

The Impact of COVID-19 on Investors' Behavior: Evidence from Risk-aversion, Herding Behavior, and Availability Bias

Zixuan He^{1, a,*}

¹ *University of California San Diego, La Jolla CA 92093, United States*

a. zih023@ucsd.edu

**corresponding author*

Abstract: The unforeseen pandemic has significantly influenced the financial market, and has caused major disruptions in the global economy, leading to a sharp decline in stock prices and increased volatility in financial markets. Assessing the impact of the COVID-19 pandemic on the market is essential for both investors and policymakers. This study recognizes that irrationality exists during the pandemic in investors' decision-making and find that the efficient market hypothesis does not always hold perfectly. According to the analysis, emotional and cognitive biases play significant roles in investors' decision-making, especially under uncertainty. Using empirical data from the previous study, the existence of risk aversion, herding behavior, and availability bias during the pandemic is testified. The results suggest that the pandemic has led to an increase in risk aversion among investors, as well as a tendency towards herding behavior in the stock market but not the crypto market. Furthermore, evidence of availability bias is found, with investors placing greater weight on recent news and information related to the pandemic, and making decisions based on that information. These findings have important implications for investment strategy and risk management during a crisis.

Keywords: behavioral finance, risk-aversion, herding behavior, availability bias

1. Introduction

In 2019, the first case of coronavirus disease was identified in China, which then rapidly outbreaked and became a worldwide pandemic around early 2020, widely known as COVID-19. Even though the virus was first recognized in China, the exact origin and reason of the virus remain a mystery and are under investigation. With the outspread of the virus, the global economy has been significantly impacted by the pandemic, causing a slowdown in economic growth with a drop in consumer behaviors and business activities, and a surge in inflation driven by the government's implementation of its monetary and fiscal policies in the purpose of mitigating the impacts of the pandemic [1].

The sudden change in economic activities brought up by COVID-19 has dramatically influenced the financial market, leading to an increase in uncertainties and panics among investors, which drives changes in their investment logic and decision-making [2]. The unforeseen pandemic dealt a serious blow not only to the stock market but also to bonds and currency [3].

The sudden drop in prices on major indexes and individual stocks caused panic among investors, which is also regarded as the largest decline since the 2008 financial crisis. With the sharp decline in interest rates, the yields on government bonds fell to historic lows, especially long-term bonds [1]. The implementation of government subsidies and the increase in government spending gives rise to a roar in inflation and causes further concerns about economic stability and long-term sustainability [4]. This emotion aggravated the volatility in the market and further devastated the market which causes the stock price further plummeted leading to a vicious cycle. These unexpected outcomes can barely be explained by traditional finance which usually assumes the market is efficient and people are rational, where they are able to make decisions based on the same, accurate information [5]. According to Tseng, the efficient market hypothesis is built on three basic assumptions. First, people are rational and are likely to respond to the market rationally. Second, despite some participants being irrational, their trading activities could be arbitrated away by rational investors, keeping the market efficient. Lastly, market participants will maximize their subjective utility functions [6]. Tseng claimed that in situations where there are risks, uncertainty, incomplete information, or high complexity, people may act differently than what traditional economic theory would predict, deviating from rationality [6]. Researchers usually use mathematical models and theories to explain and predict the financial market in studying traditional finance [6]. However, research has shown that people are usually emotion-driven, and often make decisions that are impulsive and irrational, and thus, behavioral finance emerges as a response to the limitations of traditional finance, examining people's financial decision-making based on emotional and cognitive biases. Behavior finance is a study to examine how psychological factors and cognitive biases drive deviations from rational decision-making leading to even worse performances and consequences [7]. Under negative surprises such as the sudden pandemic, Covid-19, there was an increase in fear and uncertainty in the market and individual investors which led to a change in investment behaviors driven by emotion and affected their perception of risks, causing a reduction in risk tolerance and an increase in risk-averse [5].

Therefore, to better understand how behavior finance contributes to the analytics of people's behavioral changes and their effects on the overall market as a complement of the predicted models and theories explained by traditional finance, this paper is to investigate the changes in investors' behaviors and decision-making in response to COVID-19 led by risk-aversion, herd mentality, availability bias, and to explain the market outcomes given those behavioral changes, as well as how they will impact both individual investors and the market as a whole during the economic downturn and how people should learn a lesson from to navigate the challenges in pursuit of better future decision-making.

