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Does personal experience with COVID-19 impact investment decisions? Evidence from a survey of US retail investors

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ABSTRACT

This paper explores the link between personal experience with COVID-19 and US retail investors' financial decision-making during the first COVID-19 wave. Do retail investors that have personally experienced COVID-19 change their investments after the pandemic outbreak, and if so, why? We use a cross-sectional dataset from an online survey of US retail investors collected in July and August 2020 to assess if and how respondents change their investment decisions after the COVID-19 outbreak. On average retail investors increase their investments during the first wave of COVID-19 by 4.7%, while many of them decrease their investments suggesting a high heterogeneity of investor behaviours. We provide the first evidence that personal experience with the virus can have unexpected positive effects on retail investments. Investors who have personal experience with COVID-19, who are in a vulnerable health category, who tested positive, and who know someone in their close circle of friends or family who died because of COVID-19, increase their investments by 12%. We explain our findings through terror management theory, salience theory and optimism bias, suggesting that reminders of mortality, focussing on selective salient investment information, and over-optimism despite personal vulnerable health contribute to the increase in retail investments. Increased levels of savings, saving goals and risk capacity are also positively associated with increased investments. Our findings are relevant to investors, regulators, and financial advisors, and highlight the importance of providing retail investors with access to investment opportunities in periods of unprecedented shocks such as COVID-19.

1. Introduction[1]

The outbreak of the SARS-CoV-2 (COVID-19) pandemic[2] has caused extraordinary changes to national economies and stock market crashes all over the world (Zhang, Hu, & Ji, 2020). Given the economic downturn in the aftermath of the outbreak, a large body of literature has emerged regarding the financial implications of COVID-19 for both institutional and retail investors. While investment activities of institutional investors initially declined due to uncertainty (Anser et al., 2021), some retail investors increase their trading activity (Chiah & Zhong, 2020; Ortmann, Pelster, & Wengerek, 2020; Pagano, Sedunov, & Velthuis, 2021; Priem, 2021), seeing the market crash in March 2020[3] (Frazier, 2021; Talwar, Talwar, Kaur, Tripathy, & Dhir, 2021) and subsequent decrease in interest rates as an investment opportunity (Funds Europe, 2021; Bloomberg, 2020). The general increase in investment by individual investors during COVID-19 crisis has been documented, but the connection between COVID-19 personal experience and investments is not yet explored in depth. Scholars who research individual investors' investment behaviours during COVID-19 predominantly use transaction data provided by brokerage firms or asset management platforms (Luo, Ravina, Sammon, & Viceira, 2022; Ortmann et al., 2020; Pagano et al., 2021; Priem, 2021). Trading datasets give a good picture of financial decision-making, but they do not provide information on personal experiences, views, perceptions, and motivations of retail investors. We aim to fill this gap by using survey responses from US retail investors during the first COVID-19 outbreak.

A large stream of financial media coverage documents the increased trading activity of retail investors during COVID-19. For instance, the so-called "Covid trading boom" starts after March 2020 (BBC, 2020; Benoit, 2021; Demos, 2020; Franklin & Moise, 2021; Goldfarb, 2020; Osipovich

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[1] We would like to thank the anonymous reviewers for their thoughtful comments and efforts towards improving our manuscript.

[2] https://edition.cnn.com/interactive/2020/health/coronavirus-maps-and-cases/, accessed 31/05/2021.

[3] The Dow Joes index lost 37% of its value between the 12th of February 2020 and the 23rd of March 2020.

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& McCabe, 2020; Shrikanth, 2020; Yoon, 2021), in line with studies on retail investors' behaviours during COVID-19 (Chiah & Zhong, 2020; Ortmann et al., 2020; Pagano et al., 2021; van der Beck & Jaunin, 2021), and investors' sentiment (Biktimirov, Sokolyk, & Ayanso, 2021; Duan, Liu, & Wang, 2021; Huynh, Foglia, Nasir, & Angelini, 2021; Smales, 2021). However, investing in volatile stock markets during a health crisis can make retail investors susceptible to significant financial losses (Beck, 2020; Corbet, Larkin, & Lucey, 2020b). Holding back from investing in such circumstances could be considered the more rational decision for retail investors (Barrafrem, Västfjäll and Tinghög, 2020b; Talwar, Talwar, Kaur, et al., 2021). This is evidenced by Glossner, Matos, Ramelli, and Wagner (2021) who show that in the aftermath of the stock crash starting with 11th of March 2020, US retail investors displayed opposite behaviours than institutional investors by buying high-leveraged firms with low cash-flows and worse stock performance.

Despite the increased volatility of financial markets due to COVID-19, some researchers argue that investors displayed irrational and over-optimistic behaviours. For instance, Vasileiou (2020) observes that between December and October 2020 the health risk related to COVID-19 was underestimated or outright ignored by US investors. This behaviour was marked by market growth after a stimulus package was announced,[4] despite a large increase in COVID-19 cases and deaths. Yue, Gizem Korkmaz, and Zhou (2020) find that Chinese households who knew someone infected with COVID-19 decreased their total investments and displayed reduced risk tolerance, and Hurwitz, Mitchell, and Sade (2021) find that those financially affected are less likely to recommend that others increase their savings. Those findings indicate that personal experience with COVID-19 might be a factor in individual investors' financial decision-making. To the best of our knowledge, there are currently no works in the financial literature that study the relationship between personal experience with COVID-19 and investment decisions in the US. We aim to fill this gap by conducting an online survey with US retail investors that explores their experience with COVID-19 during the first lockdown in July and August 2020, and the drivers of investment decisions.

Retail investors' trading activity has increased markedly in the past decade (Seth, Talwar, Bhatia, Saxena, & Dhir, 2020), making them an important part of the market, and capable to move stock prices (Burch, Emery, & Fuerst, 2016). However, retail investors' decisions are partly rational, based on valuations and expected returns (Cuong & Jian, 2014) and partly irrational based on heuristics and behavioural biases as suggested by behavioural finance theory (Baltussen & Post, 2011). Therefore, our study is important in providing insight into retail investors' decision-making processes during a global pandemic.

Moreover, to our knowledge, there are no prior studies on retail investors' behaviours in the face of an external health threat, as the focus has mainly been on institutional investors and macroeconomic factors (Ichev & Marinč, 2018; Kowalewski & Śpiewanowski, 2020). As such, this study provides novel evidence of the interrelations between personal experience with COVID-19 and investments. Despite its negative socio-economic effects, a pandemic also represents a natural experiment for investigating how retail investors' financial decision-making is influenced by their personal experience with the virus (Mirza, Naqvi, Rahat, & Rizvi, 2020). The pandemic has a unique life-threatening element, that is bound to have psychological effects on investors' decisions, a gap that we aim to fill in this study. The effects of personal experience with COVID-19 on a large and growing class of retail investors are not yet fully explored in the literature, despite their importance for retail investors, governments, and financial advisors. Therefore, the main motivation of this study is to uncover the link between personal experience with COVID-19 and retail investors' financial decisions, to help inform such decisions in future similar crisis events.

Our paper sheds light on the relationship between personal experience with COVID-19 and investment decisions of retail investors by answering three main research questions. Firstly, do retail investors change their level of investments after the COVID-19 outbreak, and if so, why? Secondly, how are investments affected by retail investors' personal experience with COVID-19? To answer the latter question, we tested for three different levels of COVID-19 severity on retail investors' experience with the virus, namely having tested positive, knowing someone in their family/close circle of friends who tested positive, or knowing someone in their family/close circle of friends who died because of COVID-19. Finally, what is the relationship between saving rates, saving goals and investment levels during COVID-19?

We contribute to the behavioural finance literature by providing the first survey-based evidence that personal experience with COVID-19 has an impact on retail investors' investment decisions. We collect online survey responses of 1,031 US individual investors in July and August 2020. We measure respondents' percentage change in investments and savings after the COVID-19 outbreak, respondents' personal experience with the virus, whether they are in a vulnerable health status, if they tested positive, and know someone who died because of COVID-19. We also control for a set of factors such as respondents change in financial capacity, risk tolerance, and demographic characteristics.[5] We find that on average there was a moderate self-reported increase in investments after the COVID-19 outbreak (4.7%). This increase is driven mainly by male retail investors, as compared to men, female retail investors decrease their investments by circa 6% during the pandemic. We also find that investors who were affected by the pandemic increase their investments by 12%, almost three times more the average increase observed in the all sample. The effect of personal experience with COVID-19 on investments is most pronounced for equities and cryptocurrencies, with affected retail investors more likely to increase their holdings by 15.48% and 18.56%, respectively. In addition, we show that respondents with increased risk capacity (higher risk tolerance, increased capacity to bear losses, and increased time frame of investments) are more likely to increase their investments. Similarly, we find that changes in saving rates and goals are positively related to changes in investments. One standard deviation increase in savings is associated with a1.49% increase in investments. We draw from risk perception literature, terror management theory, salience theory and optimism bias to further interpret our findings on personal experience with COVID-19. Experience with a COVID-19 related death, testing positive and having a higher risk perception of COVID-19 make a respondent more likely to increase their investments. The experience with COVID-19 is a reminder of mortality for investors, and trigger increase materialism, consumption, and investments.

Our findings contribute to the financial literature in several ways. Firstly, this study contributes to the growing body of literature on the impact of COVID-19 on the investment decision-making of retail investors. Scholars have found evidence of increased trading amongst retail investors during this period (Luo et al., 2022; Ortmann et al., 2020; Pagano et al., 2021; Priem, 2021). The effects of personal experience with COVID-19 have only been briefly analysed for Chinese households (Yue et al., 2020) and US respondents with a savings account (Hurwitz et al., 2021). Our study provides novel survey-based evidence on the effects of personal experience with the virus on US retail investors. Second, we contribute to the behavioural finance literature exploring retail investors' behaviours during a crisis event. Retail investors engage in contrarian strategies after 9/11 as they seem to believe in mean reversion of share prices (Glaser & Weber, 2005). They interpret the drop in share prices as temporary and overestimate future returns.

[4] The Coronavirus Aid, Relief, and Economic Security Act (CARES Act) was a $2.2 trillion economic stimulus bill passed by the US Congress and signed into law on the 27th of March 2020 by US President Donald Trump. Available at: https://home.treasury.gov/policy-issues/coronavirus/assistance-for-state-local-and-tribal-governments/coronavirus-relief-fund

[5] A full list of all questions asked in the survey can be found in Appendix A.

Similar contrarian behaviours were observed during COVID-19 (Luo et al., 2022; Ortmann et al., 2020; Pagano et al., 2021; Priem, 2021). Our paper contributes to this stream of research by considering the role played by the retail investors' personal experience with COVID-19 in driving the growth in investments. Third, this study contributes to the personal finance literature. The academic literature on savings is widely focused on household finance and not individual investors. Our research contributes to the personal finance literature by analysing savings from an individual investors' perspective and their change during an unprecedented health crisis. Several scholars find that the uncertainty due to a crisis event leads to a change in savings patterns by households, resulting in increased levels of savings (Aaberge, Liu, & Zhu, 2017; Broadway & Haisken-DeNew, 2018; Guariglia, 2001). Household's savings are also positively correlated to investments, particularly stock holdings (Campbell, 2006; Changwony, Campbell, & Tabner, 2021; Shum & Faig, 2006). Our findings indicate that individual investors save more during the COVID-19 health crisis, and a positive correlation between savings, savings goals, and percentage change in investments. The latter result suggests that a portion of these additional savings is used for investing during COVID-19.

Fourth, our study contributes to the behavioural finance literature. Our main result regarding the positive relationship between personal experience with COVID-19 and retail investments is explained through different behavioural finance theories, namely terror management theory, salience theory, and optimism bias. Terror management theory suggests that mortality reminders lead people to place more value on money and wealth creation (Arndt, Solomon, Kasser, & Sheldon, 2004; Kasser & Sheldon, 2000; Rindfleisch, Burroughs, & Wong, 2008; Zaleskiewicz, Gasiorowska, Kesebir, Luszczynska, & Pyszczynski, 2013), salience theory posits that retail investors in particular tend to consider the most salient information and overestimate future returns (Bordalo, Gennaioli, & Shleifer, 2012; Bordalo, Gennaioli, & Shleifer, 2013; Itti & Koch, 2000; Kahneman & Tversky, 1973), and optimism bias is associated with high trading volumes (Glaser & Weber, 2007; Iqbal, 2015; Puri & Robinson, 2007) and it is higher in people who are more vulnerable to COVID-19 (Asimakopoulou et al., 2020; Fragkaki, Maciejewski, Weijman, Feltes, & Cima, 2021; Gassen et al., 2021; Maksim et al., 2022) as observed in our study. We contribute to these streams of literature by showing that COVID-19 vulnerable people invest more as a result of their personal experience with the pandemic. In the face of health threats, emotional responses interact with cognitive appraisal and the combination of both determines decision-making (Bish & Michie, 2010). Our findings support these theories of financial decision-making by retail investors.

Our results have empirical implications for retail investors, financial advisors and policymakers. By providing evidence of increased levels of investments during the COVID-19 pandemic, and factors influencing this change, our findings can inform retail investors of the potential risks and benefits of investing during a health crisis. Financial advisors can be better equipped to advise retail investors by considering the underlying behavioural factors that can affect retail investors' decision-making such as personal experience with COVID-19. For instance, our findings show that retail investors who are more risk tolerant, have higher risk capacity and increase investments' time horizon are more likely to increase their investments after COVID-19. In this sense, COVID-19 can lead to a greater gap between risk tolerant and risk averse investors, with risk averse investors potentially missing investment opportunities, and ending up with lower levels of wealth in the long-run. Our findings can inform policymakers by providing insights into the behaviours of retail investors during a pandemic, and factors affecting them. Policymakers could take initiatives to support vulnerable investors who personally experience COVID-19. Finally, we note that the findings of our study are not meant to be representative of investment decisions during normal times (i.e., not during a crisis event), but they do support literature findings of investment and risk-taking behaviours during a crisis such as the global financial crisis (Cohn, Engelmann, Fehr, & Maréchal, 2015; Guiso, Sapienza, & Zingales, 2018; Knüpfer, Rantapuska, & Sarvimaki, 2017; Malmendier & Nagel, 2011; Necker & Ziegelmeyer, 2016), and natural disasters (Brown, Daigneault, Tjernstrom, & Zou, 2018; Cameron & Shah, 2015). Therefore, our findings are representative of retail investors' financial decision-making in the context of a crisis (particularly a global health crisis).[6]

The remainder of this paper is organised as follows. Section 2 describes the literature review and our hypotheses. Section 3 explains our dataset and methodology. Sections 4 and 5 present our empirical results. Section 6 presents our robustness checks. Lastly, Section 7 summarises and highlights the importance of our findings.

2. Literature review and hypothesis development

The COVID-19 pandemic has been life-changing in many aspects of people's daily and social lives, but has it also changed attitudes towards investments? In the finance literature, there has been increasing interest in the effects of the pandemic on global stock markets performance (Ashraf, 2020; Narayan, Phan, & Liu, 2021; Phan & Narayan, 2020), the increased stock volatility associated with COVID-19 government policies (Zaremba, Kizys, Aharon, & Demir, 2020; Zhang et al., 2020), national stock markets volatility (e.g., China: (Al-Awadhi, Alsaifi, Al-Awadhi, & Alhammadi, 2020; Xiong, Wu, Hou, & Zhang, 2020) Japan: (Narayan, Devpura, & Wang, 2020) Hong Kong: (So, Chu, & Chan, 2021) and the US: (Baek, Mohanty, & Glambosky, 2020; Liu, Qiu, & Wang, 2021; Mazur, Dang, & Vega, 2021; Sharif, Aloui, & Yarovaya, 2020; Yousfi, Ben Zaied, Ben Cheikh, Ben Lahouel, & Bouzgarrou, 2021), as well as studies of the effects of the pandemic on cryptocurrencies markets (Conlon, Corbet, & McGee, 2020; Corbet, Hou, Hu, Larkin and Oxley, 2020a; Dwita Mariana, Ekaputra, & Husodo, 2021; Iqbal, Fareed, Wan, & Shahzad, 2021; Mnif, Jarboui, & Mouakhar, 2020).[7] Behavioural finance researchers also investigated the effects of COVID-19 on stock markets, focusing mainly on herding behaviours observed amongst investors. Herding behaviours during COVID-19 increased in European and several international markets, fuelled by fear (Espinosa-Mendez & Arias, 2021; Kizys, Tzouvanas, & Donadelli, 2021), whereas in China herding was lower than in regular times (Wu, Yang, & Zhao, 2020). Other behaviours associated with the COVID-19 pandemic analysed in the literature are trust (Engelhardt, Krause, Neukirchen, & Posch, 2021; Mazumder, 2020), financial well-being (Barrafrem, Vastfjall and Tinghog, 2020a), panic (Umar & Gubareva, 2020), and investors' attention to the health crisis (Smales, 2021). Huynh et al. (2021) created a "feverish sentiment" index based on media coverage, news, panic and "infodemic" based on 17 countries, revealing that this index is a negative predictor of stock returns and a positive predictor of volatility.

