"The impact of Covid-19 on the relation between cognitive biases and investment decisions"

Noha Mohammad Nour El-Din Elbendari

<u>Supervised by</u>

Prof. Farid Moharam

Professor of Financial Accounting

Faculty of Business

Ain Shams University

Abstract

This research entitled ― The impact of Covid-19 on the relation between cognitive biases and investment decision is an attempt to discuss the impact of behavioural biases as mentioned in Kahneman and Tversky theories of Prospect and Heuristics theory taking into account the effect of Covid-19 as moderator variable. The aim of this research is to spotlight the different individual behaviour biases and attitudes of investors and its impact on their investment decisions and whether or not this relation is affected by the unprecedented Covid-19 pandemic fear. The theoretical framework related to this issue has been mentioned and a relevant literature is reviewed. The methodology of the research is the quantitative one where a questionnaire was distributed to a sample of 385 individual investors in Egypt. The analysis is done using SPSS Version 26

to generate frequencies, mean scores, percentages, standard deviation and regression analysis.

In addition, findings of the research are discussed in relation to research hypotheses concluding that cognitive biases play a significant role in individual investment decisions and confirming the non-significance of the moderating effect of Corona virus fear on the relation between cognitive biases and investment decisions.

Finally, recommending several techniques to reduce and overcome cognitive biases that affects investment decisions such as placing the burden on Egypt Stock Exchange (EGX) to initiate investor education programs so that individual investors would understand the happenings in the stock exchange which in turn would guide proper investment.

Key Words : Covid 19

Cognitive biases

Investment decisions

Introduction

Coronavirus outbreak has created dramatic challenges for individuals, economies, financial markets, financial institutions and governments leading to unprecedented repercussions on the economy of every country. People are worried about their jobs and paying bills so talking about spending more money on investment has not been high on their list. The behaviour in

unprecedented conditions at a micro level must be investigated in order to understand better aggregating the market outcomes.

An individual investor can be defined as one who purchases usually small amount of assets for their own. Regardless of the information an investor has about a particular investment, carried out due diligence or analysed about a certain asset prior to putting money in it, he always has the fear of loss in the future. Investor behavior is influenced by varying factors leading to their irrationality.

The investment decision making process is a complex and challenging process and the investors have to choose a course of action among various alternatives in the world of uncertainty, a process that is influenced by a number of determinants and biases. As a result, the notion of irrational investor behavior aroused and has been able to pave the way for behavioral biases in financial decision-making (Abdelhedi and Boujelbene-Abbes, 2019). Identifying investors' financial decisions using the term "Quasi-rational" to describe how, when and why investors sometime behave irrationally, behaviour finance determined two primary reasons which make investors behavior quasi-rationally. First, investors are human beings and experience a range of emotions while making an investment decision, and second, external factors such as uncertainties, news, media and researches.

Even though the discipline of modern finance has grown progressively and regardless of disciplined investment it is still difficult to explain on the scientifically why do people behave

non- rationally while dealing in money and often make mistakes when they decide on their investment. While Conventional finance assumes people rationalize and enhance their financial decisions, behavior finance includes the relevance of what investors should do and blend the basics of traditional finance with what people do in terms of their investment decisions (Mitroi, Adrian Stancu, 2014) and suggesting that the investment decision-making process is influenced by various behavioural biases that cause investors to deviate from rationality and make irrational investment decisions.

Cognitive bias

Cognitive biases are viewed as building blocks of behavioral finance that significantly influence the decision making of individual investor. Hogarth (1987) identified more than 20 different cognitive biases based on prior studies in the area of forecasting and planning (Hogarth & Makridakis, 1981).

Rational individuals consider all the available information from which they develop unbiased forecasts about happening of future events, which allow them to make the best financial decisions (Fama, 1970); (Michael C. Jensen, 1978). However, people are bounded by limited information, knowledge and perceptive abilities, which forces them to rely on certain simplifications formally known as "heuristics" to enable them to facilitate the decision- making process, yet, the decision reached may not be optimal but it could be satisfactory at that point. These heuristics

are subject to a set of subconscious, systematic errors known as cognitive biases. Generally, Humans are either partly rational or irrational in their decisions and have various biases and cognitive limitations which hinder them from rational though at the time of decision-making (Ahmad Zamri, Ibrahim, Haslindar, Tuyon, 2017). Individual investor's behavior is extensively influenced by various biases highlighted in the growing discipline of behavior finance often resulting in inefficient and irrational investment decisions, which can lead to market disasters.

Behavioural finance studies the psychological aspect of financial decision-making and explains the irrationality of investors in investment decision-making. Usually, the investor's behaviour deviates from making rational or logical decisions and tends to be influenced by various behavioural biases. Moreover, Kahneman and Tversky (1979) explained that the investor's decision-making is based on potential gains and losses rather than on final outcomes. This phenomenon occurs because of the cognitive biases that affect the judgement of these gains and losses.