2. Risk-aversion

The outbreak of COVID-19 has caused a crash in the global stock market leading to a heightened emotional contagion due to uncertainties and fear worldwide, which played a significant role in changes in investors' behaviors, especially apparent in risk-aversion. In the article in *Nature Human Behavior*, researchers have shown that during a pandemic, fear is considered to be a prominent emotional response that individuals commonly experience [8]. The article also indicates that the negative emotions brought up by threats are likely to be contagious and the emotion can aggravate fears so that it can make the threats more imminent [8]. Raut has made the statement that investors generally engage in emotional contagion no matter what level of investment experience they have [9]. Research has shown that most investors are more likely to exhibit risk-averse during an economic downturn. One of the most apparent indicators of risk aversion is the loss-aversion, where some investors tend to make decisions to better avoid losses in exchange. Typically, Rational investors will trade more if they are less risk-averse. However, data has shown that during covid, there were fewer

trades happened, indicating that investors might have been more risk-averse in the context of COVID-19.

In Okorie's theory, the consideration drives taking short or long positions were not based on the traditional alpha rule. Still, under the threats of the outbreak virus, the thing that investors care more about is keeping sufficient resources for daily living and consumption, instead of returns [10]. Christoph conducted an experimental approach to investigating the differences in investment behaviors between financial professionals, practitioners, and nonprofessionals, typically students, during the period of real-world economic turmoil and financial instability, and found out that there was a drop in investing activities and changes in behaviors majorly among professionals, while the world stock situation during pandemic mildly influences the behaviors among students [11]. Also, he has concluded that it is risk tolerance that contributed to the changes in investors' decision-making instead of beliefs. Through the experiment, he found that professionals have shown a 12 percent drop in their investment in the stock market during late 2019 [11].

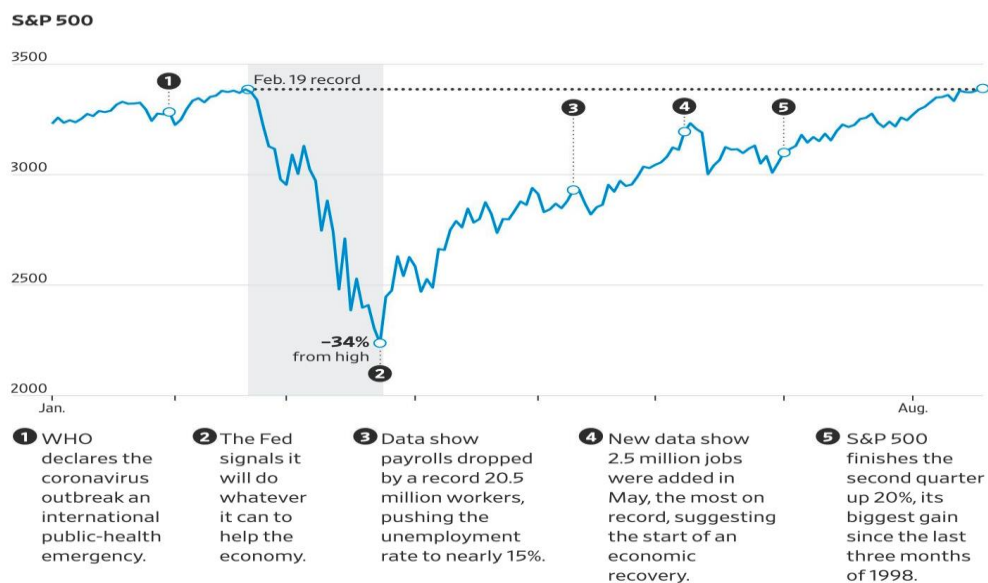


Figure 1: S&P 500 Sets First Record Since February, Erasing Its Coronavirus Plunge.

