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Review of COVID-19 Pandemic's Impact on Investment Decisions under Behavioral Finance

Yifei Shao[1,a,*]

[1]*Rotman School of Management, University of Toronto, Ontario, M5R 0A3, Canada*
a. katherine.shao@mail.utoronto.ca
**corresponding author*

Abstract: Since the COVID-19 pandemic outbreak, many studies have explored the impact of the COVID-19 pandemic on financial markets and investors' decisions. Most of the studies are conducted under the assumption of rationality and efficient market hypothesis, which imply that investors' decisions are always aiming at the maximum profit. However, analyses of investors' behaviors during the pandemic with a focus on irrationality are not common. Irrationality is the main theme of behavioral finance, which studies the psychological factors that bias investors' decisions from rationality. This paper reviews common theories and biases studied in behavioral finance, including heuristics, mental accounting, disposition effects, overconfidence, and anchoring. In this paper, those concepts are linked to the increased volatility and strikes in financial markets during the pandemic. By analyzing the relationship between behavioral finance concepts, hypotheses are given regarding the impact of the pandemic on increase or decrease of the common irrational behaviors in the financial markets, especially in the stock market.

Keywords: Behavioral finance, Risk preferences, COVID-19, Financial markets, Investment decisions

1. Introduction

During the COVID-19 financial crisis in 2020, the financial market went through anomalies. As the investment environment changed during the pandemic, investors' decisions were also impacted. As countries were experiencing lockdowns and policy controls related to the pandemic, the global and individual stock markets suffered from systematic risks [1].

Income for firms and households decreased during the pandemic, many of which faced liquidity shortages. As people were afraid of being infected, they engaged in fewer economic activities, so demand in various industries dropped significantly. Moreover, the governments set quarantine and lockdown policies, which further restricted activities related to consumption. As for the supply side, the disruption in supply chains further contributed to the decrease in GDP for various countries [2]. To combat the recessions and stimulate the economy, federal governments implemented monetary policies to drive down the interest rate.

Financial markets also experienced significant disruptions and uncertainties. For instance, during February and March 2020, the value of the S&P500 index decreased by around 33.3% in the stock market, and in the bond market, the US corporate bond yield experienced a sharp increase [2]. The financial market efficiency was also negatively impacted by the pandemic, especially in the S&P500

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index [3]. However, the cryptocurrency market, which is less efficient in normal periods, was less affected. Studies also show a positive correlation in the US and China between confirmed cases of infection and the impact on the financial market [4]. The causal impact between confirmed cases and the stock market returns has also proved significant in advanced countries, including Canada, France, Germany, Italy, and the US. The volatility also increased during the pandemic outbreak [5]. Standard deviation in the Chinese financial market peaked in February and decreased to its trough in March 2020, while the systemic risk was amplified in March 2020 [5].

As the risks increased and the market became bearish during the pandemic, investors' decisions were significantly impacted. Investors' behaviors are often studied in the context of traditional finance and behavioral finance. Many studies analyze changes in investment decisions during the pandemic from the traditional finance standpoint. However, few studies analyze the relationship between the COVID-19 pandemic and investors' behaviors from the perspective of behavioral finance. This paper will explore how the COVID-19 pandemic impacts the common irrational behaviors in the investment decision-making process by analyzing the causes and effects of those biases.

2. COVID-19's Impact on Investment Decisions

With all the impact that the COVID-19 pandemic has had on the global stock market, various studies in the field of finance have explored the factors influencing investment decisions. According to those factors, studies have given suggestions for investors during the COVID-19 pandemic. This part of the paper will discuss how investment decisions are affected by risk preference and financial attitudes, as well as the investment tips suggested by professionals. Besides summarizing results from previous studies, this part of the paper will interpret those factors and suggestions in the context of behavioral finance.

2.1. Investment Decisions and Risk Preference

During the COVID-19 pandemic, risks in stock investment increased significantly [1]. According to the research from Huber et al., investment decisions are related to risk preferences. They let subjects forecast the price-to-earnings ratios of the stocks invested, estimate the riskiness of the stock, and make decisions on the percentage of investment in risky stocks during two waves of experiments, with one in December 2019 and the other in March 2020. Huber et al. discovered that variation in beliefs on price and return is not why investors invest less in risky assets. Instead, they reduce the risky portion in their portfolios because of their increase in risk aversion. Their results matched the drop in risky investment between the two waves of experiments, while the forecasts on price and return in the two waves of experiments did not vary [6]. A study from Hawkar Anwar Hamad et al. also demonstrates that risk perception and financial risk tolerance are key determinants to consider when investing during the COVID-19 pandemic [7].