Furthermore, the effects of the pandemic on cryptocurrencies have been documented in the literature, showing co-movements amongst some of the major currencies during this period (Goodell & Goutte, 2021; Yousaf & Ali, 2020). Demir, Bilgin, Karabulut, and Doker (2020) found a positive causal relationship between the number COVID-19 cases/deaths and Bitcoin, Ethereum and Ripple prices. Iqbal et al. (2021) also found that for small increases in the intensity of the pandemic, major cryptocurrencies registered positive gains, whereas Bitcoin, Cardano, and Crypto.com Coin registered gains even for large increases in the pandemic intensity. The positive performance of cryptocurrencies during the pandemic, and their potential role as a hedge against COVID-19 is also supported by other studies such as Mnif et al. (2020), Corbet, Hou, Hu, Larkin and Oxley, 2020a, Dwita Mariana et al. (2021), and Conlon et al. (2020).

[6] We thank the anonymous reviewer for this comment.

[7] As our focus is on retail investors, exploring in-depth the literature on stock markets during COVID-19 is beyond the scope of this study. For this reason, we only summarise the core findings for context.

A stream of finance literature provides evidence that retail investors do invest more during COVID-19, despite the global turmoil in financial markets. Chiah and Zhong (2020) show that stock trading volume in 37 major countries increased significantly during the outbreak. Ortmann et al. (2020) find that retail investors increased their trading activity during the pandemic, with an average weekly growth of 13.9% while the number of COVID-19 cases doubled. Some scholars try to explain this increased investment and posit that some individual investors use the stock market as an alternative for gambling (Gao & Lin, 2015; Kumar, 2009), and that personality traits of traders and gamblers share many similarities (Jadlow & Mowen, 2010), as well as symptoms of problem gambling in retail investors (Cox, Kamolsareeratana, & Kouwenberg, 2020). As gambling venues shut down during lockdowns, the observed surge in retail investors trading activity could be explained as a replacement for gambling. Other possible cited explanations for the increased investments during COVID-19 are more free time during lockdowns, spending surplus income, and easy access to financial markets through online facilities (Pagano et al., 2021; Talwar, Talwar, Kaur, et al., 2021). Talwar, Talwar, Kaur, et al. (2021) find that retail investors who are strongly inclined to put aside savings for the future are likely to trade more during a crisis.[8] Pagano et al. (2021) show that since March 2020 Robinhood investors successfully engaged in both momentum and contrarian trading strategies and that financial markets' performance can be affected by retail investors, especially during crisis times. Talwar, Talwar, Tarjanne, and Dhir (2021) explore retail investors' high equity trading activity during COVID-19 through the lens of behavioural biases, finding that herding, hindsight bias, overconfidence, representativeness, and anchoring have a positive effect on levels of investment as well as investment recommendations done by Finnish retail investors. Analysing retail investors' behaviour during the General Financial Crisis (GFC), Hoffmann, Post, and Pennings (2013) find that risk tolerance and perceptions varied greatly between 2008 and 2009, leading to considerable variations in trading and risk-taking behaviours. Despite these differences in risk perceptions, retail investors did not reduce the risk of their portfolios during the GFC and did not change their trading activity.

Contrary to the studies illustrated above, a few studies find a decrease in investments by households. For instance, COVID-19 led to a decrease in total investments by Chinese households, and a reduction in risk tolerance for investors who know someone infected with COVID-19 (Yue et al., 2020). Among possible reasons, the reduced confidence in the economy and investing caused by the personal experience with COVID-19 (Yue et al., 2020), as well as by a reduction in households' liquidity due to lower income, higher unemployment rates, and higher savings (Li, Song, Peng, & Wu, 2020) are mentioned. In a cross-sectional survey, Hurwitz et al. (2021) explore the effects of personal experience with COVID-19 in the context of US savings behaviours. They find that individuals who are more likely to contract COVID-19 or die from it do not change their savings nor their savings recommendations to others, while those who are financially affected by COVID-19 (i.e., loss of income) are less likely to recommend that others save more for the future.

However, to our knowledge, there are no works directly exploring the effect of personal experience with COVID-19 and investment decisions during the pandemic for retail investors. The present study aims to fill this gap by documenting the link between personal experience with COVID-19 and investments while controlling for other financial and demographic factors, exploring potential reasons behind this through the lens of behavioural finance theories.

Our study focuses on the effect of personal experience with COVID-19 (i.e., individuals who contracted the virus, knew someone who contracted the virus or knew someone who died because of the virus) on retail investors' financial decision-making. Personal experience with COVID-19 can affect retail investors from different cultures and geographical areas, with literature findings from different regions (i.e., China and Finland) qualitatively generalisable to the US. Despite the cultural and geographical differences, people's own experiences and perceptions are subjective and can show similarities between different markets. Moreover, research on terror management theory which we use to explain our results later in this study, shows similar results in different cultures such as Poland (Zaleskiewicz et al., 2013) and US (Kasser & Sheldon, 2000; Rindfleisch et al., 2008).

Retail investors' continued trading during crisis events and periods of uncertainty could be considered irrational when compared to literature findings on financial behaviour. For instance, in a financial experiment Cohn et al. (2015) show that subjects framed with a "financial bust" scenario were more risk-averse in their financial decisions. Guiso et al. (2018) find that in the aftermath of the GFC individuals reduced investments in stocks. Knüpfer et al. (2017) find that individuals who experienced job loss during the Finish Great depression were less likely to invest in risky assets. Moreover, households who have adverse experiences during the GFC are more likely to be informed on banking supervision regulations and spread their savings to different banks (Van Der Cruijsen, De Haan, Jansen, & Mosch, 2012). For US households, few studies report reduced risk tolerance, increased levels of precautionary savings in the aftermath of the GFC (Bricker, Bucks, Kennickell, Mach, & Moore, 2011), and a strong positive relationship between consumer confidence and household savings that increased after the GFC (Vanlaer, Bielen, & Marneffe, 2019).

The present study contributes to the existing crisis literature on retail investments during the COVID-19 health crisis (Chiah & Zhong, 2020; Ortmann et al., 2020; Pagano et al., 2021; Priem, 2021; Talwar, Talwar, Kaur, et al., 2021) by showing that during the COVID-19 lockdown between July-August 2020, US retail investors who personally experience COVID-19 increase their investments more than those who do not have any personal experience with the virus. By considering the change in investments in relation to respondents' personal experience with COVID-19 - i.e., testing positive, knowing someone who tested positive or knowing someone who died because of COVID-19-, their risk capacity, and savings behaviours, we provide a deeper understanding of retail investments during a health crisis.

Crisis-type events can also lead to changes in risk tolerance. Experiencing a financial crisis (Cohn et al., 2015; Guiso et al., 2018; Knüpfer et al., 2017; Malmendier & Nagel, 2011; Necker & Ziegelmeyer, 2016), or natural disasters (Brown et al., 2018; Cameron & Shah, 2015) can decrease individuals' willingness to take financial risks. The literature is limited regarding changes in individuals' risk tolerance due to COVID-19, and results are heterogeneous. Bu, Liao, and Liu (2020) repeatedly survey a sample of students located in the Wuhan area and find a negative relation between exposure to the coronavirus, financial risk-taking behaviours and optimism. Heo, Grable, and Rabbani (2020) survey a sample of US respondents and show that risk tolerance starts decreasing after the initial peak of COVID-19. Conversely, Guenther, Galizzi, and Sanders (2021) find no significant connection between risk tolerance and COVID-19 risky behaviours (such as self-isolating) for UK survey participants. However, respondents who take more significant COVID-19 related risks in their personal lives, have higher financial risk tolerance. Yue et al. (2020) find that Chinese households who have a family member, colleague, fellow student, friend, or acquaintance in the same community who has COVID-19, decrease their confidence in the economy, their risk tolerance, and investments. Knowing someone infected with COVID-19 increases households' likelihood to change their portfolio composition (Luo et al., 2022; Ortmann et al., 2020; Pagano et al., 2021; Priem, 2021), but the portfolio restructuring results in reduced investments (Yue et al., 2020).

We contribute to this literature by exploring how personal

[8] The increase in trading activity for retail investors because of too much free time due to lockdown measures is also illustrated by the increase in investors on platforms like Robinhood, which registered a triple average trading volume in 2020 compared to 2019, and 3 million newly funded accounts. For instance, see the article at: https://www.bnnbloomberg.ca/robinhood-blows-past-rivals-in-record-year-for-retail-investing-1.1478014

experience with COVID-19 affects the participants' amount of investment. The studies mentioned above explore the relationship between COVID-19 experience and risk tolerance (Bu et al., 2020; Guenther et al., 2021; Heo et al., 2020), but only one explores the direct relationship between investments and personal experience with COVID-19 (Yue et al., 2020). We expand these works by analysing more facets of personal experience with COVID-19, including experience with COVID-19 related deaths, and health vulnerability, in addition to knowing someone who tested positive. We also focus on retail investors instead of households, and analyse the US market, providing novel evidence. The investors' past experience with an event holds great importance in future decisions when facing similar situations, sometimes more so than any rational judgment (Brown, Cookson, & Heimer, 2019; Kaustia & Knupfer, 2008). For example, when it comes to future investments, those who personally experience losses during GFC are more likely to reduce financial risk than those who experience losses second or third hand (Andersen, Hanspal, & Nielsen, 2019). Similar patterns are found during COVID-19 by Dryhurst et al. (2020) who show that personal experience with the virus, social amplification of risk through family and friends, and prosocial values are the most significant determinants of risk perceptions. A similar stream of literature exists on the relationship between natural disasters (e.g. extreme weather events) and risk aversion of those affected (van der Linden, 2015). However, natural disasters have also shown mixed effects on the risk aversion. Some scholars support van der Linden (2015) finding that natural disasters increase risk aversion (Bourdeau-Brien & Kryzanowski, 2020; Goebel, Krekel, Tiefenbach, & Ziebarth, 2015), while others find the opposite relationship (Brown et al., 2018; Kahsay & Osberghaus, 2018). Our paper contributes to this literature by demonstrating that personal experience with COVID-19 is directly connected with retail investors' financial decisions. This study contributes to the literature findings on people's reaction to crisis events by shedding light on the unique context of individuals' investments during a global pandemic.

The effects of personal experience with COVID-19 on investments can be framed in the context of behavioural finance theories such as salience theory, overestimating future returns, optimism bias, or purely psychological frameworks such as terror management theory. For instance, Talwar, Talwar, Tarjanne, and Dhir (2021) find that retail investors' trading decisions during COVID-19 were affected by multiple behavioural and cognitive biases, suggesting that after controlling for other factors, the link between personal experience with COVID-19 and retail investments can be rooted in a combination of biases.

Psychological research shows that human attention is a limited resource (Berger, 1996; March, 1982) and only a small proportion of data that we detect directly influences behaviours (Itti & Koch, 2000). The way attention resources are allocated biases people towards certain stimuli based on their salience (Itti & Koch, 2000). In this context, people tend to overweight salient information when making decisions (Grether, 1980; Kahneman & Tversky, 1973). Bordalo et al. (2012) adapt the salience theory to behavioural finance for decision-making under risk, predicting that individuals pay more attention to investments' most salient payoffs, which probability of occurrence is then overweighted in the decision-making process. Consequently, assets with a salient upside attract excess demand, becoming overpriced and generating low returns (Bordalo et al., 2013). In the context of COVID-19, the salient information available is the drop in stock markets that occurred in early 2020 (Shehzad, Xiaoxing, Arif, Rehman, & Ilyas, 2020; Zhang et al., 2020). Retail investors might consider this salient information and engage in a contrarian strategy as they overestimate potential future returns due to the drop in stock prices. Additionally, less sophisticated investors, such as retail investors, are more likely to extrapolate past stock returns into the future (Da, Huang, & Jin, 2021), and for this reason, tend to overinvest as a result of salient market information. Chen, Lepori, Tai, and Sung (2022) test this theory and show that cryptocurrencies that are more attractive to "salient thinkers" earn lower future returns and are overpriced.

Investors' tendency to overvalue the returns of a risky asset is also linked to optimism bias according to which investors selectively base their financial decisions on salient good news, a behaviour that can even create bubbles in some markets (Bansal, 2020). Primarily people tend to be overoptimistic about their life prospects (Weinstein, 1980) overestimating the likelihood of positive events in the future (Shah, 2012). This optimism also directly affects financial decisions (Puri & Robinson, 2007) and is linked to overinvesting and high trading volumes by retail investors (Glaser & Weber, 2007; Iqbal, 2015).

In addition to the macroeconomic effects, the pandemic also had a life-threatening element to it that could impact the psyche and behaviours of investments, leading to suboptimal decisions (Hurwitz et al., 2021). As such medical research during COVID-19 also highlights that survey respondents with high risk of severe COVID-19 and also high optimism bias tend to behave inconsistently with their elevated risk of mortality by being more reckless (Asimakopoulou et al., 2020; Gassen et al., 2021). Fragkaki et al. (2021) similarly find that individuals with high optimism bias engaged in less protective behavioural changes and were less satisfied with government response. Maksim et al. (2022) posit that optimism bias towards contracting COVID-19 persists throughout the pandemic, except for situations where participants have little to no influence on the occurrence of the event. The exception to this is those who knew personally someone who died from COVID-19, as these individuals persisted in showing optimism bias in any situation (Maksim et al., 2022). These findings suggest that optimism bias can persist during a pandemic, and that this bias can even be more pronounced for investors who have personal experience with the virus.

Experience with death and related emotions can also be explained by terror management theory (TMT). Defined by Solomon, Greenberg, and Pyszczynski (1991), TMT "posits that all human motives are ultimately derived from a biologically based instinct for self-preservation". The experienced terror is then managed through cultural beliefs and escapism, which provide a sense of order, meaning, stability, and permanence. Using a TMT framework, Arndt et al. (2004) show that reminders of mortality lead to increased materialism, wealth creation and consumption. Solomon, Greenberg, and Pyszczynski (2004) also support this theory describing this behaviour as "death-defying materialism". Under the same theory, in an experimental design, Zaleskiewicz et al. (2013) find that participants who are reminded of death place a higher value on money and feel their death anxiety soothed by having money. Experiment participants reminded of their mortality also display increased future financial expectations (Kasser & Sheldon, 2000) and increased consumption of leisure or luxury goods (Rindfleisch et al., 2008). Following this stream of literature, close experience with COVID-19 acts as a reminder of mortality, and the increased materialism described by the literature takes the form of increased investments.

Based on the above literature exploring people's reactions to a crisis, the relationship between COVID-19, risk tolerance and investments, and related behavioural finance theories, we expect personal experience with COVID-19 to have a significant relationship with investors' decisions. Given the mixed evidence of the findings and the uncertainty on the direction of the relationship between personal experience with COVID-19 and investments, we formulate our first hypothesis as follows:

Hypothesis 1. Personal experience with COVID-19 is a significant predictor of the level of investments.

Savings represent the most common method of accumulating wealth for individuals and the determinants of savings in retail investors include gender, age, education, income, marital status, occupation, and financial advice (Prasad, Kiran, & Sharma, 2020). In recent years shocks to household incomes have become more frequent. The uncertainty caused by any kind of shock or crisis, has been associated with changes to consumption and savings. Aaberge et al. (2017) find that uncertainty due to a political shock cause Chinese households' levels of savings to increase. Broadway and Haisken-DeNew (2018) also find that households tend to save more during and after a crisis, due to both real income uncertainty caused by the GFC, and perceived economic uncertainty. Similar findings are reported by Guariglia (2001) for British households, and by Chamon, Liu, and Prasad (2013) for Chinese households. Examining the COVID-19 health crisis in Italy, Bonacini, Gallo, and Scicchitano (2020) posit that working from home during COVID-19 is also related with an increase in labour income and growing savings for employees. Other past pandemics and wars have been associated with higher saving rates such as in Japan during the first World War, in the US during the Spanish flu outbreak, and in the UK during the smallpox outbreak in the 1870s (The Economist, 2021).

The relationship between savings of households and retail investors, and subsequent investments has also been studied by scholars. Shum and Faig (2006) find a positive relationship between households' savings goals and their stock holdings. Households who set themselves savings goals for education, household purchases or retirement are more likely to invest in stocks. Campbell (2006) also shows that households tend to invest disproportionately in stocks and do not diversify enough. Changwony et al. (2021) document a correlation between households' savings goals and their investments and show that households shift their portfolios from safe assets to fairly safe and risky assets when the number and time horizon of their savings' goal increases. Changwony et al. (2021) explain this finding through prospect theory (Kahneman & Tversky, 1979), arguing that people with many savings goals tend to focus more on aggregate goals rather than feeling regret about single losses, therefore they are more likely to invest in riskier assets.