This change was majorly caused by risk aversion, while the expectations on the stock price remain unchanged. Cohn carried out that experimental evidence has shown that individuals have countercyclical risk aversion, meaning that they tend to show higher risk-averse during economic downturns. Moreover, fear has been recognized as the mediator of this behavior [12]. In terms of the definition of risk aversion, a higher level of risk means a higher level of risk premium, in other words, higher expectations on returns. From an economical perspective, a higher risk aversion could drive the demand down for assets, which could further exacerbate the crisis as a drop in demand is usually accompanied by a drop in price and amplify the fear on the market, further increasing risk aversion. Nevertheless, as shown in Fig.1 and Fig. 2, there is a huge plunge in S&P 500 performance at the beginning of the pandemic, but with the increase in the number of new COVID-19 cases, the situation is not getting worse which supports Huber's claim that the crash in the stock market is not led by belief. By comparing the return and future price expectations, there were no differences between the two periods before COVID and after COVID, hence the decrease in investments is not caused by beliefs, the prospect of future performances, but risk-aversion which is in line with the findings of Cohn et al. [12]. In short, in Cohn's findings, professionals exhibit higher sensitivity to risk on observing the volatility of the market before and during the actual spread of the pandemic, and more

moderate in March 2020 accompanied by less volatility. This verifies the proposal Payzan-LeNestour has made on the neurological explanation that after a high-volatility phase, it is rather accompanied by relatively moderate volatility.

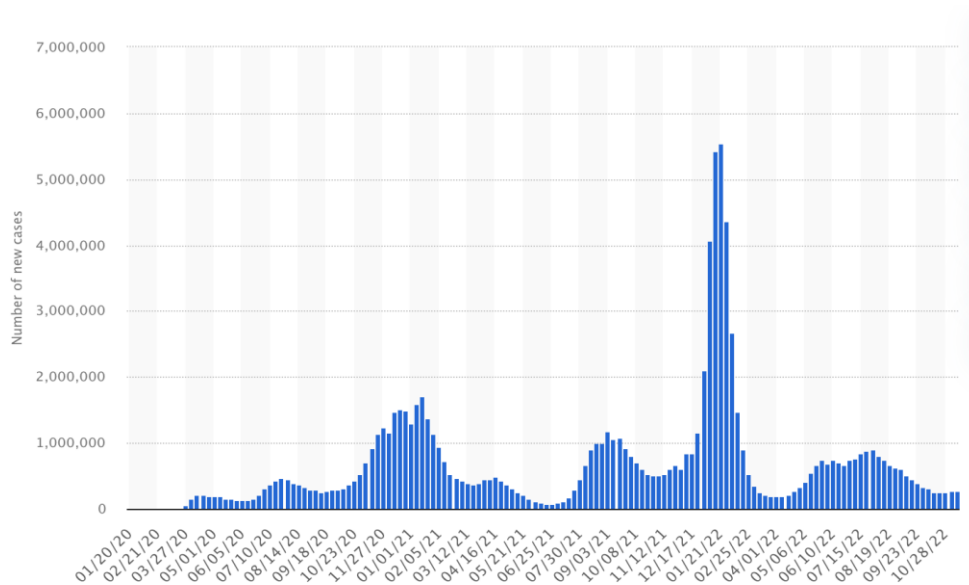


Figure 2: Number of new cases of coronavirus (COVID-19) in the United States from January 20, 2020 to November 11, 2022, by week, Statista.

Okorie utilized nonlinear process, DMCA, and DCCA techniques, to fractal contagion effects on both stock market returns and volatilities and provides evidence that there is a remarkable but temporary contagion effect during the pandemic among the global stock market, which further verifies Cohn's findings [10]. Cohn's finding provides the foundation and has been proved by Zhang that in a bust, risk-aversion increases, leading to more panic and uncertainty [13]. Zhang D. initials a statistical model to analyze and assess the effects of Covid-19 on the level of risk present in the stock market [13]. The outbreak pandemic has caused significant loss of life and challenges to every individual and country around the world. Besides, the financial markets have experienced unprecedented levels of volatility, causing depressed market sentiment. Zhang has shown that as a result, there has been a substantial increase in risks in the global financial market brought up by the pandemic, where the uncertainty and economic consequences have led to a highly unstable and unpredictable market [13]. All in all, evidence has shown that risk-aversion happened during the COVID-19 pandemic, but it does not consistently drive the stock price down, which is verified by Huber, et al. that the changes in stock price are more likely to be driven by changes in investors' investment behaviors and decision-making rather than their beliefs on long-term expectations.