2.2. Investment Decisions and Financial Attitudes

Besides risk aversion, financial attitudes also contribute to changes in investment activities during the COVID-19 pandemic. Manish Talwar et al. defined financial attitudes using six dimensions and examined their correlation with the trading activities of retail investors who invest on their behalf.

Their results resemble that among the six dimensions, interest in financial issues impacted investment decisions the most. Dimensions of deliberative thinking need for precautionary savings, financial security, optimism, and financial anxiety also have a positive impact on retail investors' trading activities in descending order. It indicates that retail investors who increase trading behaviors under outlier events such as the COVID-19 pandemic are likely to have more interest in financial

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news or financial discussions, plan and analyze the investment and portfolio more often, get used to putting aside a proportion of money for contingency, feeling secure in the financial situation, hold positive attitude regarding future stock prices, and feels anxious about decision making and therefore tend to procrastinate their decision-making on investment [8].

Investors who engage more often in financial discussions could recognize the undervalued stocks during COVID-19 as an investment opportunity. However, those investors mainly face two risks: misunderstanding the information given by the financial news and increasing volatility in the stock market. Interests in financial news do not guarantee the knowledge for investment, so they are likely to face the cognitive bias of overconfidence, which makes them fail to interpret the information and, therefore, make rational investment decisions.

Investors high in deliberative thinking have investment plans prior to investment decision-making, and they tend to regularly analyze their investments and restructure them accordingly [8]. During COVID-19, portfolios are subject to higher risks and volatility, so the analyses and restructuring of portfolios need to be conducted more frequently for investors with highly deliberative thinking. Thus, their purchases and sales of stocks increase more than other investors. This financial attitude can be related to risk aversion since planning and restructuring the portfolio according to stock market changes is helpful for managing additional risks caused by the COVID-19 pandemic. While mitigating unexpected risks, investors with deliberative thinking are likely to overreact to market information, possibly making them forgo opportunities to make profits.

Similar to investors who think deliberatively, investors who have needs for precautionary savings are also risk-averse. With the need to keep certain amounts of savings, they set a bottom line on their budgets and are not allowed to engage in excessive risk-taking. However, as Manish Talwar et al. mentioned in their paper, they came up with a confounding result that investors with saving habits engage in trading activities more often during COVID-19, when they need even more savings for contingent situations. They argued that the underlying reason could be the recognition of arbitrage opportunities due to undervalued stock [8]. With the purpose of arbitraging, those investors are likely to be engaged in overconfidence and heuristic simplification, which makes them overreact to market changes and financial information.

Other groups of investors who are likely to engage in overconfidence are the investors with high financial security and optimism. With less worry about their future budget or a positive view of future stock market performance, they are less risk-averse than insecure investors. Therefore, contrary to investors who are strict about investment plans and precautionary savings, they are less likely to avoid market fluctuation under outlier circumstances such as the COVID-19 pandemic. Although they are less likely to overreact to negative news, they are more likely to be overconfident and overreact to positive news while under-reacting to positive news due to their financial security and optimism.

The last dimension of financial attitude studied in the research is financial anxiety, represented by investors' anxiety about decision-making and their behaviors of procrastinating in making investment decisions. Talwar et al. also defined this result as confounding, because intuitively these investors are risk-averse and avoid engaging in an increasingly volatile market during the COVID-19 pandemic. Talwar et al. suggested that this positive correlation can be explained if these investors are less risk-averse during the COVID-19 pandemic [8]. According to prospect theory in behavioral finance, investors have a tendency to avoid certain losses [9]. Therefore, when financially anxious investors overreact to negative news, they would engage in selling securities to avoid the highly-potential loss, which increases the investment activities.

While the changes in market volatility affect investors' decisions, investors engage in investment activities more frequently and further amplify the uncertainties in the stock market [8]. Moreover, the stock market has high sensitivity regarding investors' expectation of future stock price: the expectation of decreasing stock price results in investors selling stocks before the price falls, which

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creates excess supply in the market that drives down the stock price. On the other hand, the expectation of increasing stock price results in investors buying stocks before the stock price rises, which creates excess demand in the market that drives up the stock price [10]. Consequently, it is more difficult for investors to make forecasts about future stock market performance and thus fail to make the most profitable decisions.