Gerhard, Gladstone, and Hoffmann (2018) also analysed the drivers of savings behaviours in a sample of more than 3,000 households by exploring the big five personality traits, optimism, and promotion versus prevention savings goals. Promotion and prevention-oriented savings goals are derived from regulatory focus theory (Higgins, 1997; Shah, Higgins, & Friedman, 1998). Based on this theory, promotion goals relate to positive outcomes such as achieving financial gains, while prevention goals relate to security needs, and avoiding adverse outcomes such as financial losses (Cho, Loibl, & Geistfeld, 2014; Gerhard et al., 2018; Zhou & Pham, 2004). Gerhard et al. (2018) find that for individuals who are older and have higher income, promotion savings' goals are associated with higher household saving rates, while prevention savings' goals are associated with reduced household savings. Our paper sheds light on the relationship between savings and investments during a health crisis.

Research conducted by Deloitte with an international panel of 8,000 consumers provides further evidence of the increased level of savings during COVID-19 due to negative perceptions around financial security (Deloitte, 2022). The motivation behind the growth in savings is threefold: immediate short-term protection against economic uncertainty, long-term protection against future crises and saving for retirement (i.e., precautionary savings goals). Half of the respondents want to keep their savings in an easily accessible account, around one third want to save for retirement and one fourth of respondents to invest in the stock market (Deloitte, 2022). This represents a big shift from pre-pandemic motivations when the majority of savings were allocated towards consumption (Deloitte, 2022). Based on the relationship between crises, savings, and investments, we formulate our second hypothesis.

Hypothesis 2. An increase in savings and savings' goals during COVID-19 will be associated with increased levels of investments.

3. Data and methodology

3.1. Data & sample selection

Our cross-sectional dataset consists of a sample of 1,031 retail investors from the US[9]. We design the survey using Qualtrics, while we collect the responses using Amazon Mechanical Turk (MTurk) in July and August 2020[10] to capture respondents' behaviour during the first COVID-19 lockdown, at the peak of the first wave when personal experience with COVID-19 is most likely to occur.[11] We select only participants who hold mutual fund investments,[12] and respondents are compensated for their participation in the study. Before the beginning of the survey, anonymous participants are presented with a statement summarising the contents of the survey.[13] Amazon MTurk has been used extensively in the financial literature in areas such as business ethics (Amos, Zhang, & Read, 2019; Johnson, Martin, Stikeleather, & Young, 2022; Pirson, Martin, & Parmar, 2017), behavioural heuristics or biases (Elliot, Rennekamp, & White, 2018; Eskinazi, Malul, Rosenboim, & Shavit, 2022; Babin, Chauhan, & Liu, 2022), and the eonomic impact of COVID-19 on payment use (Asebedo, Quadria, Gray, & Liu, 2022). Moreover, Gandullia, Lezzi, and Parciasepe (2020) explore the behaviour economics models of impure altruism and warm-glow by replicating using Amazon MTurk a study conducted by Gangadharan, Grossman, Jones, and Leister (2018) during a lab experiment. The results obtained by Gandullia et al. (2020) were consistent with the experimental results. Snowberg and Yariv (2021) investigated the differences between behaviours amongst US student survey respondents, a US population representative sample and US Amazon MTurk survey respondents, finding high correlations amongst their behaviour patterns when testing for behavioural attributes such as risk aversion, altruism, over-confidence, over-precision, various strategic interactions.

In order to reduce the risk of self-response bias, participants are not told about the ultimate purpose of the survey (Saunders, Lewis, & Thornhill, 2019). Due to the sensitive nature of the COVID-19-related

[9] Due to the sensitive nature of COVID-19 related questions 17 participants (1.48%) chose the "Prefer not to answer" option. After the first 100 responses (8.71%) from the pilot study we introduced two additional questions on self-reported risk tolerance, and self-reported percentage change in investments. We use power analysis tools to compute the ideal sample size of the survey. The ideal sample size is calculated for 328,239,523 US population of 18 years and older, and a 95% confidence interval. For a 4% margin of sampling error, the sample should include 601 participants, and 1,067 participants for 3% margin of sampling error (Dillman et al., 2014; Smith, 2020). As a result, our sample size provides us with 95% power to detect effects in the regressions analysing the relationship between level of investment, personal experience with COVID-19, risk capacity variables and emotions. In addition, we take several measures to guarantee the quality of the data collected. A total of four attention check questions were asked at different stages during the survey to check if the participants were engaging with the questionnaire. We discard 5.63% of responses where the attention questions were not correctly answered. As per Greszki, Meyer, and Schoen (2014) methodology, we calculate the median completion time, and 0.65% of responses with a completion time under or over the median time by 50% were discarded.

[10] We control for potential variations due to different time periods in the econometric model by introducing dummy variables for each month.

[11] The total number of COVID-19 cases in the US when the survey began on the 30th of June was approximately 2.8 million and by the time the response collection ended on the 28th of August, the number of cases had reached approximately 6.2 million. The number of deaths also increased in this period from 131,014 in June to 187, 139 in August. Available at: https://www.worldometers.info/coronavirus/country/us/

[12] We employed Amazon MTurk's premium qualification named 'Financial Asset Owned – Mutual Funds' to select only retail investors as participants to our survey.

[13] Participants were anonymous, identified only by a unique random ID number. No names or personal details were collected.

questions, responses are also prone to social desirability bias. However, Dillman, Smyth, and Christian (2014) found that this type of response bias is relatively unlikely in web-based surveys such as ours. To further minimise response bias, we take several precautions when designing the survey (Hardy & Ford, 2014) such as keeping the questions short and clear, explaining difficult concepts, using interval questions instead of Yes/No answers, and keeping open-ended questions to a minimum.[14]

We also use survey quotas to ensure that the sample is representative for gender, age, and geographical location. First, subjects were split into two halves corresponding to gender. Second, the age of participants follows a normal distribution ranging from 18 to 92 years old. Third, participants were chosen from every US region, based on the definitions and distribution percentages provided by the US Census data from 2019.[15]

3.2. Variables

3.2.1. Percentage change in investments (% Investments)

The aim of this study is to identify the relationship between personal experience with COVID-19 and investments decisions of retail investors. In order to capture investment decisions, we measure retail investors' self-reported percentage change in investments. As such, the dependent variable used in our empirical analysis is the percentage change in investments measured during the first COVID-19 outbreak in July-August 2020. The percentage change in investments (*% Investments*) is a continuous variable taking values between -100% and 100%. It represents the self-reported percentage increase or decrease in the level of investments experienced by respondents after the COVID-19 outbreak.

In Section 3.5 and our robustness checks we use the variable *Difference in Investments (ΔInvestments)* alongside the percentage change in investments, to better illustrate the extent of the changes reported by retail investors. *Investments Before* and *Investments After* are variables representing the level of investments as percentage of disposable income before and after the COVID-19 outbreak. These proxies are categorical variables, ordered from 0 to 4, and are adapted from Gambetti and Giusberti (2012). The variables equal zero for an investment level of 0%, one for an investment level of 0%-10%, two for 10%-20%, three for 20%-30%, and four for 30% or more. *ΔInvestments* is a categorical variable ordered from 0 to 2. The difference in investments was computed as the difference between the level of investments after and before the COVID-19 pandemic. The variable equals zero for a decrease in the level of investments, one for no change, and two for an increase in investments.

3.2.2. Personal experience with COVID-19

Personal losses due to coronavirus and second-hand experiences or losses of family members are adapted from Andersen et al. (2019) and Dryhurst et al. (2020). Death related to COVID-19 (*COVID-19 Death*) is a binary variable that equals one if the respondent knows someone in their family or close circle of friends who had passed away because of coronavirus[16] and zero otherwise. *Tested Positive* is a binary variable that equals one if the investor tested positive for coronavirus themselves or knows someone in their family and/or close circle of friends who tested positive, and zero otherwise. Vulnerable Health Category *(Vulnerable*) is also a binary variable that equals one if the respondent has a health condition which makes them more vulnerable to coronavirus, and zero otherwise. Based on the three variables described above, we also construct one variable measuring the overall exposure to the COVID-19 pandemic of each respondent. Therefore, the variable *Affected* is a binary variable that equals one if the respondent experienced all the above conditions (*COVID-19 Death*, *Tested Positive* and *Vulnerable*), and zero otherwise. Cronbach's Alpha[17] for *Vulnerable*, *Tested Positive* and *COVID-19 Death* is 0.74, suggesting good reliability of the scale.

Participants' COVID-19 risk perception is also measured through the survey question "How likely do you think it is that you will catch the coronavirus/COVID-19 in the next 6 months?" (Dryhurst et al., 2020; Lee & You, 2020). COVID-19 Risk Perception is a 5-level categorical variable ranging from 0 (Extremely Unlikely) to 4 (Extremely Likely). Similar variations of this risk perception question have been used in the medical literature as part of the Health-Belief Model exploring determinants of COVID-19 vaccination (Chu & Liu, 2021; Coe, Elliott, Gatewood, Goode, & Moczygemba, 2022; Guidry et al., 2021)[18]. Therefore, COVID-19 risk perception refers to an investors' personal perception about how likely it is that their health will be affected by the virus in the next 6 months. We expect COVID-19 risk perception to have a negative relationship with the dependent variable %Investments (Dryhurst et al., 2020; van der Linden, 2015).

3.2.3. Risk capacity

Capacity to bear losses and investments' time frame before and after the COVID-19 outbreak are ordinal scores from 0 to 2 (Brooks, Sangiorgi, Hillenbrand, & Money, 2018 and Brooks, Sangiorgi, Hillenbrand, & Money, 2019). Respondents are asked to report answers for levels before and after the pandemic. Capacity to bear losses is defined as the extent to which an investor's income exceeds their outgoings. Capacity equals 0 for low capacity to bear losses, one for medium, and two for high capacity. The time frame is the investor's time horizon for their investments. Time frame equals zero for short-term horizons (0-5 years), one for medium-term (5-10 years), and two for long-term (more than 10 years).

We use as explanatory variables the difference in capacity to bear losses (*ΔCapacity*), and the difference in investments' time frame (*ΔTime*). Both variables are computed as the difference in the capacity and time frame scores after and before COVID-19. The resulting ordinal variables are scores from zero to two, where zero represents a decrease in the variable, one represents no change, and two represents an increase. Brooks et al. (2018) point to a positive relationship between risk tolerance and capacity, liquidity and time frames. Rieger, Nguyen, Schnur, and Wang (2020) also find that when faced with long time horizons, experiment participants tend to allocate more of their endowment to risky investments. Therefore, we expect capacity to bear losses and time frame to have a positive relationship with the changes in level of investments.

Participants' risk tolerance is also assessed using The Grable and Lytton Risk Tolerance Scale (Grable & Lytton, 1999). This is a 13-item questionnaire that measures risk tolerance on a scale from 13 to 47. The results can be interpreted as low risk tolerance (18 and below), below-average risk tolerance (19-22), moderate risk tolerance (23-28), above-average risk tolerance (20-32), and high risk tolerance (33 and above). We expect risk tolerance to be positively associated with the dependent variable, as higher risk tolerance is related to increased trading activity (D'Hondt, De Winne, & Merli, 2021; Guiso et al., 2018; Hoffmann, Post, & Pennings, 2015).

3.2.4. Savings

We construct the independent variable percentage change in savings (*% Savings*) in a similar way to the dependent variable percentage

[14] We collected 100 pilot responses during June 2020, but these responses are not used in the present analysis. This pilot study helped us to test the questionnaire design with qualitatively similar findings.

[15] https://www.census.gov/popclock/data_tables.php?component=growth, accessed 29/05/2020.

[16] This questions also had the option for a "Prefer not to say" answer, therefore we have 1,128 responses for this variable.

[17] Chronbach's Alpha of over 0.7 is considered acceptable (Cortina, 1993)

[18] The referenced papers were published after the present survey was concluded. However, we quote them to emphasise the usage of this type of risk perception question in COVID-19 related research.

change in investments. *% Savings* is a continuous variable taking values between -100% and 100% and represents the self-reported percentage increase or decrease in savings as a percentage of disposable income experienced by respondents after the COVID-19 outbreak. In Section 3.5, we display descriptive statistics of *% Savings* and conduct robustness checks using *ΔSavings*. *Savings Before* and *Savings After* are variables representing the level of savings before and after the COVID-19 outbreak. They are both categorical variables, ordered from 0 to 4. The variables equal zero for a savings level of 0%, one for a savings level of 0%-10%, two for 10%-20%, three for 20%-30%, and four for 30% or more. *ΔSavings* is a categorical variable ordered from 0 to 2. The difference in savings is computed as the difference between the level of savings after and before the COVID-19 pandemic. The variable equals zero for a decrease in savings, one for no change and two for an increase in savings.

We employ promotion-oriented and prevention-oriented savings goals (Gerhard et al. (2018). Savings for a deposit to buy a property, for a planned future purchase (e.g. car etc.), for holidays or other leisure activities are the promotion-oriented savings goals set to achieve positive outcomes for investors. Savings for unexpected expenditures, paying for bills, for planned maintenance costs (e.g., home renovation etc.), and repaying a loan are the prevention savings goals, which aim to avoid negative outcomes for investors.

In the present study, these goals are measured as self-reported responses before and after the pandemic on a 5-point Likert scale. Prevention and promotion goals are also aggregated in two indices computing the average score for each type of goal. Then, we compute the differences of the scores before and after COVID19 for promotion goals (*ΔPromotion Goals*) and prevention goals (*ΔPrevention Goals*). Cronbach's alphas for the aggregate indices of prevention goals and promotion goals are 0.71 and 0.70, respectively, suggesting that the scale is reliable and has good internal consistency.

3.2.5. Emotions

Emotions can often influence financial decisions. Retail investors tend to attribute their good mood to positive economic prospects instead of emotions and tend to buy stock when feeling positive (Gabbi & Zanotti, 2019). Retail investors also exhibit a positive relationship between risk taking behaviours and positive emotions (Alempaki, Starmer, & Tufano, 2019). For instance, Delis and Mylonidis (2015) find that trust, a positive emotion, increases respondents' inclination towards risky investments. Using an experimental asset market, Breaban and Noussair (2018) find a strong correlation between positive emotions, increased purchasing and overpricing of assets, implying that changes in emotions are associated with poor financial decisions. Anger is associated with risky investment decisions and longer investment horizons, whereas anxious people are less willing to invest their saving (Gambetti & Giusberti, 2012). Traczyk et al. (2018) show that people with higher numeracy are more susceptible to the effects of incidental fear and sample more information before making a financial decision.

Participants in this study are asked to rate their emotions after the COVID-19 outbreak in comparison to before COVID-19. We use seven positive emotions (*"Joy", "Excitement", "Inspired", "Enthusiastic", "Strong", "Determined", "Active"*) and seven negative emotions (*"Nervous", "Sadness", "Anger", "Fear", "Shame", "Disgust", "Anxiety"*) selected from the PANAS-X Scale (Watson, Clark, & Tellegen, 1988). Participants are asked to score each emotion before and after COVID-19 using a Likert Scale from one ("Very slightly or not at all") to five ("Extremely or Always"). We use a reverse scoring method for negative emotions and regular scoring for positive emotions and construct an index for emotions before and after the outbreak by averaging the scores corresponding to each emotion. These indices range from negative to positive emotions. To capture the change in emotions due to COVID-19, we compute the difference between emotions indices (ΔEmotions) as the spread between the index of emotions experienced after COVID-19 (*Emotions Index After*) and index of emotions experienced before the outbreak of the virus (*Emotions Index Before*). Cronbach's alpha for the index of emotions is 0.83 with good reliability.

3.2.6. Location, time, and gender

We control for differences amongst participants based on geographical location. *Northeast, Midwest, South* and *West*[19] are binary variables taking the value one if the participant is from that region and zero otherwise. Midwest is used as reference category in the regression analysis. Since the responses are collected over two months, we control for time effects using binary variables corresponding to the month of the recorded participant responses. July is used as reference category in the regression analysis. We also control for differences in gender, using a binary variable taking the value one if the respondent is female and zero otherwise. Male investors are used as reference category. Research shows that on average, male investors are more overconfident than females and are likely to trade more frequently (Barber & Odean, 2001; Paisarn, Chancharat, & Chancharat, 2021; Seru, Shumway, & Stoffman, 2009). For instance, Belgian male retail investors increased their equity positions more than women during the COVID-19 lockdown in 2020 (Priem, 2021). Therefore, we expect a larger decrease in investments by female investors.

3.3. Econometric model and methodology

In this section, we aim to explain the variation in level of investments (*% Investments*) during the COVID-19 lockdown between July-August 2020. Considering the structure of our cross-sectional data, we employ an ordinary least squares (OLS) regression model with robust standard errors clustered by state presented in equation (1). The level of investments, savings, capacity to bear losses, time frame and emotions before and after the pandemic are self-reported by the respondents at one moment in time. Hence, we do not employ panel regression methods, but proceed with a cross-sectional OLS approach." We begin with a simple model introducing only a few control variables, which we progressively include in the model specification:

$$\%Investments = \alpha + x' Covid19 + z' X + \varepsilon_i \quad (1)$$

Where α is a constant term; *% Investments* is the dependent variable used and described in section 3.2.1; *Covid19* is a vector of variables for personal experience with COVID-19; X represents a vector of explanatory variables; ε is an i.i.d. error term. We use the continuous variable *% Investments,* actual percentage change in investments, as dependent variable in our main analysis to assess the economic impact of personal experience with COVID-19 on the change in investments[20].