3. Herd Behavior

Existing literature with empirical tests and evidence have shown that the COVID-19 pandemic has caused a roar in uncertainties and volatility in financial markets in general [4, 14]. Market sentiments such as fear and stress are considered triggers of a cognitive bias, the herding behavior. Yarovaya claimed that even though there are strong theoretical reasons that there might be a "black swan" effect on cryptocurrency herding during Covid-19, in his study, the results turn out that herding behavior does not necessarily increase for the crypto market during COVID-19, and his result shows that herding behavior in the crypto market stays contingent depending on the market fluctuation and the

herding is time-varying [15]. Bouri basically suggests that during periods with high uncertainty, herding behavior tends to be more prevalent regardless of whether there were irrational behaviors among investors, developed by Baker et al. [14]. Investors show stronger reactions in response to bad news compared to good news indicating a higher level of sensitivity towards unfavorable events [16], meaning that when bad news is revealed, investors are more likely to follow others' reactions, abandoning their own beliefs and seeking consensus to hedge the risk.

From the psychological notion that people may feel a sense of security by conforming to the behavior of a larger group [17]. Keynes, a notable economist, placed emphasis on the importance of herding behavior and claimed that people are more likely to conform to the actions of others during times of heightened uncertainty due to the fear of making mistakes when making decisions alone [18]. This change in investment behavior and decision-making is the so-called herding behavior. Kizys has found evidence that during the pandemic, due to the elevated uncertainties, there is herding presenting in the financial market, and prominent herding behaviors can significantly impede the efficiency of the market and plays a significant role in the financial market returns and volatility [19]. With the statistical model based on the EMH, it was hard to explain the price fluctuations and volatility in the financial market driven by irrational investment behaviors such as herding behaviors. A widely used proxy to represent investor sentiment is CBOE's Volatility Index, the VIX, investors' fear gauge and anxiety, investors' sentiment, and uncertainty [4, 20], and for uncertainty and macroeconomic hazards. Aharon has shown that with a higher VIX index, herding behavior tends to increase dramatically during COVID-19 and has concluded that this result might be driven by investors' belief that the mass has access to more accurate information, so it is safer to just follow and herd, even it might deviate from their own opinion. Aharon recognizes that given the uncertainty, herding might be served as an alternative to hedge risks [20]. In addition, researchers have developed other tools to capture herding behavior by effectively quantifying the fear and expectations of investors such as news reports and some internet-based tools. For example, Baker proposed a newspaper-based measurement, EMV, as a forward-looking method in the explanation of economic uncertainty, which turns out a similar outcome as VIX [4].

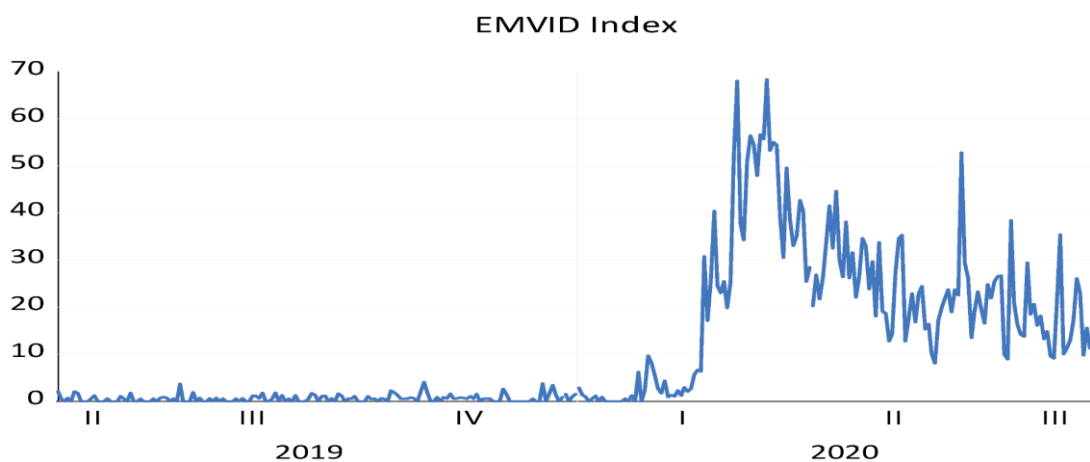


Figure 3: The plot of the EMVID Index.