2.3. Investment Strategies and Opportunities

Although the COVID-19 pandemic created tremendous risks and volatility in the stock market and led to a severe drop in stock prices [10], it remains an investment opportunity for different categories of investors. While airline companies and restaurants lost demand and, therefore, faced a revenue strike, online platforms and necessities were not struck by and even thrive in the COVID-19 pandemic. For example, stocks in the industries of online entertainment, such as Netflix, stocks in the online education industry, such as Zoom, and online job markets benefit from the lockdown. The food industry and healthcare were not negatively impacted by the COVID-19 pandemic either, due to the increasing need for food delivery, groceries for cooking, and medical supplies such as alcohol and masks [10].

Diana Tashanova et al. recommends several investment suggestions for individual investors seeking profit during the COVID-19 pandemic, including reducing the frequency of checking portfolio, avoiding selling securities with low valuations, restricting trading on impulse, and making plans about investment in the future [10]. These investment tips are helpful but, on the other hand, can cause cognitive biases. As mentioned in Talwar et al.'s study, checking portfolios and planning investments are related to the financial attitude of deliberative thinking [8]. They help investors make responses to market fluctuations on a rational base, but checking portfolios frequently can possibly result in overreaction to market fluctuations. Investors who avoid selling cheap stocks during the market downturn will not miss the opportunity to gain positive returns when the market bounces back. However, irrationally holding cheap stocks will result in investors engaging in the disposition effect. Restricting trading on impulse is helpful for avoiding cognitive biases of overconfidence and overreaction to information, whereas setting excess restrictions on stock trading will cause access financial anxiety, leading to irrational loss aversion [8].

3. Behavioral Finance and the COVID-19 Pandemic

Traditional or standard finance model studies investment decisions or strategies based on the efficient market hypothesis and the theory of rationality. The efficient market hypothesis assumes that information on stocks is captured and fully reflected by stock price [11]. The theory of rationality suggests that, theoretically, investors react to market movements in a rational manner, including selecting strategies that lead to maximum expected benefits and minimum expected cost and taking investment actions according to the selected strategies [11].

However, people are not completely rational and are subject to psychological factors, which results in investment behaviors that contradict the efficient market hypothesis and the rationality rules [11]. To understand investment decisions in a real-world situation, behavioral finance explores the psychological factors and examines how and why they lead to irrational investment decisions [12]. Common psychological factors discussed by behavioral finance include heuristics, personality traits, and investment sentiments. By exploring those factors and variables, biases in the investment decision-making process are identified, including but not limited to loss aversion, overconfidence, anchoring, regret aversion, and herding effects [12].

This part will discuss common biases studied in behavioral finance and how they impact investment decisions. As the COVID-19 pandemic significantly increased volatility in the financial

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market and struck the stock price, biases studied by behavioral finance are amplified or reduced to different extents. This paper also hypothesizes how they are impacted by the COVID-19 pandemic. The cognitive biases are divided into categories according to how they make investors worse off.

3.1. Biased through Net Wealth

3.1.1. The Prospect Theory

The prospect theory in behavioral finance focuses on people's valuation of gains and losses. It suggests that people hold different attitudes toward gains and losses. When facing the same amount of gain and loss in the investment portfolio value, investors' pain from loss outweighs the joy from gain, illustrating an asymmetric effect of gain and loss [9].

Since, under the prospect theory, investors value gains and losses asymmetrically, their investment decisions are driven by an emphasized fear of losses. To minimize the negative emotions from losses, investors tend to avoid risk-taking behaviors when facing gains, while they demonstrate excess risk-taking behaviors when facing losses [9]. Particularly, their risk preferences change, facing gains and losses when they are given two options with the same expected value. Assuming one of the options is a guaranteed gain of $100, and the other option will lead to a $200 or $0 gain with equal probability, investors tend to choose the former in order to earn a guaranteed gain. In contrast, if the investors are given one option of a guaranteed $100 loss, they tend to choose the other option that results in a $200 or $0 loss with equal probability.

Investors' decision-making can be negatively impacted by the fear of certain losses because they will make irrational decisions to invest in portfolios with a lower net present value just to avoid certain losses.

This paper suggests that people were likely to engage in excessive risk-taking during the COVID-19 pandemic, especially in the early months, because stock prices showed decreasing trend and the market was bearish. Under the prospect theory, investors would take risky positions to avoid highly likely losses during the pandemic.

3.1.2. Mental Accounting

While the prospect theory suggests that people have separate valuations for losses and gains instead of focusing solely on the net return, mental accounting is the cognitive bias in that people set separate criteria for different categories of spending [9].