3.4. Data summary statistics

Table 1 presents the frequency distribution of the main variables, the number of observations and the percentage for each level of the categorical variables. Out of the three types of personal experience with

[19] Geographical distribution is based on the regions defined by the US Census.

[20] The variable ΔInvestments is based on questions with an ordinal response scale (e.g. level of investments 0%-10%), whereas the continuous variable percentage change in investments is a self-reported percent known as an absolute open-ended quantifier (DeCastellarnau, 2018). Both types of quantifiers have advantages and disadvantages (Couper, Traugott, & Lamias, 2001; Miethe, 1985), thus we ask respondents about their change in investments both as an open-ended quantifier and as an ordinal response scale to ensure a comprehensive analysis. We use the answers from open-ended, continuous scale (*% Investments*) as dependent variable in regression analysis. The answers from the ordinal response scale version of this question are used for robustness checks in two ways. First, we ensure response consistency by checking that the direction of the change in investments is the same in both questions. Second, we replicate the regression analysis using the percentage change in investments as dependent variable in an ordered probit model, with qualitatively similar results.

COVID-19, 25.99% of our respondents are affected by all of these types, as indicated by the variable *Affected by COVID-19* (Table 1). Personal experience with COVID-19 appears to be mostly driven by being in a *vulnerable health category* (56.74%) or *tested positive* (46.17%), followed by knowing someone who died because of COVID-19 (31.13%). Almost half of respondents report an increase in their investments (42.19%), while one quarter (25.99%) report a decrease, suggesting that the variation of retail investments during COVID-19 is more heterogeneous that it appears when assessing the average at the aggregate level (Table 2).

Table 2 presents summary statistics for the level of investments before and after the pandemic outbreak. Panel A shows different levels of self-reported percentage change in investments, showing that there is an increase in investments of 4.67% on average. Almost 49% of respondents report having increased their invested amount, while only 22.70% report no change, and 28.32% reduce investments. Panels B presents the percentages of investments before and after the pandemic expressed by levels. Almost 13% of respondents invest 30% or more of disposable income after the outbreak compared to before, and overall, 42.19% of investors report having increased their investments after the pandemic. The mean increase in investments is statistically significant at 1% (Panel C).

Table 3, Panel A presents summary statistics for ΔInvestments and the other main independent variables. The level of savings also increases after the outbreak, with a positive mean difference significant at 1%. The observed increase in savings is supported by similar findings in the literature associating crises or uncertainty with increased savings (Aaberge et al., 2017; Bricker et al., 2011; Broadway & Haisken-DeNew, 2018; Vanlaer et al., 2019). Scores for capacity to bear losses, time frame and emotions decrease after the pandemic. These findings are in line with similar studies in the literature. For instance, Chhatwani and Mishra (2021) find in a US survey conducted between June-July 2020 that 27.8% of respondents self-identify as financially fragile during COVID-19, and on average optimism is low (0.2 out of 1). Clark, Lusardi, and Mitchell (2021) also show that 20% of US respondents are financially fragile (i.e. could not afford an emergency expense) in the first COVID-19 lockdown.

Panel B presents Pearson's correlation coefficients between *% Investments* and the independent variables of interest. The highest correlation of 41.74% is observed between *% Savings* and *% Investments*. Being affected by COVID-19 has a positive and significant correlation with investments at 20.60%. There is a positive, statistically significant relationship between *% Investments* and all remaining variables of interest. This indicates that investors who are more capable of taking risks and bear losses, with longer investment time frames, and who feel more positive might tend to invest more after the COVID-19 outbreak.

Fig. 1 illustrates changes in investments conditional on the different types of experience with COVID-19. The first panel on the left-hand side shows that 69% of those who experience COVID-19 in all three types of personal experience, increase their investments. Similar results are obtained when separating personal experience with COVID-19 for respondents who are in a vulnerable health category (53%), tested or knew someone who tested positive (57%), and know someone who died because of COVID-19 (65%). The decreased level of investment for investors who are not affected by COVID-19 do not differ much from those affected. In all four panels of Table 3, both those who suffer personal experience with COVID-19 and those who do not, report between 22% and 28% decrease in investments. 41% of respondents who were not affected by COVID-19 do not change their investments. Almost half of respondents who report no change in investments are not in a vulnerable health category (49%), did not test or know someone who tested positive (47%), and respondents who do not know someone who died because of COVID-19 (43%).

Table 4 presents summary statistics and paired t-tests between percentage change in investments of those affected by COVID-19 and those not affected. The mean difference is statistically significant at 1% for those affected either through having experienced a positive test, *COVID-19 Death*, being in a vulnerable category or all the above, suggesting that personal experience with COVID-19 is associated with increased investments. For instance, those who knew someone who died due to COVID-19 have a mean 13.78% increase in investments, while those in a vulnerable health category or experienced positive COVID-19 tests

Table 1
Descriptive statistics of main variables.

		Freq.	Percent	Cum.
Affected by COVID-19	No	763	74.01%	74.01%
	Yes	268	25.99%	100%
Vulnerable Health Category	No	446	43.26%	43.26%
	Yes	585	56.74%	100%
Tested Positive	No	555	53.83%	53.83%
	Yes	476	46.17%	100%
COVID-19 Death	No	710	68.87%	68.87%
	Yes	321	31.13%	100%
ΔInvestments	Decrease	268	25.99%	25.99%
	No Change	328	31.81%	57.81%
	Increase	435	42.19%	100%
ΔSavings	Decrease	256	24.83%	24.83%
	No Change	398	38.60%	63.43%
	Increase	377	36.57%	100%
ΔCapacity	Decrease	319	30.94%	30.94%
	No Change	442	42.87%	73.81%
	Increase	270	26.19%	100%
ΔTime Frame	Decrease	304	29.49%	29.49%
	No Change	493	47.82%	77.30%
	Increase	234	22.70%	100%
Risk Tolerance	Below-average	283	27.45%	27.45%
	Average	567	55%	82.44%
	Above-average	181	17.56%	100%
ΔEmotions	Decrease	678	65.76%	65.76%
	No Change	146	14.16%	79.92%
	Increase	207	20.08%	100%
Region	Midwest	217	21.05%	21.05%
	Northeast	173	16.78%	37.83%
	South	393	38.12%	75.95%
	West	248	24.05%	100%
All		*1,031*	*100%*	

This table presents frequencies, percentages of total and cumulative percentages for the main dependent and independent variables in our study. The first column presents the frequency distribution, the second column present percentage of total by each category, and the third column present cumulative percentages. COVID-19 Death is a binary variable that equals one if the respondent knows someone in their family or close circle of friends who had passed away because of coronavirus and zero otherwise. *Tested Positive* is a binary variable that equals one if the investor tested positive for coronavirus themselves or knows someone in their family and/or close circle of friends who tested positive, and zero otherwise. *Vulnerable Health Category* is a binary variable that equals one if the respondent has a health condition which makes her more vulnerable to coronavirus, and zero otherwise. *Affected* is a binary variable that equals one if the respondent experienced all of COVID-19 Death, Tested Positive and Vulnerable Health Category, and zero otherwise. ΔCapacity and ΔTime are computed as the difference in capacity to bear losses and the difference in investments' time frame scores before and after COVID-19. The variables are scored from zero to two, where zero represents a decrease in the variable, one represents no change, and two represents an increase. *ΔInvestments* is a categorical variable ordered from 0 to 2 computed as the difference in savings between the level of Investments After and the level of Investments Before COVID-19. The variable equals zero for a decrease in investments, one for no change and two for an increase. *ΔSavings* is a categorical variable ordered from 0 to 2 computed as the difference in savings between the level of Savings After and the level of Savings Before COVID-19. The variable equals zero for a decrease in savings, one for no change and two for an increase. Risk Tolerance is computed using The Grable and Lytton Risk Tolerance Scale taking values between 13 and 47, where 18-22 is below-average risk tolerance, 23-28 is moderate risk tolerance, 29 and above is above-average risk tolerance. ΔEmotions is computed as the difference between *the Emotions Index After and Emotions Index Before COVID-19*. The variable equals zero for a decrease in the emotions index, one for no change and two for an increase. Northeast, Midwest, South and West are binary variables taking the value one if the participant is in that region and zero otherwise.

Table 2
Summary statistics for % change investments, ΔInvestments, investments before and after, and T-tests.

Panel A - Summary statistics for % change in investments after COVID-19 outbreak

% Change Investments	N	% N	Mean	Median	Std. Dev.	Min	Max
-100%: -30%	101	9.80%	-56.90%	-50.00%	0.2241	-100.00%	-30.00%
-30%: -1%	191	18.53%	-12.69%	-10.00%	0.0651	-25.00%	-1.00%
0%	234	22.70%	0.00%	0.00%	0	0.00%	0.00%
1%: 30%	330	32.01%	11.81%	10.00%	0.0655	1.00%	27.00%
30%: 100%	175	16.97%	51.93%	50.00%	0.1836	30.00%	100.00%
All	1,031	100.00%	4.67%	0.00%	0.3091	-100.00%	100.00%

Panel B - Summary statistics for difference in investments

Investments Before			Investments After			ΔInvestments		
	N	% N		N	% of N		N	% N
0%	48	4.66%	0%	78	7.57%	Decrease	268	25.99%
0% - 10%	275	26.67%	0% - 10%	248	24.05%	No Change	328	31.81%
10% - 20%	389	37.73%	10% - 20%	290	28.13%	Increase	435	42.19%
20% - 30%	240	23.28%	20% - 30%	281	27.26%			
≥30%	79	7.66%	≥30%	134	13.00%			
All	1,031		All	1,031		All	1,031	

Panel C - T-test for level of investments before and after COVID-19 outbreak

	N	Mean	Std. Dev.
Investments Before	1,031	2.0262	0.9963
Investments After	1,031	2.1406	1.1476
Mean Difference	1,031	0.1145***	1.1314

This table presents summary statistics for the level of investments before and after the COVID-19 outbreak for retail investors. Panel A presents summary statistics for self-reported percentage change in investments - % change investments. *% Investments* is a continuous variable taking values between -100% and 100%. It represents the self-reported percentage increase or decrease in the level of investments experienced by respondents after the COVID-19 outbreak. Panel B presents summary statistics for the level of investments before and after the outbreak, as well as the difference in investments (ΔInvestments). ΔInvestments Variable definition and measurements are explained in notes to Table 1. Panel C presents paired t-test results between investments after and before the pandemic measured as categorical variables that construct ΔInvestments (See section 3.2.1). *,** and *** represent significance at 10%, 5% and 1% levels.

Table 3
Summary statistics and pearson correlation matrix for % investments and core independent variables.

Panel A - Summary statistics and t-tests

	N	Mean	Mean Difference	Median	Std. Dev.	Min	Max
ΔInvestments	1,031	1.1620	0.1145***	1.0000	0.8101	0.0000	2.0000
ΔSavings	1,031	1.1174	0.1232***	1.0000	0.7751	0.0000	2.0000
ΔCapacity	1,031	0.9525	-0.0714***	1.0000	0.7547	0.0000	2.0000
ΔTime	1,031	0.9321	-0.0949***	1.0000	0.7195	0.0000	2.0000
ΔEmotions	1,031	-0.4110	-0.4206***	-0.2143	0.6774	-3.0714	2.1429
Affected	1,031	0.2599	-	0.0000	0.4388	0.0000	1.0000
Risk Tolerance	1,031	0.9011	-	1.0000	0.6638	0.0000	2.0000

Panel B - Pearson's correlation matrix

	% Investments	Affected	% Savings	ΔCapacity	ΔTime	Risk Tolerance
Affected	0.2060***					
% Savings	0.4174***	0.1381***				
ΔCapacity	0.1835***	0.1575***	0.1718***			
ΔTime	0.1450***	0.1297***	0.0861***	0.2540***		
Risk Tolerance	0.1118***	0.0884***	0.0707**	-0.0193	-0.0296	
ΔEmotions	0.2317***	0.2492***	0.1979***	0.1541***	0.1466***	0.1315***

This table presents summary statistics, t-tests and correlation matrix for % Investments and the core independent variables Affected, % Savings, ΔCapacity, ΔTime, ΔEmotions, Risk Tolerance. *% Savings* is a continuous variable taking values between -100% and 100%. It represents the self-reported percentage increase or decrease in the level of savings experienced by respondents after the COVID-19 outbreak. Other variable definitions and measurements are explained in notes to Table 1 and Table 2. Panel A presents summary statistics for ΔInvestments and the core independent variables, as well as t-tests between after and before values for ΔInvestments, ΔSavings, ΔCapacity, ΔTime. Panel B reports the Pearson correlation matrix of *%Investments*, Affected, *%Savings*, ΔCapacity, ΔTime, ΔEmotions and Risk Tolerance. *, ** and *** represent significance at 10%, 5% and 1% levels.

reported a mean increase of around 9%. Following this Table 4 presents summary statistics and paired t-tests between percentage change in investments between decrease and increase in the core variables. The difference between a decrease and an increase in savings, capacity to bear losses and emotions is statistically significant, showing that, on average, investors who after COVID-19 save more, have higher capacity

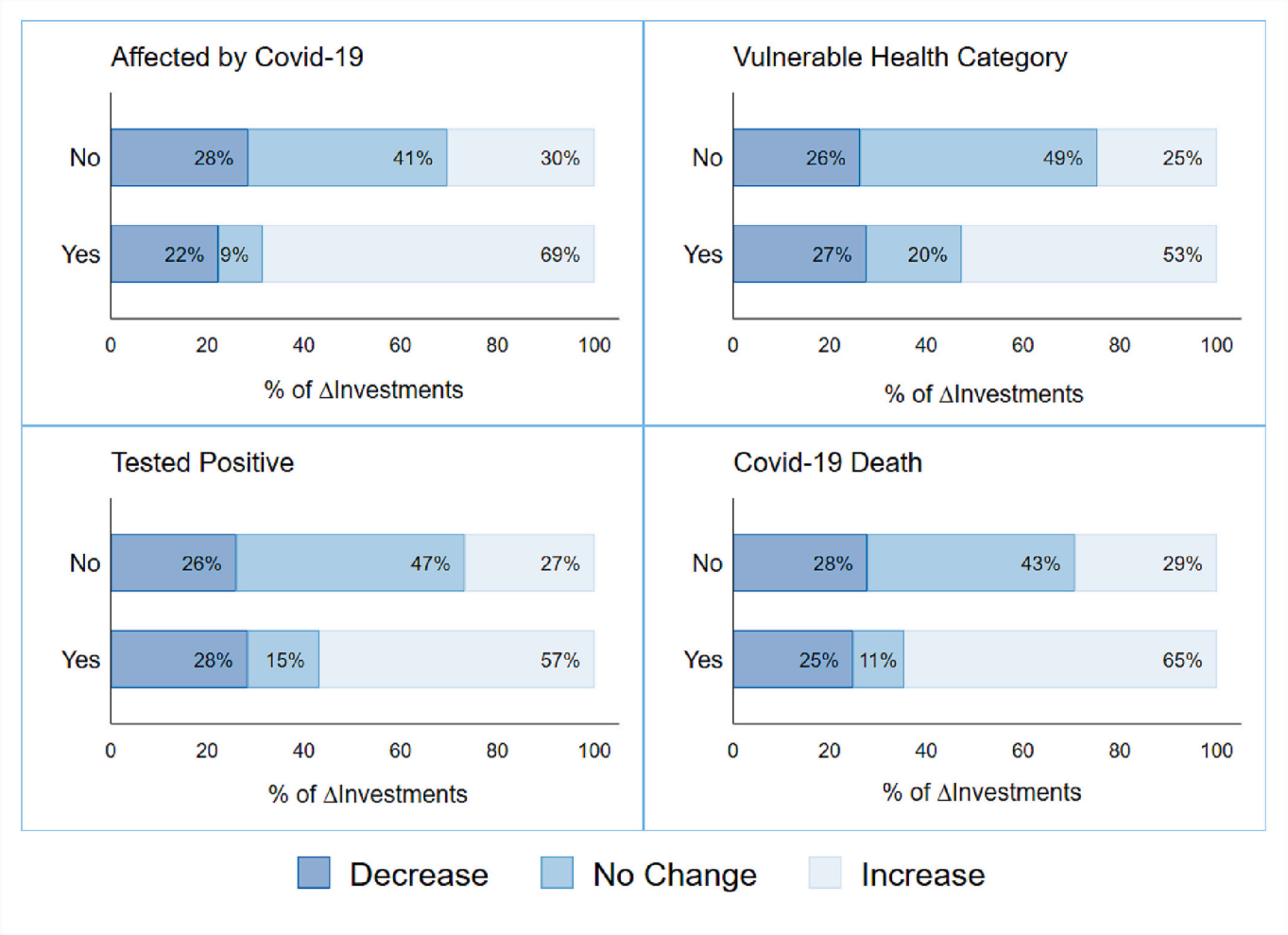

Fig. 1. Distribution of ΔInvestments by personal experience with COVID-19
This figure shows the distribution of changes in investments (ΔInvestments) by respondents' personal experience with COVID-19. "Affected by COVID-19", the first panel on the upper left side, presents respondents change in investments by cumulative experience with COVID-19 (variable *affected* described in Section 3.2.1.). "Vulnerable Health Category", the second panel on the upper right side, presents respondents change in investments by their COVID-19 vulnerable health category status (variable *vulnerable* described in Section 3.2.1.). "Tested Positive", the third panel on the bottom left side presents respondents' change in investments by their experience with testing positive for COVID-19 (variable *tested* described in Section 3.2.1.). "COVID-19", the fourth panel on the bottom right side, presents respondents change in investments by their personal experience with COVID-19 death (variable *COVID-19 death* described in Section 3.2.1.).

to bear losses and are more positive, also invest more.