According to this index, as shown in Fig. 3, there is a significant increase in uncertainty during the pandemic, which allows us to track and examine the connection between herding behaviors and the market uncertainty caused by the pandemic [14]. The result aligns nicely with documents employing VIX, where Baker's study implies that the pandemic drove a response in the stock market collapse and the rise in its volatility [4]. Besides the newspaper-based measurement, the google trends index has been widely used in many studies to investigate the connected between the fear brought up by the

uncertainty of the pandemic and the performance of the financial market [2, 21]. By examining the google trends index, Bouri has shown a direct link between the outbreak of the pandemic and increasing herding behavior in support of Bart's finding and highlighted the heterogeneity of herding behavior across the global market, where investors perform differently in response to the worldwide pandemic result in different market fluctuations, where the herding effects driven by uncertainty are especially apparent in emerging stock markets and European PIIGS stock markets [14]. This finding backs up Economou's assumption that participants in emerging markets exhibit a higher likelihood to facilitate herding behavior compared to developed markets [22].

The results from VIX, newspaper-based index, and Google trends index have shown similarity and consistency in their results considered good indicators of revealing the herding effects driven by uncertainties during the pandemic. Those results are crucial to both investors and regulators on the maintenance of market stability as herding behavior has been confirmed to have negative impacts on market efficiency by reducing the heterogeneity of investors' decision-making, further amplifying market volatility and price fluctuations. Schmitt indicates that increasing market sentiments lead to a decrease in diversification in investors' behaviors and market inefficiencies, whereas his model implies that certain policies could contribute to controlling the herding behavior and managing market stability [18]. Thus, for both policy-makers and investors, it is critical to take herding effects into consideration while facing uncertainties and financial instability in their decision-making. Through indexes such as VIX, newspaper-based index, and Google trends index, researchers have successfully quantified the herding behaviors in the financial markets during the COVID-19 pandemic and proved that media has played an essential role in disseminating contagion during the pandemic.

4. Availability Bias

From the previous section, the efficient market theory has shown its deficiency that it could not perfectly explain the market changes led by the changes in investors' behaviors and investors are not always rational, typically under COVID-19, where the investors are facing both healthy threats and economic downturns. In the complementary of traditional finance, the efficient market theory, in the context of COVID-19, researchers suggested that specific elements should be taken into consideration in the explanation of the investors' rationality and the market sentiment. Researchers such as Yarovaya have defined COVID-19 as a black swan" event whose impact is hard to estimate and predict. Also, during the economic downturn with heightened uncertainty, the market price responds severely to the available news [15]. In Bouri's model, he mainly focuses on the association between herding behavior and market volatility, but he also proposed and initiated the idea that heightened volatility might induce risk perception which drives changes in investors' behaviors [14]. Vasileiou adopted and improved the google trends index to examine the market sentiment more broadly on heuristic factors related to COVID-19 such as availability bias, and risk aversion [5]. He quantifies the fear by collecting the data from Google searches related to Covid terms from the early stage to the late stage and suggests that there is a positive correlation between the index value and level of fear, whereas the index value increases, so do the fear, as well as the risk perception, among the market.

Google searches, as well as news reports, are considered major media exposure in modern society, which play significant roles in influencing investors' behaviors and decision-making by inducing cognitive biases such as availability bias [5]. Marty carried out an experiment that confirmed that the release of public information plays an important role in reducing information asymmetry, but the mass could quickly respond to and absorb that information and it is reflected in the market price [23]. Availability bias refers to the cognitive bias where investors make decisions relying too heavily on the limited information that they are easily exposed to without further reviewing and a comprehensive understanding of the market [24]. Furthermore, availability bias is not limited to a specific gender or

demographic group but can impact investors from various backgrounds [25]. Khan verifies that there is no apparent indicator that can reveal the relationship between gender and risk-taken activity [25]. In terms of Khan's finding, there is a significant difference in risk perception between males and females, but males and females tend to respond similarly. Also, Khan reports a clear relationship that investors' decision-making is determined by their risk perception and attitude, and the differences in decision-making could be driven by availability bias and risk aversion. This finding is in line with Alrabadi who found that availability bias has a notable impact on investment performance [25]. Media coverage and news reports could be triggers that will cause availability bias, and lead to poor decision-making. During the early stage of COVID-19, Haroon has shown that there is a positive correlation between the media coverage reported and the market sentiment by running regression models [26]. Haroon also testified to the relationship between negative news reports and the volatility in global stock markets which was consistent with the finding of Vasileiou [26]. In previous studies, researchers have shown that a significant drop in citizens' trust can effectively lead to turbulence in the financial market, while a drop in trust can result in availability bias [4].