Understanding and examining the effect of cognitive and behavioural biases on the investment process is very crucial when aiming for higher profits and better investing performance due to several reasons. First, identifying behavioral biases at the right time can save investors from potential financial disaster (by Michael M. Pompian, Book: Behavior Finance and Wealth Management, second edition, Wily publication). Moreover, investors have different

personality traits and accordingly have different biases, but as only some of the investors are aware of their own biases and can take those biases into account when making their investing decision, which can result in significant advantages. Finally, individual investors and their advisors may be able to improve economic outcomes and attain stated financial objectives.

Investment decisions

Decision making is the mental or cognitive process that results in the selection of a course of action among several alternative situations. Every decision-making process comes to its end with an action or an opinion of final choice. Virlics (2013) define decision making as a subjective act based on analysis of risk and uncertainties pertaining to the different alternatives and choices are influenced by expected costs, risk perception, experience and expectations about the future. Another decision-making definition by Lichtenstein and Slovic (1970) as man's capability of integrating information into a judgement. Decision making entails selecting an alternative among many available options (Shunmugathangam, 2017) describing decision making as a complex process involving several factors and looks at the process as one of the very critical things investors ought to do.

Investment is the process of investing money hoping for future benefit. Decisions taken by the investors play an important role in shaping the market trend, which ultimately affects the economy. Investment decision making means final selection of

the best alternative which are available for the investors in the market some investment decisions are easy and other investment decision are complex and require the multiple approach. An investment decision is one made by an investor about where, how much and when to invest to achieve income from various financial instruments (Geetha, N., & Ramesh, M., 2012). There are various option or choice available for the investors in the market while taking investment decisions. In normal circumstances, people would have sufficient time to collect adequate information, think rationally, analyse the market and make informed decisions (Mertzanis & Allam, 2018). However, in the world of uncertainty, periods of market distress, for instance, the COVID-19 outbreak investment decision making is much more complicated and challenging. Moreover, since every individual investor is a different type of person and tend to have their own emotional processes, personality traits and mental mistakes, this also adds to the complexity of the investing process. It is much more than just analysing numbers to make decisions to buy or sell various assets as the investors often have behavioural biases about a certain investment opportunity and tend to make decisions under the influence of feelings and emotions although the thoughts wouldn't have any concrete facts supporting the investment decision.

Behavioral finance plays a crucial role in improving investment decision making by exploring how the investment decision-

making process is influenced by various heuristics that urge investors to deviate from rationality in their related decisions (Niehaus & Shrider, 2014).

Covid-19

The year 2020 astonished and frightened the world with Covid-19. Its outbreak caused a high level of uncertainty in economies around the world. During the pandemic, a change in the spending habits and demand patterns of the people was observed. Most of the industries witnessed a change in the demand patterns, some experienced a sharp rise in demand, while others faced a sharp decline (Levy and Galili 2006; Luo et al. 2020; Wang and Young 2020). COVID-19 has had an adverse impact to the extent that he propensity of its severity could be compared to terrorist aggression in several aspects, as people's behavior pattern changes after an act of terrorism (Goodell 2020).

Until May 2022 there have been 526 million reported cases of COVID-19 and 6.3 million deaths caused by this virus worldwide. United states of America reported the highest number of cases and is highly-hit country by this pandemic with a total of 84.8 million cases and 1.03 million deaths. Until the first of June 2022 and according to World Health Organization (WHO) statistics, Egypt reported 513,944 confirmed cases and 24,718 deaths -shown in figure 3- by which it is ranked number eighty-seven among world countries affected with the novel corona virus, while in Africa Egypt came among top five countries

taking the fourth place arranged as follows: South Africa, Morocco, Tunisia, Egypt and Libya respectively.

The outburst of Covid-19 has severely impaired financial activities around the world. This pandemic gave rise to volatility in business and investment. The COVID-19 pandemic has negatively impacted all the sectors of the world's economies, especially the stock markets creating wide ranging changes in the share market (Sansa, 2020), and influenced investors' emotions which caused stock price volatility and resulted in stock market crashes.

Despite the profound impact of the COVID–19 pandemic, Egypt was one of the few emerging market countries that witnessed a positive growth rate in 2020, due to the government's timely response, the short period of lockdown and Egypt's relatively diversified economy. Egypt is one of the few African countries that did not enter a recession and moreover, it experienced a positive growth in 2020 at 3.6% a slower rate than in 2019 which was 5.6% because of the high domestic consumption.

2. Literature review

2.1 Cognitive biases

The term "bias" is interpreted in different ways in literature; mostly, it is considered an irrational belief that influences the ability to make a specific decision based on facts and evidence (Schwenk, 1986; Busenitz and Barney, 1997; Das and Teng, 1999; Simon et al., 2000).

According to the literature, which classifies biases, there are some disturbances in the nomenclature of these concepts. some authors refer to biases as heuristic, while others call beliefs, decisions, preferences, cognitive, or emotional factors. Pompian (2006a, p. 49) emphasizes that such a classification would facilitate individuals to understand theory, but what is important is to determine how biases will emerge in behaviors.

When we review the behavioral finance literature, it has been shown that cognitive biases and heuristics have a significant impact on the decisions taken by individuals. Psychological biases and heuristics were first introduced in their studies by Tversky and Kahneman (1974). A heuristic is defined as a shortcut or strategy that can be applied to solve various problems, but does not always provide the right solution (Atkinson, Atkinson, Smith, Bem, & Nolen-Hoeksema, 1996, p. 714). In their study, Tversky and Kahneman (1974) discussed the heuristics under three main headings: representativeness, availability, and adjustment-anchoring where individuals who are in the process of decision making often refer to heuristics.