Table 5 shows summary statistics and paired t-tests for risk tolerance scores between investors who have personal experience with COVID-19 and those who do not. Those who suffer all three types of COVID-19 experience display higher risk tolerance on average, and the difference is statistically significant at 1%. The same holds when considering the types of experience on their own: *Tested Positive, COVID-19 Death, Vulnerable.*

4. Results and discussion

4.1. Core results

Table 6 presents core estimated results of model (1) on the relationship between *%Investments* and personal experience with COVID-19. Column (1) includes only *Affected*, Location and Time as independent variables. The coefficient of *Affected* is positive and significant at 1%, suggesting that before controlling for the additional explanatory variables, the percentage of investments increases for those affected by COVID-19. Investors who are affected by the pandemic experience a 12% increase in their investments compared to those not affected. This result confirms our first hypothesis that personal experience with COVID-19 is associated with changes in the level of investments, with a positive relationship. This latter result is unexpected with respect to the literature on financial behaviours during a crisis (Cohn et al., 2015; Guiso et al., 2018; Knüpfer et al., 2017; Malmendier & Nagel, 2011; Necker & Ziegelmeyer, 2016) or catastrophe events (Bourdeau-Brien & Kryzanowski, 2020; Goebel et al., 2015; van der Linden, 2015), which suggest a negative correlation between such events and risk-taking behaviours. The positive relationship between personal experience with COVID-19 and investments could be supported by the anecdotal evidence of increased trading in retail investors documented by news reports during the COVID-19 pandemic (BBC, 2020; Benoit, 2021; Demos, 2020; Franklin & Moise, 2021; Goldfarb, 2020; Osipovich & McCabe, 2020; Shrikanth, 2020; Yoon, 2021), as well as scholars' findings that natural disasters lead to decreased risk aversion and less trading (Brown et al., 2018; Kahsay & Osberghaus, 2018).

Table 6 also presents results for the location of respondents and time. These variables are controlled for in every model presented throughout this paper, and the coefficients illustrated here remain consistent throughout, but for brevity we do not report them. Respondents located in the Northeast and West regions are more likely to increase their

Table 4
Summary statistics and T-tests for % change in investments by core variables.

	N	Mean	Median	Std. Dev.	Min	Max	Mean Difference Decrease-Increase / No-Yes
Affected							
No	763	0.0090	0.0000	0.2867	-1.0000	1.0000	
Yes	268	0.1541	0.1000	0.3441	-0.9000	1.0000	-0.1451***
Tested Positive							
No	555	0.0017	0.0000	0.2707	-1.0000	1.0000	
Yes	476	0.0991	0.1000	0.3415	-1.0000	1.0000	-0.0974***
COVID-19 Death							
No	710	0.0038	0.0000	0.2796	-1.0000	1.0000	
Yes	321	0.1416	0.1000	0.3482	-1.0000	1.0000	-0.1378***
Vulnerable							
No	446	-0.0094	0.0000	0.2492	-1.0000	1.0000	
Yes	585	0.0895	0.1000	0.3420	-1.0000	1.0000	-0.0989***
ΔSavings							
Decrease	256	-0.1001	-0.1000	0.3517	-1.0000	0.9000	
No change	398	0.0224	0.0000	0.2291	-1.0000	1.0000	
Increase	377	0.1720	0.1000	0.3023	-0.9000	1.0000	-0.1225***
ΔCapacity							
Decrease	319	-0.0135	0.0000	0.3658	-1.0000	0.9500	
No change	442	0.0347	0.0000	0.2071	-1.0000	1.0000	
Increase	270	0.1374	0.1000	0.3529	-1.0000	1.0000	-0.0482**
ΔTime							
Decrease	304	0.0134	0.0000	0.3803	-1.0000	1.0000	
No change	493	0.0198	0.0000	0.2347	-1.0000	1.0000	
Increase	234	0.1467	0.1000	0.3241	-1.0000	0.9900	-0.0064
Risk Tolerance							
Low	283	-0.0280	0.0000	0.2674	-1.0000	0.7500	
Average	567	0.0781	0.0500	0.3109	-1.0000	1.0000	
High	181	0.0652	0.0500	0.3442	-1.0000	1.0000	-0.1061***
ΔEmotions							
Decrease	678	0.0121	0.0000	0.2951	-1.0000	1.0000	
No change	146	0.0765	0.0500	0.2873	-0.9000	1.0000	
Increase	207	0.1389	0.1000	0.3469	-1.0000	1.0000	-0.0644**
Total	1,031	0.0467	0.0000	0.3091	-1.0000	1.0000	

This table presents summary statistics and t-tests for the core independent variables Affected, ΔSavings, ΔCapacity, ΔTime, ΔEmotions, Risk Tolerance. Variables Tested Positive, COVID-19 Death and Vulnerable are used to construct Affected. Definitions and measurements for these three variables are explained in notes to Table 1. Column Mean Difference (No-Yes) reports the mean difference between having had an experience with COVID-19 and not having had one. Column Mean Difference (Decrease-Increase) reports the mean difference between experiencing an increase in the variable after the outbreak and experiencing a decrease. *,** and *** represent significance of the paired t-tests at 10%, 5% and 1% levels.

Table 5
Summary statistics and T-tests for risk tolerance score by personal experience with COVID-19.

	N	Mean	Median	Std. Dev.	Min	Max	Mean Difference No-Yes
Affected							
No	763	24.62254	25	4.420973	13	40	
Yes	268	25.41791	25	3.386022	16	39	-0.7954***
Tested Positive							
No	555	24.24505	25	4.359867	13	39	
Yes	476	25.5105	25	3.876772	13	40	-1.2655***
COVID-19 Death							
No	710	24.56901	25	4.410546	13	40	
Yes	321	25.40498	25	3.593985	16	39	-0.8359***
Vulnerable							
No	446	24.40359	24.5	4.436152	13	37	
Yes	585	25.15385	25	3.964775	13	40	-0.7503***
Total	*1,031*	*24.8293*	*25*	*4.18967*	*13*	*40*	

This table presents summary statistics and t-tests for risk tolerance score by the core variables measuring experience with COVID-19: Affected, Tested Positive, COVID-19 Death and Vulnerable. Definitions and measurements for these four variables are explained in notes to Table 1. Column Mean Difference (No-Yes) reports the mean difference in risk tolerance between having had an experience with COVID-19 and not having had one. *,** and *** represent significance of the paired t-tests at 10%, 5% and 1% levels.

Table 6
Regression results on % change investments and core independent variables.

Dep. Var. % Investments	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Affected	0.1200***	0.1226***	0.0891***	0.1079***	0.1121***	0.1021***	0.1190***	0.0946***	0.0617***
	(0.0306)	(0.0298)	(0.0256)	(0.0326)	(0.0280)	(0.0305)	(0.0288)	(0.0302)	(0.0254)
% Savings			0.3692***						0.3403***
			(0.0404)						(0.0435)
ΔCapacity				0.0574***		0.0486**			0.0260*
				(0.0192)		(0.0189)			(0.0166)
ΔTime Frame					0.0505***	0.0384***			0.0308***
					(0.0121)	(0.0114)			(0.0111)
Risk tolerance							0.0332***		0.0244**
							(0.0122)		(0.0105)
ΔEmotions								0.0780***	0.0394**
								(0.0171)	(0.0150)
Female		-0.0597***	-0.0450**	-0.0559***	-0.0585***	-0.0556***	-0.0547***	-0.0544***	-0.0372**
		(0.0170)	(0.0175)	(0.0183)	(0.0170)	(0.0180)	(0.0169)	(0.0174)	(0.0182)
Northeast	0.0730*	0.0727*	0.0463	0.0629	0.0723*	0.0640	0.0666*	0.0621	0.0338
	(0.0371)	(0.0374)	(0.0386)	(0.0405)	(0.0366)	(0.0397)	(0.0371)	(0.0389)	(0.0405)
South	0.0195	0.0197	0.0214	0.0113	0.0218	0.0141	0.0178	0.0148	0.0148
	(0.0230)	(0.0232)	(0.0192)	(0.0249)	(0.0234)	(0.0251)	(0.0236)	(0.0241)	(0.0214)
West	0.0513**	0.0498**	0.0435**	0.0456*	0.0524**	0.0482**	0.0455**	0.0433*	0.0372*
	(0.0218)	(0.0226)	(0.0195)	(0.0247)	(0.0213)	(0.0234)	(0.0225)	(0.0215)	(0.0198)
August	0.0963***	0.0957***	0.0742***	0.0912***	0.0940***	0.0907***	0.0921***	0.0873***	0.0660***
	(0.0167)	(0.0171)	(0.0157)	(0.0161)	(0.0160)	(0.0156)	(0.0171)	(0.0151)	(0.0142)
Constant	-0.0852***	-0.0557**	-0.0522***	-0.0993***	-0.1007***	-0.1269***	-0.0818***	-0.0078	-0.0948***
	(0.0201)	(0.0211)	(0.0180)	(0.0284)	(0.0248)	(0.0301)	(0.0240)	(0.0214)	(0.0277)
Observations	1,031	1,031	1,031	1,031	1,031	1,031	1,031	1,031	1,031
Adj. R-squared	0.0635	0.0720	0.220	0.0901	0.0847	0.0967	0.0760	0.0983	0.240

This table presents results for OLS regressions with robust standard errors clustered by 46 states (reported in brackets). The dependent variable used is the continuous variable *% Investments* (see notes to Table 2). Location represents a vector of dummy variables indicating the region where the respondents live as follows: Northeast, West, South, Midwest are all dummy variable taking the value 1 if a respondent is located in that region and 0 otherwise. Midwest is used as reference category. Time represents a vector of dummy variables indicating the month when the respondents completed the questionnaire as follows: July, August are dummy variable taking the value 1 if a respondent answered during that month and 0 otherwise. July is used as reference category. Other variables' definitions and measurements are explained in section 3.2. *,** and *** represent significance at 10%, 5% and 1% levels.

investment during COVID-19 than those located in the Midwest. When controlling just for *Affected*, location and time in column (1), investors in the Northeast are associated with a 7.30% increase in investments than those from the Midwest. Similarly, those located in the West show 5.13% increase in their investments compared to those located in the Midwest. The coefficient for the South region is also positive, but it is not statistically significant. These results hold in columns (2) through (9), as well as the remaining results' tables. The Northeast and West regions have the states with some of the largest average net worth[21] in the country and largest median income.[22] These regions were also heavily affected by COVID-19. The Northeast has the highest number of COVID-19 deaths between July-August 2020 at around 41% of total, while the West region has the second highest number of cases in the same period at around 20%[23].

During August, the number of COVID-19 cases and deaths had increased. Respondents who answered in August are 9.63% more likely to increase their investments than those who responded in July, as presented in column (1) Table 5. This coefficient is significant at 1%, and it remains consistent in models (2) through (9)[24].

Column (2) introduces gender, which shows that compared to male respondents, females decrease their investments by 5.97% during COVID-19. The decrease in investments associated with female respondents remains significant at 1% in models (3) through (8) when controlling for other factors. Our results are supported by a variety of studies documenting the differences between men and women when it comes to financial decisions such as increased trading by male retail investors compared to female (Odean, 1999; Phan, Rieger, & Wang, 2018), increased loss aversion in female retail investors (Rau, 2014), and higher risk tolerance for retail male investors (Bernasek & Shwiff, 2001; Brooks et al., 2019). In the context of a crisis, Browne, Jaeger, and Steinorth (2019) find that the financial crisis in 2008-2009 leads to a decrease in risk tolerance, and in the aftermath of the crisis males were quicker to increase their individual risk tolerance than females.

In column (3), we control for *% Savings*, which has a positive and significant effect on *% Investments*, as posited by our second hypothesis. One standard deviation increase percentage point increase in savings during this period is associated with a 1.49% increase in investments[25]. This result contributes to previous findings linking increased savings to subsequent investments (Campbell, 2006; Shum & Faig, 2006). In columns (4) to (7) in Table 6, we introduce the remaining risk capacity variables, difference in capacity to bear losses, difference in time frame and risk tolerance. The parameter estimates of these variables are positive and statistically significant, suggesting that investors with increased capacity, increased time frame and higher risk tolerance after the coronavirus outbreak increase their investment by 5.74%, 5.05% and 3.32% compared to participants with lower capacity, shorter time frame and lower risk tolerance. The results hold when considering *ΔCapacity* and *ΔTime Frame* together in column (6), and are in line with the literature (Brooks et al. (2019) Brooks et al. (2018) and (Rieger et al.,

[21] Washington, Alaska, Colorado in the West are among the states with the largest average net worth. See for instance: https://www.cnbc.com/select/average-net-worth-by-state/

[22] Large average income is observed in Northeast states such as Massachusetts, New Jersey Connecticut New Hampshire. See the following link: https://worldpopulationreview.com/state-rankings/median-household-income-by-state

[23] The percentages mentioned are our own calculations based on historic COVID-19 data from the Centers for Disease Control and Prevention (CDC) (https://data.cdc.gov/Case-Surveillance/United-States-COVID-19-Cases-and-Deaths-by-State-o/9mfq-cb36/data, accessed 17/03.2021).

[24] However, in column (8), when controlling for our whole core model, August is not significant anymore, suggesting that other variables explain the variation in ΔInvestments.

[25] The effect of a standard deviation change on the dependent variable (*% Investments*) is computed asstandard deviation * regression coefficient (e.g. 0.0404 * 0.3692 = 0.0149).

2020).

Column (8) from Table 6 introduces the variable *ΔEmotions*. Investors who experience a one unit increase in the emotions index (feeling more positive) increase their investments by 7.80%, in line with a large body of literature that shows a relationship between positive emotions and increased trading or risk taking (Alempaki et al., 2019; Breaban & Noussair, 2018; Delis & Mylonidis, 2015; Fehr-Duda, Epper, Bruhin, & Schubert, 2011; Gabbi & Zanotti, 2019), as well as with the optimism bias theory (e.g., Bansal, 2020), as positive emotions could feed the optimism bias leading to higher levels of investments.

Finally, column (9) presents our core model including all the explanatory variables. Our results hold when controlling for all variables, and the adjusted R-squared in model (9) is 24%. The positive relationship between personal experience with COVID-19 and changes in investments is still highly significant when controlling for the main explanatory variables.

Table 7 analyses our ordered risk capacity variables, separating these variables by their corresponding levels. An increase in capacity to bear losses and increase in the time frame are associated with an increase in investments of 5.05% and 6.23%, respectively. Column (7) shows that investors who are more risk tolerant compared to a low risk tolerance are 6.97% and 5.72% more inclined to increase their investments. This result implies that risk tolerant investors tend to invest more after Covid-19 than risk averse investors and echoes the findings form the literature, pointing to investment in risky assets with higher expected returns by risk tolerant investors (Guiso et al., 2018) and (D'Hondt et al., 2021).

4.2. Personal experience with COVID-19

In Table 8, we separately control for each type of personal experience, namely *Vulnerable*, *Tested Positive*, and *COVID-19 Death* as described in sub-section 3.3.3. Column (1) presents regression results using only Affected, Gender, Location and Time, while column (2) presents our core model from Table 5 as reference. In column (3), we introduce the dummy variable *Vulnerable*, which equals one if the investor considers themselves to be in a COVID-19 vulnerable health category and zero otherwise. The estimated parameter of *Vulnerable* is positive and significant at 1% suggesting that investors in a vulnerable health category increase their investments by 7.23% compared to those who are not in a vulnerable category. This result holds in model (4) when considering *Vulnerable* together with the variables of the core model specification[26]. Columns (5) and (6) show results of the model with variables *COVID-19 Death*, a dummy variable that equals one if the respondents experienced a COVID-19 related death of a family member or close friend and 0 otherwise. As such when considering *COVID-19 Death* together with our core model in column (6), respondents who had this experience are 7.57% more likely to increase their investments that those who did not have it. The effect on *% Investments* of having experienced a COVID-19 death is greater than that of being in a *Vulnerable* category. These results can be explained considering the terror management theory discussed in section 4.1. Knowing someone close who passed away because of COVID-19 represents a more powerful reminder of mortality than any other COVID-19 experience, leading to greater investments. Overall, the results presented in Table 8 are in line with the TMT framework (Arndt et al., 2004; Solomon et al., 2004; Rindfleisch et al., 2008; Zaleskiewicz et al., 2013; Kasser & Sheldon, 2000). Wider TMT literature on political choices also supports these results enforcing the finding that mortality salience has a polarising effect on risk-taking and behaviours leading people to shift their beliefs and attitudes in the opposite direction compared to their regular choices (Burke, Kosloff, & Landau, 2013; Cohen, Solomon, & Kaplin, 2017; Landau et al., 2004; Pyszczynski, Lockett, Greenberg, & Solomon, 2021).