According to the exemplification by Tai-Yuen Hon et al.'s review paper, setting the daily food budget and entertainment budget in separate accounts instead of in a combined account is a common everyday behavior related to mental accounting [9]. People are used to setting lower budgets for daily food and grocery purchases while setting looser restrictions on entertainment expenditures. With different criteria for various mental accounts, it is common to overspend on accounts with higher budgets, such as entertainment, and meanwhile try to save money on the accounts with stricter budgets, such as groceries and daily food. The excess expenditures in the former accounts often outweigh the savings from the latter accounts, summing up into a net loss compared to the set criteria. Without setting separate accounts, people can possibly gain the same utilities while spending less money in total, which better follows the theory of rationality.

The example mentioned above is analogous to financial investments in low-risk and risky assets. For example, assume investors are planning to invest in portfolios with both Treasury bonds and highly volatile stocks. They are likely to set a portion of their budgets for buying Treasury bonds and use the rest for purchasing stocks. They realize that the Treasury bonds are risk-free, and the stocks are much riskier. Given this awareness of different risk levels, they accept lower losses from the Treasury bonds and allow for higher losses from the stocks. Therefore, they tend to sell the Treasury

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bonds once their value decreases but hold the stocks when their value diminishes since it matches what they expect. As a result, they easily fail to avoid further loss. If they view the bond investment and stock investment as a combined account, they will monitor the total return instead of focusing on them separately. With the goal of maximizing total value, investors will avoid treating the bond side with exaggerated risk aversion while tolerating excess risks on the stock side and earning higher net profits with higher rationality.

This paper suggests that mental accounting was not significantly impacted by the COVID-19 pandemic because as the income decreased for investors, the contraction of the budget applied to every mental account.

3.1.3. Disposition Effect

The disposition effect is highly related to regret aversion. Investors feel the negative emotions of regret if they take action when the optimal timing for selling securities has already passed [9]. To be more specific, they do not suffer from regret if they have sold the securities too early and then see the stock prices increase further. Instead, they regret not selling the securities at their peak and then seeing the stock prices decrease. To avoid regret, when their holdings are on a rising trend, they seldom wait for the price to rise further. However, when their holdings are having decreasing stock prices, they tend to wait longer hoping for the price to bounce back. It is against the theory of rationality since the investors treat losing and winning stocks asymmetrically. It can also be explained by the prospect theory since investors would like to earn the sure gain when the price rises and avoid the sure loss when the price drops. It can negatively impact the investment value because of excess risk-taking facing the loser stocks.

This paper suggests that the disposition effect was amplified during the pandemic. As the investment budget for investors contracts, investors were more distressed facing regret. Therefore, the increased regret aversion contributed to more frequent disposition effects.

3.2. Biased through Valuation

3.2.1. Time Preference

When calculating the net present value of investment portfolios, the discount rates that investors use are not equal to the interest rate stated by the market. Instead, the discount rates take into account psychological factors such as investors' time preferences and self-control [9]. Due to the differences in emotional states and self-control, investors who are less patient and dislike delays discount the values more heavily, since they experience more psychological costs waiting for future cash flows. Values are also discounted asymmetrically, with higher discount rates on gains than losses and on small magnitudes than large magnitudes [9]. Because of the asymmetric discounting process, investors bias the net values and deviate from the rational calculation.

This paper suggests that time preference was impacted by the pandemic. As fear of emergency needs for money increased, investors tended to discount money more heavily and prefer immediate money.

3.2.2. Money Illusion

Investors experience money illusions when they mistakenly use nominal interest rates to discount real cash flows [9]. When inflation is high, investors having money illusions underestimate the stock price, because nominal interest rates increase relative to the real interest rates during the high-inflation period. On the other hand, money illusions make investors overestimate the stock price during

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deflationary periods. However, the effects of the money illusion on the two scenarios above are asymmetric, and the money illusion has more impact during the deflationary periods [9].

This paper suggests that the money illusion was made more obvious by the pandemic. As the monetary policies decreased nominal interest rates to combat the recession, investors were likely to overestimate the stock price.

3.3. Biased through Cognition

3.3.1. Cognitive Dissonance and Ostrich Effect

When investors find negative information about the securities they hold, they experience cognitive dissonance with news contradictory to their beliefs that the stocks will perform well in the future. To mitigate the distress from cognitive dissonance, they tend to look for information that enhances their beliefs and ignore the information contradictory to their investment choices [9]. This irrational behavior frequently makes investors hold on to potentially losing stocks and eventually miss the best time to sell them.