Cognitive biases, another concept that is effective in the decision-making process, were introduced by Kahneman and Tversky (1979), individuals in this study were given specific situations and they were asked to make a choice and it was observed that individuals tend to avoid loss in their choices. Cognitive biases mean that the same systematic errors are made continuously

when making a decision (Gazel, 2014, p. 12). In general, cognitive biases can be defined as "cases in which human cognition reliably produces representations that are systematically distorted compared to some aspect of objective reality" (Haselton et al., 2015). As suggested by Das and Teng, "cognitive biases are an ever-present ingredient of strategic decision-making" (1999, pp. 757).

In particular, we focus on the role of cognitive biases, which appears to be a dominant theme in literature framework. But even more importantly – because according to the definition provided by Barbera-Marine et al. (2019) – cognitive biases are considered as "useful measurements for detecting process improvement actions" (p. 2890)

In the present study on cognitive biases, various sub-biases occur because investors show various types of behavioural biases. In this study, seven biases and heuristics are included: Overconfidence, availability, representativeness, anchoring, avoiding regret, avoidance of loss and herding.

2.2.1 Heuristic theory

Heuristics is referred to as "rules of thumb", which makes decision making simpler and easier, especially in complex and uncertain environments (Ritter, 2003, p.431) by reducing the complexity of assessing probabilities and predicting values to simpler judgments (Kahneman & Tversky, 1974, p.1124).

However, it often results in poor decision making (Abarbanell and Bernard 1992; Shah et al. 2018).

Kahneman and Tversky seem to be ones of the first writers studying the factors belonging to heuristics when introducing three factors; representativeness, availability bias, and anchoring (Kahneman & Tversky, 1974, p.1124-1131). Furtherly, Waweru et al. added two additional biases; Gambler's fallacy and Overconfidence into heuristic theory (Waweru et al., 2008, p.27). The heuristics and biases are the prime reason for an adverse outcome (Barnes 1984). These heuristics could influence investment and other finance-related decisions (Debondt and Thaler 1990; Abarbanell and Bernard 1992). This research examines the four most prominent heuristics biases; availability, anchoring, representation, and overconfidence (Waweru et al. 2008; Shah et al. 2018). These four biases are used to reduce the intensity of risk in uncertain times (Debondt and Thaler 1990; Abarbanell and Bernard 1992).

2.2.2 Prospect theory

It is one of the well-known examples promoting frame dependence, it rests on the notion that every financial problem or situation can have different responses and interpretations based on how well they are presented or framed (Kahneman and Tversky, 1979) and irrationality occurs due to presenting a problem in a specific structure (Waweru et al. 2008; Shah et al.

2018) describing how an investor is aware more of losses than gains, irrespective of their magnitude (Yechiam, 2019).

The Prospect Theory describes the state of mind that affects any individual's decision-making aspect, so as to include loss aversion, regret aversion, mental accounting (Waweru et al., 2003; Pompian and Wood 2006; Shah et al. 2018).

This research examines two related biases of the prospect theory; regret aversion and loss aversion.

2.2.3 Herding bias

Herding refers to the tendency of the individuals to imitate the judgements of others whether rational or irrational. Thus, herding behaviour of investors is the root cause of bubbles in finance. Fernandez et al. (2011) proposed an interdependent relation between the information availability and the herd behaviour. They found that when the information is uncertain, investors are more prone to imitate the decisions of others or group.

During times of market distress such as market anomalies, price bubbles, rumours, presence of herding effect is more profound (Mertzanis & Allam, 2018). Herding has seen as collective imitation leading to a unification of movements (Philippas, Economou, Babalos, & Kostakis, 2013). Caparrelli et al. (2004) found that during volatile market conditions, investors are more inclined towards herding behavior. Lee et al. (2004) stated that individual investors are more prone to herd behavior in comparison to institutional investors. In an unpredictable market,

institutional investors herd more than individual investors (Dennis and Strickland, 2002). Nofsinger and Sias (1999) found that herding by institutional investors' affects stock prices more often than herding by individuals.

2.2 Investment decision

Investment decision making is more human than analytical owing to behavioural biases (Virigineni & Rao, 2017). The extent to which investor's investment decisions are rational or irrational, and the factors affecting them, have long been discussed in the literature. Studies in different places and times provide evidence that investors exhibit different behavioral characteristics.

There are many psychological and technical factors which influence investment decisions. J. Shiller (1991) said, "the decision of the individual investor is getting vary at the time of fluctuations in the market". There have been many theories which have discussed individual investor behaviour: for example, nudge theory (Suter, 2008), behavioural game theory (Smith, 1970), evolutionary psychology (Darwin, 1992), behavioural portfolio theory (Lo, A., & Wang, 2000) etc. Consequently, the psychological behaviour of investors and their decision-making under various conditions must be studied nowadays.

