the current literature on heuristics in the Brazilian stock market and provides ways for researchers to study this area in more detail in the future.

References

Ashraf, J., Gnahe, F. E. G., Huang, F. M., & Rizk, Z. (2022). Do the Outbreak of COVID-19 Influence the China Stock Market? *Problemy Ekorozwoju, 17*(2). https://doi.org/10.35784/pe.2022.2.07

Barber, B. M., & Odean, T. (2008). All that glitters: The effect of attention and news on the buying behavior of individual and institutional investors. *The review of financial studies, 21*(2), 785-818. https://doi.org/10.1093/rfs/hhm079

Barber, B. M., & Odean, T. (2013). The behavior of individual investors. In *Handbook of the Economics of Finance* (Vol. 2, 1533-1570). Elsevier. https://doi.org/10.1016/B978-0-44-459406-8.00022-6

Barber, B. M., Odean, T., & Zhu, N. (2008). Do retail trades move markets? *The Review of Financial Studies, 22*(1), 151-186. https://doi.org/10.1093/rfs/hhn035

Brasil, B. B. (B3). *Annual Report 2021*. Retrieved February 1, 2022, from https://ri.b3.com.br/pt-br/informacoes-financeiras/central-de-resultados/

Brav, A., Constantinides, G. M., & Geczy, C. C. (2002). Asset pricing with heterogeneous consumers and limited participation: Empirical evidence. *Journal of Political Economy, 110*(4), 793-824. https://doi.org/10.1086/340776

Chuang, W. I., & Susmel, R. (2011). Who is the more overconfident trader? Individual vs. institutional investors. *Journal of Banking & Finance, 35*(7), 1626-1644. https://doi.org/10.1016/j.jbankfin.2010.11.013

Chuang, W. I., Lee, B. S., & Wang, K. L. (2014). US and domestic market gains and Asian investors' overconfident trading behavior. *Financial Management*, *43*(1), 113-148. https://doi.org/10.1111/fima.12030

Cole, S. A., & Shastry, G. K. (2009). Smart money: The effect of education, cognitive ability, and financial literacy on financial market participation (pp. 09-071). Boston, MA: *Harvard Business School.*

Dhar, R., & Zhu, N. (2006). Up close and personal: Investor sophistication and the disposition effect. *Management science, 52*(5), 726-740. https://doi.org/10.1287/mnsc.1040.0473

Fisher, K. L., & Statman, M. (2000). Investor sentiment and stock returns. *Financial Analysts Journal*, *56*(2), 16-23. https://doi.org/10.2469/faj.v56.n2.2340

Frieder, L., & Shanthikumar, D. M. (2008). After a restatement: Long-run market and investor response. *Available online at SSRN 1266367*. https://doi.org/10.2139/ssrn.1106855

Gnahe, F. E., Huang, F. M., & Ashraf, J. (2021). The Impact of COVID-19 on Stock Market Returns: Case of Bourse Regionale des Valeurs Mobiliers. 18 *Technium Social Sciences Journal, 207-214.* https://doi.org/10.47577/tssj.v18i1.3014

Gnahe, F. E., Ashraf, J., & Huang, F. M. (2022). The Effect of the COVID-19 Pandemic on Stock Market Returns in Emerging Economies: Empirical Evidence from Panel Data. J. *Asian Financ. Econ. Bus., 9,* 191-196.

Goetzmann, W. N., & Kumar, A. (2008). Equity portfolio diversification. *Review of Finance, 12*(3), 433-463. https://doi.org/10.1093/rof/rfn005

Hair Jr, J., Page, M., & Brunsveld, N. (2020). *Essentials of business research methods*. Routledge.

https://doi.org/10.4324/9780429203374

Heaton, J., & Lucas, D. (1999). Stock prices and fundamentals. *NBER macroeconomics annual, 14*, 213-242. https://doi.org/10.1086/654387

Hibbert, A. M., Lawrence, E. R., & Prakash, A. J. (2013). Does knowledge of finance mitigate the gender difference in financial risk-aversion? *Global finance journal*, *24*(2), 140-152. https://doi.org/10.1016/j.gfj.2013.07.002

Khan, H. H., Naz, I., Qureshi, F., & Ghafoor, A. (2017). Heuristics and stock buying decision: Evidence from Malaysian and Pakistani stock markets. *Borsa Istanbul Review*, *17*(2), 97-110. https://doi.org/10.1016/j.bir.2016.12.002

Kimura, H. (2003). Behavioral aspects associated with capital market reactions. *RAE Electronics*, *2*. https://doi.org/10.1590/S1676-56482003000100007

Liu, H. H., Chuang, W. I., Huang, J. J., & Chen, Y. H. (2016). The overconfident trading behavior of individual versus institutional investors. *International Review of Economics & Finance, 45*, 518-539. https://doi.org/10.1016/j.iref.2016.07.016

Lobão, J. (2020). *Behavioral Finance* (2nd ed.). Leya.

Mosca, A., & Behavioral, F. (2009). *manage your emotions and achieve success in investments.* Gustavo Cerbasi Organization.

Odean, T. (1999). Do investors trade too much?. *American economic review*, *89*(5), 1279-1298. https://doi.org/10.1257/aer.89.5.1279

Pompian, M. M. (2006). How to build optimal portfolios that account for investor biases. *Behavioral Finance and Wealth Management*.

Shefrin, H. (2001). Do investors expect higher returns from safer stocks than from riskier stocks?. *The Journal of Psychology and Financial Markets*, *2*(4), 176-181. https://doi.org/10.1207/S15327760JPFM0204_1

Tversky, A., & Kahneman, D. (1974). Judgment under Uncertainty: Heuristics and Biases: Biases in judgments reveal some heuristics of thinking under uncertainty. *science*, *185*(4157), 1124-1131. https://doi.org/10.1126/science.185.4157.1124

Vissing-Jørgensen, A. (2002). Limited asset market participation and the elasticity of intertemporal substitution. *Journal of political Economy, 110*(4), 825-853. https://doi.org/10.1086/340782

Vitor Jordão da Gama Silva, P., Brandalise Santos, J., & Portes Pereira, G. (2019). Behavioral Finance in Brazil: A bibliometric study from 2007 to 2017. *Latin American Business Review*, *20*(1), 61-82. https://doi.org/10.1080/10978526.2019.1578177

Waweru, N. M., Munyoki, E., & Uliana, E. (2008). The effects of behavioral factors in investment decision-making: a survey of institutional investors operating at the Nairobi Stock Exchange. *International Journal of Business and Emerging Markets*, *1*(1), 24-41. https://doi.org/10.1504/IJBEM.2008.019243

Wu, C. S., & Cheng, F. F. (2011). The joint effect of framing and anchoring on internet buyers' decision-making. *Electronic Commerce Research and Applications*, *10*(3), 358-368. https://doi.org/10.1016/j.elerap.2011.01.002