The association between personal experience with COVID-19 and increased investments can occur due to a combination of behavioural factors. First, in the TMT framework, Kasser and Sheldon (2000) posit that reminders of mortality are linked to higher future financial expectations. Second, salience theory suggests that investors are prone to focus on the most salient information available when making financial decisions which results in overestimating future returns, but in reality salient assets end up overpriced and with low future returns (Bordalo et al., 2012; Itti & Koch, 2000; Kahneman & Tversky, 1973). Third, optimism bias posits that investors selectively focus their decisions on salient news (Bansal, 2020), and even more so people with higher exposure to the virus (i.e., more vulnerable from a health perspective) are more likely to exhibit optimism bias and take more risks, contrary to their mortality risk (Asimakopoulou et al., 2020; Fragkaki et al., 2021; Gassen et al., 2021); Maksim et al., 2022). Considering all three theories combined together with the fact that retail investors are more likely to extrapolate past information into future returns (Da et al., 2021), suggests that personal experience with COVID-19 drives investments mainly due to behavioural biases, as the effect holds when controlling for other financial and demographic factors at the same time.

Column (7) introduces the dummy variable *Tested Positive* which equals one if the respondents tested positive for COVID-19 themselves or knew someone in their family/close friends who tested positive, and 0 otherwise. Investors who tested positive display a 7.91% increase in their investments. However, the observed relationship loses significance in model (6) when putting together *Tested Positive* with our core model. We study this variable further in columns (9) to (10), and separate *Tested Positive* in its components: knowing someone who tested positive for COVID-19 (dummy variable Tested Positive Family/Friends), and the respondent themselves testing positive (dummy variable Tested Positive Self). Those who know someone close to them who tested positive show a 5.31% increase in their investments, while those who tested positive themselves show a 19.38% increase. First-hand experience with an adverse event has a greater impact on people's attitudes than second-hand experiences (Andersen et al., 2019; Dryhurst et al., 2020).

Finally, in columns (11) and (12) we control for respondents' risk perception of COVID-19. Investors with higher risk perceptions are found to be more likely to trade, display higher turnover and hold riskier portfolios (Hoffmann et al., 2013). An increase in the COVID-19 risk perception is associated with a 2.97% increase in investments. The significance of the parameter also holds in model (12) when considering it together with our core model with a coefficient of 1.74%.

4.3. Savings goals

Table 9 shows results on the relationship between promotion and prevention savings' goals and investment patterns. Promotion savings' goals focus on positive future outcomes for the investors and have a positive, significant effect on the percentage change in investments, suggesting that those with higher promotion goals after COVID-19 experience higher increases in their investments. Column (8) shows regression results for savings goals together with the core model, and the positive effect of promotion goals on the percentage change in investments holds significant at 10%. This result is in line with the related literature stating that savings goals are associated with increased investments (Campbell, 2006; Changwony et al., 2021; Shum & Faig, 2006). Prevention savings' goals have no significant impact on *%Investments*. Gerhard et al. (2018) find a similar result showing that promotion goals are associated with increased household savings, while for some households, prevention goals have a negative effect on savings. This result is further supported by industry evidence showing that, during COVID-19, 25% of consumers invest their savings on the stock market (Deloitte, 2022). Investing in the stock market is perceived as a

[26] Models from columns (4), (6), (8), (10) and (11) use dummy variables for the components of personal experience with COVID-19 (measured by *Affected*), instead of the *Affected* variable itself. We do not show regression results obtained when controlling simultaneously for all components of personal experience in the same model due to multicollinearity issues.

Table 7
Regression results on % investments and core independent variables by levels.

Dep. Var. % Investments	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Affected	0.1200***	0.1226***	0.0891***	0.1137***	0.1105***	0.1037***	0.1125***	0.0946***	0.0596***
	(0.0306)	(0.0298)	(0.0256)	(0.0340)	(0.0313)	(0.0336)	(0.0308)	(0.0302)	(0.0277)
% Savings			0.3692***						0.3392***
			(0.0404)						(0.0435)
No chg. Capacity				0.0744**		0.0703**			0.0413*
				(0.0329)		(0.0335)			(0.0289)
Increase Capacity				0.1121***		0.0946**			0.0505*
				(0.0379)		(0.0373)			(0.0328)
No chg. Time					0.0462*	0.0213			0.0161
					(0.0245)	(0.0246)			(0.0222)
Increase Time					0.1018***	0.0777***			0.0623**
					(0.0234)	(0.0222)			(0.0219)
Avg. Risk Tolerance							0.0697***		0.0422**
							(0.0198)		(0.0173)
High Risk Tolerance							0.0572**		0.0441*
							(0.0266)		(0.0230)
ΔEmotions								0.0780***	0.0373**
								(0.0171)	(0.0145)
Female		-0.0597***	-0.0450**	-0.0563***	-0.0583***	-0.0551***	-0.0551***	-0.0544***	-0.0372**
		(0.0170)	(0.0175)	(0.0182)	(0.0173)	(0.0181)	(0.0171)	(0.0174)	(0.0181)
Location	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.0852***	-0.0557**	-0.0522***	-0.1092***	-0.0977***	-0.1276***	-0.0969***	-0.0078	-0.1020***
	(0.0201)	(0.0211)	(0.0180)	(0.0342)	(0.0294)	(0.0364)	(0.0270)	(0.0214)	(0.0368)
Observations	1,031	1,031	1,031	1,031	1,031	1,031	1,031	1,031	1,031
Adj. R-squared	0.0635	0.0720	0.220	0.0900	0.0839	0.0959	0.0793	0.0983	0.239

This table presents results for OLS regressions with robust standard errors clustered by 46 states (reported in brackets). The dependent variable used is the continuous variable % Investments (see notes to Table 2). %Savings variable definition and measurement is explained in notes to Table 3. Other variable definitions and measurements are explained in notes to table 1. ΔCapacity is measured as Decrease Capacity, No chg. Capacity, and Increase Capacity. ΔTime is measured as Decrease Time, No chg. Time and Increase Time. Decrease Savings, Decrease Capacity and Decrease Time are used as reference categories. Risk tolerance is measured as Low Risk Tolerance, Average Risk Tolerance and High Risk Tolerance. Low Risk Tolerance is used as reference category. Other variables' definitions and measurements are explained in section 3.2. and Table 4 notes respectively. *,** and *** represent significance at 10%, 5% and 1% levels.

good investment for their future, protecting against crises, supporting the view that promotion goals have a positive impact on investments while prevention goals do not.[27]

5. Experience with Covid-19 and changes in investments by asset class

Finally, we explore how investments in different asset classes including stocks, bonds, cryptocurrencies, and real estate are affected by the pandemic. The inclusion of these variables is inspired by Cohn et al. (2015), and we use them as dependent variables in our core regression model instead of *%Investments*[28]. *Stocks*, *Bonds*, and *Cryptocurrencies* are ordered variables measured on four levels as follows. Each variable equals zero if the respondent has not bought nor sold stocks/bonds/cryptocurrencies during the pandemic, one if the respondent has only sold stocks/bonds/cryptocurrencies, two if the respondent has mainly sold stocks/bonds/cryptocurrencies, three if the respondent has mainly bought stocks/bonds/cryptocurrencies, and four if the respondent has only bought stocks/bonds/cryptocurrencies.

Table 10 presents joint frequencies of stocks, bonds and cryptocurrencies during the pandemic and respondents' personal experience with COVID-19. The chi-square is statistically significant at 1% in every panel, suggests that there is a statistically significant relationship between *Affected* and holdings of stocks, *Affected* and bonds, or *Affected* and cryptocurrencies. Comparing those who only bought stocks, bonds and cryptocurrencies, it appears that only 36.30% of those who bought stocks are affected by COVID-19, while 46.38% and 53.25% of those who only bought bonds and respectively cryptocurrencies are affected by COVID-19. Similar results are observed for those who mainly bought the assets. Almost half of those who mostly bought bonds and cryptocurrencies are affected, compared to only 31.94% of those who mainly bought stocks. We know from our previous findings from Tables 5 to 8 that respondents with personal experience of the pandemic are more likely to increase their investments. Therefore, the frequencies illustrated in Table 9 suggest that that increases in investments are more pronounced for cryptocurrencies and bonds rather than stocks. Some scholars find a positive relationship between cryptocurrencies performance and the intensity of the COVID-19 pandemic (Demir et al., 2020; Iqbal et al., 2021), suggesting that cryptocurrencies could play an important role as a hedge against the pandemic (Mnif et al., 2020; Corbet, Hou, Hu, Larkin and Oxley, 2020a; Dwita Mariana et al., 2021; Conlon et al., 2020). The higher percentage of investments associated with cryptocurrencies observed in our descriptive statistics suggests that investors are aware of the positive performance of cryptocurrencies and see it as an investment opportunity during COVID-19.

Finally, Table 11 analyses how investments in different assets are affected during the COVID-19 pandemic. We use investments in stocks, bonds, and cryptocurrencies as dependent variables. We employ an ordered probit regression model, estimated based on maximum likelihood, with robust standard errors clustered by state. Marginal effects are calculated for the case when the dependent variable equals four, representing the situation "only bought" that specific asset[29]. To capture the effect of savings on different asset classes, we use the independent variable ΔSavings described in Section 3.2.4. As such, column (1) from Table 10 presents regression results using stocks during the pandemic as

[27] Gerhard et al. (2018) suggests that prevention goals would be tackled through illiquid assets such as life insurance, which would therefore decrease the disposable cash on hand and availability of wealth to invest on the stock markets.

[28] We use these variables as dependent variables and not controls, because investing in any asset is highly correlated with the overall level of investments (% Investments) which would cause multicollinearity issues in regressions.

[29] As standard practice, the other variables are kept at their mean values in these calculations.

Table 8
Regression results on % investments and personal experience with COVID-19

Dep. Var. % Investments	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Affected	0.1226***	0.0617***										
	(0.0298)	(0.0254)										
% Savings		0.3403***		0.3427***		0.3431***		0.3432***		0.3371***		0.3396***
		(0.0435)		(0.0440)		(0.0435)		(0.0440)		(0.0444)		(0.0450)
ΔCapacity		0.0260*		0.0284*		0.0260		0.0274		0.0271		0.0292*
		(0.0166)		(0.0160)		(0.0163)		(0.0164)		(0.0163)		(0.0162)
ΔTime Frame		0.0308***		0.0335***		0.0307***		0.0336***		0.0337***		0.0335***
		(0.0111)		(0.0118)		(0.0112)		(0.0118)		(0.0115)		(0.0119)
Risk tolerance		0.0244**		0.0256**		0.0234**		0.0241**		0.0263**		0.0270**
		(0.0105)		(0.0108)		(0.0103)		(0.0104)		(0.0107)		(0.0110)
ΔEmotions		0.0394**		0.0434***		0.0389**		0.0438***		0.0428***		0.0451***
		(0.0150)		(0.0141)		(0.0149)		(0.0143)		(0.0143)		(0.0142)
Vulnerable			0.0711***	0.0416**								
			(0.0170)	(0.0159)								
COVID-19 Death					0.1155***	0.0757***						
					(0.0268)	(0.0214)						
Tested Positive							0.0740***	0.0268				
							(0.0169)	(0.0174)				
Tested Positive Family/Friends									0.0500***	0.0187		
									(0.0157)	(0.0152)		
Tested Positive Self									0.1840***	0.0887***		
									(0.0346)	(0.0299)		
COVID-19 Risk Perception											0.0304***	0.0171***
											(0.0057)	(0.0053)
Female	-0.0597***	-0.0372**	-0.0586***	-0.0362*	-0.0572***	-0.0363*	-0.0580***	-0.0356*	-0.0549***	-0.0337*	-0.0567***	-0.0349*
	(0.0170)	(0.0182)	(0.0173)	(0.0186)	(0.0169)	(0.0184)	(0.0173)	(0.0183)	(0.0173)	(0.0184)	(0.0175)	(0.0187)
Location	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.0557**	-0.0948***	-0.0688***	-0.1060***	-0.0604***	-0.0985***	-0.0625***	-0.0968***	-0.0607***	-0.0991***	-0.1513***	-0.1527***
	(0.0211)	(0.0277)	(0.0211)	(0.0282)	(0.0208)	(0.0277)	(0.0216)	(0.0289)	(0.0213)	(0.0284)	(0.0255)	(0.0241)
Observations	1,031	1,031	1,031	1,031	1,031	1,031	1,031	1,031	1,031	1,031	1,031	1,031
Adj. R-squared	0.0720	0.240	0.0554	0.237	0.0719	0.245	0.0569	0.234	0.0673	0.237	0.0555	0.237

This table presents results for OLS regressions with robust standard errors clustered by 46 states (reported in brackets). The dependent variable used is the categorical, ordered variable ΔInvestments (see section 3.2.). Definitions and measurements of Affected, %Savings, ΔCapacity, ΔTime, Risk Tolerance, ΔEmotions, Vulnerable, COVID-19 Death, Tested Positive are explained in notes to Table 1 and Table 2. The definition and measurement of location and time is explained in Table 4 notes. Tested Positive Family/Friends is a dummy variable taking the value 1 if the respondent knows someone in their family or circle of friends who tested positive for COVID-19 0 otherwise. Tested positive self is a dummy variable taking the value 1 if the respondent tested positive for COVID-19 and 0 otherwise. COVID-19 Risk perception is a categorical variable measuring the respondents' subjective risk perception on COVID-19. It takes values between 0 (Extremely unlikely to catch COVID-19) to 4 (Extremely likely to catch COVID-19). *,** and *** represent significance at 10%, 5% and 1% levels.

Table 9
Regression results on % investments, core independent variables, and savings' goals.

Dep. Var. % Investments	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Affected	0.1180***	0.0875***	0.1046***	0.1082***	0.0991***	0.1146***	0.0941***	0.0621***
	(0.0302)	(0.0263)	(0.0331)	(0.0285)	(0.0310)	(0.0294)	(0.0305)	(0.0259)
% Savings		0.3618***						0.3368***
		(0.0412)						(0.0443)
ΔCapacity			0.0542***		0.0457**			0.0254
			(0.0193)		(0.0190)			(0.0166)
ΔTime Frame				0.0487***	0.0376***			0.0310**
				(0.0128)	(0.0122)			(0.0115)
Risk tolerance						0.0320***		0.0247**
						(0.0118)		(0.0103)
ΔEmotions							0.0707***	0.0364**
							(0.0175)	(0.0151)
ΔPromotion Goals	0.0280***	0.0127	0.0245**	0.0258***	0.0234**	0.0266***	0.0178*	0.0044*
	(0.0091)	(0.0092)	(0.0096)	(0.0090)	(0.0094)	(0.0088)	(0.0109)	(0.0095)
ΔPrevention Goals	0.0292*	0.0201	0.0276*	0.0292*	0.0278*	0.0297*	0.0247	0.0181
	(0.0161)	(0.0142)	(0.0154)	(0.0158)	(0.0153)	(0.0156)	(0.0166)	(0.0136)
Female	-0.0576***	-0.0440**	-0.0542***	-0.0565***	-0.0539***	-0.0528***	-0.0533***	-0.0367**
	(0.0171)	(0.0173)	(0.0183)	(0.0172)	(0.0181)	(0.0170)	(0.0173)	(0.0180)
Location	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.1687***	-0.1180***	-0.2002***	-0.2081***	-0.2256***	-0.1925***	-0.0969***	-0.1428***
	(0.0372)	(0.0321)	(0.0429)	(0.0396)	(0.0433)	(0.0352)	(0.0310)	(0.0320)
Observations	1,031	1,031	1,031	1,031	1,031	1,031	1,031	1,031
Adj. R-squared	0.0827	0.222	0.0987	0.0945	0.105	0.0864	0.1030	0.2400

This table presents results for OLS regressions with robust standard errors clustered by 46 states (reported in brackets). The dependent variable used is the continuous variable % Investments (see section 3.2.). Location and Time are explained in Table 4 notes. Other variables' definitions and measurements are explained in section 3.2. Promotion and Prevention Savings Goals are ordered variables which take the values 0 (Decrease), 1 (No Change), and 2 (Increase). Decrease is used as reference category. *,** and *** represent significance at 10%, 5% and 1% levels.

the dependent variable, and only *Affected,* time and location as independent variables. Personal experience with COVID-19 has a positive and significant effect on the level of stock holdings of participants. Retail investors affected by the pandemic are 18.63% more likely to buy only stocks. Column (2) presents regression results using stocks during the pandemic as dependent variable and all the independent variables used in our core model from Table 5. The positive relationship between COVID-19 personal experience and stock holdings holds, with a marginal effect of 15.48%. An increase in the level of savings also has a positive effect on stock holdings, suggesting that an increase in savings is associated with a 4.16% marginal effect. Risk tolerance and ΔEmotions also have a positive and significant effect on stock holdings. ΔCapacity and ΔTime Frame do not have a statistically significant effect on stock holdings. A very similar pattern emerges in columns (3) and (4) when considering bond holdings during the pandemic as the dependent variable. As illustrated in column (4) those personally affected by the pandemic are 22.97% more likely to buy only bonds. Similarly, column (6) shows that participants affected by COVID-19 are 18.56% more likely to increase their cryptocurrency holdings. Overall, the likelihood to purchase any of the assets increases for investors affected by COVID-19. The impact is highest for cryptocurrencies and stocks. These results confirm the literature findings that retail investors raise their equity holdings during COVID-19 (Chiah & Zhong, 2020; Luo et al., 2022; Ortmann et al., 2020; Pagano et al., 2021; Priem, 2021; Talwar, Talwar, Tarjanne, & Dhir, 2021) and also invest in cryptocurrencies as a safe haven asset during this period (Conlon et al., 2020; Corbet, Hou, Hu, Larkin and Oxley, 2020a; Dwita Mariana et al., 2021; Mnif et al., 2020).