The cognitive biases and heuristics are used for decision-making under uncertainty by investors to reduce the risk of loss (Prosad et al., 2017). These heuristics and biases lead to decision-making errors, as all possible alternatives are not considered before

making any decision. Investors can make wrong decisions under the influence of these psychological biases and heuristics, which leads to market inefficiency and impact their investment decisions. Investors can be significantly affected by psychological factors which can be influenced by situations they find themselves in such as COVID-19, SARS or Swine flu (Wang et.al., 2013; Ali, 2020; Conlon & Mc Gee, 2020). This was also the case with the Ebola virus (Ichev & Marinc, 2018).

2.3 Covid-19

Kahneman (2003) stated that "the decision of human judgement is uncertainty". Across the world, since the emergence of COVID-19, the performance of share markets has become highly volatile (Ashraf, 2020). From the investors' perspective, this was a high-risk situation. Ozili et al., (2020) established that decisions concerning monetary policies seriously affected economic activities and despite the expected fast recovery of the world economies, complete market recovery after Covid-19 could take years (Lee 2020).

Traditional finance has failed to explain the uncertainty and volatility created by this unpredictable global crisis as this crisis has influenced investors' psychology and behaviors during this pandemic (Vasileiou, 2020).

Kumar (2020) studied the presence of behavioral heuristics and biases in investors' decision-making during COVID-19, he found that heuristics like representative, anchoring and availability were present and overconfidence bias, disposition effect, confirmation

bias and risk aversion. Another study was conducted by Riaz et al. (2020) on the determinants of investment decisions during COVID-19 were found to be psychological factors including behavioral heuristics (representative and anchoring), loss aversion, family and friends' opinions, herd behavior and companies' market information. Kwatra (2020) examined the role of behavioral biases in the stock market also found several behavioral heuristics and biases including representative, anchoring, availability, confirmation bias, loss aversion and optimism influenced investors' decision-making during this pandemic and accordingly their returns are affected. Putri et al. (2020) examined the cognitive biases in the financial decisions of investors during COVID-19 and found the existence of representation bias, risk-aversion, herding behavior and availability bias.

Bansal (2020) conducted a study on behavioral heuristics and biases in investors' decision making during COVID-19 and the presence of overconfidence bias and disposition effect strongly influenced investors' decisions during this pandemic was revealed. Investors relied on their private information, and they were willing to sell the stocks immediately to earn profit and avoid losses.

After studying various literatures, a serious need arouses to conduct one study to carry systematic review on behavioral biases. This study is evaluating and identify the behavioral biases involve in the investors decision making while taking investment decision, so in

this study, seven different behavioral biases have been taken as a framework to study their impact on individual investment decision-making on one hand and determining the effect of the novel corona virus on the relation between cognitive biases and investment decisions on the other hand. This framework seems to reveal an intention to explore various behavioral biases through the lens of the discipline of behavioral finance.

3. Hypothesis development

Previous studies indicated that behavioral biases have a significant impact on investment-decision making and that many behavioral biases are overlapping or expansion of other behavioral biases. Fundamentally, every investor is influenced by different behavioral biases and are generally incapable of judgment without being influenced by feelings or sentiment (Zaiane), accordingly, different investors make investment decisions differently. The investors' irrationality due to markets' volatility and inefficiency supports the assumptions of investors' bias in behavioral finance. This study makes an effort to overcome the gaps found in literature and thereby analyze the impact of behavior biases on investor's decision making considering only seven biases which were frequently observed in investment decision-making. Therefore, the first alternate hypothesis of the study in terms of determining the effect of cognitive bias and analyzing their collective impact over investment decision is provided below:

• *H1: There is significant relationship between Cognitive Biases and Investment decisions*.

The Behavioral biases and heuristics of investors are never more noticeable than in times of volatility in financial markets and have been observed during the COVID-19 crisis. The current pandemic has given us many examples of cognitive biases leading to impaired decision-making a bias that will naturally be amplified out of fear of missing out on something.

Based on prior literature, it has been proved that investors are affected by behavioral heuristics during COVID-19, it has impacted investors' tendency to focus on past performance, past news, previous days' death reports, World Health Organization, social media discussion and market experts' opinions on trading.

A moderator variable is a variable that affects and can modify the strength or form of the association between the dependent variable and its predictor variable. So, grounding on our review of the literature, we recognize that prior research studies ought to overlook the possible significance of moderating variables or are unsuccessful in examining thoroughly and since Covid-19 has bought high uncertainty in the economic environment (Baker et al. 2020a; Kathpal and Siddiquei 2021), examining the biases that could cloud the investors' rational judgment becomes imperative. This study attempts to examine the relationship between Covid-19 as a moderator to the relation between

cognitive biases and investment decision. Therefore, the present study posits the second hypothesis as:

• *H2: COVID-19 fear has a moderating effect on the relationship between cognitive biases and investment decisions.*

4. Conceptual Framework

In figure 1, the developed conceptual framework and the study model concluded from the above literature review and the suggested hypothesis is shown.