It is interesting that in the early literature on the Chinese stock market written by Al-Awadhi et al. [21], it turns out that there is a compelling negative correlation between both confirmed cases and casualties reports and the returns of stocks for all the companies that are listed in the Hang Seng Index and the Shanghai Stock Exchange Composite Index, which has been admitted by Vasileiou, but explained that their theory could only explain the stock performance at the early stage of the pandemic but fail to fit the results in the long run which is consistent with Cohn's finding. In summary, cognitive biases such as risk-aversion, herding behavior, and availability bias could be a chain effect, contributing to the crash in the stock market brought up by the pandemic, which helps better explain the volatilities and changes in the financial markets.

5. Limitations & Prospects

Without strong empirical and experimental support, this literature has only theoretical and practical contributions by reviewing and gathering the results from previous studies. In addition, this study has only focused on the changes in the behaviors of individual investors but has ignored the changes in institutional behaviors in the context of COVID-19, where institutional participators have played indispensable roles in the stock market. Subsequently, in the study of behavioral finance, there are only limited emotion-driven, and cognitive biases explained in this paper, including risk-aversion, herd behavior, and availability bias, while other heuristic factors are needed to be included in the future. Furthermore, most of the results are mostly representative of the global financial market, but some are geographically restricted, and different places and markets could react heterogeneously in response to the pandemic. Moreover, COVID-19 is regarded as a special case that can be separable from previous single Infectious disease disasters or financial crises, where the COVID-19 case should be examined more independently and comprehensively with considerations on multiple factors simultaneously. However, it lacks social and cultural evidence on the contribution of investors' behavior changes. Moreover, as COVID-19 is a recent event, there is limited previous similar research which might lead to biases and the absence of vital factors driving investors' biases. Lastly, there is not enough empirical prediction for the volatility of the future market, and some hypotheses on mitigating the impacts of the pandemic on investors' behaviors needed further support.

The following research may be expanded to investigate more on the global market in sections, focusing on the behavioral changes across sections, excepting shared similarities, and finding more heterogeneity. Moreover, further research could include other factors such as social and cultural factors which play significant roles in determining the characteristics of individuals in explanation of the implicit reasons for their behavior changes besides the explicit reasons such as uncertainties.

Besides, it is essential to conduct experiments for institutional behavior changes to better understand the change in market volatilities and prices. For example, how institutions drive herding behavior.

6. Conclusion

In summary, this study has presented evidence indicating that the stock market does not always consistent with what the efficient market hypothesis has suggested during the Covid-19 pandemic, which implies that investors do not always make rational decisions, and the market price might not contain all the available information. Researchers have shown that the efficient market hypothesis cannot explain all the changes in the market during the pandemic brought up by uncertainties, especially volatility and market sentiment. Additionally, the EMH fails to contain the health threats in response to the COVID-19 pandemic, which has had significant impacts on investors' behaviors. Baker has initiated a newspaper-based index and Aharon has formed a Google trends index, VIX, to quantify the fear and to better measure the market sentiment that causes deviations in investors' rationality. The researchers have verified that during the COVID-19 pandemic, risk aversion, herd behavior, and availability bias exist and have played significant roles in investment decision-making.