6. Robustness checks

We perform a series of robustness checks to verify the validity of our main findings. Firstly, in unreported results, we replicate all our regression results using robust standard errors that were not clustered by respondents' state instead, and our results hold. For brevity we do not display those results here, but they are available upon request.

We replicated all our main results using ordered probit models with robust standard errors clustered and not clustered by state, and the ordinal dependent variable ΔInvestments and ΔSavings instead of the continuous variables used in model (1). Our main findings are confirmed except for the results of the gender variable, which is negative, but not statistically significant.

Secondly, as Panel B from Table 5 showed evidence of small correlations among some of the independent variables, we conducted a variance inflation factor (VIF) analysis to test for multicollinearity in our models and found no evidence of multicollinearity[30].

We controlled for other variables which are not reported in this paper. For instance, we controlled for ΔLiquidity alongside ΔCapacity and ΔTime Frame. The difference in level of liquidity (ΔLiquidity) is constructed with a similar approach and based on the same methodology as Capacity and Time. Liquidity is defined as the investor's urgency to access their investments in case of unforeseen circumstances. ΔLiquidity has no statistically significant effect on ΔInvestments.

We also test the effect of respondents' financial advice seeking behaviours and investors' self-reported investment experience, showing a positive relationship between these variables and an increase in investments. However, when introducing investment experience in the core model, the coefficient is no longer statistically significant. Hence, we exclude this variable from the main model specification.

A series of demographic variables are also controlled for including age, ethnicity, marital status, education, employment status, religious views, and political affiliations. None of the demographic variables have a significant effect on % Δ Investments nor ΔInvestments.

The period following the COVID-19 outbreak is also marked by low interest rates and increased trading in cryptocurrencies seen as safe haven assets. For this reason, we include daily Bitcoin returns, and yields for US T-Bills on the dates when our respondents filled in the online survey. The effects of Bitcoin and yields on ΔInvestments are not

[30] If a predictor has large VIF values, then it might be collinear with other predictors in the models. Denis (2020) states that VIF values between 5 and 10 could indicate multicollinearity, while Hair and Babin (2018) state that VIF values smaller than 10 are acceptable. In our analysis all VIF values lie between 1 and 5, hence no evidence of multicollinearity is found.

Table 10
Summary statistics for stocks, bonds and cryptocurrencies.

Panel A - Cross-tabulation of stocks during the pandemic and personal experience with COVID-19

Stocks	Not affected	Affected	Total
Neither sold nor bought	263	12	275
	95.64%	4.36%	100%
Only Sold	62	20	82
	75.61%	24.39%	100%
Mainly sold	87	54	141
	61.70%	38.30%	100%
Mainly bought	179	84	263
	68.06%	31.94%	100%
Only bought	172	98	270
	63.70%	36.30%	100%
Total	763	268	1,031
	74.01%	25.99%	100%

Panel B - Cross-tabulation of bonds' during the pandemic and personal experience with COVID-19

Bonds	Not affected	Affected	Total
Neither sold nor bought	435	18	453
	96.03%	3.97%	100%
Only Sold	39	15	54
	72.22%	27.78%	100%
Mainly sold	87	54	141
	61.70%	38.30%	100%
Mainly bought	91	85	176
	51.70%	48.30%	100%
Only bought	111	96	207
	53.62%	46.38%	100%
Total	763	268	1,031
	74.01%	25.99%	100%

Panel C - Cross-tabulation of cryptocurrencies during the pandemic and personal experience with COVID-19

Cryptocurrencies	Not affected	Affected	Total
Neither sold nor bought	491	24	515
	95.34%	4.66%	100%
Only Sold	35	20	55
	63.64%	36.36%	100%
Mainly sold	71	42	113
	62.83%	37.17%	100%
Mainly bought	87	92	179
	48.60%	51.40%	100%
Only bought	79	90	169
	46.75%	53.25%	100%
Total	763	268	1,031
	74.01%	25.99%	100%

This table presents joint frequencies and percentages of categorical variables Stocks, Bonds, Cryptocurrencies and Affected. Panel A presents join frequencies and row percentages between Stocks and Affected. Chi-Squared for this panel is 97.8177***. Panel B presents join frequencies and row percentages between Bonds and Affected. Chi-Squared for this panel is 215.5782***. Panel C presents join frequencies and row percentages between Cryptocurrencies and Affected. Chi-Squared for this panel is 257.5805***. *,** and *** represent significance at 10%, 5% and 1% levels.

statistically significant. However, it is essential to note that our dataset is a cross-sectional, and it is not possible to consistently capture time series and expectations of returns. Analysing the connections between retail investors financial decisions and financial markets movement during the COVID-19 pandemic is a topic of interest for further research.

7. Conclusions

In this paper we investigate retail investors behaviour during the first wave of COVID-19 between July and August 2020 in the US. We collect online survey responses from 1,031 US retail investors who hold at least mutual funds and a savings account. We shed light on the relationship between changes in the levels of investments before and after the pandemic, and the personal experience of retail investors with COVID-19. We account for factors affecting changes in investments such as changes in savings, risk capacity, risk tolerance, and investors' emotions.

In the context of the COVID-19 health crisis, many academics analyse the stock market crash (Anser et al., 2021; Mazur et al., 2021; Zhang et al., 2020) and volatility (Al-Awadhi et al., 2020; Baek et al., 2020; Liu et al., 2021; Zaremba et al., 2020). Few studies investigate the effects of COVID-19 on households and retail investors (Chiah & Zhong, 2020; Hurwitz et al., 2021; Ortmann et al., 2020; Pagano et al., 2021; Talwar, Talwar, Kaur, et al., 2021; Talwar, Talwar, Tarjanne, & Dhir, 2021). The latter evidence does not yet explore the effect of personal experience of COVID-19 on retail investors' financial decision-making. Our paper contributes to the behavioural finance literature by shedding light on the link between the increased level of investments by retail investors during the COVID-19 pandemic, and their personal experience of COVID-19, explained through salience theory, optimism bias and terror management theory.

We show that respondents with direct personal experiences with COVID-19 are more likely to increase the level of their investments (Brown et al., 2018; Kahsay & Osberghaus, 2018). We also find that an increase in the level of savings (Campbell, 2006; Shum & Faig, 2006), as well as promotion savings' goals (Changwony et al., 2021; Gerhard et al., 2018) are also associated with increased investments. Higher risk tolerance (D'Hondt et al., 2021; Guiso et al., 2018; Hoffmann et al., 2015), more capacity to bear losses (Brooks et al., 2019) and longer investments' time frame (Rieger et al., 2020) are all associated with increased investments. We also document a positive relationship between positive emotions and investments (Alempaki et al., 2019; Breaban & Noussair, 2018; Delis & Mylonidis, 2015; Fehr-Duda et al., 2011; Gabbi & Zanotti, 2019). We also find evidence that compared to male respondents, females decrease their investments during COVID-19 (Bernasek & Shwiff, 2001; Brooks et al., 2019; Odean, 1999; Phan et al., 2018; Rau, 2014). We further explore retail investors' asset allocations and the effects of personal experience with COVID-19, showing that the positive impact of personal experience with COVID-19 on asset allocation is highest for cryptocurrencies and stocks. These results confirm the literature findings that retail investors raise their equity holdings during COVID-19 (Chiah & Zhong, 2020; Luo et al., 2022; Ortmann et al., 2020; Pagano et al., 2021; Priem, 2021; Talwar, Talwar, Tarjanne, & Dhir, 2021) and also invest in cryptocurrencies as a safe haven asset during this period (Conlon et al., 2020; Corbet, Hou, Hu, Larkin and Oxley, 2020a; Dwita Mariana et al., 2021; Mnif et al., 2020).

Our findings are important to retail investors and financial advisors. Considering that investors who have personal experience with COVID-19 are more likely to increase their investments during the crisis, financial advisors should take into account both investment opportunities and underlying behavioural factors that can affect decision-making such as personal experience with COVID-19.

The democratisation of finance brought about by technological innovations has made investment opportunities readily available to the public at relatively low costs. Although a positive innovation, open access to investment platforms also leaves retail investors exposed to misinformed financial decisions. Evidence shows that retail investors made riskier investment choices during COVID-19 choosing highly leveraged firms (Clark et al., 2021) or impulse selling energy ETFs at lower prices (Shrikanth, 2020). Our findings support existing evidence of increased trading amongst retail investors during COVID-19, but we also show that this behaviour can be exacerbated by negative personal with COVID-19. A combination of death anxiety due to experience with COVID-19, increased savings and easy access to investment opportunities could result in increased risk-taking for retail investors. On average taking more risks can make investors wealthier but can also

Table 11
Regression results on investments in stocks, bonds or cryptocurrencies and core independent variables during COVID-19.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.	Stocks	Stocks	Bonds	Bonds	Cryptocurrencies	Cryptocurrencies
Affected	0.5857***	0.4925***	1.0140***	0.9229***	1.1134***	0.9770***
	(0.0716)	(0.0751)	(0.0738)	(0.0757)	(0.0776)	(0.0802)
	18.63%	15.48%	25.60%	22.97%	22.34%	18.56%
ΔSavings		0.1323***		0.0763*		0.0617
		(0.0410)		(0.0447)		(0.0477)
		4.16%		1.90%		1.17%
ΔCapacity		0.0041		0.0185		0.0468
		(0.0429)		(0.0451)		(0.0481)
		0.13%		0.46%		0.89%
ΔTime Frame		0.0258		-0.0196		0.0110
		(0.0426)		(0.0452)		(0.0505)
		0.81%		0.49%		0.21%
Risk tolerance		0.2742***		0.1347**		0.2122***
		(0.0530)		(0.0563)		(0.0607)
		8.62%		3.35%		4.03%
ΔEmotions		0.0675*		0.1657***		0.2871***
		(0.0390)		(0.0415)		(0.0429)
		2.12%		4.12%		5.46%
Location	Yes	Yes	Yes	Yes	Yes	Yes
Time	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,031	1,031	1,031	1,031	1,031	1,031
Pseudo R-squared	0.0293	0.0425	0.0735	0.0820	0.105	0.127

This table presents results for Ordered Probit regressions with robust standard errors clustered by 46 states (reported in brackets). The dependent variables used are the categorical, ordered variables Stocks in columns (1)-(2), Bonds in columns (3)-(4), and Cryptocurrencies in columns (5)-(6). Stocks, Bonds and Cryptocurrencies are categorical variables taking the values 0 ("I haven't bought or sold…"), 1 ("I have only sold…"), 2 ("I have mainly sold…"), 3 ("I have mainly bought…"), and 4 ("I have only bought…"). Location and Time are explained in Table 4 notes. Other variables' definitions and measurements are explained in notes to Table 1. Marginal effects are reported in percentages. *,** and *** represent significance at 10%, 5% and 1% levels.

result in bigger losses. Personal experience with COVID-19 can act as a trigger, increase the gap between more cautious investors and investors who are more risk tolerant, that have higher risk capacity and increased investments' time horizon. A health crisis like COVID-19 can present good investment opportunities for retail investors. However, investment decisions should be taken with caution, so that investors can make informed rather than impulsive decisions.

Our findings have additional implications for policy makers and retail investors. A health crisis such as the one caused by COVID-19 is unprecedented and can lead to irrational financial decisions under uncertainty. We find that retail investors affected by the pandemic in personal ways (e.g., testing positive, knowing someone who died because of COVID-19 or being in a vulnerable health category) are more likely to invest more during COVID-19. Therefore, policymakers must be aware of this relationship and implement "nudging" policies to inform retail investors of the risks of making financial decisions and support vulnerable investors.

Our findings show that even though on average investors financial resilience (i.e., capacity to bear losses) decreased after COVID-19, those investors who are more resilient and capable of investing continue doing so after COVID-19. This result contributes to some industry findings suggesting that investors who experience a growth in income or savings during COVID-19 (i.e. more financially resilient), are inclined to use their savings towards investments to protect against future financial instability (Deloitte, 2022). Our findings imply that personal experience with COVID-19 changed investors perspective and long-term goals. This provides new opportunities for financial advisors and funds platforms to provide investors with advice and investment products suitable for their goals. Financial advisors should provide opportunities to retail investors to invest during a crisis in a way that fits their goals and risk appetite. However, while doing so it is important to bear in mind that a crisis like COVID-19 can act as additional motivation potentially triggering investors to take more risk than they normally would.

Finally, we recognise some limitations of our study. As our dataset is a cross-section, the level of investments, savings, capacity to bear losses, time frame and emotions before and after the pandemic are self-reported by the respondents, which could be susceptible to over or under estimation of these factors. As the present study is based on a cross-sectional dataset, capturing a snapshot of retail investors' behaviours at a point in time, it is not econometrically sound to introduce other market variables (e.g., stock market returns, macroeconomic factors, or market events). To achieve this, a panel or time series dataset should be used which is beyond the scope of this study. Other researchers have employed similar methods of using cross-sectional survey data to explore behaviours during COVID-19 (Hurwitz et al., 2021; Talwar, Talwar, Kaur, et al., 2021; Talwar, Talwar, Tarjanne, & Dhir, 2021), supporting the validity of cross-sectional surveys as a research method and its applicability to exploring retail investors' behaviour during COVID-19. Moreover, as we use a cross-sectional dataset which does not allow for testing causation, this study is limited in isolating a causal relationship between personal experience with COVID-19 and investment decisions. To study the effects of personal experience with COVID-19 on investments, we use a multivariate setting to account for the joint effect of risk capacity, risk tolerance, personal experience, and demographics. The positive, significant effect of personal experience holds when controlling for other variables. Due to the limitations of the cross-sectional dataset, we cannot unfold causality directions.

Therefore, further research could employ a panel dataset by implementing two waves of surveys to capture this difference more accurately at different moments in time. The period following the COVID-19 outbreak is also marked by low interest rates and increased trading in cryptocurrencies seen as safe haven assets. Further research should use a panel or timeseries dataset to capture the connections between retail investors' financial decisions and financial markets movement during the COVID-19 pandemic, as well as explore a causal relationship between investments and personal experience with COVID-19.

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Data availability

The authors do not have permission to share data.

Appendix A. Survey

Dear participant,

We would be very grateful if you could assist our research by participating in the following study. This is a study conducted by a team of researchers from the Finance Department of the University of Reading, UK. It explores people's general attitudes towards financial investments and savings.

Your participation will take approximately 20 minutes, during which you will be requested to complete several tasks and you will be provided with instructions before each task as follows:

- Questionnaire about your savings and investment habits
- Risk tolerance and financial literacy quiz
- Questionnaire about your current health
- Questionnaire about your basic demographic information

Please note that 2 of the questions are harder to view on mobile phones, so we recommend that you use a PC if possible.

Note that you will not be able to go back to previous pages throughout the whole study.

We want to assure you that your data will be kept confidential and secure, with only an anonymous number identifying it. The data will be utilized solely for research purposes. Remember, participation in the study is voluntary, you can withdraw at any time without having to provide any reason for doing so.

Thank you very much!

Please read the statements below and click next if you are happy to proceed.

1. I understand that my participation in the study is voluntary and that I have an option to withdraw at any point of time without having to provide a reason.