The ostrich effect is similar to approaches in that investors mitigate cognitive dissonance. To reduce distress, investors tend to avoid information that is against their positions [9]. One phenomenon illustrating the ostrich effect is that investors check portfolios more often when the market is bullish than the market is bearish because they are afraid of observing losses in their portfolios [9]. This bias makes investors underreact to negative information and miss the optimal timing for restructuring their portfolios.

Since the market was bearish during the pandemic, investors having ostrich effects theoretically check portfolios less often than in normal periods. However, it is uncertain if the biases were amplified or reduced. It is also possible that in order to avoid losses caused by the ostrich effect, they deliberately avoided these biases.

3.3.2. Availability and Representative Heuristics

Heuristics stand for shortcuts in the thinking process that provide immediate information to support the decision-making process [9]. Investors' decisions are distorted by availability heuristics: they put excess emphasis on recent information while neglecting past news. Representative heuristics make investors consider impressive events as benchmarks, even though the probability that impressive events occur is low [9]. As a result, both heuristics cause investors to overreact to the information.

This paper assumes that the highly volatile markets blurred investors' cognition about the market when it was in a relatively stable state. In this case, investors relied more on recent and representative information, leading to the increasing use of heuristics.

3.3.3. Overconfidence

When investors make decisions, they sometimes overestimate their investment skills and are overconfident that they can outperform the market. As overconfident investors are less cautious, they tend to trade higher volumes. Therefore, their participation in the market also contributes to the increasing market volatility and even financial crisis [9].

This paper suggests that overconfidence decreased during the pandemic. As investors had lower income and investment budgets, they were likely to behave cautiously when making decisions. As a result, overconfidence was deliberately avoided by many investors.

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3.3.4. Anchoring

The anchoring effect states that investors set criteria or reference points for the stock price and judge the stock performance according to how they deviate from the reference points [9]. Similar to availability heuristics, the anchoring effect causes investors to think about the more recent stock price. If the stock price drops, the investors tend to compare the current stock price with the higher price several days ago. However, if the stock price was initially even lower for the past months, investors tend to ignore this piece of information. As a result, they will consider it an optimal timing for purchasing the stock if they are trapped by the anchoring effect. In contrast, rational investors compare the stock price with the stable lower price in the past months and take short positions.

This paper suggests that investors are more likely to engage in anchoring during the pandemic, as the high volatility of stock prices became salient to investors.

3.4. Biased through Strategies

3.4.1. Herd Effect

The herd effect states that investors do not always make decisions depending on the rational strategy. Instead, they follow others' choices even if they lack rationality [9]. The herd effect is closely related to the momentum strategy of investment, where investors follow the market trend. By avoiding the herd effect, investors can also adopt the strategy of taking positions against the majority of investors. Compared to bullish market conditions, herding is more common when the market is bearish [9].

Since herding tends to increase during market anomalies [11], the COVID-19 pandemic amplified the herding effects. However, the extent of amplification depends on different personality traits. Investors with high extroversion are more exposed to external information than introverted investors. They tend to blur their own criteria for valuation but place more attention on others' judgments. Because of the emotional attachment to friends or investment partners, it is also harder for Investors with high agreeableness to ignore others' decisions and opinions [12]. As a result, investors high in these two personality traits are more vulnerable to herding during the COVID-19 pandemic. Investors high in neuroticism are less likely to engage in the herding effect because of their high self-evaluation [12]. People high in conscientiousness are less affected by the herd effect, because conscientiousness often co-exists with self-motivation and rationality [12]. They tend to depend on their own judgment instead of following others' choices.

4. Conclusion and Discussion

Unlike the majority of studies that explore the perspective of traditional finance, this paper studies the changes in investment decisions during the COVID-19 pandemic with an emphasis on irrational investment behaviors.

Under the bearish and highly volatile market during the COVID-19 pandemic, investors tend to engage more or less in various irrational behaviors. By analyzing the causes and effects of irrational behaviors, this paper hypothesizes that investors were more prone to be affected by asymmetric risk preferences under the prospect theory, disposition effect, time preference, money illusion, heuristics, and anchoring. Mental accounting, ostrich effects, and overconfidence were less likely to be enhanced by the pandemic.

The results could be used by investors who would like to invest during outlier events or market anomalies, especially when the events make the market bearish. This research is highly theoretical and on a review base. Therefore, the conclusions are hypotheses instead of proven results. To support those hypotheses with evidence, further studies can be conducted to examine them using data collection or experiments. With the awareness of how the bearish and highly volatile market can

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impact irrational behaviors, investors will be able to reduce irrationality and increase the utilities from their investments.

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