Figure 1: The conceptual Framework of the study
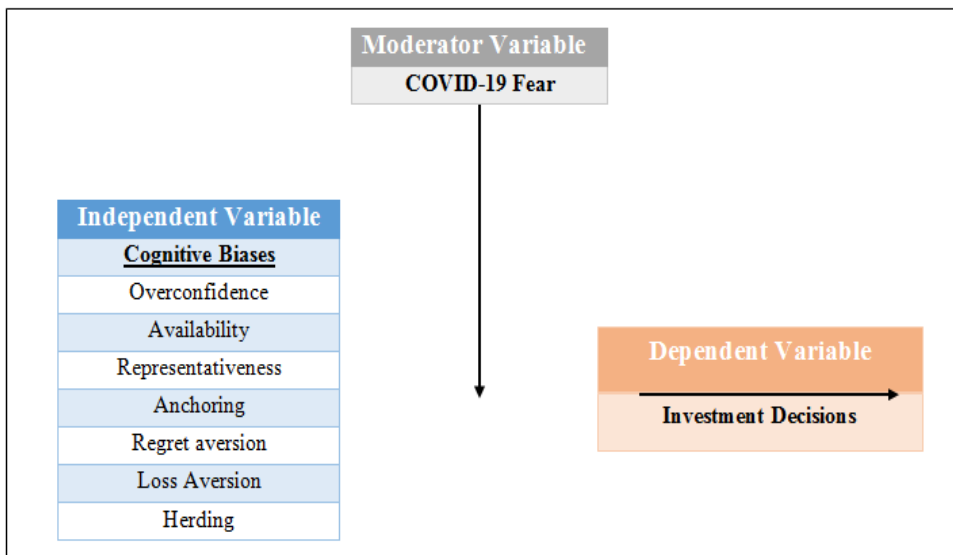
5. Research Methodology

The main focus of the study will be quantitative, in which descriptive and inferential statistical techniques used in data analysis.

Data collection

It is challenging to gather data from all the investors in Egypt, accordingly, the researcher must restrict the sample size to an adequate number of respondents. The study of (Fugard & Potts, 2015) provided the formula through which the adequate number of respondents could be determined. With this equation, the adequate sample size is determined to identify the target population, which is provided below:

$$n = \frac{Z^2 \times p \times q}{e^2}$$

Based on the equation provided above, 'z' refers to the z-score computed at 1.96 while the CI is computed at 95%. Additionally, 'e' in the above equation denotes an error estimated at 5%, while 'p' denotes the variability proportion computed at 50%. Moreover, 'q' in the equation refers to the population which has not been considered in the study.

$$n = \frac{(1.96)^2 \times 0.5 \times 0.5}{(0.05)^2}$$

Based on the prior equation, it can be determined that the adequate sample size for this study is 384. Therefore, it depicts that the sample size of 385 respondents would be adequate in terms of conducting the study.

6. Sampling technique

Considering the above discussion regarding the adequate sample size, it is evident that including the entire population is not a feasible option. Therefore, it is imperative to target the desired population or ensure that the actual number of respondents is included in the sampling process. In this manner, the researcher has provided the calculation of sample size to target the respondents through a particular sampling technique. The sampling technique adopted by the researcher is non-probability purposive sampling. As per the study of (Farrokhi & Mahmoudi-Hamidabad, 2012), purposive sampling allows the researchers to gather the data based on the purpose of the study as the study is based on investment behavior. With respect to this study and in order to analyse the overall impact of cognitive biases on investment decision and to find the specific effects on the Egyptian market in the era of Covid-19, the purposive technique would be best for sampling and the best to collect data and target the population that has been affected due to Covid-19 in terms of finance (Kaur & Bharucha, 2021).

7. Research instrument

To conduct this study, a web-based questionnaire via Google form was used to gather the responses from the individual investors in Egypt. Responses to each of the items were elicited on five-point scales ranging from 5 to 1 where on 5 points Likert scale; 1-strongly disagree, 2-disagree, 3-neutral, 4-agree and 5-

strongly agree. The expected time to complete the questionnaire was on average 10 minutes.

It consisted of 45 questions concerning the fundamental heuristics and biases affecting investment decisions and the moderating role of covid-19 fear. The questionnaire consists of ten sections. each section is tested by using a number of close ended questions.

Measurement

The primary data are collected by using the questionnaire of 45 items. The cognitive variable consists of overconfidence, availability, representativeness, anchoring, regret aversion, loss aversion and herding heuristic bias each one consisting of five items. The scale developed and validated by Nada and Moa'mer (2013) was used to measure Over-confidence bias and anchoring. The availability heuristic is measured by adopting items from Waweru et al. (2008); Luong and Ha (2011) and Kudryavtsev et al. (2013). The representativeness heuristic was adopted from Waweru et al. (2008); Luong and Ha (2011); Yalcin (2012); Sarwar et al. (2014). regret aversion was measured by attaining questions from study of (Kisaka, 2015). Loss aversion was measured by adopting five items developed and validated by Parker and Decotiis (1983) and Yalcin (2012) as for herding it was measured by the scale of Ghalandari et al., (2013) and Kengatharan & Kengatharan, (2014). Investment decisions variable consisted of five items and measured using Ahmed

(2013) scale and finally covid-19 variable was measured using Ahorsu et al.'s (2020) scale

9. Data analysis

Research Hypotheses

H1: There is significant relationship between Cognitive Biases and Investment decisions.