References

- [1] Thorbecke, W.: *The Impact of the COVID-19 Pandemic on the U.S. Economy: Evidence from the Stock Market*. *Journal of Risk and Financial Management* 13(10), 233 (2020).
- [2] Albuлесcu, C. T.: *COVID-19 and the United States financial markets' volatility*. *Finance research letters*, 38, 101699 (2021).
- [3] Wadhawan, A., Kulkarni, M. S.: *Behavioral finance and COVID-19*. Retrieved April 3, 2023, Retrieved from: <https://www.proquest.com/docview/2734428770?pq-origsite=gscholar&fromopenview=true>
- [4] Baker, S. R.: *Covid-Induced Economic Uncertainty - National Bureau of Economic Research*. 2020, Retrieved from: https://www.nber.org/system/files/working_papers/w26983/w26983.pdf.
- [5] Vasileiou, E.: *Explaining stock markets' performance during the COVID-19 crisis: Could Google searches be a significant behavioral indicator?*. *Intelligent Systems in Accounting, Finance and Management*, 28(3), 173-181 (2021).
- [6] Tseng, K. C.: *Behavioral finance, bounded rationality, neuro-finance, and traditional finance*. *Investment Management and Financial Innovations*, 3(4), 7-18 (2006).
- [7] Bansal, T.: *Behavioral finance and COVID-19: cognitive errors that determine the financial future*. Available at SSRN 3595749 (2020).
- [8] Bavel, J. J. V., Baicker, K., Boggio, P. S., et al.: *Using social and behavioural science to support COVID-19 pandemic response*. *Nature human behaviour*, 4(5), 460-471 (2020).
- [9] Raut, R. K., Kumar, R.: *Investment Decision-Making Process between Different Groups of Investors: A Study of Indian Stock Market*. *Asia-Pacific Journal of Management Research and Innovation*, 14(1-2), 39-49 (2018).
- [10] Okorie, D. I., Lin, B.: *Stock markets and the COVID-19 fractal contagion effects*. *Finance Research Letters*, 38, 101640 (2021).
- [11] Huber, C., Huber, J., Kirchler, M.: *Market shocks and professionals' investment behavior—evidence from the covid-19 crash*. *Journal of Banking & Finance*, 133, 106247 (2021).
- [12] Cohn, A., Engelmann, J., Fehr, E., Maréchal, M. A.: *Evidence for Countercyclical Risk Aversion: An Experiment with Financial Professionals*. *The American Economic Review*, 105(2), 860-885 (2015).
- [13] Zhang, D., Hu, M., Ji, Q.: *Financial markets under the global pandemic of COVID-19*. *Finance research letters*, 36, 101528 (2020).
- [14] Bouri, E., Demirer, R., Gupta, R., Nel, J.: *COVID-19 pandemic and investor herding in international stock markets*. *Risks*, 9(9), 168 (2021).
- [15] Yarovaya, L., Matkovskyy, R., Jalan, A.: *The effects of a "black swan" event (COVID-19) on herding behavior in cryptocurrency markets*. *Journal of International Financial Markets, Institutions and Money*, 75, 101321 (2021).
- [16] Groß-Klußmann, A., Hautsch, N.: *When machines read the news: Using automated text analytics to quantify high frequency news-implied market reactions*. *Journal of Empirical Finance*, 18(2), 321-340 (2011).
- [17] Hopkins, N., Reicher, S.: *Mass gatherings, health, and well-being: from risk mitigation to health promotion*, *Soc. Issues. Pol. Rev.*, 15 (1), 114-145 (2021).

- [18] Schmitt, N., Westerhoff, F.: *Herding behaviour and volatility clustering in financial markets. Quantitative Finance*, 17(8), 1187-1203 (2017).
- [19] Kizys, R., Tzouvanas, P., Donadelli, M.: *From COVID-19 herd immunity to investor herding in international stock markets: The role of government and regulatory restrictions. International Review of Financial Analysis*, 74, 101663 (2021).
- [20] Aharon, D. Y.: *Uncertainty, fear and herding behavior: Evidence from size-ranked portfolios. Journal of Behavioral Finance*, 22(3), 320-337 (2021).
- [21] Al-Awadhi, A. M., Alsaifi, K., Al-Awadhi, A., Alhammadi, S.: *Death and contagious infectious diseases: Impact of the COVID-19 virus on stock market returns. Journal of behavioral and experimental finance*, 27, 100326 (2020).
- [22] Economou, F., Hassapis, C., & Philippas, N.: *Investors' fear and herding in the stock market. Applied Economics*, 50(34-35), 3654-3663 (2018).
- [23] Marty, T., Vanstone, B., & Hahn, T.: *News media analytics in finance: a survey. Accounting & Finance*, 60(2), 1385-1434 (2020).
- [24] Yuwono, W., Elmadiani, C.: *The Effect of Emotional Contagion, Availability Bias, Overconfidence, Loss Aversion, and Herding on Investment Decisions in the Millennial Generation During the Beginning of the Covid-19 Pandemic. In Proceedings of the 1st International Conference on Law, Social Science, Economics, and Education, ICLSSEE 2021, March 6th 2021, Jakarta, Indonesia (2021, May).*
- [25] Khan, S.: *Impact of financial literacy, financial knowledge, moderating role of risk perception on investment decision. Financial Knowledge, Moderating Role of Risk Perception on Investment Decision (February 4, 2016).*
- [26] Haroon, O., Rizvi, S. A. R.: *COVID-19: Media coverage and financial markets behavior—A sectoral inquiry. Journal of Behavioral and Experimental Finance*, 27, 100343 (2020).