2. I have read the information about this study in full.

Quotas

Q1 Currently, do you have a savings account at a bank?
○ Yes
○ No
Q2 Do you have any other financial investments other than a savings account?
○ Yes
○ No
Q3 What is your age?
○ 18 - 23 (0)
○ 24 - 29 (1)
○ 30 - 39 (2)
○ 40 - 49 (3)
○ 50 - 59 (4)
○ 60 - 69 (5)
○ 70 or older (6)
Q4 What is your age? Please insert below.
Q5 Where do you currently live?
○ California
○ Florida
○ Texas
○ New York
○ Northeast (except New York)
○ Midwest
○ South (except Florida and Texas)
○ West (except California)
Q6 What is your gender?
○ Male (0)
○ Female (1)

Risk Tolerance

Q7 You are on a TV game show and can choose one of the following. Which would you take?
○ $1,000 in cash (1)
○ A 50% chance at winning $5,000 (2)
○ A 25% chance at winning $10,000 (3)
○ A 5% chance at winning $100,000 (4)

Q8 You have just finished saving for a "once-in-a-lifetime" vacation. Three weeks before you plan to leave you lose your job. You would:
○ Cancel the vacation (1)
○ Take a much more modest vacation (2)
○ Go as scheduled, reasoning that you need the time to prepare for a job search (3)
○ Extend your vacation, because this might be your last chance to go first-class (4)
Q9 If you unexpectedly received $20,000 to invest, what would you do?
○ Deposit it in a bank account or money market account (1)
○ Invest it in safe high-quality bonds or bond mutual funds (2)
○ Invest it in stocks or stock mutual funds (3)
Q10 In terms of experience, how comfortable are you investing in stocks or stock mutual funds?
○ Not at all comfortable (1)
○ Somewhat comfortable (2)
○ Very comfortable (3)
Q11 When you think of the word "risk", which of the following words comes to mind first?
○ Loss (1)
○ Uncertainty (2)
○ Opportunity (3)
○ Thrill (4)
Q12 Some experts are predicting prices of assets such as gold, jewels, collectibles, and real estate (hard assets) to increase in value. Bond prices may fall; however, experts tend to agree that government bonds are relatively safe. Most of your investment assets are now in high interest government bonds. What would you do?
○ Hold the bonds (1)
○ Sell the bonds, put half the proceeds into money market accounts, and the other half into hard assets (2)
○ Sell the bonds and put the total proceeds into hard assets (3)
○ Sell the bonds, put all the money into hard assets, and borrow additional money to buy more (4)
Q13 Given the best and worst case returns of the four investment choices below, which would you prefer?
○ $200 gain best case; $0 gain/loss worst case (1)
○ $800 gain best case; $200 loss worst case (2)
○ $2,600 gain best case; $800 loss worst case (3)
○ $4,800 gain best case; $2,400 loss worst case (4)
Q14 In addition to whatever you own, you have been given $1,000. You are now asked to choose between:
○ A sure gain of $500 (1)
○ A 50% chance to gain $1,000 and a 50% chance to gain nothing (3)
Q15 In addition to whatever you own, you have been given $2,000. You are now asked to choose between:
○ A sure loss of $500 (1)
○ A 50% chance to lose $1,000 and a 50% chance to lose nothing (3)
Q16 Suppose a relative left you an inheritance of $100,000, stipulating in the will that you invest ALL the money in ONE of the following choices. Which one would you select?
○ A savings account or money market mutual fund (1)
○ A mutual fund that owns stocks and bonds (2)
○ A portfolio of 15 common stocks (3)
○ Commodities like gold, silver, and oil (4)
Q17 If you had to invest $20,000, which of the following investment choices would you find most appealing?
○ 60% in low-risk investments, 30% in medium-risk investments, 10% in high-risk investments (1)
○ 30% in low-risk investments, 40% in medium-risk investments, 30% in high-risk investments (2)
○ 10% in low-risk investments, 40% in medium-risk investments, 50% in high-risk investments (3)
Q18 Your trusted friend and neighbour, an experienced geologist, is putting together a group of investors to fund an exploratory gold mining venture. The venture could pay back 50 to 100 times the investment if successful. If the mine is a bust, the entire investment is worthless. Your friend estimates the chance of success is only 20%. If you had the money, how much would you invest?
○ Nothing (1)
○ One month's salary (2)
○ Three month's salary (3)
○ Six month's salary (4)

Self-reported savings behaviour

Q19 Are you currently receiving any professional financial advice, and how often do you seek financial advice?
○ Yes, I currently receive financial advice (1)
○ No, I don't currently receive any financial advice (3)
○ I seek advice for all my financial decisions (7)
○ I seek advice for most of my financial decisions (8)
○ I seek advice for about half of my financial decisions (9)
○ I seek advice for some of my financial decisions (10)
○ I never seek financial advice (11)
Q20 Disposable income represents income remaining after deduction of taxes and social security charges, available to be spent or saved as one wishes.

How much of your disposable income have you saved **before and during** the COVID-19 pandemic?

	0% (0)	0% - 10% (1)	10% - 20% (2)	20% - 30% (3)	30% or more (4)
Before the COVID-19 pandemic	○	○	○	○	○
During the COVID-19 pandemic	○	○	○	○	○
Please tick "20% - 30%"	○	○	○	○	○

Q21 Since the beginning of the COVID-19 pandemic, by how much have your savings increased OR decreased with respect to disposable income (as percentage)?

Please insert **a percentage** if appropriate and leave out the percentage sign "%".

○ Increased by (%) _____

○ Stayed the same (%)_____

○ Decreased by (%)_____

Q22 During the COVID-19 pandemic, did you have to access money from a savings account that you weren't planning to use otherwise, or had to borrow money from friends/family?

○ Yes, I had to access money from my savings account

○ Yes, I had to borrow money from friends/family

○ Yes, both

○ No, neither

Q23 What were your savings goals **before and after** the COVID-19 pandemic?

	Before COVID-19 pandemic					After COVID-19 pandemic				
	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
For unexpected expenditures (a rainy day)	○	○	○	○	○	○	○	○	○	○
To pay for bills (e.g., gas, electricity, etc)	○	○	○	○	○	○	○	○	○	○
For a deposit to buy a property	○	○	○	○	○	○	○	○	○	○
For a planned purchase in the future/upcoming event (e.g., car, fridge, marriage etc)	○	○	○	○	○	○	○	○	○	○
For holidays or other leisure expenditures	○	○	○	○	○	○	○	○	○	○
Because it's a good investment in the long-term	○	○	○	○	○	○	○	○	○	○
In order to repay a loan	○	○	○	○	○	○	○	○	○	○
For planned maintenance costs in the future (e.g., car repairs, home renovation, etc)	○	○	○	○	○	○	○	○	○	○
Please tick "Strongly Disagree" for both	○	○	○	○	○	○	○	○	○	○

Q24 How much of your disposable income have you invested **before and during** the COVID-19 pandemic?

	0% (0)	0% - 10% (1)	10% - 20% (2)	20% - 30% (3)	30% or more (4)
Before the COVID-19 pandemic	○	○	○	○	○
During the COVID-19 pandemic	○	○	○	○	○

Q25 Since the beginning of the COVID-19 pandemic, by how much have your investments increased OR decreased with respect to disposable income (as percentage)?

Please insert a percentage if appropriate and leave out the percentage sign "%".

○ Increased by (%) _____

○ Stayed the same (%) _____

○ Decreased by (%) _____

Q26 Please report your level of financial risk taking **before and after** the COVID-19 pandemic.

Read each item and then mark the appropriate answer, using the scale ranging from "Very risk averse" to "Very risk tolerant".

	Very risk-averse (0)	A little risk-averse (1)	Risk neutral (2)	Quite risk-tolerant (3)	Very risk-tolerant (4)
Before the COVID-19 pandemic	○	○	○	○	○
After the COVID-19 pandemic	○	○	○	○	○

Q27 In your financial decisions during the COVID-19 pandemic:

○ I have been only buying financial assets, as I believe their market value is below their true value, and the market will bounce back

○ I have been mainly buying financial assets, as I believe their market value is below their true value, and the market will bounce back

○ I haven't changed my investments

○ I have been mainly selling financial assets, as I believe that the current market trend will persist

○ I have been only selling financial assets, as I believe that the current market trend will persist

Q28 During the COVID-19 pandemic have you bought/sold individual stocks?

○ Yes, I have bought stocks

○ I have mainly bought stocks, and sold few stocks

○ I have mainly sold stocks, and bought few stocks

○ Yes, I have sold stocks

○ No, I haven't bought or sold stocks

Q29 During the COVID-19 pandemic have you purchased real estate (for instance a house)?

○ Yes, I have purchased real estate

○ No, I haven't purchased real estate

○ No, I wanted to but I decided to postpone the purchase

○ No, I wanted to but I couldn’t afford to buy the property anymore

Q30 During the COVID-19 pandemic have you invested in bonds?

○ Yes, I have bought bonds

○ I have mainly bought bonds, and sold few bonds

○ I have mainly sold bonds, and bought few bonds

○ Yes, I have sold bonds

○ No, I haven't bought or sold bonds

Q31 During the COVID-19 pandemic have you invested in cryptocurrencies?

○ Yes, I have bought cryptocurrencies

○ I have mainly bought cryptocurrencies, and sold a few cryptocurrencies

○ I have mainly sold cryptocurrencies, and bought a few cryptocurrencies

○ Yes, I have sold cryptocurrencies

○ No, I haven't bought or sold cryptocurrencies

Q32 Which of the following best describes your current portfolio composition?

○ 100% bonds and cash

○ 70% bonds and cash - 30% equities

○ 50% bonds and cash - 50% equities

○ 30% bonds and cash- 70% equities

○ 100% equities

Financial literacy and experience

Q33 How would describe your level of experience with financial investing?

○ Experienced (2)

○ Moderately experienced (1)

○ Little or no experience (0)

Q34 How would you describe your financial knowledge?

○ Extremely knowledgeable (2)

○ Moderately knowledgeable (0)

○ Little or no knowledge (1)

Q35 Suppose you had $100 in a savings account and the interest rate was 2 percent per year. After 5 years, how much do you think you would have in the account if you left the money to grow?

○ More than $102

○ Exactly $102

○ Less than $102

Q36 Imagine that the interest rate on your savings account was 1 percent per year and inflation was 2 percent per year. After one year, with the money in this account, would you be able to buy:

○ More than today
○ Exactly the same as today
○ Less than today

Q37 Do you think that the following statement is true or false? "Buying a single company stock usually provides a safer return than a stock mutual fund."
○ True
○ False

Q38 If interest rates rise, what will typically happen to bond prices? Rise, fall, stay the same, or is there no relationship.
○ Rise
○ Fall
○ Stay the same
○ No relationship

Q39 A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage but the total interest over the life of the loan will be less.
○ True
○ False

Financial resiliency

Q40 The capacity to bear losses is the extent to which your employment income exceeds your outgoings.
How would you rate your capacity to bear financial losses **before and after** the COVID-19 pandemic?

	Low capacity for loss - My income was/is lower than my spending (0)	Medium capacity for loss - My income was/is about the same as my spending (1)	High capacity for loss - My income exceeded/ exceeds my spending (2)
Before the COVID-19 pandemic	○	○	○
After the COVID-19 pandemic	○	○	○

Q41 Liquidity indicates how likely it is that you would need access to your investment under consideration, if you hit unforeseen circumstances.
How would you rate your expected need for financial liquidity **before and after** the COVID-19 pandemic?

	Low need for liquidity - I had/have other savings which I can use for most needs (2)	Medium need for liquidity - I might need access to my investments (1)	High need for liquidity - I might need access to my investments due to a lack of alternative resources (0)
Before the COVID-19 pandemic	○	○	○
After the COVID-19 pandemic	○	○	○

Q42 How would you describe the time frame of your investments before and after the COVID-19 pandemic?

	Short-term (<5 years) (0)	Medium-term (5-10 years) (1)	Long-term (>10 years) (2)
Before the COVID-19 pandemic	○	○	○
After the COVID-19 pandemic	○	○	○

Fear

Q43 **At the moment** I am experiencing the emotion - fear - because of the COVID-19 pandemic.
○ Strongly agree (5)
○ Somewhat agree (4)
○ Neither agree nor disagree (3)
○ Somewhat disagree (2)
○ Strongly disagree (1)

Q44 **Before** the COVID-19 lock-down period I was experiencing the emotion - fear - because of the COVID-19 pandemic.
○ Strongly agree (5)
○ Somewhat agree (4)
○ Neither agree nor disagree (3)
○ Somewhat disagree (2)
○ Strongly disagree (1)

Q45 Please rate how fearful you feel about the following because of the COVID-19 pandemic:

	Extremely afraid (5)	Very afraid (4)	Afraid (3)	Slightly afraid (2)	Not afraid at all (1)
Loved ones' health	○	○	○	○	○
Global economy	○	○	○	○	○
Job security	○	○	○	○	○
Social life	○	○	○	○	○
Permanent changes in society and social interactions	○	○	○	○	○
Please tick "Slightly afraid"	○	○	○	○	○

Q46 Have you, someone in your family or close friends tested positive for the coronavirus?
○ I have tested positive
○ Someone in my family has tested positive
○ Both me and someone in my family have tested positive
○ Neither me nor someone in my family have tested positive
Q47 Has someone in your family or close group of friends passed away because of the coronavirus?
○ Yes (1)
○ No (0)
○ Prefer not to say
Q48 How likely do you think it is that you or someone close to you will catch the coronavirus/COVID-19 in the next 6 months?
○ Extremely likely (5)
○ Somewhat likely (4)
○ Neither likely nor unlikely (3)
○ Somewhat unlikely (2)
○ Extremely unlikely (1)
Q49 This scale consists of a number of words that describe different feelings and emotions. Please indicate to what extent you generally felt this way, that is, how you felt on average **before and after** the COVID-19 pandemic. Read each item and then mark the appropriate answer, using the scale ranging from "Very slightly or not at all" to "Extremely or always".

	Before COVID-19					After COVID-19				
	Very slightly or not at all	A little	Moderately	Quite a bit	Extremely or always	Very slightly or not at all	A little	Moderately	Quite a bit	Extremely or always
Joy	○	○	○	○	○	○	○	○	○	○
Excitement	○	○	○	○	○	○	○	○	○	○
Inspired	○	○	○	○	○	○	○	○	○	○
Enthusiastic	○	○	○	○	○	○	○	○	○	○
Strong	○	○	○	○	○	○	○	○	○	○
Determined	○	○	○	○	○	○	○	○	○	○
Active	○	○	○	○	○	○	○	○	○	○
Nervous	○	○	○	○	○	○	○	○	○	○
Sadness	○	○	○	○	○	○	○	○	○	○
Anger	○	○	○	○	○	○	○	○	○	○
Fear	○	○	○	○	○	○	○	○	○	○
Shame	○	○	○	○	○	○	○	○	○	○
Disgust	○	○	○	○	○	○	○	○	○	○
Anxiety	○	○	○	○	○	○	○	○	○	○
Please tick "Quite a bit" for both	○	○	○	○	○	○	○	○	○	○

Health and fitness

Q50 To your knowledge, are you at high risk (vulnerable) from coronavirus, because of existing health conditions?
○ Yes (1)
○ No (0)

Q51 Which of the following best describes your overall health?
○ Very unhealthy - Serious medical history/Very poor diet and no exercise (0)
○ Unhealthy - Some serious medical history/Poor diet and little exercise (1)
○ Average - Some medical history/No set diet or fitness regime (2)
○ Healthy - Little or no medical history/Balanced diet and active lifestyle (3)
○ Very healthy - No previous medical history/Balanced diet and very active lifestyle (4)

Q52 Do you smoke?
○ Yes, regularly (3)
○ Yes, occasionally (2)
○ No, not anymore (1)
○ No, I have never smoked (0)

Other

Q53 Which of the following best describes your employment situation during the COVID-19 pandemic period?
○ I am working from home
○ I lost my job
○ I was placed on furlough
○ I am temporarily unable to return to work because of the lock-down
○ I am working as usual, because I am an essential worker
○ Already retired
○ Other (Please specify) _____

Q54 How effective do you think the government measure to limit the spread of coronavirus have been up until now in your country of residence?
○ Extremely effective (4)
○ Very effective (3)
○ Moderately effective (2)
○ Slightly effective (1)
○ Not effective at all (0)

Demographics

Q55 What is your annual gross income?
○ Less than $15,000 (0)
○ $15,000 - $24,999 (1)
○ $25,000 - $34,999 (2)
○ $35,000 - $49,999 (3)
○ $50,000 - $74,999 (4)
○ $75,000 - $99,999 (5)
○ $100,000 - $150,000 (6)
○ More than $150,000 (7)

Q56 What is your annual gross income? Please insert below.
_____

Q57 Please indicate your highest educational level
○ Less than high school diploma
○ High school degree or equivalent
○ Some college, no degree
○ Bachelor's degree
○ Master's degree
○ Professional degree
○ Doctorate

Q58 Please indicate your marital status
○ Single
○ Living together
○ Married or domestic partnership
○ Separated
○ Divorced
○ Widowed
○ Other

Q59 Please specify your ethnicity
○ White
○ Hispanic or Latino
○ Black or African American
○ Native American/American Indian

○ Pacific Islander
○ Asian
○ Other
Q60 What is your employment status?
○ Director/Partner
○ Employed and self-employed (simultaneously)
○ Self-employed
○ Employed
○ House-person
○ Semi-retired
○ Student
○ Not working
○ Retired
Q61 What is your political party affiliation?
○ Democratic Party
○ Republican Part
○ Independent
○ Other (Please specify) _____
Q62 What describes your religious beliefs best?
○ Christianity
○ Islam
○ Judaism
○ Hinduism
○ Buddhism
○ Sikhism
○ Agnosticism/Atheism
○ Other
Q63 **Important! Please Read!**
Here is your ID: ${e://Field/Random%20ID}
Copy this value to paste into MTurk.
When you have copied this ID, please click the next button to submit your survey.

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