Pearson correlation analysis is used to establish whether the study variables are significantly associated as a prerequisite for running hierarchical regression models to test the study hypotheses. The correlation strength is tested using SPSS-bivariate- Pearson correlation. Descriptive statistics and Pearson correlations among the seven cognitive biases construct and the investment decision variables are displayed in Table 1. It provides preliminary support for the anticipated hypothesis (H1) of the research.

The output of the analysis shows the correlation coefficient for the seven cognitive heuristics and investment decision variables. The results revealed that all those seven cognitive heuristics are positively and significantly related to investment decision with also a p-value of 0.000 ($p < 0.01$) thus reaching a high significance value.

Table 1: Descriptive statistics and person correlation

Field	Mean	Std. Deviation	Pearson Correlation Coefficient	P-value (Sig.)
Overconfidence	15.07	5.098	0.416	0.000**
Availability	18.14	3.708	0.336	0.000**
Representativeness	19	3.642	0.379	0.000**
Anchoring	18.19	3.649	0.467	0.000**
Regret Aversion	17.91	3.735	0.493	0.000**
Loss Aversion	18.67	3.679	0.441	0.000**
Herding	17.71	3.876	0.444	0.000**
Cognitive Biases	124.69	20.399	0.571	0.000**
Investment decision	16.81	3.375	1	

$N = 385$, *$p < 0.05$, **$p < 0.01$

**. Correlation is significant at the 0.01 level (2-tailed)

Going further in the analysis by testing the linear regression for investment decisions as the dependent variable and the independent variable cognitive biases, it is confirmed that the relations is also significant as shown in table 2.

Table 2: The relationship between cognitive biases and investment decision

Field	Pearson Correlation Coefficient	Unstandardized Beta	P-value (Sig.)	R Square
Cognitive biases	0.571[a]	0.094	0.000**	0.326
Constant		5.035	0.000**	

**. Correlation is significant at the 0.01 level (2-tailed)

a. Dependent variable: Investment decisions

Analysis of Variance (ANOVA) consists of calculations that provide information about levels of variability within a regression model and form a basis for tests of significance. From the study findings in Table 3, the significance value is 0.000 which is less than 0.01, thus the model is statistically significant in predicting that Cognitive biases influence the individual investment decisions in Egypt.

An F-test is any statistical test in which the test statistic has an F-distribution. It is used when comparing statistical models that have been fitted to a data set, to identify the model that best fits the population from which the data were sampled. The F statistic in this study was significant < 0.001 and =184.967 and this showed that the model had a good fit and it is a good model.

Table 3 ANOVA (Analysis of Variance)

Model	Sum of squares	Df	Mean square	F	Sig.
Regression	1424.384	1	1424.384	184.967	0.000[b]
Residual	2949.393	383	7.701		
Total	4373.777	384			

Dependent variable: Investment decisions

b. Predictors: (Constant), Cognitive biases

Testing the direct relation between Cognitive biases and Investment decision revealed P = 0.000 but a moderate correlation strength of 0.57.

Determinant coefficient R squared of 0.326 meaning that cognitive biases explain 32.6% of changes in investment

decisions. Thus, other factors not part of this study contributed by 67.4% of variance in the individual investment decisions dependent variable. The values of Adjusted R Square of 0.324 and R squared of 0.326 are very close because it is a simple regression.

This relationship that can be reflected in the following simple regression equation:

$$Y= 5.03+0.09 * X + \varepsilon$$

Y: Dependent Variable- Investment decisions   **X**: Independent Variable- Cognitive biases

ε: Random error

Figure 2 the coming figure is a scatter graph demonstrating the relationship between cognitive biases and investment decisions.

Figure 2: The relationship between cognitive biases and investment decision
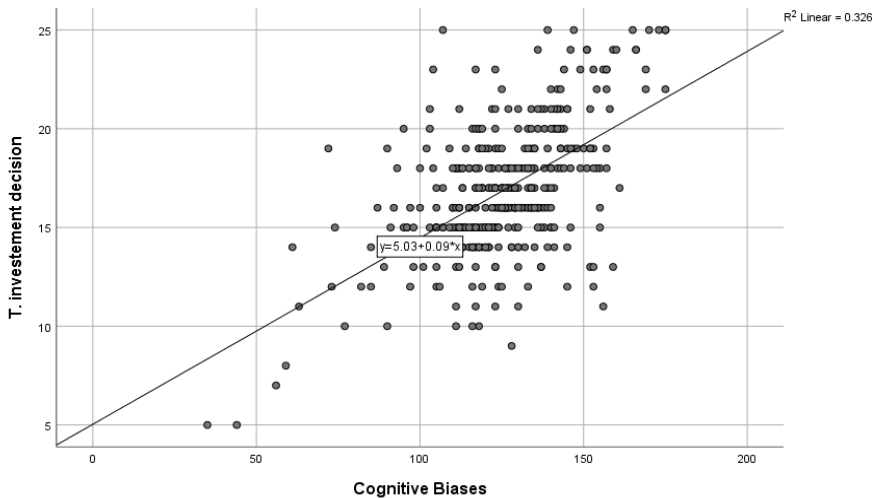
Since p < 0.01 (p= 0.000), r = 0.57, therefore, there is a positive significant moderate relationship between cognitive bias and investment decisions at the 0.01 level (2-tailed) and hence this hypothesis is supported and cannot be rejected.

These findings reveal that cognitive heuristic biases affect investment decisions of individual investors. The higher the cognitive bias perceived by investors, the more often investors make investment decisions. Psychologically, this means that heuristic-driven behavioral biases impair the investment decision-making process of individual investors as investors who are suffering from heuristic-driven biases cannot make rational decisions and they make poor decisions related to an investment

opportunity. The presence of cognitive biases in individuals' investment decisions can lead to several problems such as excessive trading this finding is consistent with Bhandari and Deaves (2006), Deaves et al. (2010) and Prosad et al. (2015), poorly diversified portfolio management, and wrongfully assuming that their decisions are always right (Merkle, 2017), bear larger risk accumulation (McCannon et al., 2016), thinking that their skills are valuable and productive, consider themselves highly skilled, and can make the right decisions in various situations (Din et al., 2020). Investors suffering from cognitive biases also tend to focus their verdict on unrelated facts and data (Brooks, 2011), their decisions are based on most available information because of minimum search cost attached to them which is consistent with Waweru et al. (2008), Massa and Simonov (2005), putting more weight on losses than gains, increasing the dependency on others advice and they don't have their own opinion in investment decision which matches the findings of Messis and Zapranis (2014) and represents an additional risk factor for the investors.

H2: COVID-19 fear has a moderating effect on the relationship between cognitive biases and investment decisions.

We are now to examine the moderator effect of the COVID-19 fear variable which is considered the moderator variable. In the context of these data, the model was tested, and the findings regarding the model are illustrated in Figure 3.

Figure 3: The moderator effect of the COVID-19 fear variable on the relationship between Cognitive biases and investment decisions
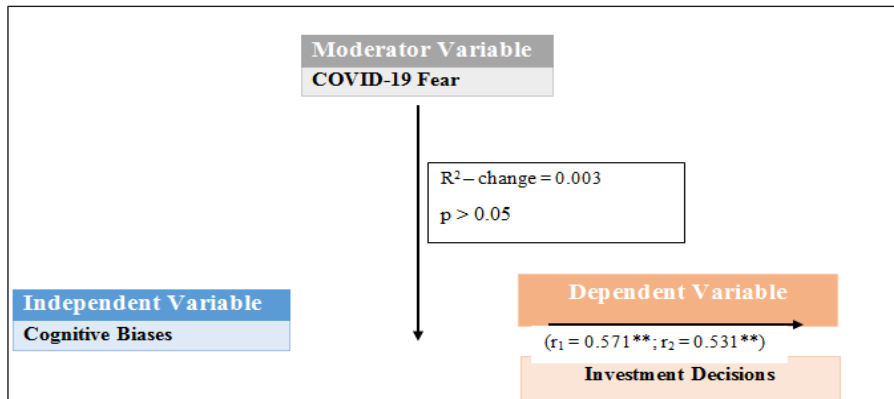
**. Correlation is significant at the 0.01 level (2-tailed)

The results of the analyses performed to examine the moderating effect of the COVID-19 fear variable on the relationship between Cognitive biases and investment decisions are illustrated in Figure 3. According to these results, the relationship between Cognitive biases and investment decisions can be seen as positive and significant ($r = 0.571$; $p < 0.01$). This situation shows the first effect result (H1 is supported). Then we can examine the moderating effect of the COVID-19 fear variable, it is seen that this variable positively decreases the relationship between the independent variable (Cognitive biases) and the dependent variable (investment decision) ($r_1 = 0.571**$; $r_2 = 0.531**$). According to this result, the positive relationship between Cognitive biases and investment decisions is decreased. Results

of moderation testing done via SPSS version 26 and PROCESS V4.2 is presented in the following 4 tables.

Table 4 Moderation Model Summary

R	R-sq.	MSE	F	df1	df2	p
0.5806	0.3371	7.6100	64.5801	3.000	381.0000	0.0000

Table 5 Moderation Model- PROCESS

	Coeff	se	t	p	LLCI	ULCI
Constant	16.7446	0.1483	112.9384	0.0000	16.4531	17.0361
Cognitive Biases	0.0883	0.0075	11.6968	0.0000	0.0735	0.1031
Covid-19 fear	0.0673	0.0341	1.9724	0.0493	0.0002	0.1344
Int_1: Cognitive Biases x Covid-19 fear	0.0017	0.0013	1.3426	0.1802	-0.0008	0.0042

Table 6 Moderator Effect Analysis Results

Field	Unstandardized Beta	Coefficients Std. Error	Pearson Correlation Coefficient	P-value (Sig.)	R^2	ΔR^2
Step 1						
Constant	5.035	0.877		0.000**		
Cognitive biases	0.094	0.007	0.571	0.000**	0.326	0.326
Step 2						
Constant	4.651	0.890		0.000**		
Cognitive biases	0.088	0.008	0.531	0.000**		
Fear of Covid-19	0.074	0.034	0.099	0.030*	0.334	0.008
Step 3						
Constant	4.631	0.890		0.000**		
Cognitive biases	0.088	0.008	0.534	0.000**		
Fear of Covid-19	0.067	0.034	0.091	0.049*		
Cognitive bias x Fear of Covid-19	0.157	0.117	0.057	0.180	0.337	0.003

Dependent variable: Investment decisions

*p < 0.05, **p < 0.01

Table 7 Test of highest order unconditional interaction

	R-sq. change	F	df1	df2	P-value (Sig.)
Cognitive biases x Fear of Covid-19	0.0031	1.8025	1.000	381.0000	0.1802

After examining Tables from 4 to 7, it can be noted that the model summary is significant and there is a positive change and increase in R^2 across the three steps, but the interaction effect is not significant which means that fear of Covid-19 is not a moderator between the relationship between cognitive biases and investment decision ($p > 0.05$, $p = 0.180$) concluding that the relationship between Cognitive bias and investment decisions is not moderated by fear of Covid-19 and accordingly, hypothesis 2 is rejected and COVID-19 fear has no moderating effect on the relationship between cognitive biases and investment decisions.

On contrary to this result, in other studies investigating the aspects of the pandemic the negative effects of the pandemic have been observed (e.g., Guan et al., 2020; Karakose & Demirkol, 2021; Koçak et al., 2021; Okuhara et al., 2020; Phelps & Sperry, 2020; Sheridan et al., 2020; Van Bavel et al., 2020).

Karakose and Malkoc (2021b) stated that the emergence of various psychological problems both during and following the end of the pandemic is an expected situation. Moreover, other studies found out that the pandemic has negatively affected so many areas (Gritsenko et al., 2020; Kameg, 2020; Santini et al.,

2020; Torales et al., 2020), confirming that these negative effects are also valid in the future as even the end of the pandemic will not necessarily mean the end of its impact.

10. Conclusion

This research concludes that investor decisions are not rational but are influenced by behavioural biases and also it is found that there is persuasive evidence that investors make major systematic errors and there is evidence that psychological biases affect market prices substantially. These biases are manifested in different forms. On the second side, the moderation effect of covid-19 on the relation between cognitive biases and investment decisions is nowhere to be found.

11. Recommendations

The Bright Side of Coronavirus Pandemic

The COVID-19 pandemic has been declared as modern history's gravest health emergency by many countries. Everything that is considered normal has changed. Generating strong repercussions in all countries of the world and having a lot of dark sides, the pandemic represents a huge stressor shaking up psyche and causing fears and uncertainties, reflected in different aspects; people get sick and die, schools close, the healthcare system is overloaded, employees lose their jobs, many companies face bankruptcy and stock markets collapse.

No matter how serious and sad all of this is, there is still some light at the tunnel; there are positive sides and opportunities as

well that can be seized. By learning the right lessons from the pandemic and building resilience, there will be an opportunity to turn the COVID-19 disruption to an advantage.

The pandemic triggers a sudden need for focusing on digital transformation as long as there is a strong enough stimulus, things can change leading to remarkable innovations that can be easily and steadily maintained after the crisis.

Coronavirus causes a significant reduction in greenhouse gasses and other air, water and land polluting outputs which are good news for nature and to build on this, we should reconsider and reorganize in a way that has less impact on the planet.

If we keep concentrating at the brighter sides, the longer the crisis lasts, the larger the upsides and opportunities are and the bigger the chances are of actually making changes and gains.

Adaptability to new technology

Investors should be adaptive to new technology and always find new ways to accomplish their financial objectives. Thanks to unparalleled digital access to financial information, and up-to-date analytics driven by new age modern technologies, investors now may find it easy to identify the right investment opportunities, and to invest through investment applications and build wealth in ways that were not available in the era before machine learning and artificial intelligence.

Overcoming the Biases

Financial decisions are very important for social and human life of an investor and poor financial decisions have strong impact on both social and human life so it is necessary to avoid these biases. Although there are a lot of biases that the investors have and possibly aren't even aware of, there is a lot of ways and techniques to try and overcome them. Secondly, independent research about a specific investing asset is needed to avoid filtered information and the anchoring bias that often come with it. Generally, the investors that rely on only a single or a couple of sources are very bias prone and do not make the best investing decisions. Thirdly, the study suggests that creating a list of variety of possible scenarios needed to get rid of biased expectations. By listing down also the unpopular and unlikely scenarios the investor can make the decision based on what works best across several possible eventualities. On the contrary, if the investor expects only one future outcome, for example for the stock price to increase, it makes it difficult to adjust and make the best investing decision (Rizzi, 2005).

12. Further research

Research may also be directed towards the investigation of the behaviour of individual investors, since individual investors behave differently extending into proposing investment models that explain more precisely behavioural factors and biases affecting investment decision making.

Also, further research may be needed in the relation between behavioural finance and the influence of market makers on determining prices.

13. Limitations of the study

Our study is based on data from individual investors in Egypt, so future research could study these relationships in other contexts in order to enhance the generalizability of our findings.

The study depends on primary data -questionnaires which can be general and vague and may not really help individuals make decisions on investment. The information and data may not be very accurate or may be biased which in turn may lead to inaccurate results as it depends totally on the fair responses and honesty of the respondents.

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